SOAP 2024 Annual Meeting

Focusing on the Patient:

Improving individual outcomes & experiences

SYLLABUS

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SOAP 56th Annual Meeting

Focusing on the Patient:
Improving Individual Outcomes & Experiences

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Wednesday, May 1

Thursday, May 2

Friday, May 3

Saturday, May 4

Sunday, May 5

Welcome to Denver!

On behalf of the SOAP Board of Directors and the 2023-2024 Annual Meeting and Live Events Committee, we are delighted to greet you in Denver for the 2024 SOAP 56th Annual Meeting. This year, we welcome you to the Mile High City, where history, culture and nature converge at 5280 feet above sea level. Get ready to connect, learn, play and eat!

The meeting theme is ***"Focusing on the patient: Improving individual outcomes and experiences".*** We are excited to feature themed lectures and panels to explore this topic as well as our historical educational sessions.

Pre-meeting workshops feature hands-on sessions including an all-day ***Focused Assessed Transthoracic Echocardiography (FATE)*** course, and a half-day ***POCUS workshop***. Aligned with the annual meeting theme, we are delighted to feature a special workshop on ***Trauma informed care for optimal outcomes.*** We are thrilled to welcome our Chinese colleagues to this year's ***International Symposium***. Following the pre-meeting events on Wednesday, please join our community in the beautiful Sheraton Downtown Hotel for our ***Welcome Reception*** where friends and colleagues can reunite, and new connections can be formed!

Our meeting will officially open on Thursday May 2nd, with the featured keynote lecture. ***"Honoring the patient experience"*** will be presented by renowned speaker, Susan Burton, who is the host, writer, reporter and co-producer of "The Retrievals", an award-winning podcast series from Serial Productions and the New York Times. This will be followed by a special President's panel, ***"Turning Oops into Ops: Leveraging our opportunities to improve our patients' experiences"*** that will feature international experts sharing a spectrum of insights drawn from research, clinical experience, and personal stories. This will be followed by a lecture from Dr. Nuala Lucas, President of the OAA, entitled ***"Perioperative cardiac arrest in obstetrics: Findings from NAP7".*** Next, the best research of the meeting will be highlighted in the ***Best Paper Competition***. Dr Tracey Vogel will deliver ***"A TIC TALK for anesthesia providers: New insights into the importance of trauma informed care".*** Dr. Leilah Zahedi-Sprung will deliver our ***Society of Maternal Fetal Medicine Session "What's New in Obstetrics?"*** focusing on ***"Post-Roe landscape: Navigating abortion bans".*** Then join us in breakout rooms for the first round of abstract presentations!

On Friday, May 3rd, explore abstract presentations in moderated breakout room sessions followed by the beloved annual ***Gertie Marx competition,*** which highlights trainee research endeavors. Following lunch, join a special session on the ***SOAP State Representative Initiative***, or attend the first of our two ***Oral Research*** presentations. This year, the ***Fred Hehre lecture*** will be given by distinguished honoree Dr. Barbara Scavone. Following these sessions, the first of our three sessions of the ***Sol Shnider Clinical Track*** will occur. This first session will feature talks on challenging topics in OB anesthesia, and the use of neuraxial adjuvants. Concurrently, our ***Research Track*** will feature a panel presentation on ***"How to answer important questions in OB anesthesia: the optimal study design for your research".*** At the end of the day, all Obstetric Anesthesiology Fellows and Residents are welcome to join us for a special reception for trainees.

Saturday May 4th starts bright and early with ***The Research Network Symposium*** from 7am-10am, where research experts provide constructive feedback on ideas and discuss opportunities for collaboration. Registration for this session is required.

- Continued on next page

Separately, our main stage program starts the day with a continuation of the ***Sol Shnider Clinical Track***; this second session will focus on difficult conversations after traumatic events, cutting edge information about uterine atony, and updates on labor analgesia. In the popular ***"Best Case Reports"*** session, our members highlight some of the most challenging and interesting cases we face in obstetric anesthesia. After lunch, join us for the ***Annual ASA Update*** from Dr. Ron Harter, our ASA President. Following the incredible legacy of Dr. Gertie Marx, Drs. Klaus Kjaer and May Pian-Smith will be sharing exciting information about the launch of a first-ever ***Endowment Fund Campaign***, an opportunity for each and every one of us to be part of a ***historic one million dollar infusion of vitality*** to SOAP's future- together, our synergistic efforts will make a huge difference! Don't miss our most anticipated annual lecture, the ***Gerard W. Ostheimer Lecture***, which is presented by Dr. Melissa Bauer with a comprehensive review of the best papers in our field in 2023. Following this lecture, please join us for several important announcements on SOAP initiatives and the annual award presentations. Notably, our ***Distinguished Service Award*** will be presented to Dr Brandan Carvalho. To finish our educational day, we feature abstract presentations, covering a wide spectrum of topics in breakout sessions.

On our last day of the meeting, Sunday May 5th, the programming will still be going strong! Don't miss our ***SOAP/ASRA panel*** which will feature ***"PDPH beyond the guidelines: How to improve patient care,"*** including ways in which we can apply recommendations to clinical scenarios. Our last concurrent sessions of the meeting will include the third **Sol Shnider Track** (featuring perils of intrapartum cesarean deliveries, a lively Pro-Con debate about NPO in labor, and ways to improve patient outcomes by addressing disparities), and the final **Oral Poster Presentation** session. Our meeting concludes with joint Research abstract and Case Report presentations in our breakout rooms.

Want opportunities to Collaborate and Network at the Meeting?

Once again, our **Special Interest Groups (SIGs**) will have an opportunity to meet during the continental breakfast period in the Exhibit Hall on May 3rd, 4th, and 5th prior to the start of the presentations. If you are a member of one of these groups, please join in on the discussion and for any attendee interested in joining one of these groups, please grab some breakfast and pull up a chair to one of the tables.

We're excited to welcome you to Denver!

Sincerely,

Rebecca Minehart, MD, MSHPEd

Annual Meeting and Live Events Committee, Chair

May Pian-Smith, MD, MS

SOAP President

On behalf of the SOAP Board of Directors and the 2024 Annual Meeting & Live Events Committee, we are delighted to welcome you to the Society for Obstetric Anesthesia and Perinatology (SOAP) 56th Annual Meeting, May 1-5, 2024

Educational Program

This meeting is dedicated to Focusing on the Patient: Improving Individual Outsomes & Experiences

Rebecca Minehart, MD
Chair, Annual Meeting and Live Events Committee

May Pian-Smith, MD
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DON'T FORGET!

Your registration also includes the Virtual Highlights event, June 10-11, 2024.

The virtual event will leverage a curated offering of popular recorded content from this in-person event plus new, original content.

Thank You Planning Committees

ANNUAL MEETING AND LIVE EVENTS

Rebecca Minehart, MD, MEd - Chair
Amy Lee, MD – Vice Chair
Tiffany Angelo, DO
Tom Klumpner, MD
Pervez Sultan, MD
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With special thanks to members of the following subcommittees who volunteered their time and expertise to the planning of the 56th Annual Meeting.

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*Special thanks are due to **Ruth Landau, MD**, chair of the Abstract Review Subcommittee, and the dedication of these volunteers who reviewed hundreds of abstracts to help in creating the educational program.*

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Program Information

ACCME Accreditation and Designation Statements

CEU
Accreditation Statement, American Association of Nurse Anesthetists
This program has been prior approved by the American Association of Nurse Anesthesiology for 38.25 Class A CE credits; Code Number 1044361; Expiration Date 5/5/2024.

Overall Accreditation Statement

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Society of Anesthesiologists and the Society for Obstetric Anesthesia & Perinatology.

The American Society of Anesthesiologists is accredited by the ACCME to provide continuing medical education for physicians.

Wednesday Workshops / Symposium

Optional Workshops

8:00am – 5:00pm	FATE Workshop The American Society of Anesthesiologists designates this live activity for a maximum of *8.0 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.
12:00pm – 5:00pm	POCUS Workshop The American Society of Anesthesiologists designates this live activity for a maximum of *5.0 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.
12:00pm – 5:00pm	Trauma Workshop The American Society of Anesthesiologists designates this live activity for a maximum of *5.0 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.
1:00pm – 4:00pm	International Symposium The American Society of Anesthesiologists designates this live activity for a maximum of *3.0 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

2024 SOAP Annual Meeting

The American Society of Anesthesiologists designates this live activity for a maximum of *27.75 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

2024 SOAP Virtual Highlights

The American Society of Anesthesiologists designates this live activity for a maximum of *20 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Target Audience
This meeting is intended for Anesthesiologists, Anesthesiologists Assistants, CRNAs, Nurses, Resident/ Fellows, and Medical Students interested in the recent advances in obstetric anesthesia and the application of these advances to their practice.

Mission of the SOAP Annual Meeting and Live Events Committee
The mission of the AMLE Committee is to provide anesthesiologists, obstetricians, and other physicians and members of related allied health specialties with the knowledge that will reinforce past learning as well as disseminate new concepts, practices, and skills involving anesthesia and analgesia for the pregnant patient.

Participation in the SOAP 56th Annual Meeting
Attendance is open to all health practitioners, provided that they have registered for the meeting. CME credit will only be offered to those with an MD, DO or equivalent.

Educational Format
CME activities may include the following formats: plenary sessions, debates, lectures, poster discussions, oral abstracts, problem-based learning, and skill-set workshops.

Annual Meeting Objectives
At the completion of this conference the participants should be able to:

1. Improve the care of women during, pregnancy, labor, delivery, and the early postpartum period by hearing what they each have to say and acting upon their observations. To understand the importance of shared decision-making between patient and caregiver, and to respect patient autonomy. Language barriers contribute to the problems we face and so comprehensive and easily accessed translation services will assist in understanding a patient's needs, concerns and answering questions.

2. Understand the issues surrounding anesthetic management for intrapartum cesarean delivery and how early neuraxial analgesia, with regular monitoring for efficacy and side-effects, can help prevent the need for general anesthesia in this setting.

3. Help reduce the risk of aspiration pneumonitis by revisiting the reasons for fasting guidelines in obstetric anesthesia. In turn, participants can go on to educate other caregivers at their own institutions.

Special Needs Statement
The American Society of Anesthesiologists and the Society for Obstetric Anesthesia and Perinatology are committed to making its activities accessible to all individuals and fully comply with the legal requirements of the Americans with Disabilities Act and the rules and regulations thereof. If you are in need of an accommodation, please do not hesitate to submit a description of your needs in writing to membership@soap.org.

Disclosure Policy
The American Society of Anesthesiologists remains strongly committed to providing the best available evidence-based clinical information to participants of this educational activity and requires an open disclosure of any potential conflict of interest identified by our faculty members. It is not the intent of the American Society of Anesthesiologists to eliminate all situations of potential conflict of interest, but rather to enable those who are working with the American Society of Anesthesiologists to recognize situations that may be subject to question by others. All disclosed conflicts of interest are reviewed by the educational activity course director/chair to ensure that such situations are properly evaluated and, if necessary, resolved. The American Society of Anesthesiologists educational standards pertaining to conflict of interest are intended to maintain the professional autonomy of the clinical experts inherent in promoting a balanced presentation of science. Through our review process, all American Society of Anesthesiologists CME activities are ensured of independent, objective, scientifically balanced presentations of information. Disclosure of any or no relationships will be made available for all educational activities.

How to Receive CME Credit
To receive credit, participants must access the ASA Education Center, review the meeting information, and complete the evaluation. Further instructions will be emailed to each participant immediately prior to and after the activity.

Disclaimer Statement
The information provided at this accredited activity is for continuing education purposes only and is not meant to substitute for the independent medical judgment of a healthcare provider relative to diagnostic and treatment options of a specific patient's medical condition.

SESSION DESCRIPTIONS

Pre-Meeting Workshops

Focused Assessment Transthoracic Echocardiography (FATE) Course
This hands-on workshop will include a practice of standard TTE windows on patient models and a review of the pre-course materials. Attendees will review 4-5 clinical OB-Anesthesia related cases (1-Pulmonary Embolism, 2-Preeclampsia, 3-Peripartum CMP, 4-Amniotic Fluid Embolism, 5-Hypovolemic shock/PPH) and rotate through stations.

Trauma Informed Care for Optimal Outcomes
This immersive and interactive workshop covers the basics of trauma-informed and collaborative care in the obstetric setting. This program utilizes various learning platforms to present the material: didactic lectures introduce psychological trauma and its relevance in the peripartum period in addition to communication strategies for optimal outcomes; case exploration in small groups will address perspective taking and management of acute stress responses; simulation exercises will allow participants to reinforce their new skills in a variety of challenging scenarios. Time will be allocated for final debriefing, questions, self-care, and reflection prior to completion of the workshop.

Point of Care Ultrasound (POCUS)
POCUS workshop covering Gastric-, Neuraxial-, Airway-, and FAST (abdominal) ultrasound. Focus of the workshop will be hands-on training on patient models with brief, 10-15 minutes lectures on each topic.

Sessions

Best Case Reports
This live presentation highlights some of the most well-written and interesting case reports submitted to the Annual Meeting. Cases were selected to represent a wide range of topics from various institutions and are sure to foster lively discussions among the panelists. There will be author and audience participation, via virtual chat function, to encourage interactive discussion. This engaging session will be moderated by Dr. John Kowalczyk, and will feature panelists Dr. Cally Hoyt, Dr. Allison Lee, and Dr. Alicia Dennis.

Best Paper Competition
This curated session includes presentations from the top rated and most impactful research abstracts submitted this year. Presenters compete for the title of SOAP Annual Meeting Best Paper via presentations and a question- and-answer session. This competition will be moderated by Dr. Ruthi Landau Research Abstract Subcommittee Chair and distinguished researchers in the obstetric anesthesiology field.

Case Reports Sessions
These moderated sessions, scheduled for Friday, Saturday, and Sunday, are designed to highlight educationally valuable case reports submitted and presented by obstetric anesthesiology fellows and residents across the country. There will be opportunities to participate and ask questions regarding some of the most challenging clinical scenarios our presenters have encountered.

Research Abstracts Sessions
These moderated sessions, scheduled for Friday and Sunday, showcase the state-of- the-art research being conducted in obstetric anesthesia.

Oral Presentations
Oral presentations of diverse, high-quality and hand-selected peer-reviewed scientific research related to obstetric anesthesia will be presented in sessions on Friday and Sunday, followed by a moderated question-and-answer session. Friday's session will be moderated by Rich Smiley, MD and Sunday's session moderator will be Ashraf Habib, MD.

Gertie Marx Research Competition
Named in memory of obstetric anesthesia pioneer Gertie Marx, this research competition highlights the best quality research performed by our trainees (medical students, residents and fellows). Six presenters will compete in this judged competition, moderated by Dr. Cynthia Wong and judged by Dr. Roshan Fernando, Dr. Ron George, Dr. Lisa Leffert, Dr. Feyce Peralta, and Dr. Paloma Toledo

Fred Hehre Lecture
This session offers reflections from a renowned member of the obstetric anesthesia community, which bring insights into scope of practice changes over time and focuses on what matters most to the art and science of obstetric anesthesia practice. This year's Fred Hehre lecturer will be obstetric anesthesia legend Dr. Barbara Scavone.

Gerard W. Ostheimer Lecture
Always a highlight and one of the most highly anticipated sessions of the meeting, the Gerard W. Ostheimer lecture is a review of important, relevant, and practice-changing literature related to obstetric anesthesia, obstetrics, perinatology, and allied medical disciplines that was published in the preceding calendar year (2023). This digestible synthesis of the literature analyzes the clinical impact of published works and latest evidence-based advances in the field of obstetric anesthesia. This year's Ostheimer lecturer will be Dr. Melissa Bauer.

SOAP Distinguished Service Award Presentation & Awards Ceremony
Join us as we honor Dr. Brendan Carvalho, 2024 recipient of SOAP's highest honor, the 2024 Distinguished Service Award. Dr. Carvalho will be introduced by Dr. Gillian Abir. This session will also include Dr. May Pian-Smith, SOAP President, announcing recipients of the Gertie Marx and Best Paper Competitions, Teacher of the Year Awards, Research in Education, Frederick P. Zuspan Award, Patient Safety Award, and the Diversity and Inclusivity Award. Don't miss it!

Keynote – "Honoring the Patient Experience"
The keynote presentation is by Dr. Susan Burton, Susan Burton is the host, writer, reporter, and co-producer of *The Retrievals*, an award-winning podcast series from Serial Productions and the New York Times. Ms. Burton will share the patient perspective on patient experience around pain and its management by the medical community.

President's Panel: Turning Oops into Ops: an international expert panel on leveraging our opportunities to improve our patients' experiences
The session will be moderated by Dr. May Pian-Smith and including panelists Sharon Dekel, MD; Brinda Kimdar, MD; Klaus Kjaer, MD; Nuala Lucas, MD; Tracey Vogel, MD.

OAA: Perioperative cardiac arrest in obstetrics-findings from NAP7
Dr. Nuala Lucas will share the findings from the NAP7 study which provides a comprehensive and detailed picture of perioperative cardiac arrest in all NHS hospitals in the UK. This data has the potential to drive improvements in perioperative care with practical and accessible recommendations.

SMFM Session: Post-Roe Landscape: Navigating Abortion Bans
The session will be presented by Dr. Leilah Zahedi-Spung and will provide information and insight on how the medical community is navigating maternal fetal care in the post-Roe medical environment.

ASRA/SOAP Panel - PDPH Beyond the Guidelines: How to Improve Patient Care
This joint panel moderated by Lisa Leffert, MD will feature Dr. Vishal Uppal, Dr. Wouter Schievink and Alexandra Schyns-van der Berg representing ASRA, and Dr. Lisa Leffert and Dr. Sharon Orbach-Zinger, representing SOAP, as they provide thoughtful discussion surrounding post dural puncture headache. This session will discuss SOAP and ASRA consensus statements and guidelines and how to apply them in patient scenarios to aid in clinical decision-making.

ASA Update
SOAP is honored to host Dr. Ron Harter, President, American Society of Anesthesiologists, for an update on the work of the ASA. SOAP President Dr. May Pian-Smith will provide the introduction.

Clinical Track

Sol Shnider Clinic Track – Session #1
The Sol Shnider clinical track session #1 will cover clinically relevant reviews and updates for important topics such as “Wrangling with the Experts: A Discussion of Challenging Topics in
OB Anesthesia” moderated by Dr. Katie Arendt and “Don’t Forget the Neuraxial Adjuvants! Clonidine, Dexmedetomidine, Epinephrine, and Buprenorphine” moderated by Dr. Britany Raymond.

Sol Shnider Clinic Track – Session #2
The Sol Shnider clinical track session #2 will cover clinically relevant reviews and updates for important topics including “What to Say When There are No Words: Disclosure and Debriefing Strategies for our Darkest Days After a Traumatic Event“ by Dr. Caitlin Sutton, “Of Mice and Women: Cutting Edge Research in Uterine Atony” moderated by Dr. Shubhangi Singh, and “Updates on Labor Analgesia: How to Deliver the Best Option for Your Patient” by Dr. Sharon Reale.

Sol Snider Clinical Track – Session #3
The Sol Shnider clinical track session #3 will cover clinically relevant reviews and updates for important topics including “Three Perils of Intrapartum Cesarean Deliveries: Pain, PPH, and PTSD” moderated by Dr. Brendan Carvalho, “PRO/CON: NPO in Labor vs. Fed in Labor” by Dr. Mark Zakowski and Dr. Manny Vallejo, and “Addressing Maternal Disparities: Three Areas to Improve Your Patients Outcomes” moderated by Dr. Fatoumata Kromah.

SOAP Research Network Symposium
The second iteration of the SOAP Research Network Symposium provides the opportunity to present research proposals to SOAP’s network of research experts, who will provide constructive feedback on rigor, relevance, methodology, ethics, feasibility, and fundability of research ideas and discuss opportunities for potential project collaborators. This is an excellent opportunity to receive constructive feedback with the goal of everyone in the SOAP research community supporting everyone’s excellent research!

SOAP 2024 Program Schedule

WEDNESDAY, MAY 1

8:00am – 5:00pm Focused Assessed Transthoratcic Echocardiography (FATE) Course

Governor's Square 11

Faculty:

1. Jean Marie Carabuena, MD – Brigham and Women's Hospital
2. Kelly Feoruk, MD – Stanford University
3. Cedar Fowler, MD – Stanford University
4. Clemens Ortner, MD – Stanford University
5. Cesar Padilla, MD – Stanford University
6. Fantin Raffaella, MD - Medical University of Innsbruck
7. Ana Lisa Ramirez, MD – University of Texas Health Science Center at Houston
8. Maria Sheikh, MD – Columbia University Irving Medical Center
9. Emily Stockert, MD - Stanford University
10. Caroline Thomas, MD – University of Chicago
11. Ivan Velikovic, MD – SUNY Downstate Health Science University

12:00pm – 5:00pm Point-of-Care Ultrasound (POCUS)

Governor's Square 16

Faculty:

1. Cristian Arzola, MD – Mount Sinai Hospital, University of Toronto
2. Juliana Barrera, MD – University of British Columbia
3. Naida Cole, MD – University of Chicago
4. Javier Cubillos, MD – London Health Science Center
5. Jackie Galvan, MD – UTSW Medical Center
6. Brinda Kamdar, MND – MGH, Harvard
7. Yusuke Mazda, MD – Saitama Medical Center
8. Leziga Obiyo, MD - University of Chicago
9. Naveed Siddiqui, MD – Mount Sinai Hospital, University of Toronto
10. Evan Wild, MD – Mount Sinai Hospital, University of Toronto
11. Fabricio Zasso, MD – Mount Sinai Hospital, University of Toronto

12:00pm – 5:00pm Trauma Informed Care for Optimal Outcomes

Governor's Square 9

Faculty:

1. Anjum Anwar, MD – University of Washington Medical Center
2. Katie Seligman, MD – University of British Columbia
3. Andrea Traynor, MD – Stanford University
4. Tracey Vogel, MD – Allegheny Health Network
5. Cristina Wood, MD – University of Colorado Hospital

Wednesday, May 3 - Continued

1:00pm – 4:00pm Internation Symposium: China

Plaza Court 7

Jie Zhou, MD

1. Barbara S. Orlando, MD – UT Houston
2. Grace Shih, MD – University of Kansas Health System
3. Alice O'Brien, MD – UT Houston
4. Ghislaine 'Beba' Echevarria, MD – Mount Sinai Morningside Hospital
5. Amber High, MD – UTMB Galveston
6. Shobana Murugan, MD – UTMB Galveston

1:00pm – 5:00pm Board of Directors Meeting

Plaza Court 6

5:00pm Educational Programming Adjourns for the Day

6:00pm -8:00pm Welcome Reception - Sheraton Hotel

Ballroom DEF

THURSDAY, MAY 2

7:00am – 9:00am Continental Breakfast in Expo Hall

Ballroom DEF

7:00am – 7:45am Special Interest Group Roundtable Discussions

Ballroom Foyer

7:50 am – 8:00 am Opening Remarks

Ballroom ABC

May Pian-Smith, MD – SOAP President & Rebecca Minehart, MD, MEd

8:00am – 9:00am KEYNOTE LECTURE: "Honoring the Patient Experience"

Ballroom ABC

Susan Burton

The Retrievals, podcast series, Serial Productions/New York Times

This American Life, Producer

9:00am – 10:00am President's Panel: Turning Oops into Ops: an international expert panel on leveraging our opportunities to improve our patients' experiences

Ballroom ABC

Panelists: Sharon Dekel, MD
Brinda Kimdar, MD
Klaus Kjaer, MD
Nuala Lucas, MD
May Pian-Smith, MD
Tracey Vogel, MD

10:00am – 10:45am BREAK IN THE EXPO HALL

Ballroom DEF

Thursday, May 2 - Continued

10:45am – 11:30am OAA: Perioperative cardiac arrest in obstetrics-findings from NAP7

Ballroom ABC

Nuala Lucas, MD

President, Obstetric Anesthetists' Association

11:30am – 12:30pm LUNCH ON YOUR OWN

11:30am – 12:30pm Sponsor Lunch (NO CME) – pre-registration required

Rivanna – *Governor's Square 12*

12:45pm – 1:45pm Best Paper Research Competition

Ballroom ABC

Moderator: Ruthi Landau, MD

Judges: Jake Beilin, MD
Grace Lim, MD
Carolyn Weiniger, MD
Phil Hess, MD
Jill Mhyre, MD

1. Development and validation of the Stanford Obstetric Recovery checklist (STORK) – Pervez Sultan, MD
2. The incidence and characteristics of intraoperative pain during cesarean delivery: a multicenter cohort study – Daniel Conti, MD
3. Bioequivalence and Pharmacokinetics of Intravenous Calcium in Parturients – Daniel Conti, MD
4. Programmed Intermittent Epidural Bolus (PIEB) for neuraxial labor analgesia: finding the best combination of intermittent bolus volume and time interval using pragmatic sequential optimization – Fatima Khatoon, MD
5. Cross-sectional survey to assess hospital system readiness for hemorrhage during and after cesarean section in Africa – Marcelle Crowther
6. Ex-vivo Evaluation of Dexmedetomidine on Pregnant Human Myometrial Contractility – Leland Ustare, MD

1:45pm – 2:30pm A TIC TALK for Anesthesia Providers: New Insights into The Importance Of Trauma Informed Care

Ballroom ABC

Tracey Vogel, MD

2:30pm – 3:15pm BREAK IN THE EXPO HALL

Ballroom DEF

3:15pm EXPO HALL CLOSES FOR THE DAY

3:15pm – 4:15pm SMFM Lecture: Post-Roe Landscape: Navigating Abortion Bans

Ballroom ABC

Leilah Zahedi-Spung, MD

4:15pm – 5:15pm SOAP State Representatives Meeting

Plaza Court 2

Thursday, May 2 - Continued

4:15pm – 6:30pm Case Reports - Abstract Breakouts

Breakout 1: All these airway issues and other disasters (*Governor's Square 17*)

1. Difficult Airway During STAT Cesarean Delivery – A Case Report - Shreya Ranjan, MD
2. Management of Undifferentiated Peripartum Acute Hypoxic Respiratory Failure - Arwa Raza, MD
3. Individualized management of two parturients with airway stenosis - Margaret Smith, MD
4. Saddle Pulmonary Embolism Thrombectomy in the Parturient with Congenital Inferior Vena Cava Absence - David Gutman, MD, MBA
5. Massive pulmonary embolism during hemorrhagic shock - Graziana Massolini, MD
6. Management of Parturient with Subglottic Stenosis Unable to have Neuraxial Anesthesia - Casey Fitzgerald, MD
7. Multidisplinary Care for Parturient with Laryngotracheal Stenosis - Mariah Dahmen, MD
8. Anticipated difficult airway management and multidisciplinary approach to a high-risk pregnancy - Caelie Stewart, MD
9. Subglottic stenosis complicating emergent cesarean delivery - Sarah McCraney, MD
10. Multidisciplinary management of repeat cesarean delivery in a parturient after an emergent antepartum tracheostomy - Phillip Callihan, MD, PhD
11. Anesthetic Management in a Patient with Obstructing Oropharyngeal Neurofibroma and Tracheostomy in the setting of NF type 1- A Case Report - John Robison,
12. Conversion to General Anesthesia and a Failed Intubation - Taylor Leathers, MD
13. A Case of Peripartum Pneumomediastinum After Prolonged Labor - Marisela Sandoval
14. Thriving with THRIVE: The use of transnasal humidified rapid insufflation ventilatory exchange (THRIVE) in a morbidly obese pregnant patient undergoing robotic cholecystectomy - Sara Feldman, MD
15. The use of transcutaneous CO2 monitoring to guide ventilatory management in pregnant patients undergoing laryngeal surgery - Sara Feldman, MD
16. A case of advanced oropharyngeal cancer in a parturient requiring preterm delivery - Jil Decker, MD
17. Rescue Laryngeal Mask Airway for Difficult Airway in an Urgent C-section Complicated by Massive Hemorrhage- 2 cases – Shobana Murugan, MD
18. Anesthetic Management of a Parturient with Idiopathic Subglottic Stenosis - Lauren Blake, MD
19. Management of a parturient with airway compression with heliox during cesarean delivery - Amy Zheng, MD
20. Management of a 23-week pregnant patient with idiopathic subglottic stenosis undergoing laser ablation surgery - Amy Zheng, MD

Thursday, May 2 - Continued

Breakout 2: Hematology (*Governor's Square 16*)

1. Comprehensive Labor and Delivery in a Parturient with Cold Urticaria - Katherine Ampolini, CRNA
2. A Case of Severe, Recurrent Thrombocytopenia in a Third Trimester Parturient - Jessica Bonilla, DO
3. Anesthetic Management of Acquired Hemophilia A in a Parturient - Jessica Bonilla, DO
4. Diagnosing pregnancy-associated atypical hemolytic uremic syndrome, a case report - Ashley Wicker, MD
5. Swimming in Dangerous Waters - The Case of a Parturient with Platelet Storage Pool Disorder - Jhovan Kepple, M.B,B.S
6. Anesthesia Management of Severe Neutropenia in Pregnancy - Ani Chilingirian, MD
7. Thrombocytopenia: Evaluation and Management of a Parturient at Term - Michael Heller, MD
8. A Parturient with Factor VII Deficiency: A Case Report - Sana Rukh, MD MPH
9. Viscoelastic Test-guided Spinal Anesthesia for Cesarean Section in Factor VII Deficiency – A Case Report - Shannon Haley, MD, PhD
10. Navigating Birth in a Patient with Bombay Phenotype: No Blood, Big Problem - Hasti Mazdeyasna, MD
11. Anesthetic Management of a Parturient with Alpha-Gal Syndrome - Lauren Marzolini, BS
12. Perioperative Implications of Alpha-Gal Syndrome in a Patient for Scheduled C-section - Stephen Ford, DO
13. Management of a parturient with mast cell activation syndrome - Jayne Manigrasso, MD
14. Thrombotic thrombocytopenic purpura resulting in maternal and fetal mortality - Maitri Shah, MD
15. Anesthetic Management for Cesarean Delivery in a case of Autoimmune Hemolytic Anemia - Maya Menon, MD
16. Management Of Acquired Hemophilia A Diagnosed During Pregnancy - Maya Menon, MD
17. A Case of Pancytopenia in a Parturient with Autoimmune Hepatitis undergoing Cesarean Section - Kalissa Zhang, MD
18. Klippel-Trenaunay Syndrome and Chronic Localized Intravascular Coagulopathy: Management of Labor and Delivery - Leila Katabi, MD, MA
19. May-Hegglin Anomaly in Pregnancy: Cesarean Section with Severe Thrombocytopenia - Jared Keele, DO
20. Blood, Sweat, and Tears: Managing Anticoagulation in the Parturiant - Loren Farley, MD
21. What is Your Definition of Readily Available? - Sadaf Chaugle, MD
22. Emergent Cesarean Section due to Severe Undiagnosed Falciparum Malaria - Rahool Patel, MD
23. Delayed Interval Hysterectomy for Placenta Percreta: A Case Report - Paige Oates, MD

Thursday, May 2 - Continued

Breakout 3: When it bleeds (accretas, abruption and coagulopathies) (*Governor's Square 15*)

1. Placental Accrete Spectrum with Presenting Fetal Parts in the Bladder - Neva Lemoine, MD
2. Managing two similarly challenging cases of placenta accreta: the importance of multidisciplinary planning. - Alice Campeggi, MD
3. Multi-disciplinary management for Placenta Accreta Spectrum with secondary abdominal pregnancy: A Case Report - Patricia Strutz, MD, MSCI
4. Perioperative management to promote maternal recovery with placenta accreta spectrum - Jonathan Gougelet, MD
5. Against all odds: surviving septic shock and massive hemorrhage in a patient with placenta accreta - Jennifer Hoayek, MD
6. Expectant Management in a Patient with Placenta Accreta Spectrum... What can go Wrong? - Roy Lei, MD
7. Placenta Accreta Spectrum Disorder Complicating Second Trimester Pregnancy Loss - Laura Starzenski, MD
8. Labor Analgesia and Hemorrhage Management in a Brugada SCN5A Heterozygous Patient - Michael Furdyna, MD
9. Anesthetic management of two parturients with congenital hypofibrinogenemia - William Pinkston, DO
10. A Patient with Hypodysfibrinogenemia Undergoing Cesarean Delivery: Discordant Dose-Response and ROTEM Results – Allizon Mootz, MD
11. Anesthetic Management of a Patient with Multiple Coagulopathies Undergoing Cesarean Delivery - Jack Peace, MD
12. Tranexamic Acid: An Attempt to Conserve Fibrinogen - Candice Cuppini, MD
13. Management of Recurrent Extensive Deep Vein Thrombosis Surrounding Delivery - Stephan Kienzle, MD
14. Management of DAPT in Kawasaki Disease in Pregnancy: A Case Report - Eleanor Kenny, MD
15. Uterine Window and Abnormal Vascularity - A Warning Sign for Morbidly Adherent Placenta - Taylor Leathers, MD
16. ANESTHETIC MANAGEMENT OF DYSFIBRINOGENEMIA DURING DELIVERY - Courtney Dorris, MD
17. Anesthetic Management of Multigravida with Placenta Accreta, Uncontrolled Hypertension, and Ascending Aortic Aneurysm - Sadaf Mirkarimi, MD
18. Anticoagulation Management in Patient with Mechanical Aortic Valve and History of Prior Valve Thrombosis Undergoing Induction of Labor - David Gutman, MD, MBA
19. Placental Abruption with Couvelaire Uterus with Profound Anemia - Jessica Stockinger, MD

Breakout 4: Broken Hearts (*Governor's Square 14*)

1. Management of a pregnant patient on dual antiplatelet therapy after percutaneous intervention: Cangrelor bridging as a path to neuraxial anesthesia for delivery - Brian Waldman, MD

Thursday, May 2 - Continued

2. Peripartum management of myocardial infarction in pregnancy - Stephanie Lee, MD, PhD
3. Rheumatic Heart Disease and Placenta Accreta Spectrum Disorder: An ECMO-Assisted Cesarean Delivery and Subsequent Valvular Replacement - Paul Vozzo, MD
4. Anesthetic Management of a High-Risk Cardiac Patient Undergoing Cesarean Section - Nguyen Nguyen, DO
5. Perioperative Management of a Parturient with Double Outlet Right Ventricle - Jessica Ng, MD
6. Anesthetic Management of a Parturient with Severe Aortic Stenosis and Di/Di Twin Gestation - Nancy Greenspon, MD
7. Postpartum Spontaneous Coronary Artery Dissection, A Case Report - Richard Bui, BA
8. SCAD is Bad but Pseudoaneurysm is Worse - Caroline Tybout, MD
9. Obstetric Management of the Loey-Dietz Syndrome Parturient - Becky Mirsky, MD
10. Anesthetic Considerations for the Parturient with Brugada Syndrome - Haley Randich, MD
11. Anesthetic Management of a Parturient with Congenital Long QT Syndrome - Naomi Nguyen
12. Anesthetic Management of Parturient with Severe Mitral Stenosis and Recent Flash Pulmonary Edema - Christopher Lee, MD
13. Management of Cesarean Section Delivery in a Patient with Heart Failure with Reduced Ejection Fraction and Pericardial Effusion - Olivia Lucas, MD
14. Multidisciplinary Approach for Cesarean Delivery in a Parturient with Fontan Circulation - Carlos Guardia Ferrer, MD
15. Emergent Total Hysterectomy in a Patient with Fontan Physiology Due to Delayed Postpartum Hemorrhage - Daron Jacob, MD
16. Anesthetic Management of a Patient with Complex Congenital Heart Disease and Cervical Spine Disease: only teamwork will make this dream work. - Neva Lemoine, MD
17. Acute Myocardial Infarction in Pregnancy - Julie-Ann Thompson, MD
18. Management of a parturient with a history of tachycardia-induced cardiomyopathy - Jacob Moore, DO
19. Conservative Management of Complete Heart Block Detected During Labor - Lucille Hu, MPH

Breakout 5: When it hurts & abnormal bones (*Governor's Square 11*)

1. Bilateral Erector Spinae Plane Catheters for Successful Labor Analgesia - Shreya Goswami, MD
2. A case of cosmetic experimental biopolymers leading to non-neuraxial management of labor analgesia - Ann Norris, MD
3. Shared Spaces: Ultrasound-Guided Labor Epidural Placement in a Patient with a Spinal Cord Stimulator - Shayna Levine, MD, MS
4. Neuraxial anesthesia for repeat cesarean delivery in a patient with a history of CRPS type II following her previous delivery - Shakthi Jayanthy Venkatachalam, MBBS

Thursday, May 2 - Continued

5. Dexmedetomidine Infusion for Effective Analgesia and Prevention of Spasticity and Shivering in a Patient with Spastic Cerebral Palsy After Failed Epidural Placement: A Case Report - Amnon Berger, MD, PhD
6. Dexmedetomidine to Potentiate Epidural Analgesia During the Second Stage of Labor: A Case Report - Leonard Soloniuk, MD
7. Hips Don't Lie: Atypical Pain from Peripartum Pubic Symphysis Diastasis – Christopher Yeh, DO
8. Is fentanyl necessary? Using intrathecal dexmedetomidine instead of fentanyl in spinal anesthesia for cesarean delivery: 2 case reports - Leonard Soloniuk, MD
9. Anesthetic Management for Cesarean Section in a Parturient with Known Conversion Disorder - Kaylyn Guthrie, DO
10. Mental Health and an Effective Obstetric Anesthesia Care Plan - Robert Trainor
11. Anesthetic Considerations and Physiological Impact of Electroconvulsive Therapy in a Pregnant Patient with Catatonia - Jovan George, DO
12. Uncommon cause of altered mental status in the parturient with polysubstance use: Could it be the thyroid? - Saheb Dhillon, MD
13. Incomplete Spinal Anesthesia in a Term Patient with Dorsal Root Ganglion Stimulator- A Case Report - Hande Bilen, MD
14. Medical Decision-Making in High-Risk Parturient without Capacity Requiring Cesarean Section - Jessica Stockinger, MD
15. Hypophosphatasia Syndrome- Neuraxial Anesthesia Considerations - David Gutman, MD, MBA
16. Anesthetic Management of a Parturient with Osteogenesis Imperfecta Type 1 for Cesarean Delivery - Raji Naamani, MD
17. Osteogenesis Imperfecta Type III - Julie-Ann Thompson, MD
18. CESAREAN SECTION IN PARTURIENT WITH KLIPPEL FEIL SYNDROMA- case report - Borislava Pujic
19. Anesthesia Considerations for Caesarean Section under GETA in Patient with Arthrogryposis - John Robison
20. SIADH, oxytocin, magnesium, and potassium: An electrolyte balancing act or alphabet soup? – Jason White, MD

Breakout 6: Fixing babies & maternal genetic disorders (*Governor's Square 10*)

1. Anesthetic Considerations for Fetal Cardiac Intervention: A Case Report - Claire Naus, MD
2. Challenges in Maternal Pain Management Following Minimally Invasive In-Utero Surgery for Fetal Myelomeningocole (fMMC) - Aria Shafai, MD
3. Correcting the Record: Anesthetic Management for a Patient with MELAS Syndrome and History of a Failed Spinal Undergoing Cerclage Placement - James Conwell, DO
4. Anesthetic Management of a Pregnant Patient on Fondaparinux Undergoing Urgent Fetoscopic Laser Surgery - Alva Powell, MD
5. Anesthetic Management of a Parturient for an EXIT Procedure for a Neonate with a Large Neck Mass - Lawrence Weinstein, MD
6. Delivery of Fetus with Upper Airway Obstructing Mass - Blake Caracci, DO

Thursday, May 2 - Continued

7. The ex utero intrapartum treatment procedure for a fetus with massive neck mass - Mengyun Zhao, Doctor of Medicine
8. Maternal Isoimmunization and Fetal Anemia Requiring Intrauterine Transfusion and Conversion to Emergent Cesarean Delivery - David Gutman, MD, MBA
9. To EXIT or not to EXIT: an EXIT to tracheostomy procedure on a patient with a BMI of 60, Pre-Eclampsia, asthma and gastroparesis - Jennifer Hoayek, MD
10. Ex utero intrapartum treatment (EXIT) in the morbidly obese: A case report and best practices at a tertiary center - Christopher Welker, BS
11. The unique case of a Percutaneous transuterine Fetal cerebral embolization to treat vein of Galen malformation - Jennifer Hoayek, MD
12. Anesthetic Considerations for a Parturient with Glycogen Storage Disease Type 1a - Roy Lei, MD
13. Cardiomyopathy secondary to carnitine deficiency in pregnancy - Shonna Gaskin, MD
14. Hypercoagulable and coagulopathic states in a parturient with Klippel Trenaunay syndrome: a case report - Gabriela Cruz
15. Successful Neuraxial Anesthesia in a Parturient with Klippel-Trénaunay Syndrome - Carolina Aravera, MD
16. Management of Pulmonary Arteriovenous Malformations of Hereditary Hemorrhagic Telangiectasias in Pregnancy - Christine Ha, MD
17. Anesthetic Considerations in a Parturient with Mitochondrial Disease – Maria Mauravyeva, MD, MPh
18. Combined spinal epidural in Chromosome 15 deletion complicated by short stature - Xiao Lu Zhang, DO, PhD
19. Peripartum management of parturient with carnitine palmitoyl transferase II deficiency - Jazib Hassan, MD

6:30pm — Educational Programming Adjourns for the Day

6:30pm - 7:30pm — Sponsored Happy Hour – Flat Medical

Governor's Square 12

7:00pm — DINNER ON YOUR OWN – Explore Denver

FRIDAY, MAY 3

7:00am – 9:00am — Continental Breakfast in Expo Hall

Ballroom DEF

7:00am – 7:30am — Special Interest Group Roundtable Discussions in Expo Hall

Ballroom Foyer

7:30am – 10:45am — Abstract Breakouts

Breakout Room 1: ERAS (*Governor's Square 17*)

1. Optimizing preoperative fluid administration in Elective Cesarean Delivery Patients Utilizing Acumen IQ Non-invasive Monitoring Technology - Melissa Brown, MD
2. The Impact of an Enhanced Recovery Protocol on Postpartum Recovery Following Elective Cesarean Delivery: A Prospective Observational Study - Kaede Watanabe, MD

Friday, May 3 - Continued

3. Health Disparities in Obstetrical Care Before and After Implementation of an Enhanced Recovery After Surgery Protocol (ERAS) - Abbey Gilman, BS
4. Intraoperative Pain During Cesarean Delivery - Quality Improvement Project Part I: Quantification and Documentation - Neva Lemoine, MD
5. Intraoperative Fluid Administration During Elective Cesarean Delivery and Maternal Outcomes for ERAC - Phillip Callihan, MD, PhD
6. Development and Validation of a Filipino Version of Obstetric Quality of Recovery-10 (ObsQoR-10-Filipino) - Rafael Jacob Carandang, MD-MBA, DPBA
7. Urinary Retention and Early Foley Removal after Cesarean Delivery with Neuraxial Morphine - Jennifer Gage, MD
8. Best Practice at the Time of Labor Epidural Catheter Removal: Use of the Delphi Method to Create a Consensus-Based Educational Resource - Jonathan O'Doherty, MBChB
9. Timing of initiation of non-opioid analgesics for post-cesarean delivery pain: a before and after comparison of opioid utilization - Michael Wen, MD
10. A comparison of perioperative temperature monitoring modalities during elective Cesarean deliveries for the prevention of maternal hypothermia - Nada Ismaiel, MD, MSc, FRCPC
11. Delphi study to develop a core outcome set for inpatient pain assessment after cesarean delivery - Sarah Ciechanowicz, BMBCh MA MRes FRCA
12. Utilizing wearable technology to profile early postpartum sleep quality and physical activity: actigraphy findings from a pilot study - Sarah Ciechanowicz, BMBCh MA MRes FRCA
13. Incidence and interference of chronic pain after cesarean delivery: a systematic review with meta-analysis - Sarah Ciechanowicz, BMBCh MA MRes FRCA
14. Quality Improvement Methodology Used In Development Of Enhanced Recovery After Cesarean Delivery Protocols: An Exploratory Analysis - Kelly Fedoruk, MD, FRCPC
15. Development of US specific multidisciplinary guidelines for enhanced recovery after cesarean delivery using a Delphi approach - Pervez Sultan, MD, MD(Res), FRCA

Breakout Room 2: Hypotension + Vasopressors / Cardiac + Preeclampsia (*Governor's Square 16*)

1. Keeping it in the loop: Impact of closed-loop vasopressor systems on maternal and neonatal outcomes- A systematic review and meta-analysis - Jazib Hassan, MD
2. Prolonged corrected QT interval decreases the incidence of maternal hypotension during spinal anesthesia in cesarean delivery: a prospective observational study - Jungmin Lee, MD.
3. Crystalloid and phenylephrine for prevention hypotension - Xin-Zhong Chen
4. A Pilot Study for Future Investigation to Define Hypotension in Cesarean Deliveries under Spinal Anesthesia to Predict Neonatal Outcomes - Jack Wang, BS
5. Delivery timing in patients with pre-existing cardiac disease and hypertensive disorders of pregnancy - Maura Jones Pullins, MD

Friday, May 3 - Continued

6. Preeclampsia management with nifedipine verses labetalol: Is there a clear winner? - Ashley Vincent, MD
7. Management of Chronic Hypertension in Pregnancy after the CHAP Trial: How are we doing? - Ashley Vincent, MD
8. Pre-eclampsia Causes Unique Changes in Plasma miRNA Profile of Mom and Baby Compared to Healthy Controls: An Exploratory Pilot Study - Katelyn Scharf, MD
9. Automated non-invasive blood pressure measurement underestimates systolic blood pressure in hypertensive disorders or pregnancy - Amnon Berger, MD, PhD
10. Peripartum Antihypertensive Impact Neonatal Hypoglycemia and Postpartum Uterine Atony - Amnon Berger, MD, PhD
11. Association between preeclampsia risk and air pollutant PM2.5 and heavy metals during pregnancy using national health insurance claims data of South Korea - Yoon Ji Choi
12. Pregnancy and neonatal outcomes in parturients with pulmonary hypertension - Evan Liu
13. Minimum Test Tradeoff Applied to Uterine Artery Pulsatility Index for Antepartum Prediction of Preeclampsia - Zachary Janik, MD
14. The Association of Food Insecurity with Hypertensive Disorders of Pregnancy: A National Health Interview Survey Analysis - Brittany Burton, MD, MHS, MAS

Breakout Room 3: Racial disparities + global health (*Governor's Square 15*)

1. Effect of Race and Socioeconomic Status on Rates of Epidural Usage - George Ghafari
2. Racial and Ethnic Disparities in Labor Epidural Analgesia Outcomes - Shakthi Jayanthy Venkatachalam, MBBS
3. Development of an Obstetric Anesthesia Quality Improvement Framework for Low- and Middle-Income Countries: A Pilot Study in Vietnam - Allison Mootz, MD
4. Improving Obstetric Anesthesia Care in Low- and Middle-Income Countries: Results of a Pilot Needs Assessment Survey in Vietnam - Gavin Ovsak, MD MBA
5. A Perioperative Needs Assessment of a Tertiary Maternity Hospital in Freetown, Sierra Leone - Anjan Saha, MD, PhD
6. Midazolam and analgesic medication administration in Spanish-speaking patients during cesarean delivery - Paul Vozzo, MD
7. Does English Fluency Correlate with the Use of Sedatives and Analgesics during Cesarean Section? - Kendall Jenkins
8. Does Interpreter Use Affect Neuraxial Complication Treatment in the Spanish Speaking Population? - Eleanor Kenny, MD
9. Racial and Ethnic Disparities in Parturients Undergoing General Anesthesia for Cesarean Delivery: a retrospective cross-sectional study - Caroline Thomas, MD
10. Implementation of a novel, remote obstetric anesthesia lecture series for anesthesiology residents at Black Lion specialized teaching hospital in Addis Ababa, Ethiopia - Jordan Francke, MD MPH
11. Facilitators and Barriers in Providing Obstetric Anesthesia Informed Consent for Patients with Limited English Proficiency: A Mixed-Methods Study - Won Lee, MD, ScM

Friday, May 3 - Continued

12. Association of Race and Ethnicity in Post-Cesarean Pain Management Practice - Erica Chung, BA
13. A survey of obstetrical anesthesia health equity practices at academic centers in the United States (US) - Eliana Weinstein, BS
14. Beliefs, perspectives, and experiences with non-use of epidural analgesia for labor: A breakdown by race and educational background - Eliana Weinstein, BS
15. Cognitive Aids for In-the-moment Communication with OB Spanish Speaking Patients - Virginia Berry, MD
16. Impact of No Pain Labor & Delivery - Global Health Initiative on Cesarean Delivery Rates: A Meta-Analysis - Lauren Weber, BS
17. Introducing and evaluating the effectiveness of C/Safe, an intervention to improve the quality of maternal and newborn perioperative care in regional hospitals in Ghana - Mikaela Holthaus, Nursing student
18. No Difference in Epidural Labor Analgesia Replacement Times in Black Women Versus Non-Hispanic White Women: A Retrospective Single-Center Observational Study - Savanah Hardcastle, BS
19. Hospital-Level Factors Associated with Rates of General Anesthesia at Cesarean Delivery - Arielle Coughlin, MD
20. Maternal Satisfaction with Anesthetic Experience and Perceived Importance of Anesthetic Outcomes in a Diverse New York City Hospital - Amanda Tomlinson, MD

Breakout Room 4: PAS + PPH – coagulation (*Governor's Square 14*)

1. Anesthetic Management and Outcomes Following Cesarean Hysterectomy for Placenta Accreta Spectrum - Alexandra Bickett, BS
2. Factors associated with need for blood transfusion in patients undergoing Cesarean Hysterectomy for Placenta Accreta Spectrum: A Multicenter Retrospective Cohort Study - Hannah Zang
3. Is the "Double Stick" worth it? Assessing the merit of thoracic epidural plus lumbar spinal anesthetic for patients with placenta accreta spectrum undergoing cesarean hysterectomy - Dayley Keil, MD
4. Using basic code to reproduce a thromboelastogram waveform, a precursor to AI prediction of coagulation. - Jay Bisen
5. Variability in ROTEM values with and without the administration of tranexamic acid in labor and delivery. - Hande Bilen, MD
6. Availability and Use Patterns of Fibrinogen Concentrate on Labor and Delivery Units - A Survey of the Society for Obstetric Anesthesia and Perinatology Centers of Excellence Designees - Alexander Samworth, MD
7. Tranexamic Acid in Postpartum Hemorrhage – Manny Vallejo, MD
8. Identifying perioperative maternal risk factors associated with haemorrhage during and after caesarean section in Africa. - Marcelle Crowther, MBChB (UP), DA (SA), DipObs (SA), FCA, MMed (UCT)
9. Impact of the 2017 revised Japanese obstetric hemorrhage management guideline on tranexamic acid use in cesarean delivery: an interrupted time series analysis - Hiroshi Yonekura
10. Type and Screen: Transfusion Ratio: A single center exploration of a novel quality metric - Alla Yarmosh, MD, MCR

Friday, May 3 - Continued

11. A single center evaluation of a transfusion risk stratifying algorithm for guiding type and screen ordering in peripartum patients - Lynn Squires, MD FRCPC
12. Single center implementation of a postpartum pharmacologic thromboprophylaxis protocol - Ann Bruno, MD
13. Individual patient data meta-analysis of tranexamic acid pharmacokinetic data for postpartum hemorrhage - Sebastian Seifert, MD
14. Integration of A Quantitative Blood Loss and Hemorrhage Alert System for Vaginal Delivery: A Before and After Comparison To Evaluate Postpartum Hemorrhage Outcomes over 8 Years - Laura C. Ibanez-Pintor, MD
15. Decreased Dose-Response to Fibrinogen Concentrate in Parturients During Postpartum Hemorrhage: A Retrospective Study - Allison Mootz, MD
16. Trends of tranexamic acid (TXA) use in High-Acuity Obstetric Patients in a High-Resource Setting - Noor Raheel, MD, MPH

Breakout Room 5: Neuraxial Labor Analgesia (*Governor's Square 11*)

1. Changes in velocimetric indices of uterine and umbilical arteries before and after combined spinal-epidural analgesia in laboring women - Javiera Vargas
2. Assessment of sensory block during labour epidural analgesia: prospective cohort study investigating upper and lower sensory block levels to ice & pinprick in patients experiencing pain during labour - Juan Pablo Ghiringhelli, MD
3. Effectiveness of Clonidine and Dexmedetomidine Adjuncts for Labor Epidural Analgesia Initiation: A Randomized Double-Blind Fentanyl-Controlled Non-Inferiority Trial (The CLASSIER Trial) - Catherine Bergeron, MD
4. Exploration of the optimal programmed intermittent epidural bolus volume with dural puncture epidural technique for labor analgesia: A biased-coin up-and-down sequential allocation trial - Yujie Song
5. Comparative study of labor analgesia onset with injection of loading dose through the epidural needle versus catheter : A prospective, double-blinded, randomized clinical trial - Lihong Sun, MD
6. Predictive value of neutrophil-to-lymphocyte ratio on admission for intrapartum maternal fever in parturients undergoing epidural analgesia: A propensity score-matched analysis - Kunyue Li
7. Machine learning modeling to predict epidural-related maternal fever - Scott Segal, MD, MHCM
8. Impact of a Change in Default PIEB + PCEA Settings on Epidural Failure Rate for Labor Analgesia: A Single-Center Retrospective Analysis - Sophia Bechek, MD
9. A comparison of cold and sharp modalities for testing sensory blockade in neuraxial labor analgesia: A prospective observational trial - Laura Somppi-Montgomery, MD
10. Patient Trust in Anesthesiologists during Labor and Delivery - Talia Scott, MD
11. Pocket Warming of Bupivacaine with Fentanyl to Shorten Onset of Labor Epidural Analgesia: A Double-Blind Randomized Controlled Clinical Trial - Tyler Balon
12. Programmed Intermittent Epidural Bolus versus Continuous Epidural Infusion - Is One Better? A Retrospective Chart Review - Katelyn Fields, BS
13. Making Labor Epidural Analgesia Better: A Quality Improvement Project - Shreya Vinjamuri, BA

Friday, May 3 - Continued

14. A Randomized Controlled Trial of Combined Spinal Epidural versus Dural Puncture Epidural Technique for Labor Analgesia - Hannah Zang
15. Impact of epidural analgesia on labour progression in a third-level hospital: a retrospective study - Mariangela Di Muro

Breakout Room 6: Morbidity, drugs, and non-CS anesthesia (*Governor's Square 10*)

1. Virtual Reality Compared to Nitrous Oxide for Labor Analgesia: A prospective, randomized, cross-over non-inferiority study - Z Bekemeyer, BA
2. Do Essential Oil Diffusers During Labor Pose a Contamination Risk to Sterile Neuraxial Placement? - Neva Lemoine, MD
3. Bicarbonation of local anesthetics and effect on storage of pH - Samantha Armstrong, BS
4. Anesthetic factors improve the prediction of intra-partum cesarean delivery when added to known obstetric factors - Amnon Berger, MD, PhD
5. Maternal, Neonatal and Delivery Outcomes Following a SARS-CoV-2 Moratorium on Elective Deliveries - Jayne Caron, MD
6. Patients' perspectives on non-utilization of neuraxial epidural analgesia: A qualitative study - Eliana Weinstein, BS
7. Influence of Nitrous Oxide Use on Surgical Anesthesia Method For Cesarean Delivery - Grace DeSena & Omowonuola Ogundele
8. Analgesic Use After Vaginal Delivery in Women with Postpartum Perineal Pain - Catherine Gao, MD
9. Error-focused versus conventional checklist assessment of lumbar epidural placement - Hans Sviggum, MD
10. An Analysis of Non-Cesarean Anesthesia Utilization from 2016-2022 - Nafisa Mostofa, BS
11. Outcomes With Intrathecal 3% 2-Chloroprocaine For Cervical Cerclage - A Quality Assurance Study - Ebubechukwu Obiora
12. Impact of a Standardized Oxytocin Administration Protocol for Cesarean Delivery - Beth Clayton, DNP, CRNA
13. Use of 1% Ropivacaine in Spinal Anesthesia for Cesarean Section During Medication Shortage - Angel Pagan, MD
14. Assessing the Efficacy of an Innovative Airway Device Delivering Supplemental Oxygen During Intubation with GAX-specimen. - Noah Swigart
15. The anesthetic quality and safety of dural puncture epidural (DPE) in cesarean section. - Mingpin Hu

10:30am – 11:00am BREAK IN THE EXPO HALL

10:30am – 11:00am Mentoring Academy Mentor/Mentee Meet-Up Informational Session

Governor's Square 9

11:00 am – 11:10 am Opening Remarks

Dan Katz, MD & Jaime Daly, MD

11:10am – 12:40am Gertie Marx Research Competition (General Session)

Ballroom ABC

Moderator: Cynthia Wong, MD

Friday, May 3 - Continued

Judges: Lisa Leffert, MD
Ron George, MD
Feyce Peralta, MD
Paloma Toledo, MD
Roshan Fernando, MD

1. Etiologies and Management of Maternal Cardiac Arrest During Peripartum Anesthetic Care: A Study from the Multicenter Perioperative Outcomes Group Consortium - Michael Furdyna, MD
2. Washout time for the return to "safe-for-spinal" levels of anti-Xa levels following prophylactic and secondary prevention doses of enoxaparin in pregnancy: a pharmacodynamic study – Ehab Natsheh
3. EVERY 72 hours, really? Investigating the necessity of repeat type and screen testing pre-delivery - Brian Waldman, MD
4. Local Anesthesia Injection (ILA) Pain Severity as a Predictor of Post-Cesarean Pain and Obstetric Quality-of-Recovery Scores (ObsQoR-11): A Prospective Observational Study – Erin Dengler, MD
5. Racial and Ethnic Disparities in Neuraxial Analgesia Use in the United States, 2016-2022 – Eva Martinez, MD
6. Peripartum Mood and Anxiety Disorders and the Development of Preeclampsia - Heather Acuff, MD

12:40 am – 1:45 pm LUNCH ON YOUR OWN

12:40 am – 1:40 pm SPONSORED LUNCH (NO-CME) – pre-registration required

Legally Mine – *Governor's Square 12*

CONCURRENT SESSIONS

1:45 pm – 2:30 pm Oral Presentations #1 - Main stage *Ballroom ABC*
Moderator: Rich Smiley, MD

1. Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate Utilization for Postpartum Hemorrhage from 2015 to 2023 – Lillian Liao, MD
2. Volume versus concentration: A comparison of two delivery strategies for maintenance of neuraxial labor analgesia with programmed intermittent epidural bolus - Elizabeth Lange, MD
3. Maternal Intensive Care Unit Utilization by Mode of Delivery in the United States: a retrospective cohort study – Rebecca Himmelwright, MD
4. Planning for postpartum tubal ligation: aspiration risk during immediate postpartum period – Christopher Cariello

1:45 pm – 2:30 pm Breakout – *Governor's Square 12*

A Network to Enhance Maternal Care: The SOAP State Representative Initiative

Panelists: Holly Ende, MD
Michaela Farber, MD
Klaus Kajer, MD
LaToya Mason-Bolden, MD

Friday, May 3 - Continued

2:30pm – 3:30pm Fred Hehre Lecture – Leadership Lessons and Clinical Pearls

Ballroom ABC

Intro: Jaime Daly, MD

Speaker: Barbara Scavone, MD

3:30pm – 4:15pm BREAK IN THE EXPO HALL

Ballroom DEF

4:30pm EXPO HALL CLOSES FOR THE DAY

CONCURRENT SESSIONS

4:15pm – 6:15pm Sol Shnider Track #1

Mainstage - *Ballroom ABC*

1. Wrangling the Experts: A Discussion of Challenging Topics in OB Anesthesia

   Moderator: Katie Arendt, MD

   Panelists: Lawrence Tsen, MD
   Joy Hawkins, MD
   Feyce Peralta, MD

2. Don't Forget the Neuraxial Adjuvants! Clonidine, Dexmedetomidine, Epinephrine, and Buprenorphine

   Moderator: Britany Raymond, MD

   Panelists: Dan Katz, MD
   Ruth Landau, MD
   Laura Sorabella, MD

4:15pm – 6:15pm Research Track #1

Breakout – *Governor's Square 12*

How to Answer Important Questions in OB Anesthesia – The Optimal Study Design for Your Research

Moderator: Pervez Sultan, MD

Panelists: Anton Chau, MD
Ron George, MD
Jill Mhyre, MD
Cynthia Wong, MD

Friday, May 3 - Continued

6:30pm Educational Programming Adjourns for the Day

6:30pm – 7:30pm Sponsored Happy Hour – Stryker

Governor's Square 12

7:15pm – 8:15pm FELLOWS & RESIDENT'S RECEPTION

Bezel Bar

SATURDAY, MAY 4

7:00am – 9:00am Continental Breakfast in Expo Hall – *Ballroom DEF*

7:00am – 10:00am Research Network Symposium

Governor's Square 12

7:50 am – 8:00 am Opening Remarks

Ballroom ABC

Brandon Togioka, MD

SOAP Speaks! Speaker Database for Curricular Development

Caitlin Sutton, MD

8:00am – 10:00am Sol Shnider Clinical Track #2

Ballroom ABC

1. What to Say When There are No Words: Disclosure and Debriefing Strategies for our Darkest Days After a Traumatic Event

   Caitlin Sutton, MD
2. Of Mice and Women: Cutting Edge Research in Uterine Atony

   Moderator: Shubhangi Singh, MD

   Panelists: Jessica Ansari, MD; Naida Cole, MD; David Combs, MD
3. Updates on Labor Analgesia: How to Deliver the Best Option for Your Patient

   Sharon Reale, MD

10:00AM – 10:45AM BREAK IN EXPO HALL

Ballroom DEF

10:45am – 12:00pm Best Case Reports

Ballroom ABC

Moderator: Moderator: John Kowalczyk, MD

Panelists: Cally Hoyt, MD

Allison Lee, MD

Alicia Dennis, MD

- Acute intracranial hemorrhage requiring emergent cesarean section - Shonna Gaskin
- Delayed Interval Hysterectomy for Placenta Percreta: A Case Report - Paige Oates
- A Case of Serotonin Syndrome During Intrapartum Cesarean Delivery - Michael Wen
- Peripartum management of a patient with vascular Ehlers-Danlos Syndrome and Loeys - Dietz Syndrome complicated by aortic and carotid dissections - Jacob M. Nieb

Saturday, May 4 - Continued

- Took Much of a Good Thing: High Dose Aspirin and Neuraxial Anesthesia - Sara Dryden
- A case of cosmetic experimental biopolymers leading to non-neuraxial management of labor analgesia - Ann Norris
- The use of transcutaneous CO2 monitoring to guide ventilatory management in pregnant patients undergoing laryngeal surgery - Sara Feldman
- A Patient with Hypodysfibrinogenemia Undergoing Cesarean Delivery: Discordant Dose-Response and ROTEM Results - Allison A. Mootz
- Uncommon cause of altered mental status in the parturient with polysubstance use: Could it be the thyroid? - Saheb S. Dhillon
- Management of a pregnant patient on dual antiplatelet therapy after percutaneous intervention: Cangrelor bridging as a path to neuraxial anesthesia for delivery – Brian Waldman

12:00pm – 1:00pm LUNCH ON YOUR OWN

12:00pm – 1:00pm SPONSORED LUNCH (NO-CME) – pre-registration required

Carus – *Governor's Square 12*

1:00pm – 1:30pm ASA Update

Ballroom ABC

Ron Harter, MD, President of ASA

1:30pm – 1:50pm SOAP Endowment Fund 2026 Campaign Launch

Ballroom ABC

Klaus Kjaer, MD & May Pian-Smith, MD

1:50pm -2:50pm Gerard W. Ostheimer Lecture

Ballroom ABC

Intro: Pervez Sultan, MD

Speaker: Melissa Bauer, DO

2:50pm – 3:15pm BREAK IN EXPO HALL

Ballroom DEF

3:15 pm – 3:25 pm Distinguished Service Award

Ballroom ABC

Introduction: Gillian Abir, MD
Recipient: Brendan Carvalho, MD

3:25 pm – 4:00 pm SOAP Awards

- Best Research Paper
- Gertie Marx
- Teacher of the Year
- Best Case Report
- Diversity & Inclusivity Award
- Patient Safety Award
- Research in Education Award
- Frederick P. Zuspan Award
- SOAP/Kybele International Outreach Grant
- SOAP Diversity & Inclusivity Mentored Grant
- Center of Excellence

Saturday, May 4 - Continued

4:00pm – 4:30pm BREAK IN EXPO HALL

Ballroom DEF

4:30pm EXPO HALL CLOSES/EXPO MOVES OUT

4:15pm – 6:30pm Abstract Breakout Sessions - Case Reports

Breakout 1: Broken uterus and other unusual bleeders (*Governor's Square 17*)

1. Anesthetic Management of Cesarian Deliveries Following Uterine Transplant - Annalese Neuenschwander, MD
2. Di-Cavity Twin Pregnancy in the Setting of Uterine Didelphys - Annalese Neuenschwander, MD
3. Disseminated Intravascular Coagulopathy Following Primary Cesarean Section Complicated by Broad Ligament Hematoma - Bryan Wakefield, MD
4. The Repeat Offender: A Rare Case of Recurrent Incarcerated Uterus in Pregnancy - YeongHa Oh, BA
5. A Case of Uterine Rupture in a Nulliparous Patient - Pasha Rahbari, MD
6. Bandl's Ring - Natalya Malenko, DNP, CRNA
7. Cesarean Hysterectomy in a Nulliparous Parturient Complicated by Acute Kidney Injury - Kyle Sullivan, MD
8. Delayed Diagnosis of Uterine Rupture After Successful Vacuum-Assisted Vaginal Birth After Cesarean Delivery - Catharine Keim, MD
9. Uterine Rupture During Induction of Labor for Second Trimester Fetal Demise - Shannon Paquette, MD
10. Successful anesthetic management of spontaneous splenic rupture during urgent cesarean delivery - William Pinkston, DO
11. Intrapartum Management of a Patient with History of Recurrent Spontaneous Postpartum Retroperitoneal Hemorrhages - Talia Strulowitz, MD
12. Mitigating Risks During Cesarean Delivery for Advanced Maternal Age with Significant Fibroid Burden - Carlos Guardia, MD
13. Extremely Rare Case of Haemophilus Influenza Type B Bacteremia with Intrauterine Seeding - Heidi Heyman, MD
14. Intrapartum Acute Abdomen Requiring Urgent Cesarean Delivery and Exploratory Laparotomy - Ashwini Joshi, MD
15. Neuraxial Anesthesia to Facilitate Manual Reduction of an Incarcerated Gravid Uterus - Raji Naamani, MD
16. The importance of pregnancy tests: Placental abruption mistaken for abnormal uterine bleeding - John Robison
17. Maternal Bladder Exstrophy Complicating Cesarean Delivery: A Multidisciplinary Approach to Care - Benjamin Boudreau
18. Our Missing Person - Matthew Sikora, DO

Breakout 2: It's not all in the head - sometimes the spine is broken (*Governor's Square 16*)

1. Maternal cranial arachnoid cyst: Is neuraxial anesthesia appropriate? - Michael Wen, MD

Saturday, May 4 - Continued

2. Unexpected Subdural Hematoma after Dural Puncture Epidural: a case without warning signs - Allen Le, MD
3. Anesthetic Management of Symptomatic Chiari I Malformation in A Parturient - Kevin Rychik, MD
4. Successful Vaginal Delivery after a Spinal Cord Injury Complicated by Autonomic Dysreflexia - Kathryn Kim, MD
5. Anesthetic Management of Cesarean Delivery in a Patient with Cerebral AVM - Vanna Cochran
6. Cesarean Delivery and Posterior Craniotomy in a Patient with Von Hippel Lindau - Leila Katabi, MD, MA
7. Cesarean Delivery in a Spontaneously Laboring Patient with History of Fontan Circulation, Complicated by Intrapartum Stroke - David Gutman, MD, MBA
8. Neuromyelitis Optica and Anesthetic Considerations for Cesarean Delivery: A Case Report - Latha Hebbar, MBBS
9. Superior Sagittal Sinus Thrombosis in a Viable Parturient - Jessica Stockinger, MD
10. Slow and Steady Births the Baby: A Case Study on Management of Parturients with Muscular Dystrophy - Natalie Campbell, MD
11. Anesthetic Management of a Parturient with Neurofibromatosis Type 1 – Christopher Lee, MD
12. Seizure or no seizure, that is the question - cesarean delivery with a vagal nerve stimulator - Morgan Clinton
13. Neuroleptic Malignant Syndrome in Early Pregnancy - Patricia Dalby, MD
14. Diffuse Central Venous Sinus Thrombosis (CVST) in Pregnancy with Elevated ICP and Ischemic Stroke: A High-Pressure Cesarean Delivery (CD) - Kelsey De Silva, MD
15. Anesthetic Management of a Parturient with a Neurologically Compromising Spinal Cord Tumor - Naima Kotadia, MD
16. Labor Analgesia in a Patient with Resolved Transverse Myelitis - Maya Menon, MD
17. An Unusual Cause For A Positional Headache: A Case of Pneumorrhachis and Pneumocephalus Following Combined Spinal Epidural Placement for Labor Pain Management - Calvin Wong, MD
18. Peripartum Management of a Parturient with Spinocerebellar Ataxia Type III - Jazib Hassan, MD
19. Peripartum Management of a Parturient with Spinal and Cerebellar Hemangioblastomas Secondary to Von Hippel-Landau Syndrome: A Case Report - Leslie Goldberg, MD, PhD
20. Urgent Cesarean Delivery with Cervical Spine Tumor - Michael Oyekan, MD
21. A Rare Spinal Angiolipoma Causing Severe Myelopathy in a Parturient - Polina Ferd, MD
22. Neuraxial Anesthesia in Parturients with Intracranial Arteriovenous Malformations - Deniz Isikkent

Saturday, May 4 - Continued

Breakout 3: We did not forget preeclampsia/HELLP and a few other placental zebras (*Governor's Square 15*)

1. Acute intracranial hemorrhage requiring emergent cesarean section - Shonna Gaskin, MD
2. Cardio-Obstetrics: A Case of Repaired Tetralogy of Fallot Complicated by Right Heart Failure, Preeclampsia and Acute Kidney Injury - James Conwell, DO
3. MRI to Diagnose Atypical PDPH: A challenging diagnosis of a Multifactorial Headache in a patient with PDPH, PRES, Pre-eclampsia and Migraines - Amnon Berger, MD, PhD
4. Significant Maternal Morbidity in Parturient with Eclampsia - Glenn Slick
5. Management of a Pericardial Effusion in a Pre-Eclamptic Parturient; Pericardiocentesis Prior to Cesarean Delivery - Anusha Reddy, MD
6. Management Challenges in Severe Pre-eclampsia: A Case of Magnesium Toxicity – Ayse Kula, MD
7. HELLP: A Diagnosis by urine - Lauren Hilt
8. Progressive Encephalopathy in a Parturient with Reversible Cerebral Vasoconstriction Syndrome - Reagan Hattaway, MD
9. Antepartum Psychosis in a Patient with Severe Pre-eclampsia - Andrea Fritz, MD, MPH
10. Anesthetic management of cesarean delivery for decompensated mitral stenosis in the setting of preeclampsia with severe features - Erin Dengler, MD, MBA
11. Anesthetic Management of an Obstetric Patient with History of Catastrophic Antiphospholipid Syndrome and HELLP – Rebecca Minehart, MD
12. Management of a parturient presenting with preeclampsia and peripartum cardiomyopathy - Lillye Anderson, MD
13. Magnesium Toxicity and Cesarean Section Avoidance with the Help of Patient-Accessed EMR - Blake Sowers
14. Late Postpartum Preeclampsia with Severe Features from Retained Products of Conception - Libertie Broussard, MHS, BS
15. Refractory Preeclampsia in a Post-Kidney Transplant Parturient - Anna Fenner, MD
16. Management of Pregnant Patient with Acute Respiratory Failure - Olubukola Toyobo, MD, MBA
17. Delayed recognition of post-partum hemorrhage in setting of severe pre-eclampsia - Jessica Stockinger, MD
18. Advanced Molar Pregnancy in a Grand Multiparous Patient - Madison Kohl, DO
19. Eclampsia in a sixteen-year-old parturient complicated by retinal detachment and posterior reversible encephalopathy syndrome (PRES) requiring emergent cesarean delivery - Bryan Wakefield, MD
20. A Parturient with Metastatic Choriocarcinoma and a Viable Fetus - Neva Lemoine, MD
21. Atypical Presentation of Eclampsia - Soshana Clerizier, MD

Saturday, May 4 - Continued

22. Anesthetic Considerations for Cesarean Hysterectomy for Complete Molar Pregnancy with Coexisting Fetus: A case report - Zach Wright, MD
23. A lifesaving misdiagnosis of eclampsia - Simon Wydall, MBBS BSc FRCA

Breakout 4: Oh no - pulmonary hypertension, dissecting aortas & pheochromocytoma (*Governor's Square 14*)

1. Peripartum management of a patient with vascular Ehlers-Danlos Syndrome and Loeys-Dietz Syndrome complicated by aortic and carotid dissections - Jacob Nieb, MD
2. Delivery with Severe Pulmonary Artery Hypertension – Kaitlyn Brennan, DO, MPh
3. Severe Rheumatic Mitral Stenosis with Secondary Pulmonary Hypertension Requiring Percutaneous Balloon Mitral Valvuloplasty in Pregnancy - Katherine Bartz, MD
4. Role for nitric oxide in management of severe pulmonary hypertension secondary to large atrial septal defect - Jianing Jenny He, MD
5. Every Breath You Take: Cystic Fibrosis and Pulmonary Hypertension in The Parturient - Lakshmi Nerusu, MD
6. Complex Care for a Parturient with Supra-Systemic Pulmonary Hypertension - Kylie Grady, MD
7. Anesthesia for Cesarean Delivery in the Setting of Severe Pulmonary Hypertension, Repaired Congenital Diaphragmatic Hernia and Significant Thoracolumbar Kyphoscoliosis - Rhiannon Kelsh-Lasher, MD, PhD
8. Anaesthesia for Caesarean Delivery in a Pregnant woman with Acute Type B Aortic Dissection and Marfan Syndrome - Eugene Tuyishime, MBBS, MMed, MSc
9. Anesthetic Management of a Parturient with Severe Tricuspid Regurgitation and Pulmonary Hypertension: A Case Report - Matthew Roche, MD
10. Medically Indicated Termination of Pregnancy due to Idiopathic Pulmonary Arteriolar Hypertension - David Gutman, MD, MBA
11. Management of a Pregnant Patient with Severe Rheumatic Mitral Stenosis, Aortic Regurgitation and Severe Pulmonary Hypertension. Balloon Mitral Valvuloplasty- What, Why, When, and How? - Maya Menon, MD
12. HELLP! Pulmonary Hypertension: Anesthetic Management of a Parturient with HELLP Complicated by Undiagnosed Pulmonary Hypertension for Urgent Caesarian Delivery. - Oluwadunsin Bakare
13. Management of the Parturient with Idiopathic Pulmonary Hypertension - Courtney Dorris, MD
14. Undiagnosed pulmonary hypertension in pregnancy complicated by postpartum hemorrhage - Shonna Gaskin, MD
15. Perioperative considerations in managing aortic dissection in the context of pregnancy and a rare genetic mutation (MYH11) - Jeric Israel Julian, DO
16. Anesthetic Planning and Management of a parturient with severe aortic regurgitation due to a dilated aortic root complicated by thrombocytopenia and platelet dysfunction - Britton Huskey, MD
17. Peripartum type A aortic dissection requiring emergency C section and aortic repair: A case report - Hannah Schmucker, MD

Saturday, May 4 - Continued

18. Anesthetic Management of a Parturient with Moyamoya Disease for Vaginal Delivery - Raji Naamani, MD
19. Splenic artery aneurysm rupture in a pregnant patient at 30 weeks gestation: A Case Report. - Sunti Barahi
20. Navigating the Storm: Anesthetic Management of a Rare Case of Pheochromocytoma During Pregnancy - Rebecca Himmelwright, MD
21. Pregnancy and Type IV Ehlers Danlos Syndrome - Komal Chaudhry, MD

Breakout 5: Neuraxial challenges, complications and adverse drug reactions (*Governor's Square 11*)

1. A Case of Serotonin Syndrome During Intrapartum Cesarean Delivery - Michael Wen, MD
2. Took Much of a Good Thing: High Dose Aspirin and Neuraxial Anesthesia - Sara Dryden, MD
3. Maternal Arrest from High Spinal after Local Anesthetic Bolus Through a Replacement Epidural Catheter Following Prior Placement of an Intrathecal Catheter - Eve Bishop, MD
4. We Remember it All Too Well - The time our patient got an entire epidural bupi/fentanyl bag bolused I.V. - Theophilus Abah, MD
5. Managing Labor Pain in a Patient with Lidocaine Allergy: A Case Study in Epidural Anesthesia Alternatives - Jasveen Chadha, MBBS
6. Intrathecal 3% Chloroprocaine for Cesarean Section in a Patient with Lidocaine Anaphylaxis - Damon Wallace, MD
7. Local Anesthetic Resistance in Patient Scheduled for Cesarean Section - Bradley Skene, DO
8. Motor-Sparing Epidural Anesthesia with Lidocaine For Cesarean Delivery - Kayla Robinson, MD, MS
9. Labor Analgesia in patients with CYP isoform mutations. – Meredith Albrecht, MD
10. Thoracic Dural Puncture Epidural for Parturient with Prior Lumbar Spine Surgeries - Mohammad Nawaz, MD
11. Low Thoracic Epidural Post-Cesarean Analgesia and Pompe Disease: A Case Report – Edwin Haring, MD
12. Labor Analgesia in a patient with Spina Bifida Occulta - Roy Lei, MD
13. "Can I get an epidural?" Prenatal Neuraxial Ultrasound in Patients with Spine Pathology - Marcos Izquierdo, MD
14. An Atypical Presentation of Pneumocephalus Following Epidural Analgesia - Hunter Brooks, MD
15. HORNER'S SYNDROME A Transient Complication After Lumbar Epidural Anesthesia - Marshall Reviere
16. Laboring Chiari Malformation with a Tethered Cord: to Place or Not to Place? - Mae Wimbiscus, BA
17. An Individualized Approach to Neuraxial Anesthesia Following Selective Dorsal Rhizotomy - Victorya Piehl, MD
18. Delayed Removal of Fractured Spinal Needle - Michael Rybak, CRNA

Saturday, May 4 - Continued

Breakout 6: Liver, lungs, and lumps (*Governor's Square 10*)

1. Newly diagnosed mediastinal mass in a patient requiring urgent cesarean delivery - Joy Hawkins, MD
2. Anesthetic Management of Placental Abruption in the Setting of Alcoholic Hepatitis - Andrew Mullet, MD
3. Disseminated Herpes Simplex Virus 2-Induced Hepatitis During Pregnancy - Haylee Bergstrom, MD
4. Anesthetic Considerations in a Second Trimester Pregnant Patient with Decompensated Cirrhosis - Hannah Brown
5. Cesarean Section at 28 Weeks in a Parturient with History of Liver Transplant and Impending Renal Failure - David Gutman, MD, MBA
6. Neuraxial Anesthesia in an Obstetric Patient with Thrombocytopenia After Liver Transplant - Nilson Wu, MD
7. Hypofibrinogenemia in Pregnancy: AFLP vs HLH - Aaran Varatharajan, MD
8. Maternal Mortality: Acute Liver Failure Presentation and Management - Rebecca Himmelwright, MD
9. Acute fatty liver of pregnancy at 17 weeks 6 days in a patient with intrauterine fetal demise - Amy Zheng, MD
10. A Cloudy Clinical Picture: Acute Fatty Liver of Pregnancy Complicated by Septic Shock - Arpita Bose, MD
11. Anesthetic management during cesarean delivery of a parturient with anti-PL-12 antisynthetase syndrome, severe ILD, and heart failure - Emmarie Myers, MD
12. T- Cell lymphoblastic lymphoma with anterior mediastinal mass in pregnancy - Shonna Gaskin, MD
13. Treatment of Chronic Myeloid Leukemia in Pregnancy and Anesthetic Considerations: A Case Report - Monica Lu, MD
14. Resection of Large Intrathoracic Recurrent Metastatic Hepatoblastoma at 26 weeks Gestation - Jarrett Perry, MD
15. Anesthetic Neuraxial Implications of Chronic Myeloid Leukemia in the Obstetric Patient - Juliana Barrera, MD, Msc, Frcpc
16. Anesthetic Management Of An Obstetric Patient With New Diagnosis Of Leprosy - Juliana Barrera, MD, MSc, FRCPC
17. Anesthetic Management of a Parturient with Swyer-James-MacLeod Syndrome - Malcolm Howard, MD, FRCPC, MSc
18. Cesarean Delivery in a Patient with Epidermolysis Bullosa Dystrophica - Katina Kassicieh, MD
19. Primary cesarean delivery complicated by recessive dystrophic epidermolysis bullosa - Bryan Wakefield, MD
20. Anesthetic management of a morbidly obese parturient undergoing cesarean delivery: A Case Report - Ashley Elser, MD
21. Anesthetic Management for an Urgent Cesarean Delivery in a Super-Super Morbidly Obese Patient with Metabolic Syndrome - Shashank Shettar, MD, FASA
22. Hypertriglyceridemia-Induced Acute Pancreatitis in Pregnancy - Walter Taylor, MD

Saturday, May 4 - Continued

6:30pm Educational Programming Adjourns for the Day

6:30pm – 7:30pm Sponsored Happy Hour – Edwards Lifesciences
Governor's Square 12

8:00pm DINNER ON YOUR OWN

SUNDAY, MAY 5

7:00am – 9:00am Coffee Service
General Session Foyer

7:00am – 7:45am Special Interest Group Roundtable Discussions
General Session Foyer

7:55 am – 8:00am Opening Remarks
Ballroom ABC
Emily Sharpe, MD

8:00am – 9:00am SOAP/ASRA Panel: PDPH Beyond the Guidelines: How to Improve Patient Care
Ballroom ABC
Moderator: Lisa Leffert, MD
Panelists: Vishal Uppal, MD
Wouter Schievink, MD
Alexandra Schyns-van den Berg, MD
Sharon Orbach-Zinger, MD

9:00 am – 9:15 am BREAK
General Session Foyer

CONCURRENT SESSIONS

9:15am – 11:15am Sol Shnider Track #3 *(General Session)* – MAIN STAGE
Ballroom ABC

1. Three Perils of Intrapartum Cesarean Deliveries: Pain, PPH, and PTSD
   Moderator: Brendan Carvalho, MD
   Panelists: Daniel Conti, MD; Sharon Dekel, MD; Leziga Obiyo, MD
2. PRO/CON: NPO in Labor vs. Fed in Labor
   Fasting: Mark Zakowski, MD
   Fed: Manny Vallejo, MD
3. Addressing Maternal Disparities: Three Areas to Improve Your Patients Outcomes
   Moderator: Fatoumata Kromah, MD
   Panelists: Emily Naoum, MD; Sarah Nizamuddin, MD; Paloma Toledo, MD

9:15am - 11:15am Oral Poster Presentations #2 – BREAKOUT
Governor's Square 12
Moderator: Ashraf Habib, MD

Sunday, May 5 - Continued

1. Effect of Ephedrine, Phenylephrine, and Norepinephrine on Myometrial Contractility – Wafa Bellan, MD
2. Readability, quality and accuracy of ChatGPT and BARD for common questions about obstetric anesthesia – Donald Lee, MD
3. A New Machine Learning Model for the Prediction of Severe Maternal Morbidity Using a Large Retrospective Cohort – Taylor Maney, MD
4. Development and validation of a prognostic model for maternal cardiovascular morbidity events in patients with hypertensive disorders of pregnancy - Marie-Louise Meng, MD
5. Noninvasive continuous versus intermittent oscillometric arterial pressure monitoring and maternal hypotension during cesarean delivery: A randomized controlled trial - Sun-Kyung Park, MD
6. Erector Spinae Plane Block with Liposomal Bupivacaine for Post Cesarean Delivery Analgesia: A Pilot Study – Sara Feldman, MD
7. Local Anesthetic Systemic Toxicity in Pregnancy: A Retrospective Cohort Analysis – Micah de Valle, RN, BS
8. Trends in neuraxial labor analgesia utilization by race and ethnicity among nulliparous individuals undergoing spontaneous vaginal delivery, United States, 2007-2022 – Emily Stockert, MD

11:15 am -1:15 pm Case Reports and Research Abstracts

Breakout Room 1: POCUS & failures (*Governor's Square 17*)

1. Implementation of a standardized epidural top-up algorithm - Zeitz Jack, BS
2. Failure rates of single injection spinal and combined spinal epidural anesthesia for postpartum tubal ligation: a single center retrospective study - Megan Foster, BS
3. Urine Drug Screening During Pregnancy Stratified By Race: Preliminary Results of A Single Center Retrospective Study - Ivie Izekor, BS
4. Design and production of a custom skin marking needle guide for ultrasound-guided neuraxial anesthesia using a 3D printer - Ella Taylor
5. Curvilinear versus Phased Array Transducers for Peripartum Focused Cardiac Ultrasound: A non-inferiority comparative cross over study - Lynn Squires, MD FRCPC
6. Intra- and interrater reliability of quantitative ultrasound assessment of gastric content in term parturients before elective cesarean delivery. - Juan Pablo Ghiringhelli, MD
7. The effect of a head elevating positioning device on the position, depth and height of the cricothyroid membrane in patients with obesity class 3 in their third trimester of pregnancy. - Evan Wild, MD
8. Focused Cardiac Ultrasound in the Peripartum Environment: A Case Series of the Echocardiographic Assessment Using Subcostal-Only (EASy) View In the Obstetric Population - Rhiannon Kelsh-Lasher, MD, PhD
9. Rescue Transesophageal Echocardiography (TEE) in a Case of Peripartum Maternal TRANSLATE with x English ArabicHebrewPolish BulgarianHindiPortuguese CatalanHmong DawRomanian Chinese SimplifiedHungarianRussian Chinese TraditionalIndonesianSlov - Divleen Malhi, MD

Sunday, May 5 - Continued

10. Evaluating the feasibility of measuring VTI as a surrogate for Cardiac Output in Pregnancy - Victoria Postnikova, MD
11. Neuraxial Analgesia/Anesthesia in Super and Super- Super Morbid Obese Pregnant Women. Have We Gotten Better? What is the status? - Amy Zheng, MD
12. Abnormal Echocardiogram Findings in Morbidly Obese Pregnant Patients and the Association with Obstetric Outcomes - Gurbani Singh, BS, BA & Maxwell Emmanuel, BS

Breakout Room 2: AFE and emergencies - Case Reports (*Governor's Square 16*)

1. Euglycemic Diabetic Ketoacidosis in a Parturient Leading to Maternal Cardiac Arrest - Maegan Lu, MD
2. Amniotic Fluid Embolus - O. Morgan Hall, MD
3. Safe removal of epidural catheter in the setting of AFE requiring VA ECMO - Lindsay Tremper, MD
4. Perimortem Cesarean Delivery and Refractory Cardiogenic Shock after Atypical HELLP Syndrome vs Acute Fatty Liver of Pregnancy vs Amniotic Fluid Embolism - Ijeoma Eleazu, MD
5. Amniotic Fluid Embolism: Early Recognition and Intervention - Kunal Sampat, DO
6. Navigating Splenic Hemorrhage in Pregnancy: A Multidisciplinary Case Report - Danran Zhou, RN, BS
7. Peripartum Hyponatremia - Nitisha Lotun, MD
8. Accelerated idioventricular rhythm diagnosed intra-operatively in pre-eclamptic parturient without peripartum cardiomyopathy: a case report - Daniel Tobes, DO
9. A Parturient With A Lung Arteriovenous Malformation And A New Diagnosis Of Hereditary Hemorrhagic Telangiectasia - Amanda rodriguez, MD
10. Management of a Parturient with Poorly Controlled Chronic-Phase Chronic Myeloid Leukemia - Amy Zheng, MD
11. Anesthetic Management of a Parturient with Metastatic B-Cell Lymphoma - Rechna Korula, MD, MS
12. Mediastinal Mass Pregnancy: Perioperative Management of a Parturient with a Large Mediastinal Mass. - Nicholas Cardillo, MD
13. Cesarean Delivery of Twins at 26-weeks in a Woman with Recurrent Metastatic Osteosarcoma and Mediastinal Mass - Dayley Keil, MD
14. Peripartum Anesthetic Considerations in a Patient with Fontan Physiology and Placenta Accreta Spectrum – Braydon Bak, MB, BCh, BAO

Breakout Room 3: Cardiovascular - Case Reports (*Governor's Square 15*)

1. Management of a Parturient with Elevated Mitral Valve Gradient and Suspected Prosthetic Mitral Valve Thrombus - Amy Zheng, MD
2. Management of a Parturient with Severe Mitral Stenosis and Atrial Fibrillation with Rapid Ventricular Rate - Amy Zheng, MD
3. Pregnancy and Cardiac Disease: Two Case Reports - Anuj Bapodra, MD
4. Coagulopathy in a Parturient with Aortic Stenosis Presenting for Cesarean Section - Kyle Wong, MD

Sunday, May 5 - Continued

5. Point-of-care ultrasound (POCUS) in diagnosis of sudden onset peripartum cardiomyopathy. Case report and anesthesia management. - Juan Pablo Ghiringhelli, MD
6. Shone's Complex Pregnancy: Perioperative Management of a Parturient with Congenital Cardiac Malformation. - Ralph Lamonge, MD
7. Spontaneous Coronary Artery Dissection - Tyler Guidugli, DO
8. Management of Cesarean Delivery in Fontan Physiology - Tyler Guidugli, DO
9. Successful Cesarean in Non-Operative Triple Valve Endocarditis - Madison Kohl, DO
10. Management of Labor in a Parturient with Double Inlet Left Ventricle S/P Fontan Procedure - David Gutman, MD, MBA
11. Cesarean Section in Parituent with Left Ventricular Outflow Tract Obstruction, PostValve Aortic Stenosis, and Aortic Insufficiency - David Gutman, MD, MBA
12. A Multidisciplinary Approach for Managing Incidental Finding of Left Atrial Myxoma during Pregnancy - Mohamed S Eissa, MBBCh, MSc, MD, EDAIC, FRCPC, Advanced PTEeXAM
13. Management of a Parturient with Newly Diagnosed Vascular Ehlers-Danlos - Erin Dengler, MD, MBA
14. Epidural Placement in A Patient with Ehlers-Danlos Syndrome - Blake Sowers
15. Mission Impenetrable: Failed Dural Puncture in a Parturient with Hypermobile Ehlers-Danlos Syndrome - Eric Emerling, MD

Breakout Room 4: CS Pain (*Governor's Square 14*)

1. Intraoperative Ketorolac Dosing for Analgesia Following Cesarean Delivery - Loni Kreger, MD
2. Patient and provider perspectives on pain and other dimensions of cesarean delivery experience (PARTNER Study Part 1) - Yunseo Linda Park, BS
3. Quantitative evaluation of patient and provider priorities for cesarean delivery anesthesia experience (PARTNER Study Part 2) - Briana Clifton, BA
4. Comparison of remimazolam and midazolam for intraoperative sedation during cesarean section under spinal anesthesia: a prospective randomized trial - Seung Hyun Kim
5. Association Between Preoperative Pain Phenotype and Postoperative Opioid Use after Scheduled Cesarean Delivery - Amelie Pham, MD
6. Intraoperative Pain During Cesarean Delivery - Quality Improvement Project Part II: Trainee Baseline Educational Gap Assessment - Bryan Wakefield, MD
7. Estimating the 95% Effective Duration of Music for Anxiety Reduction Before Elective Cesarean Delivery - Tristan Fong, BS
8. Anesthesia Practice During Elective Cesarean Delivery Under Spinal Anesthesia: A Prospective Observational Study - Juliana Barrera, MD, MSc, FRCPC
9. Efficacy of various loco-regional techniques and intrathecal morphine for analgesia after cesarean delivery: systematic review and component network meta-analysis of randomized controlled trials - Narinder Singh, MD
10. Incidence of dyspnea during neuraxial anesthesia for cesarean delivery: a single center retrospective study - Aakshi Sanchorawala, BS

Sunday, May 5 - Continued

11. Predictors of pain during cesarean delivery: preliminary results of a prospective observational study using two validated psychometric surveys - Jessica Litman, MD
12. Predictors of pain during intrauterine device placement: preliminary results of a prospective observational study using a validated catastrophizing survey - Micah Clay, MD
13. Comparison of postoperative opioid consumption between cohorts who received two different doses of intrathecal morphine: preliminary results of a single center study - Shabaz Saad, BS

Breakout Room 5: PDPH Depression & … oxytocin (*Governor's Square 11*)

1. Postdural puncture headache: the sphenopalatine ganglion nerve block in obstetrics (SNOB) study. - Hamad Mohamad
2. To Puncture or Not to Puncture: Neuraxial Considerations in a Pregnant Patient with Chronic Orthostatic Headaches - Claudia Sotillo, MD
3. Patient, Temporal and Provider Factors Associated with Unintended Dural Puncture in Obstetrics - Gregory Galanti, MD
4. Inadvertent Dural Puncture Leading to Subdural Hematomas and Persistent Headaches - Jessica Nieto, MD
5. Subdural Hematomas after Accidental Dural Puncture Requiring Surgical Interventions - Yujing Zhao, MD
6. Post-dural puncture headache incidence in dural puncture epidurals/ combined spinal epidurals versus conventional epidural blocks for labor: A systematic review and meta-analysis - Kumiko Chino, MD
7. Interventions to Prevent Postpartum Depression: A Systematic Review of the Literature and Network Meta-Analysis - Heather Acuff, MD, PhD
8. Development of a Psychological Birth Trauma Screening and In-Hospital Psychosocial Support Protocol - Katherine Seligman, MD FRCPC D.ABA
9. The role of neuroimaging for seizure management in pregnancy: a case series - Nicholas Ledlie, MSc, BMBS, MRCP, FRCA
10. Relationship Between Duration of Oxytocin Cessation and Estimated Blood Loss During Cesarean Delivery - Breta Osei-Bonsu, M.D
11. Methylergonovine + Oxytocin vs. Oxytocin alone in non-elective cesarean sections, a retrospective cohort study - Jordan Abrams, MD
12. Association of an oxytocin bolus protocol on use of secondary uterotonic agents during cesarean delivery - Brittany McCune, MD
13. Identifying Severe Maternal Morbidity (SMM): A Challenge In And Of Itself - Kyle Sullivan, MD

Breakout Room 6: Communication OR efficiency education SIM (*Governor's Square 10*)

1. When does labor pain become front of mind: timeline of antenatal care concerns from patients' perspectives - Abigail Wong-Rolle, BA
2. Interprofessional Simulation-Based Team Training Using Relational Coordination Theory on the L&D Unit – A Pilot Study - Katherine Bartz, MD
3. Strengths and Barriers to an Effective Multidisciplinary Safety Rounds: A Qualitative Analysis of Obstetric, Midwifery, Anesthesia, and Nursing Provider Input - Bryan Wakefield, MD

Sunday, May 5 - Continued

4. Increasing the Percentage of First Case on-time starts in the Labor & Delivery Operating Rooms - Paloma Toledo, MD, MPH, FASA
5. Decreasing the Unnecessary Wait Time for Scheduled Cesarean Section - Bhakti Chourasia, MD
6. Expanding multidisciplinary simulation-based training to medical students: a novel simulation for anesthesia and obstetric emergencies - Virginia Berry, MD
7. Cesarean Section Classification System: Improving Apgars through Expedited Communication - Matthew Sikora, DO
8. Identification of Potential Barriers to Providing Equitable Care on the Obstetric Unit: A Multidisciplinary Survey on Care Providers at Riverside Community Hospital - Morgan Currie, DO
9. Preoperative Pregnancy Screening with PREG (the Pregnancy Reasonably Excluded Guide) In a High-Volume Hospital System Reduces Testing Burden - Katherine Arendt, MD
10. Evaluation of artificial intelligence-created personal statements compared to applicant-written personal statements for obstetric anesthesiology fellowship application. - Amanda Ruiz, MD
11. Demographics and Motivations of Current United States Obstetric Anesthesia Fellows: A Survey Based Study - Christopher Mukasa, MD
12. The Obstetric Anesthesia Workforce Survey: 40-Year Update. - Brenda Bucklin, MD, MEHP
13. Evaluating Obstetric Anesthesia-Related Content on Instagram - Ogechukwu Anwaegbu, BS

1:15pm SOAP 2024 ANNUAL MEETING ADJOURNS

Speaker Disclosures

The following speakers and/or planning committee members have indicated that they have relationships with ineligible companies to disclose.

Name	Type of Relationship	Ineligible Company
Brendan Carvalho	Other Professional Activities - Consultant	Rivanna Medical, LLC
Brendan Carvalho	Other Professional Activities - Consultant	Stryker Corporation
Brendan Carvalho	Stock	Flat Medical
Michaela Farber	Other Professional Activities – Consultant	HemoSonics LLC
Michaela Farber	Other Professional Activities – Consultant	Octapharma USA, Inc.
Michaela Farber	Grant / Contract	Flat Medical
Ashwini Joshi	Stock	CVS Caremark Corporation
Tom Klumpner	Grant / Contract	University of Michigan
Tom Klumpner	Grant / Contact	BioIntellisense
Ruth Landau	Other Professional Activities – Consultant	Pacira Pharmaceuticals Incorporated
Ruth Landau	Other Professional Activities – Other	American Society of Regional Anesthesia and Pain Medicine
Elizabeth Lange	Other Professional Activities – Consultant	Octapharama USA, Inc.
Rebecca Minehart	Other Professional Activities – Consultant	Rivanna Medical, LLC
Kaitlyn Neumann	Gift	The Shane Foundation
Clemens Ortner	Other Professional Activities – Consultant	Sonologi Inc.
Anjan Saha	Other Business Ownership	Foundation for the Localization and Innovation of Global Health Technologies
Anjan Saha	Other Business Ownership	Deoxylytics
Maria Sheikh	Stock	Butterfly Network, Inc.
Shashank Shettar	Other Professional Activities – Consultant	Rivanna Medical, LLC
Brandon Togioka	Grant / Contract	B. Braun Medical
Brandon Togioka	Grant / Contract	Haisco Pharmaceutical Group
Brandon Togioka	Grant / Contract	Merck
Brandon Togioka	Grant / Contract	Georgia-Pacific
Paloma Toledo	Other Professional Activities – Other	Pacira Pharmaceuticals Incoporated
Ivan Velickovic	Other Professional Activities – Other	Juniper Consultin Group Inc. (Junicon US)
Tracey Vogel	Other Professional Activities – Consultant	NOMA.AI
Mark Zakowski	Other Business Ownership	Quantum Birthing LLC

All relevant financial relationships for this activity have been mitigated.

All other planners, faculty, and staff have reported no relevant financial relationships with ineligible companies to disclose.

Program Material
Wednesday, May 1, 2024

Focused Assessed Transthoratcic Echocardiography (FATE) Course
Faculty: Jean Marie Carabuena, MD; Kelly Feoruk, MD; Cedar Fowler, MD; Clemens Ortner, MD; Cesar Padilla, MD; Fantin Raffaella; Ana Lisa Ramirez, MD; Maria Sheikh, MD; Emily Stockert, MD; Caroline Thomas, MD; Ivan Velikovic, MD

Point-of-Care (POCUS) Ultrasound
Faculty: Christian Arzola, MD; Juliana Barrera, MD; Naida Cole, MD; Javier Cubillos, MD; Jackie Galvan, MD; Brinda Kamdar, MD; Yusuke Mazda, MD; Leziga Obiyo, MD; Naveed Siddiqui, MD; Evan Wild, MD; Fabricio Zasso, MD

Trauma Informed Care for Optimal Outcomes
Moderator: Tracey Vogel, MD
Panelists: Anjum Anwar, MD; Katie Seligman, MD; Andrea Traynor, MD; Cristina Wood, MD

Program Material
Thursday, May 2, 2024

Opening Remarks
Speaker: May Pian-Smith, MD, MS – SOAP President

Opening Keynote - "Honoring the Patient Experience"
Speaker: Susan Burton
The Retrievals, podcast series
Serial Productions/New York Times Producer, *This American Life*

President's Panel: Turning Oops into Ops: an international expert panel on leveraging our opportunities to improve our patients' experiences
Panelists: Sharon Dekel, MD; Brinda Kimdar, MD; Klaus Kjaer, MD, MBA; Nuala Lucas, MD; May Pian-Smith, MD, MS; Tracey Vogel, MD

OAA: Perioperative cardiac arrest in obstetrics-findings from NAP7
Speaker: Nuala Lucas, MD – President, Obstetric Anesthetists' Association

Best Paper Competition (Main Stage)
Moderator: Ruthi Landau, MD
Judges: Jake Beilin, MD; Grace Lim, MD; Katie Arendt, MD; Scott Segal, MD; Jill Mhyre, MD

A TIC TALK for anesthesia providers: New insights into the importance of trauma informed care
Speaker: Tracey Vogel, MD

SMFM Lecture: Post-Roe Landscape: Navigating Abortion Bans
Moderator: Leilah Zahedi-Spung, MD

Case Reports #1 (Breakout Rooms)
Room 1 – All these airway issues and other disasters
Room 2 – Hematology
Room 3 – When it bleeds (accretas, abruption and coagulopathies)
Room 4 – Broken Hearts
Room 5 – When it hurts & abnormal bones
Room 6 – Fixing Babies & Maternal Genetic Disorders

1

Susan Burton

Host, *The Retrievals*
Author, *Empty: A Memoir*
Producer, *This American Life*

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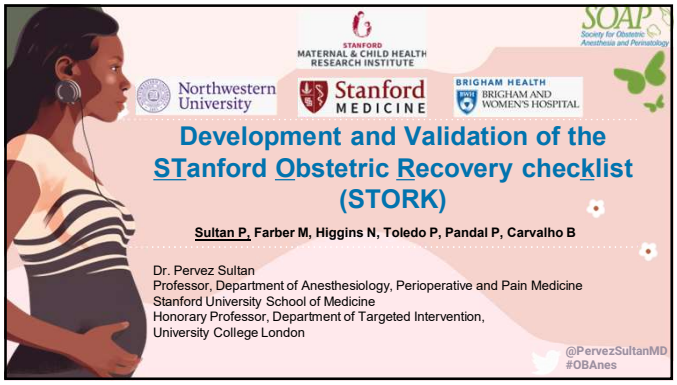
STANFORD MATERNAL & CHILD HEALTH RESEARCH INSTITUTE
SOAP
Society for Obstetric Anesthesia and Perinatology
Northwestern University
Stanford MEDICINE
BRIGHAM HEALTH
BRIGHAM AND WOMEN'S HOSPITAL
Development and Validation of the STanford Obstetric Recovery checklist (STORK)
Sultan P, Farber M, Higgins N, Toledo P, Pandal P, Carvalho B
Dr. Pervez Sultan
Professor, Department of Anesthesiology, Perioperative and Pain Medicine
Stanford University School of Medicine
Honorary Professor, Department of Targeted Intervention,
University College London
@PervezSultanMD
#OBAnes

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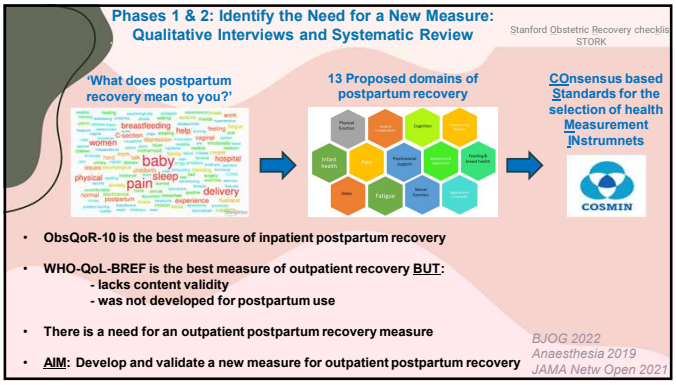
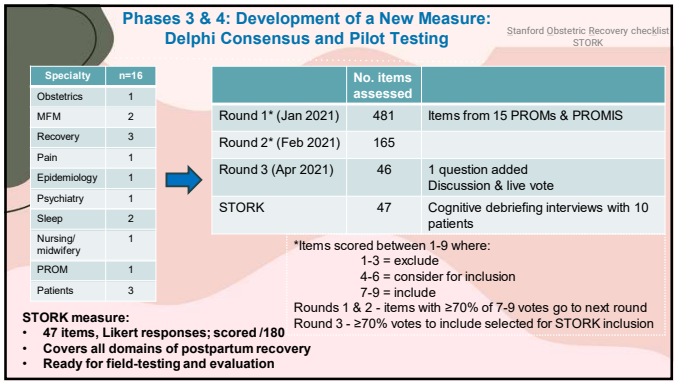
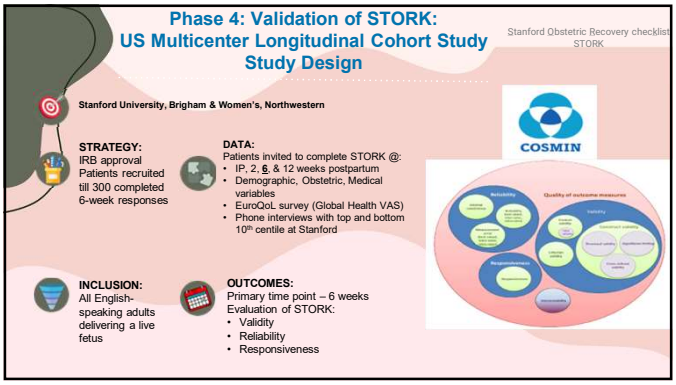

Phases 1 & 2: Identify the Need for a New Measure: Qualitative Interviews and Systematic Review
Stanford Obstetric Recovery checklist STORK
'What does postpartum recovery mean to you?'
13 Proposed domains of postpartum recovery
COnsensus based Standards for the selection of health Measurement INstrumnets
COSMIN
ObsQoR-10 is the best measure of inpatient postpartum recovery
WHO-QoL-BREF is the best measure of outpatient recovery BUT:
- lacks content validity
- was not developed for postpartum use
There is a need for an outpatient postpartum recovery measure
AIM: Develop and validate a new measure for outpatient postpartum recovery
BJOG 2022
Anaesthesia 2019
JAMA Netw Open 2021

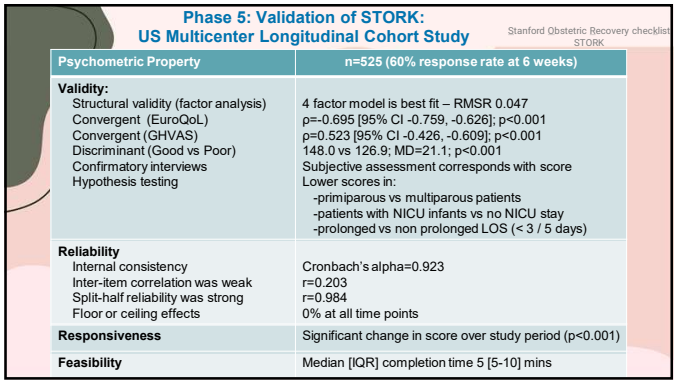
2


Phases 3 & 4: Development of a New Measure: Delphi Consensus and Pilot Testing
Stanford Obstetric Recovery checklist STORK
Specialty | n=16
Obstetrics | 1
MFM | 2
Recovery | 3
Pain | 1
Epidemiology | 1
Psychiatry | 1
Sleep | 2
Nursing/ midwifery | 1
PROM | 1
Patients | 3
No. items assessed
Round 1* (Jan 2021) | 481 | Items from 15 PROMs & PROMIS
Round 2* (Feb 2021) | 165
Round 3 (Apr 2021) | 46 | 1 question added Discussion & live vote
STORK | 47 | Cognitive debriefing interviews with 10 patients
*Items scored between 1-9 where:
1-3 = exclude
4-6 = consider for inclusion
7-9 = include
Rounds 1 & 2 - items with ≥70% of 7-9 votes go to next round
Round 3 - ≥70% votes to include selected for STORK inclusion
STORK measure:
47 items, Likert responses; scored /180
Covers all domains of postpartum recovery
Ready for field-testing and evaluation

3


Phase 4: Validation of STORK: US Multicenter Longitudinal Cohort Study Study Design
Stanford Obstetric Recovery checklist STORK
Stanford University, Brigham & Women's, Northwestern
STRATEGY:
IRB approval
Patients recruited till 300 completed 6-week responses
DATA:
Patients invited to complete STORK @:
IP, 2, 6, & 12 weeks postpartum
Demographic, Obstetric, Medical variables
EuroQoL survey (Global Health VAS)
Phone interviews with top and bottom 10th centile at Stanford
COSMIN
INCLUSION:
All English-speaking adults delivering a live fetus
OUTCOMES:
Primary time point – 6 weeks
Evaluation of STORK:
Validity
Reliability
Responsiveness

4


Phase 5: Validation of STORK: US Multicenter Longitudinal Cohort Study
Stanford Obstetric Recovery checklist STORK
Psychometric Property | n=525 (60% response rate at 6 weeks)
Validity:
Structural validity (factor analysis) | 4 factor model is best fit – RMSR 0.047
Convergent (EuroQoL) | ρ=-0.695 [95% CI -0.759, -0.626]; p<0.001
Convergent (GHVAS) | ρ=0.523 [95% CI -0.426, -0.609]; p<0.001
Discriminant (Good vs Poor) | 148.0 vs 126.9; MD=21.1; p<0.001
Confirmatory interviews | Subjective assessment corresponds with score
Hypothesis testing | Lower scores in:
-primiparous vs multiparous patients
-patients with NICU infants vs no NICU stay
-prolonged vs non prolonged LOS (< 3 / 5 days)
Reliability
Internal consistency | Cronbach's alpha=0.923
Inter-item correlation was weak | r=0.203
Split-half reliability was strong | r=0.984
Floor or ceiling effects | 0% at all time points
Responsiveness | Significant change in score over study period (p<0.001)
Feasibility | Median [IQR] completion time 5 [5-10] mins

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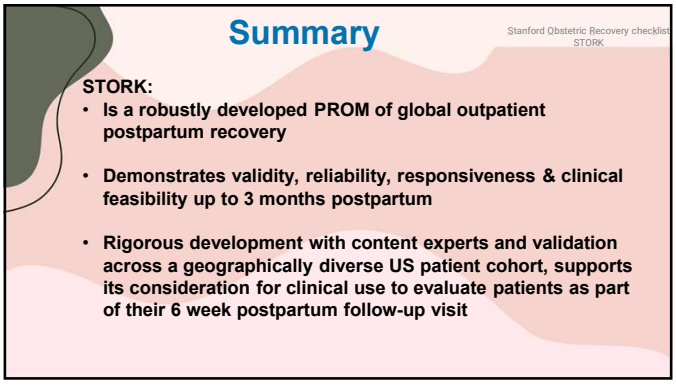
Summary
Stanford Obstetric Recovery checklist STORK
STORK:
Is a robustly developed PROM of global outpatient postpartum recovery
Demonstrates validity, reliability, responsiveness & clinical feasibility up to 3 months postpartum
Rigorous development with content experts and validation across a geographically diverse US patient cohort, supports its consideration for clinical use to evaluate patients as part of their 6 week postpartum follow-up visit

6

1

2

3

Intraoperative Pain During Cesarean Delivery:

- Previous Estimates of Risk Intraoperative Pain
  - 14.6% -> meta-analysis of published RCTs, n = 3497
  - 11.5% -> single center prospective, n = 399
- 2020 IASP Definition of Pain:
  "Pain: An unpleasant sensory and emotional experience associated with, or resembling that associate with, actual or potential tissue damage."

Aims	Inclusions	Exclusions
•Determine the incidence of intraoperative pain during cesarean delivery under neuraxial anesthesia •Characterize this experience through patient centric reporting outcomes.	All Cesarean deliveries begun with neuraxial anesthesia	•Not capable of reporting experience in follow-up window •Any pain reported as exclusively experienced prior to incision (ie during labor or neuraxial placement)

Post operative Nausea	~20%
Endometritis	11%
Postpartum Hemorrhage	3%
Wound complications	2%
Post Dural Puncture Headache	1-2%
DVT or PE	240 per 100,000
High Spinal	23 per 100,000
Neurological Complication	1.2 per 100,000
Epidural Hematoma	0.5 per 100,000

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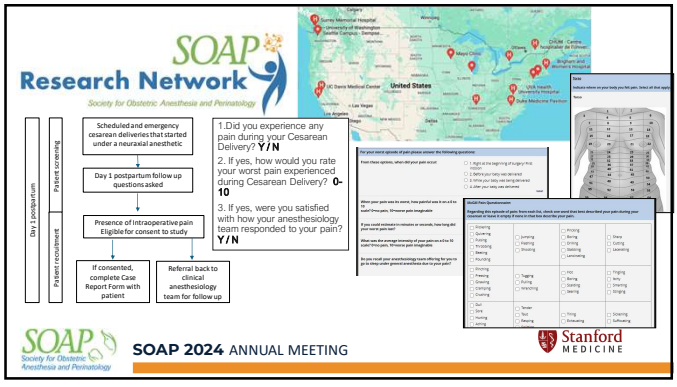

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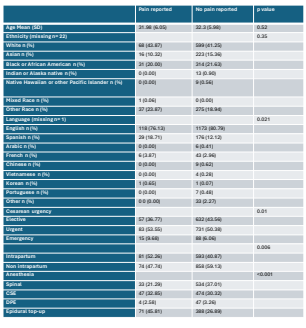
Total Patients	1607	
Overall incidence	155/1607	9.6%
W/ Spinal	33/534	6.18%
W/ CSE	47/474	9.99%
W/ Epidural top up	71/388	18.3%

- Median (IQR[Range]) pain score of 6 (4-8 [0-10])

Higher pain in urgent CDs
- Urgent: Median (IQR[Range]) pain score of 7(5-9 [2-10])
- Elective: Median (IQR[Range]) pain score of 6 (4-8 [0-10])



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	Unadjusted			Adjusted		
Variable	Odds ratio	95% CI	p value	Odds ratio	95% CI	p value
Age	0.99	0.96-1.02	0.53	1.00	0.98-1.04	0.75
Hispanic	1.28	0.88-1.86	0.20	0.71	0.37-1.36	0.31
Racial group						
White	Ref	Ref	Ref	Ref	Ref	Ref
Asian	0.63	0.36-1.11	0.11	0.61	0.34-1.11	0.11
Black or African American	0.87	0.56-1.36	0.54	0.71	0.43-1.18	0.19
Other Race	1.39	0.40-4.82	0.60	1.15	0.67-1.97	0.52
Language						
English	Ref	Ref	Ref	Ref	Ref	Ref
Spanish	**1.64**	**1.05-2.53**	**0.03**	1.66	0.86-3.19	0.13
French	1.39	0.58-3.33	0.46	1.32	0.51-3.43	0.58
Korean	9.9	0.62-160.0	0.10	-	-	-
CD urgency						
Elective	Ref	Ref	Ref	Ref	Ref	Ref
Emergency	**1.89**	**1.03-3.48**	**0.04**	1.18	0.52-2.66	0.69
Urgent	1.26	0.88-1.79	0.20	0.79	0.45-1.41	0.44
Intrapartum	**1.58**	**1.14-2.21**	**0.01**	0.92	0.47-1.79	0.82
Anesthesia						
Spinal	Ref	Ref	Ref	Ref	Ref	Ref
Combined spinal epidural	**1.6**	**1.01-2.55**	**0.045**	1.60	0.99-2.57	0.06
Dural puncture epidural	1.37	0.46-4.05	0.56	1.79	0.56-5.75	0.33
Epidural top-up	**2.96**	**1.92-4.57**	**<0.01**	**3.43**	**1.89-6.23**	**<0.01**

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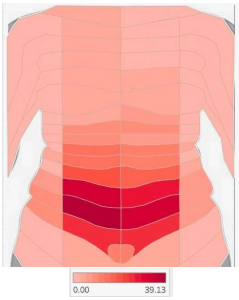
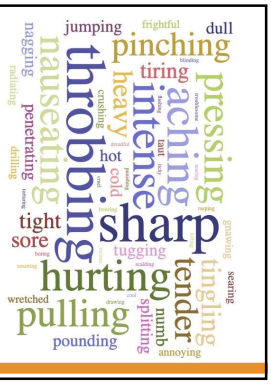


46% of patient's who reported pain had no documented block level in their anesthetic record



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Future directions:

- Trials of novel epidural top-up strategies or agents to reduce the rates of intra-cesarean pain
- Development of local QI/QA systems to track and improve rates of intra-cesarean pain over time

The MID-CD Collaborative:

Institutions:
Stanford University
Duke University
Brigham and Women's Hospital
Toronto University
University of Virginia
Yale New Haven Hospital
CHUM, QC
University of Chicago
Boston Medical Center
University of Washington Seattle
Surrey Memorial Hospital
Vanderbilt University
UC Davis Medical Center
Cornell University
Mayo Clinic
BC Womens Hospital

People:
Pervez Sultan, James O'Carroll, Brendan Carvahlo, Guillermina Michel, Eva Martinez, Lynn Squires, Daniel Conti
Ashraf Habib, Alexandra Bickett
Ayumi Maeda, Noor Raheel
Ron George, Kristi Downey
Jess Sheeran, Lexi Moruza
Philip Rubin
Genevieve La Chance
Daniel Tobes, Somayeh Mohammadi
Mark Norris
Laurent Bollag, Brianne Caoyonan
Maha Iyer
Jeanette Bauchat
Cristina Gutierrez
Sharon Abramovitz
Emily Sharpe, Jon Lucaj
Anton Chau

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Stanford MEDICINE

Bioequivalence and pharmacokinetics of intravenous calcium in parturients

Daniel Conti, Alla Yarmosh, Guillermina Michel, Steven Shafer, Jessica Ansari

SPEAKER: Jessica Ansari, MD, MS

1

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No disclosures

2

BACKGROUND

Anesthesiologists use calcium all the time.
- Approved indications
- Off-label indications

Two forms of IV calcium
- calcium gluconate
- calcium chloride

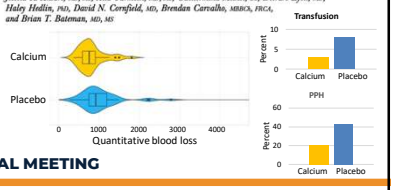
OBSTETRICS & GYNECOLOGY

Original Research

Intravenous Calcium to Decrease Blood Loss During Intrapartum Cesarean Delivery

A Randomized Controlled Trial

Jessica R. Ansari, MD, MS, Alla Yarmosh, MD, MS, Guillermina Michel, BS, Deirdre Lyell, MD, Haley Hedlin, PhD, David N. Cornfield, MD, Brendan Carvalho, MBBCh, FRCA, and Brian T. Bateman, MD, MS



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METHODS

RESEARCH ?s

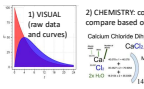
1. What is the **bioequivalent dose** of calcium gluconate compared to calcium gluconate?

2. What are the **pharmacokinetics** of an intravenous dose of calcium in parturients?

BIOEQUIVALENCE

Baseline, 5m, 10m, 15m, 30m, 60m

ASSESS BIOEQUIVALENCE 3 WAYS



PHARMACOKINETICS

BIOEQUIVALENCE STUDY (N=34)
+
Data from our 2 RCTS (N=36)

NONMEM® The program for Nonlinear Mixed Effects Modeling

2 compartment pharmacokinetic model for change in ionized calcium from measured baseline

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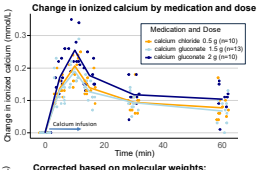
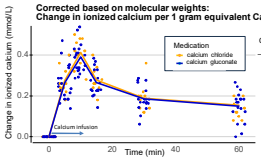
RESULTS

Change in ionized calcium by medication and dose



A 3:1 dosing ratio of calcium gluconate to calcium chloride provides very similar effect.

Corrected based on molecular weights:
Change in ionized calcium per 1 gram equivalent $CaCl_2$

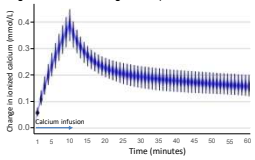


$C_{12}H_{22}CaO_{15}.H_2O$ = 448g/mol

$CaCl_2.2H_2O$ = 147g/mol

Correcting by a factor of **3.1** (based on chemistry) produces identical curves

2 COMPARTMENT PHARMACOKINETIC MODEL:
Change in ionized calcium after a 1-gram dose of calcium chloride (or 3-gram dose of calcium gluconate)



		PRACTICAL KINETICS	
Systemic Clearance (L/min)	0.027	Bioequivalent dose of calcium gluconate	3
Central Volume of Distribution 1 (L)	1.60	Peak change in ionized calcium (mmol/L)	0.4
Intercompartmental Clearance (L/min)	0.183	Time to half of peak (minutes after start of calcium infusion)	30
Peripheral Volume of Distribution (L)	2.42		
Bioequivalent ratio (gluconate / chloride)	3.11		

5

DISCUSSION & FUTURE STUDIES

CONCLUSION:

We have defined the pharmacokinetics and bioequivalence of IV calcium in parturients.

STRENGTHS:

- Large N for a pharmacokinetic study
- Robust 2-compartment pharmacokinetic model
- Practical information **relevant to everyday anesthetic practice**:
  - 3:1 dosing ratio of gluconate to chloride
  - 1 gram of $CaCl_2$ will increase ionized calcium by 0.4 mmol/L
  - Effect drops by 50% in 30 minutes but has a long tail
- This information is essential to the next trials of calcium in obstetrics

NEXT STEP:

Multicenter **dose-finding** and **efficacy** randomized clinical trial

MFMU Maternal-Fetal Medicine Units Network

Intrapartum cesarean delivery N~6000

Outcome: Major Postpartum Hemorrhage (transfusion, blood loss >1500mL, surgical intervention, ICU admission)

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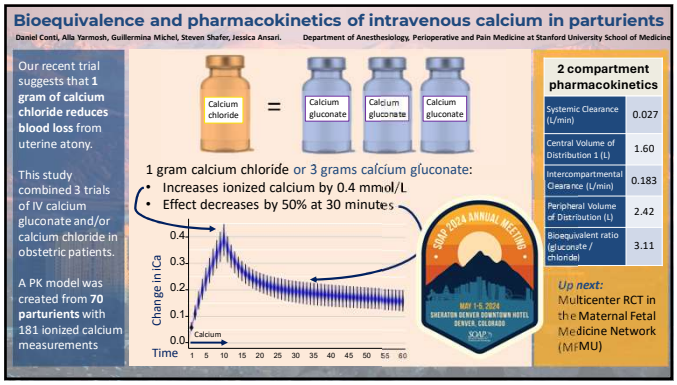
Bioequivalence and pharmacokinetics of intravenous calcium in parturients
Daniel Conti, Alla Yarmosh, Guillermina Michel, Steven Shafer, Jessica Ansari. Department of Anesthesiology, Perioperative and Pain Medicine at Stanford University School of Medicine
Our recent trial suggests that 1 gram of calcium chloride reduces blood loss from uterine atony.
This study combined 3 trials of IV calcium gluconate and/or calcium chloride in obstetric patients.
A PK model was created from 70 parturients with 181 ionized calcium measurements
Calcium chloride
=
Calcium gluconate
Calcium gluconate
Calcium gluconate
1 gram calcium chloride or 3 grams calcium gluconate:
• Increases ionized calcium by 0.4 mmol/L
• Effect decreases by 50% at 30 minutes
Change in iCa
0.4
0.3
0.2
0.1
0.0
Calcium
Time
1 5 10 15 20 25 30 35 40 45 50 55 60
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MAY 1-5, 2024
SHERATON DENVER DOWNTOWN HOTEL
DENVER, COLORADO
2 compartment pharmacokinetics
Systemic Clearance (L/min) 0.027
Central Volume of Distribution 1 (L) 1.60
Intercompartmental Clearance (L/min) 0.183
Peripheral Volume of Distribution (L) 2.42
Bioequivalent ratio (gluconate / chloride) 3.11
Up next:
Multicenter RCT in the Maternal Fetal Medicine Network (MFMU)

7

Programmed Intermittent Epidural Bolus (PIEB) for neuraxial labor analgesia: Finding the best combination of intermittent bolus volume & time interval using pragmatic sequential optimization

Khatoon Fatima, Sherrif Fathima, Fernando Roshan, Columb Malachy, John Ajinu, Kunhikkandayil Ahammad, Kapoor Shanti, Mohammed Inaam, Joseph George, Thodika AbdulVahab

Women's Wellness & Research Centre, Qatar

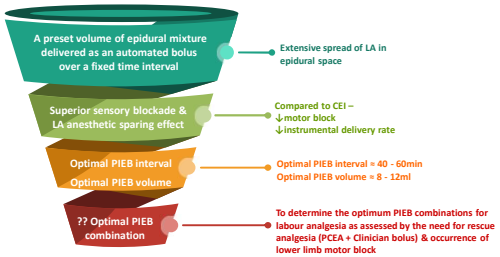
1

DISCLOSURE

I have no actual or potential conflict of interest to disclose

2

Introduction



3

Study Procedure

Primiparous ASA 2

3-4 complexes of patients (approximately 200 patients)

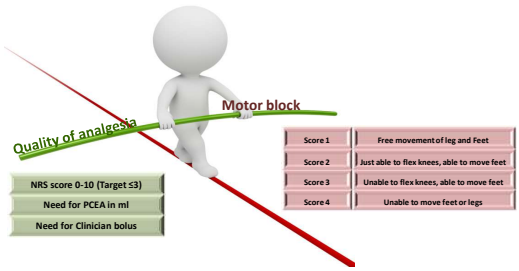
8 different groups of PIEB regimens with 6 patients / group

PIEB Settings	
Volume	8 to 12ml
Interval	30 to 75 minutes
PCEA Bolus	5ml
PCEA Lockout interval	20 minutes
Flow rate	250ml / hour

16G Touhy needle
LOR to saline
catheter 4-5cm into the epidural space
15 ml of 0.1% levobupivacaine + fentanyl 2mcg/ml

4

Choosing the best combination



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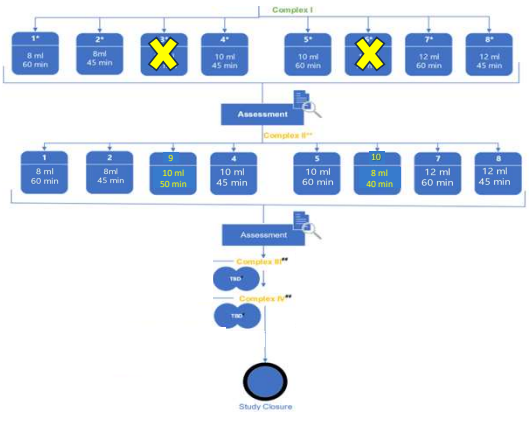

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Results

Group (PIEB Volume **ml**, Interval - **min**)	Complex 1		Complex 2			
	Rescue analgesia* (ml/hour)	Bromage	Rescue analgesia* (ml/hour)	Bromage	Simple Rank (Pain + Bromage)**	Simple Rank (Pain weighted)***
	Mean	Mean	Mean	Mean		
1 (8,60)	3.25	1.5	3.18	1.33	7	7
2 (8,45)	3.65	2	2.91	1.75	8	8
3 (10,30)	0.49	2.7				
4 (10,45)	**0.05**	**1.2**	**0.26**	**1.42**	**2**	**1**
5 (10,60)	3.32	1.3	2.81	1.33	4	6
6 (10,75)	3.89	2				
7 (12,60)	1.31	1.7	1.93	1.33	3	**4**
8 (12,45)	2.04	2.2	1.52	1.67	6	5
9 (10,50)			**1.06**	**1.17**	**1**	**2**
10 (10,40)			0.37	1.83	5	**3**

*Rescue analgesia for breakthrough pain = PCEA + Clinician bolus
** Simple Rank (Pain + Bromage) derived by ranking (Rank rescue analgesia + Rank Bromage) / 2
*** Simple Rank (Pain weighted) derived by ranking (Rank rescue analgesia x 2 + Bromage) / 2

7

Summary

- Groups 4 (10ml, 45min) & 9 (10ml, 50min) were the best performing groups
- Higher PIEB intervals compromised analgesic quality & increased motor block from more rescue analgesia
- Lower intervals reduced rescue analgesia but at the expense of dense motor block
- A new group 11 (8ml, 40min) will be added to complex 3 to compare with the best performing groups

8

Cross-sectional survey to assess hospital system readiness for hemorrhage during and after cesarean section in Africa

Marcelle Crowther, Robert Dyer, David Bishop, Fred Bulamba, Salome Maswime, Rupert Pearse, Bruce Biccard

DEPARTMENT OF ANAESTHESIA & PERIOPERATIVE MEDICINE
UNIVERSITY OF CAPE TOWN

APPRISE
African Partnership for Perioperative and CRitical Care ReSEarch

NIHR | National Institute for Health and Care Research

NIHR133850

Background

WHO recommendations for the prevention and treatment of postpartum haemorrhage
World Health Organization

Limitations

- Human resources
- Quality care
- Medication

Are countries across Africa equipped to implement the WHO recommendations relevant for the prevention and treatment of hemorrhage, during and after cesarean section

Biccard, B. et al. The Lancet 391(10130): 1589-1598.

Bishop, D et al. Lancet Glob Health 7(4): e513-e522.

Methods

Objectives

1. Determine hospital system readiness to implement the WHO recommendations
2. Evaluate availability
   - Blood and blood products
   - Skilled human resources
   - Postoperative care

Stats

- Margin of error 0.05 at 95% confidence interval
- Require 212 participants

Survey tool

Expert panel → Pretest → Pilot → Translate → REDCap

71 questions
- Likert scale
- Close ended
- Free text
- Specific options

Survey

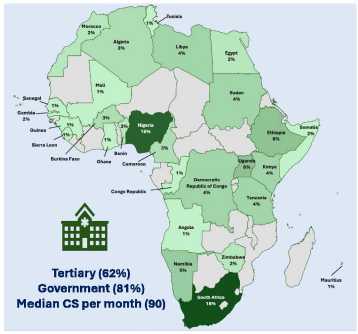
University of Cape Town, Human Research Ethics Committee, Reference number: 546/2022

Results

161 responses
30 African countries

21 excluded
16 Duplicates; 2 no consent;
2 incomplete; 1 no obstetrics service

140 responses
29 African countries
Margin of error of the survey 0.069



Tertiary (62%)
Government (81%)
Median CS per month (90)

Results

Primary objective

WHO recommendations for the prevention and treatment of postpartum haemorrhage

Prevention

✓ Oxytocin (94%), Misoprostol (73%), Controlled cord traction (99%)

✗ Heat stable carbetocin (9%), Ergometrine (26%), Delayed cord clamping (64%), Postpartum uterine tone check (82%)

Treatment

✓ Crystalloids (86%), Immediate theatre access (91%)

✗ Colloids (41%), Uterine massage (84%), Tranexamic acid (70%), Intrauterine tamponade device (29%), Uterine artery embolization (5%)

Organization

✓ Written protocols (83%)

✗ Protocols for referral (56%), Simulation training (53%)

Secondary objectives

Blood and blood products

✓ Emergency blood (73%)

✗ Platelets (23%), Cryoprecipitate (15%), Fibrinogen (8%)

Human Resources

✗ In-person specialist cover after hours

Conclusion

Easily implementable measures are not currently in place during and after cesarean section to prevent and treat postpartum hemorrhage in Africa

Limited availability of blood component therapy

Lack of skilled human resources

Limitations

- Few primary, secondary and private hospitals
- Online platform only

Strengths

- Multicenter LMICs
- Generalizable to Africa

Future

- Quality improvement

crowther.marcelle86@gmail.com

UNIVERSITY OF TORONTO
Mount Sinai Hospital
Department of Anesthesia & Pain Management

Leland Arden T. Ustare, MD, DPBA, Jose C. Carvalho, MD, PhD, Mrinalini Balki, MBBS, MD

Ex-vivo Evaluation of Dexmedetomidine on Pregnant Human Myometrial Contractility

1

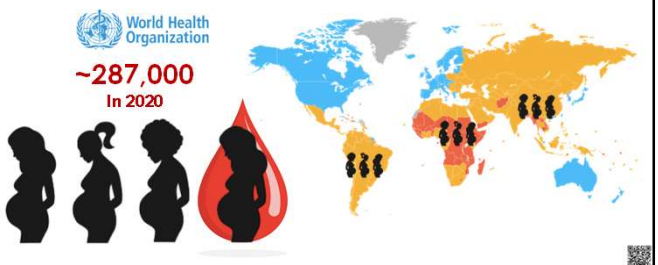
Nothing to disclose

2

Postpartum Hemorrhage

World Health Organization

~287,000
In 2020



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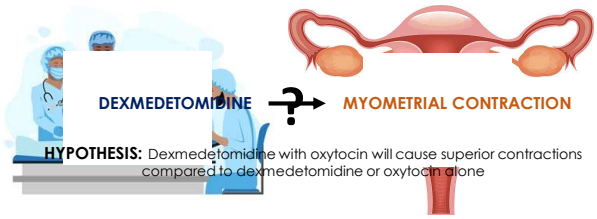
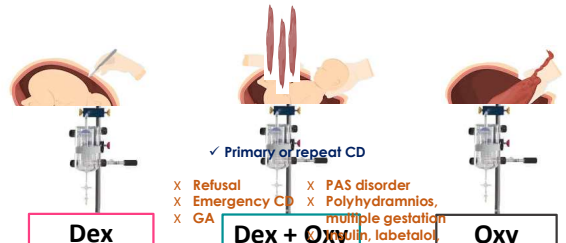
Dexmedetomidine



HYPOTHESIS: Dexmedetomidine with oxytocin will cause superior contractions compared to dexmedetomidine or oxytocin alone

4

Methods



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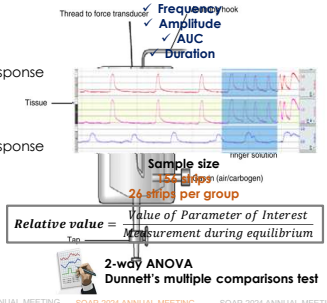
Methods

Primary outcome
MOTILITY INDEX = Amplitude x Frequency

- **Dex** — Cumulative dose-response (10^{-9} M to 10^{-4} M)
- **Dex + Oxy** — Cumulative dose-response (10^{-9} M to 10^{-4} M); Oxytocin 20 nM
- **Oxy** — Oxytocin 20 nM



✓ Frequency
✓ Amplitude
✓ AUC
✓ Duration

Sample size
15 strips
26 strips per group

$$Relative\ value = \frac{Value\ of\ Parameter\ of\ Interest}{Measurement\ during\ equilibrium}$$

2-way ANOVA
Dunnett's multiple comparisons test

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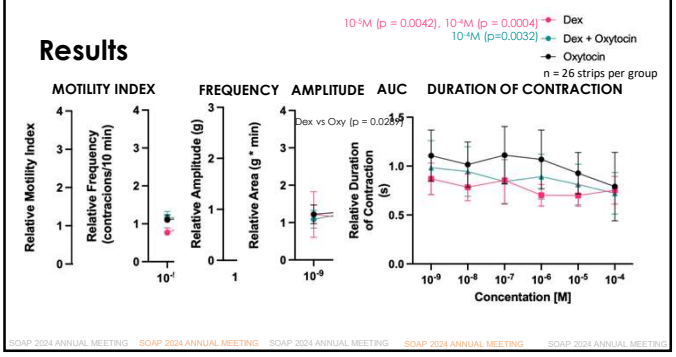
Results



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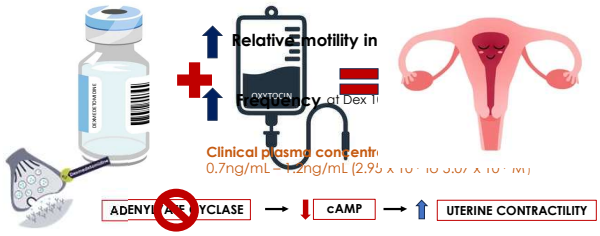
Conclusion



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8

Abstract #: THUR-BP-01

Development and Validation of the STanford Obstetric Recovery checKlist (STORK)

Presenting Author: Pervez Sultan, MD, MD(Res), FRCA
Presenting Author's Institution: Stanford Medicine - Palo Alto, California
Senior Author: Brendan Carvalho, MD - Stanford University
Co-Authors: Michaela K. Farber, MD, MS - Brigham & Women's Hospital
Nicole Higgins, MD - Northwestern University
Perman Pandal, MD - Stanford University School of Medicine
Paloma Toledo, MD, MPH, FASA - University of Miami

Background: Validated patient-reported outcome measures (PROMs) that can effectively evaluate outpatient postpartum recovery are lacking.1 We aimed to develop and validate a new measure for this complex multidimensional outcome (the STanford Obstetric Recovery checKlist; STORK).

Methods: Development of STORK involved 3-phases. 1: Existing questions used to evaluate postpartum recovery were identified in scoping and systematic reviews.[1,2] 2: Following IRB approval, 16 multidisciplinary stakeholders (experts and patients) participated in 3 rounds of a Delphi process to select items from existing PROMs identified[1,2] and develop new items where needed. This resulted in the development of a 47-item STORK PROM (Fig 1). 3: STORK was prospectively evaluated in a multicenter study across 3 US academic centers. Patients were invited to complete STORK during their inpatient stay, and at 2, 6, and 12 weeks postpartum, in a longitudinal prospective cohort study. Patients were recruited until 300 6-week STORK surveys were completed. STORK was evaluated at 6 weeks for: 1. validity: a) structural validity (exploratory factor analysis; EFA; root mean square residuals (RMSR) < 0.08 represents a good fit); b) convergent validity (correlation with global health visual analog scale score (GHVAS) and EuroQoL (EQ-5D-3L PROM)); c) discriminant validity (mean difference in STORK scores with GHVAS < 70 vs ≥70); d) confirmatory telephone interviews with patients scoring in the highest and lowest 10th centiles of STORK scores at 6 weeks; 2. reliability (Cronbach's alpha, inter-item correlation, split-half reliability and floor and ceiling effects); and 3. responsiveness (change in STORK scores over time).

Results: 525 patients following all delivery modes were recruited across 3 centers (response rate=60% at 6 weeks). At 6 weeks, STORK demonstrated: 1. validity: a) dimensions were best defined with a 4-factor model (RMSR=0.047); b) correlated with GHVAS and EQ5D3L score (ρ=0.499 and -0.686, respectively); c) discriminated between good and poor recovery (144.2 vs 121.5, respectively; mean difference 22.7; p< 0.001); d) highest and lowest scores corresponded to research team subjective assessments for good and poor recovery, respectively; 2. reliability: (Cronbach's alpha=0.923, inter-item correlation r=0.203, and split-half reliability r=0.984); and 3. responsiveness: STORK scores (as a measure of postpartum recovery) changed significantly over the 12-week study period (p< 0.001).

Conclusion: STORK is a valid, reliable, and responsive PROM of outpatient postpartum

recovery, which should be considered to screen and evaluate patients as part of their 6-week obstetric follow-up. Future studies are needed to validate this measure in specific patient groups, in different languages and as an outcome measure for interventional research.

References:
1. Sultan P, et al. JAMA Netw Open. 2021;4(5):e2111600. PMID: 34042993.
2. Sultan P, et al. JAMA Netw Open. 2020;3(5):e205540. PMID: 32442292.

Table 1. Summary of STORK domains and question content summary

Physical Health		**Motherhood Experience & Social Support**	
1	Usual activities	29	Access to medical care
2	Satisfaction with usual activities	30	Safety
3	Standing from sitting	31	Ability to feed baby
4	Bend, kneel or stoop	32	Comfortable with feeding
5	Satisfaction with healing following delivery	33	Care of baby's needs
6	Interest in sexual activities	34	Trust in instincts of caring for baby
7	Physical health	35	Relax and enjoy time with baby
8	Difficulty working or activities	36	Satisfaction with baby health
9	Fatigue interfering with physical	37	Infant growth and development
10	Need for medical treatment	38	Anxiety interfering with mothering ability
11	Pain interference with daily activities	39	Worry about finances
12	Pelvic pain	40	Unexpected pregnancy
13	Breast soreness		
Mental & Emotional Health		**Sleep & Fatigue**	
14	Satisfaction with baby health	41	Sleep satisfaction
15	Body looks	42	Rested in morning
16	Aches or pain	43	Enough time to rest
17	Pain interfering with mood	44	Difficulty falling asleep
18	Pain interfering with life enjoyment	45	Daytime sleepiness
19	Worries	46	Pain interfering with sleep
20	Helpless	47	Fatigue
21	Anxious		
22	Worthless		
23	Hopeless		
24	Lonely		
25	Childcare and work conflict		
26	Memory		
27	Problem-solving		
28	Life not worth living		

Abstract #: THUR-BP-02

The Incidence and Characteristics of Intraoperative Pain During Cesarean Delivery: A Multicenter Cohort Study

Presenting Author: Daniel Conti, MD
Presenting Author's Institution: University of California, Davis - San Jose, California
Senior Author: James O'Carroll, MBBS FRCA - Stanford University
Co-Authors: Alexandra Bickett - Duke University
Brendan Carvalho, MD - Stanford University
Jon Lucaj, MD - Mayo Clinic
Pervez Sultan, MD, MD(Res), FRCA - Stanford Medicine

Background

Pain during Cesarean delivery (CD) under neuraxial anesthesia (NA) is associated with significant morbidity including postpartum depression and PTSD[1]. There is uncertainty regarding the precise incidence of pain during CD with estimates ranging from 0.8 and 15%[2,3]. We aimed to accurately determine the incidence of *patient-reported* pain during CD under NA, by conducting a large prospective multicenter study in North America. Secondary aims were to characterize the patient pain experience and determine intraoperative pain associations.

Methods

Following a SOAP research network presentation, 16 centers* agreed to participate with respective ethical and data sharing approvals obtained. All patients over a 2-month period undergoing CD under NA at each center were evaluated. On postoperative day one, patients were asked if they experienced pain during their CD (verbal numerical rating scale 1-10 of pain intensity) and if they were satisfied with the anesthesiologist's management of their pain. Patient demographics, anesthetic and obstetric data were also collected. Patients that reported pain were approached and consented to provide granular details regarding their pain experience (Fig 1).

Results

We present a complete dataset for 3 centers with 721 patients recruited. A total of 87 (12.1%) experienced intraoperative pain, with 55 (63%) consented to further characterize their pain experience. Among patients who experienced pain, median (IQR) pain score was 6 (4-8) with 14.9% requiring conversion to general anesthesia. The incidence varied with type of anesthetic, with 18.7 vs 11.3 vs 6.9% p= 0.001 for epidural top up, combined spinal-epidural and spinal, respectively. In an unadjusted model, epidural top-ups were more likely to have intraoperative pain (OR (95% CI) 3.12 (1.74-5.58); p< 0.001) compared to spinal anesthesia. Asian patients were less likely than White patients to experience pain (OR (95% CI) 0.42 (0.20-0.91); p=0.027). In those who had pain, 85% were satisfied with their intraoperative pain management.

Conclusion

One in 8 patients reported intraoperative pain of moderate intensity on average. This estimate obtained from large US academic centers, which utilize contemporary anesthetic practices, is potentially concerning. This data should be used to counsel patients and develop optimum strategies for intraoperative pain management. Further work is required to determine long-term sequelae and associated morbidity.

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References: 1.PMID: 22670573
2.PMID: 18547291
3.PMID: 35064923

Figure 1- Intraoperative Pain During Cesarean Delivery - Conti.pdf

Abstract #: THUR-BP-03

Bioequivalence and Pharmacokinetics of Intravenous Calcium in Parturients

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Co-Authors: Guillermina Michel - Stanford University
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Introduction: Intravenous calcium is an essential medication in obstetrics, used for treating magnesium toxicity and citrate-induced hypocalcemia from transfusion. A recent clinical trial also suggests that calcium reduces blood loss from uterine atony during cesarean delivery (1). The bioequivalent ratios of calcium gluconate (CG) and calcium chloride ($CaCl_2$) and the pharmacokinetics (PK) of calcium in parturients remain undefined. We prospectively enrolled parturients in an intravenous calcium bioequivalence and PK study.

Methods: After institutional review board approval, registration with clinicaltrials.gov (NCT05973747), and informed consent, 20 parturients undergoing term cesarean delivery were randomly allocated in 1:1 ratio to receive CG 2g or $CaCl_2$ 500mg via 10-minute infusion beginning after umbilical cord clamping. Ionized calcium (iCa) was measured from venous samples at baseline and 5, 10, 15, 30, and 60 minutes after initiating calcium infusion using an Abbott iSTAT machine and EG7+ cartridges. After enrollment of 20 patients, interim analysis was performed to assess bioequivalence. If not within a 10% margin, up to 20 additional patients were enrolled with a recalibrated CG dose (adjusted to the nearest predicted CG dose divisible by 0.5g). The bioequivalent ratio of CG:$CaCl_2$ was calculated using NONMEM, PLT tools, and 1000 bootstrap replicates of the data. Bioequivalence data were then combined with iCa measurements collected from parturients who received 1g $CaCl_2$ or saline placebo infusion after umbilical cord clamp in recent clinical trials (NCT05027048 and NCT03867383) to define the population PK of intravenous calcium. One compartment PK were modeled using NONMEM and PLT tools. All data are reported as median (95% confidence interval) generated through 1000 bootstrap replications.

Results: 34 parturients received CG or $CaCl_2$ per protocol, and 181 iCa measurements recorded. The bioequivalent ratio of CG to $CaCl_2$ is 3.28 (2.86-3.83). For practical purposes, a 3:1 ratio of CG to $CaCl_2$ achieves a peak ionized calcium within a 10% bioequivalence margin (Figure 1). Population PK of calcium was then determined using 311 iCa measurements in 70 parturients (34 bioequivalence patients + 36 trial participants). We established the following: baseline iCa 1.16 (1.15-1.17) mmol/L, clearance 0.08 (0.01-0.10) L/min, and volume of distribution 2.44 (0.90-2.58) L. The half-life of intravenous calcium is 21.4 minutes. A 1g dose of $CaCl_2$ increases iCa by 0.41 (0.30-0.45) mmoL/L, and 0.5 g by 0.20 (0.15-0.23) mmoL/L.

Discussion: We performed a comprehensive bioequivalence and PK assessment of intravenous calcium in parturients. This provides novel, interpretable, practical information about intravenous calcium (eg 3:1 dosing ratio of CG to $CaCl_2$, half-life of both formulations is

21 minutes) as well as detailed PK data to inform future clinical trials assessing calcium as a novel uterotonic agent.

References: 1) Ansari. Obstet Gynecol. 2024 Jan; 143(1):104-112

Figure 1 - Bioequivalence of clacium gluconate and calcium chloride for Bioequivalence and Pharmacokinetics of Intravenous Calcium in Parturients - Conti.pdf

Abstract #: THUR-BP-04

Programmed Intermittent Epidural Bolus (PIEB) for Neuraxial Labor Analgesia: Finding the Best Combination of Intermittent Bolus Volume and Time Interval Using Pragmatic Sequential Optimization

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Introduction: PIEB provides neuraxial labor analgesia delivering a preset volume of epidural mixture as an automated bolus over a fixed time interval. Compared to a continuous epidural infusion (CEI), PIEB causes an optimum spread of local anesthetic in the epidural space with a superior sensory blockade. PIEB (vs. CEI) has a local anesthetic sparing effect with reduced motor blockade and less instrumental deliveries without compromising analgesia quality. Previous studies have investigated the optimal PIEB volume and PIEB interval separately, whereas the aim of our pragmatic trial was to vary PIEB volume and interval together using a novel methodology to assess the best PIEB combination that provides the least rescue analgesia for breakthrough pain with minimal lower limb motor blockade.

Methods: We obtained IRB approval (MRC 01-18-157) for our trial as well as informed, written patient consent. Using a pragmatic approach to sequential optimization [1], we conducted a randomized double-blind prospective trial involving laboring nulliparous ASA 1-2 pregnant women at term, requesting epidural analgesia. PIEB volumes between 8 to 12ml and intervals of 30 to 75 min were initially chosen based on previous studies and delivered with an epidural infusion device (CADD SolisÒ) at a flow rate of 250ml/hour. A 5ml PCEA bolus (20 min lockout) was available for all groups. For our 1st round of recruitment (**Complex 1**), we randomized 48 women into 8 different groups of PIEB regimens using 0.1% bupivacaine + 2mcg/ml fentanyl (n=6 per group). The two worst performing groups, ranked by the need for rescue analgesia (PCEA + Clinician bolus in ml/hour) and Bromage score, were excluded from the 2nd round of recruitment (**Complex 2**). Using sequential optimization, 2 new groups (Gp 9 and 10) with different combinations of PIEB volume / interval were added to the remaining 6 groups. Complex 2 therefore also consisted of 8 groups of 48 patients (n=6 per group).

Results: (Table) After completing Complex 1, we excluded Gp 3 (worst Bromage score) and Gp 6 (highest amount of rescue analgesia). In Complex 2, Gp 4 and 9 were the best performing groups ranked 1:1 and 2:1 (pain weighted).

Discussion: Using a simple rank, with a 1: 1 and 2:1 weighting for pain compared to motor block, we found that a PIEB volume of 10ml with an interval of 45 and 50 min to be optimal.

Higher PIEB intervals compromised analgesic quality and increased motor block from more rescue analgesia, whereas lower intervals reduced rescue analgesia but at the expense of dense motor block. Our 3rd complex will seek to fine tune our preliminary results by comparing a new PIEB group (8ml vol, 40min interval) with the best performing ones from Complex 2.

References:

Sveticic G, Gentilini A, Eichenberger U, Luginbühl M, Curatolo M. Combinations of morphine with ketamine for patient controlled analgesia. A new Optimiztion method. Anesthesiology 2003; 98: 1195-1205.

SOAP final Table 30th Jan 2024 Table for abstract-2.pdf

Abstract #: THUR-BP-05

Cross-sectional Survey to Assess Hospital System Readiness for Hemorrhage during and After Cesarean Section in Africa

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BACKGROUND: Mothers in Africa are 50 times more likely to die following cesarean section (CS) than in high-income countries, largely due to hemorrhage. It is unclear whether countries across Africa are adequately equipped to prevent and treat postpartum hemorrhage(PPH) during and after CS.

METHODS: This was a cross-sectional survey of anesthesiologists and obstetricians across the African Perioperative Research Group. The primary objective was to determine hospital system readiness to implement the WHO recommendations for prevention and treatment of PPH during and after CS. The secondary objectives were to evaluate the availability of blood products, skilled human resources and establish available postoperative care. Survey question format was close-ended or Likert scale, with options “always”, “sometimes”, or “never”.

RESULTS: Responses were analyzed from one respondent from each of 140 hospitals from 29 low- and middle-income countries across Africa. Most respondents completed every data field on the case report form.

Regarding WHO recommendations on *prevention* of PPH, oxytocin and misoprostol was always available in 130/139(93.5%) and 101/138(73.2%) hospitals respectively. There was limited access to heat-stable carbetocin [12/138(8.7%)] and ergometrine [35/135(25.9%)]. Controlled cord traction for removal of placenta was always performed in133/135(98.5%) hospitals. Delayed cord clamping when neonatal resuscitation was not indicated, was not performed universally [86/134(64.2%)].

Regarding the *treatment* of PPH, crystalloids were always available in 133/139(95.7%) hospitals, and the preferred initial resuscitation fluid [125/138(90.6%)]. Uterine massage was always performed in 117/139(84.2%) hospitals. Tranexamic acid was always available in

97/139 hospitals(69.8%). The availability of intrauterine balloon tamponade devices was limited. Most had immediate access to theatre.

Responses concerning *organizational* recommendations showed that 113/136(83.1%) hospitals had written protocols for treatment of PPH. Protocols for patient referral and simulation training were limited.

Most hospitals had access to emergency blood [102/139(73.4%)]. There was limited access to blood component therapy, with platelets available at 32/138(23.2%), cryoprecipitate at 21/138(15.2%) and fibrinogen at 11/139(7.9%) hospitals. In-person specialist cover was reduced after-hours.

CONCLUSIONS: Important WHO recommended measures to reduce hemorrhage during and after CS, are not currently available in many hospitals across Africa. It is likely that the lack of a combination of factors leads to failure to rescue mothers in Africa from postoperative complications. These findings should facilitate co-design of quality improvement initiatives to reduce hemorrhage related to CS.

References:

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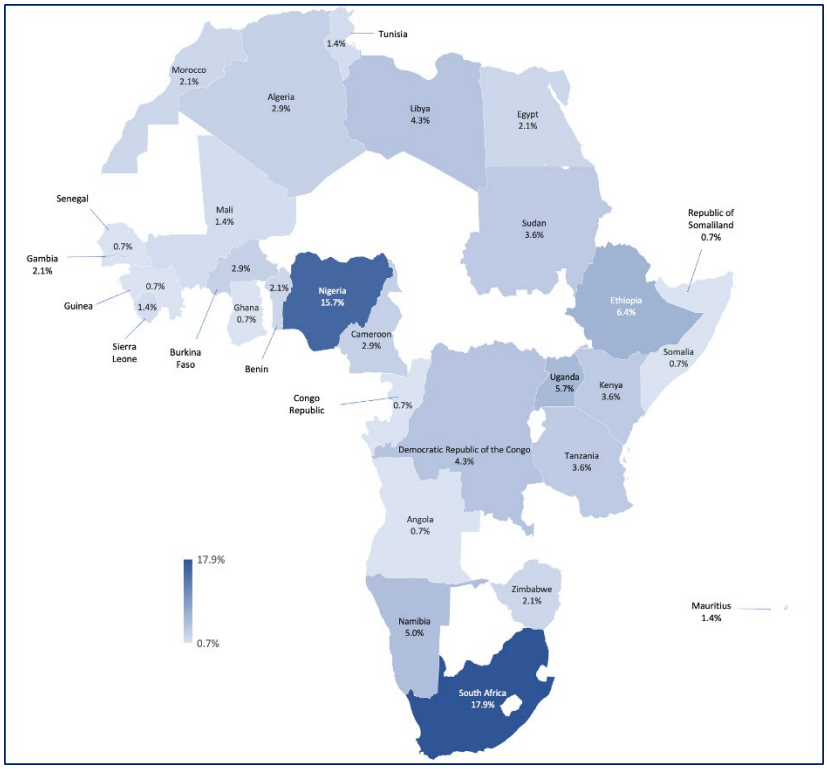

Abstract #: THUR-BP-06

Ex-vivo Evaluation of Dexmedetomidine on Pregnant Human Myometrial Contractility

Presenting Author: Leland Arden T. Ustare, MD
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Co-Authors: Mrinalini Balki, MBBS, MD - University of Toronto
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Background: Postpartum hemorrhage remains to be one of the leading causes of maternal morbidity and mortality attributed to the rising rate of uterine atony. Dexmedetomidine (Dex), a highly selective α2-adrenergic agonist, has been used in obstetric practice and has applications as an adjunct during neuraxial and general anesthesia for cesarean delivery (CD). α2-adrenergic receptors are known to be expressed on the myometrium highlighting that Dex can impact contractility during CD. The aim of this study was to determine the ex-vivo effect of Dex on myometrial contractility.
Methods: Myometrial biopsies were obtained from term pregnant patients scheduled for elective CD under spinal anesthesia. Biopsies were collected by the obstetrician after the delivery of the fetus and placenta. These samples were divided into 8 strips and mounted individually in ex-vivo organ bath chambers filled with physiological salt solution. Strips were divided into 3 groups: 1. Dex (subjected to a cumulative dose-response of Dex every 10 minutes from 10-9 to 10-4 M). 2. Dex + Oxytocin (background infusion of oxytocin 20 nM along with Dex 10-9 to 10-4 M), and 3. Control (oxytocin 20 nM only). The outcomes were: relative frequency, amplitude, and area under the curve (AUC) for contractions measured in each dose-response window. To obtain 80% power, a sample size of 26 strips per group was calculated. Statistical analysis was done using two-way ANOVA followed by Dunnett's multiple comparisons test (GraphPad Prism).

Results: A total of 33 patients (26 strips/group) were recruited for this study. Compared to control, the relative frequency significantly increased in both Dex (201%) and Dex+Oxytocin (218%) groups at 10-4 M ($p < 0.001$) (Fig 1.). Dex and Dex+Oxytocin did not have any significant effect on the amplitude of contractions within each dose-response window. Moreover, both groups did not significantly influence the AUC compared to control.

Conclusion: Our findings indicate that the administration of Dex, with or without oxytocin, leads to an increased frequency of myometrial contractions, suggesting its suitability for use during CD. Future studies will investigate the potential implications of Dex in laboring patients.

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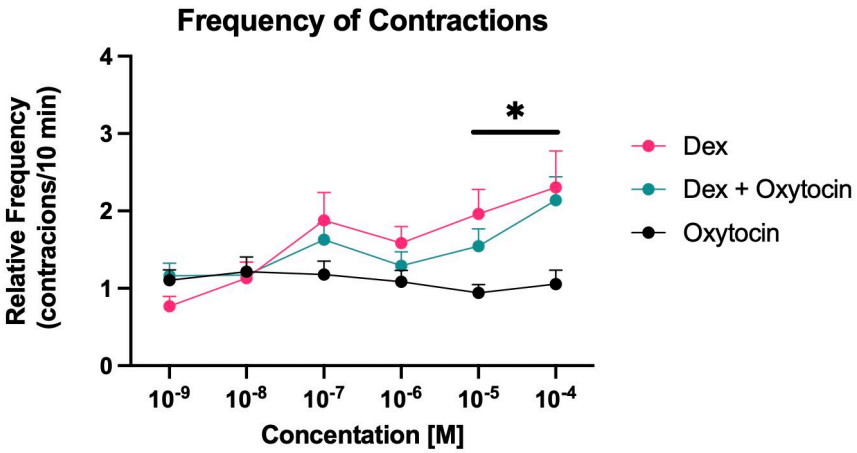


Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 01

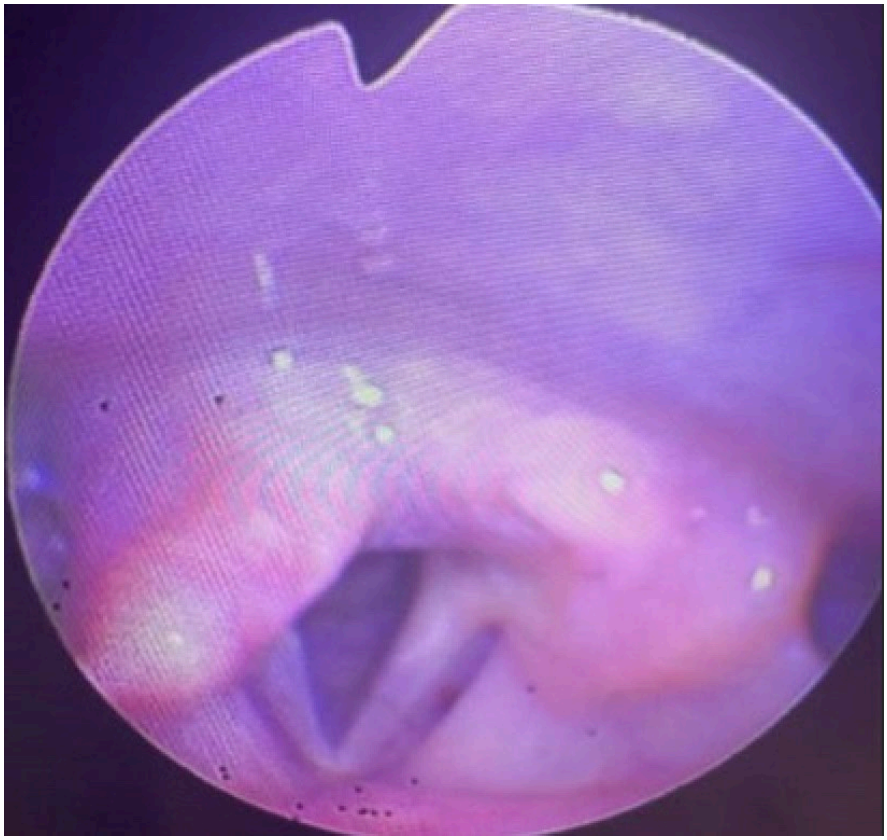
Difficult Airway During STAT Cesarean Delivery – A Case Report

Presenting Author: Shreya Ranjan, MD
Presenting Author's Institution: Tufts Medical Center - Boston, Massachusetts
Introduction: Pregnancy increases the risks of difficult intubation and failure to secure the airway during general anesthesia, which in part is likely due to soft tissue mucosal edema.1 However, unexpected airway anomalies can also result in difficult airway. We present the case of a pregnant woman who had a difficult airway for STAT cesarean delivery.

Case One: The patient was an otherwise healthy 28-year-old G4P3002 at 29 weeks and 6 days gestation with a Mallampati II airway. Upon presentation, she was 5 cm dilated and progressed to fully dilated in 30 minutes with the fetus in the breech position. Decision was made to proceed with a STAT cesarean delivery. Upon arrival in the operating room, patient was pre-oxygenated and a rapid sequence induction was performed with 200mg propofol and 100mg succinylcholine. Video laryngoscopy revealed a grade IIb view with a mass that appeared to be hanging from the anterior aspect of the pharynx. Intubation by resident was challenging due to the mass, so the attending anesthesiologist attempted to pass the ETT around the obstructive mass, but there was no end-tidal carbon dioxide. ETT was removed and a laryngeal mask airway (LMA) was placed with adequate ventilation subsequently. Patient was maintained on a propofol infusion throughout the case and the LMA was successfully removed at the end. The next day, flexible fiberoptic laryngoscopy revealed watery edema of the left aryepiglottic fold, adjacent to the arytenoid cartilage (fig. 1).

Discussion: Our case highlights the high-risk nature of obstetric anesthesia (especially when intubation is required) and the importance of making quick decisions based on the difficult airway algorithm. The anesthesia team quickly decided to switch to placement of a LMA, which while not ideal in pregnancy, likely resulted in a more favorable outcome rather than making repeated attempts at ETT and possibly never being able to secure the airway.

References: 1. Bhavani-Shankar Kodali, Sobhana Chandrasekhar, Linda N. Bulich, George P. Topulos, Sanjay Datta; Airway Changes during Labor and Delivery. Anesthesiology 2008; 108:357–362



Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 02

Management of Undifferentiated Peripartum Acute Hypoxic Respiratory Failure

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Thomas Lambert III, MD - Ohio State University Wexner Medical Center Department of Anesthesiology
Goran Ristev, MD - Ohio State University Wexner Medical Center Department of Anesthesiology
Ashley Taylor, MD - The Ohio State University Wexner Medical Center

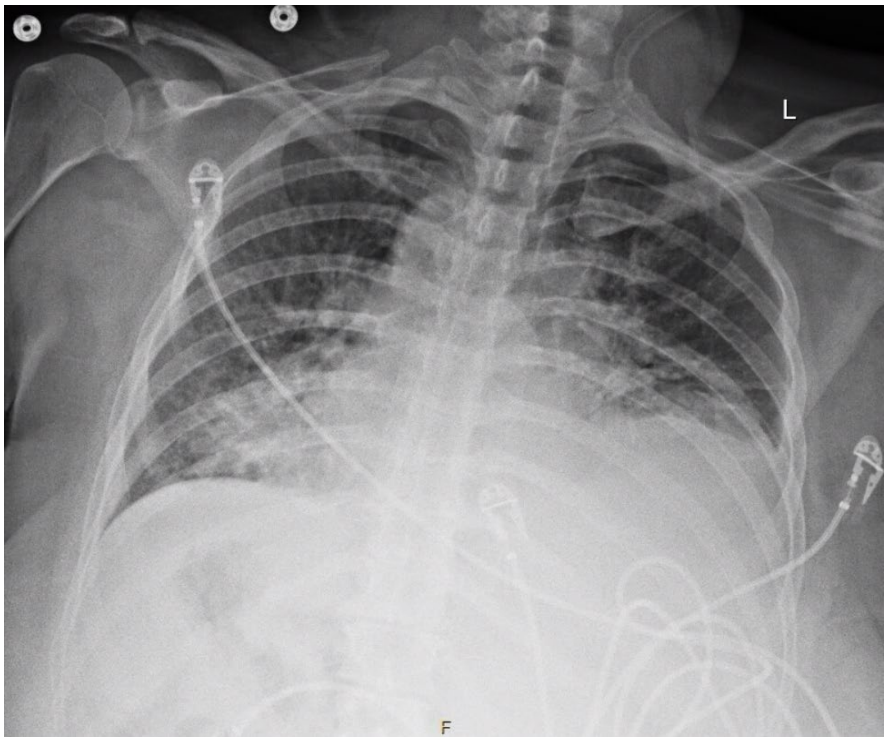
Introduction: Physiologic changes of pregnancy affect respiratory function and, especially in the hypoxic patient, should be considered when designing the anesthetic plan. Respiratory failure can affect up to 0.2% of pregnancies.

Case One: We present the case of a 36-year-old G1P0 female at 34 weeks gestation with a history of chronic hypertension and asthma who presented with acute dyspnea, orthopnea, cough, mid-sternal chest pain radiating to the back, and preeclampsia with severe features. The patient endorsed two weeks of symptoms with progressive worsening leading to admission. Chest x-ray demonstrated a left pleural effusion and pulmonary edema (Fig. 1). CT showed a 4 cm sub-carinal posterior mediastinal mass with mild mass effect on the left atrium. Subsequent echocardiogram, while limited, demonstrated normal cardiac function but noted a 1.8 cm echo-density in the right atrium. The patient had worsening hypoxia on high flow nasal cannula and blood pressures remained in severe range despite IV anti-hypertensive medications. Emergent cesarean section under general anesthesia was planned in the setting of pre-eclampsia with severe features with concomitant acute hypoxic respiratory failure. The case was performed with two large bore peripheral IVs, an arterial line, transesophageal echocardiography (TEE), and availability of cardiopulmonary bypass in case of hemodynamic collapse. After successful induction and intubation, TEE assessment confirmed normal cardiac function without any atrial mass. The case resulted in the successful delivery of a baby girl. The patient was kept intubated for transport to the ICU post-operatively.

Discussion: Normal physiologic changes during pregnancy can contribute to respiratory and hemodynamic compromise in at-risk patients. Diaphragm elevation from the gravid uterus reduces expiratory reserve volume and decreases functional residual capacity (FRC). Oxygen consumption increases by 20 to 33% per term due to increased fetal and maternal demand. To accommodate, progesterone increases respiratory drive to increase minute ventilation and increases sensitivity of peripheral chemoreceptors to hypoxia. These changes can cause mild dyspnea even in normal pregnancy and can lead to the rapid development of hypoxia with

onset of respiratory compromise. Lying supine can worsen FRC. Due to our patient's severe orthopnea and high oxygen requirements, she would not tolerate lying supine under neuraxial anesthesia and thus required general anesthesia. Head elevation during preoxygenation and induction minimized further reduction in FRC. Intraoperative use of pressure-controlled ventilation reduced the risk of barotrauma. Increased positive end-expiratory pressure (PEEP) in the setting of pulmonary edema improved oxygenation. It was decided to avoid a trial of extubation in the operating room due to high FiO2 and PEEP requirements intraoperatively, especially in the setting of undifferentiated hypoxia.

References: Lee Taiwan J Obstet Gynecol 2017



Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 03

Individualized Management of Two Parturients with Airway Stenosis

Presenting Author: Margaret E. Smith, MD
Presenting Author's Institution: Stanford University, California
Co-Authors: Eva Martinez, MD - Stanford University
Lynn Squires, MD FRCPC - Stanford Medicine

Introduction: Airway stenosis is rarely seen in the pregnant patient and poses a substantial challenge to peripartum anesthetic management. We present two cases of airway stenosis in parturients and describe their management.

Case One: A 37yo G1P0 patient with posterior glottic stenosis and vocal fold hypomobility presented to the high risk obstetric anesthesia clinic at 26wk EGA with stable inspiratory stridor. Five years previously, she sustained polytrauma necessitating tracheostomy with subsequent decannulation. Flexible laryngoscopy at 32wk revealed stable glottic stenosis with paradoxical adduction of the vocal folds and stridor during quick inspiration. A multidisciplinary team discussed risks and benefits of different modes of delivery with the patient. Given dysfunctional rapid breathing and potential for airway edema during labor, she was deemed a poor candidate for vaginal delivery. At 37w0d, she underwent planned cesarean delivery using high-flow oxygen via THRIVE, delivering a healthy infant. Advanced airway equipment including ETT size 5.0mm ID and smaller, video laryngoscopy, and 4.5mm flexible fiberoptic bronchoscope were present in the OR should airway instrumentation have been required. The patient's dyspnea improved substantially following delivery. Recovery was uneventful and she was discharged POD2.

Case Two: A 35yo G4P2012 patient with subglottic stenosis presented to the high risk OB anesthesia clinic at 24wks EGA with worsening dyspnea and stridor. Four years previously, she was endotracheally intubated after a polytrauma, and subsequently diagnosed with subglottic stenosis. At 35wks, her respiratory status progressively worsened and she was admitted to the antepartum unit for observation. After multidisciplinary evaluation, tracheal balloon dilatation was recommended and performed 35w3d utilizing intermittent apnea and continuous fetal monitoring. The patient's symptoms initially improved, however, on POD2 she developed worsening inspiratory stridor and increased work of breathing. She underwent urgent cesarean delivery and delivered a healthy infant at 35w6d under CSE anesthesia with use of THRIVE. Small size endotracheal tubes and advanced airway equipment were present in the OR. Her dyspnea improved immediately following delivery. Recovery was uneventful and she was discharged POD2, with plans for tracheal resection after 6wks postpartum.

Discussion: These descriptions of airway stenosis in parturients represent two of only a handful of cases described in the literature. Pregnancy and labor place an intense physiological burden on the respiratory system, and good ventilatory exchange is paramount.

There are no consensus guidelines for management of airway stenosis during pregnancy, though treatments described include dilation, scar lysis via laser, and elective tracheostomy. Through close monitoring, multidisciplinary communication and individualized management, both patients delivered safely with neuraxial anesthesia.

References: SA BJA 08 KK Anes Int Care 03 KM Laryngoscope 23

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 04

Saddle Pulmonary Embolism Thrombectomy in the Parturient with Congenital Inferior Vena Cava Absence

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Co-Authors: Jackson Condrey, MD - Medical University of South Carolina
Remi Kessler, MD - Medical University of South Carolina
Andra Oprisan, MD - Medical University of South Carolina

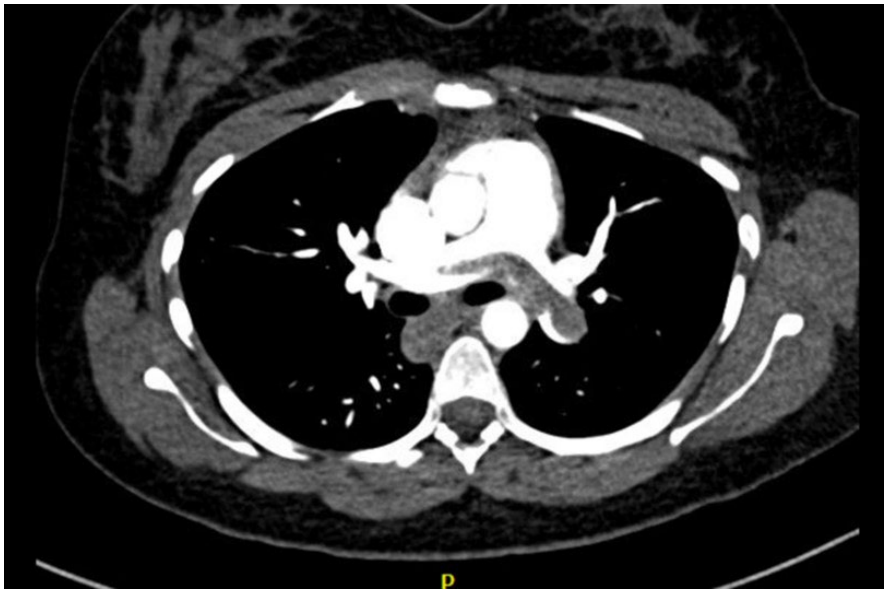
Introduction: Venous thromboembolism (VTE) is one of the leading causes of maternal morbidity and mortality, with an incidence of 0.5-2.0 per 1000 pregnant women and accounts for 9.3% of all maternal deaths in the US.1 Inferior vena cava agenesis (IVCA) is a rare condition which predisposes patients to unprovoked thromboembolic events. Though the mechanism is not well understood, venous stasis may be a predisposing factor.2

Case One: A 23-year-old G2P0101 woman with no significant past medical history at 8 weeks gestation presented to the ED with syncope, tachycardia, and hypotension along with chest pain and several weeks of dyspnea. On arrival, oxygen saturation was 100% on room air. CT chest angiogram was obtained, which demonstrated massive saddle pulmonary embolism (PE) (Figure 1a) with evidence of right heart strain. Transthoracic echocardiogram was performed showing an enlarged right ventricle with septal flattening, moderately decreased right ventricular function, and tricuspid annular systolic excursion (TAPSE) of 1.2 cm. The patient was taken to the interventional radiology (IR) suite for her procedure. The anesthesia team placed a radial arterial line and the patient tolerated a majority of the thrombectomy without sedation at her request. The IR team performed thrombectomy with significant clot burden removed from right and left pulmonary arteries (Figure 1b). The procedure was complex as she was found to have complete absence of the IVC with drainage of the iliac veins via the azygous system, which was enlarged in compensation for lack of IVC. Small segment hepatic IVC was present and draining the liver directly into the right heart. During thrombectomy she did require 2 mg midazolam, 100 mcg fentanyl, and 15 mcg epinephrine. Post thrombectomy, the patient was put on a heparin infusion in the ICU and transitioned to therapeutic enoxaparin for the remainder of her pregnancy. She was discharged home four days after admission. Hematology noted the need for lifelong anticoagulation. The patient later presented to L&D at 37w4d in labor, enoxaparin was held, and an epidural was placed uneventfully. Enoxaparin was restarted 4 hours after vaginal delivery and epidural removal.

Discussion: Normal pregnancy is a pro-thrombotic state, with an increase in coagulation factors, reduced fibrinolysis, and increased platelet reactivity. There is risk for thromboembolic complications in all pregnant women, with significant associated complications. This risk is further increased in patients with IVC anomalies. Clinicians should

have a high index of suspicion for VTE in this specific patient population. Depending on patient gestation, cooperation, and hemodynamic stability, anesthesia-led minimal sedation can be used if undergoing minimally invasive thrombectomy in IR.

References: 1 Obstet Gynecol 2017 ; 130 : 366 – 73 . 2 Br J Haematol. 2001 Sep;114(4):878-80.



Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters – 05

Massive Pulmonary Embolism during Hemorrhagic Shock

Presenting Author: Graziana Massolini, MD
Presenting Author's Institution: Hamad Medical Corporation
Co-Authors: Ahamad Kunhikkandiyil, Consultant Anesthesiology - Hamad Medical Corporation

Introduction: Thrombosis and thromboembolism (VTE) continue to be the leading cause of direct deaths within 42 days after the end of pregnancy, and the number of recognizable risk factors is on the rise. VTE is about 10 times more prevalent among pregnant women (in comparison to non-pregnant women), with a frequency of 1 in 1000 and the greatest risk occurring after childbirth. VTE is more prevalent following cesarean delivery as opposed to vaginal delivery.

Case One: 36 years old underwent a cesarean section. 12 hours later the patient was found drowsy, hypotensive, tachycardic with feeble pulse. Bedside abdominal ultrasound showed large haematoma with fluid collection. Blood gas showed hemoglobin of 5.1gm/dl, she was transferred back to OT for evacuation of hematoma+ bilateral ligation of ascending uterine arteries. She lost 2.7 liters of blood. Towards the end of the surgery, it was noted high peak pressure, saturating below 90%, HR 160/min. It was observed a disparity between PACO2 in the ABGs and ETCO2 on the ventilator monitor. Urgent heart ECHO showed severely dilated right ventricle and severely reduced right ventricle function, pulmonary artery pressure severely increased, highly suggestive of acute PE. She was thus placed on VA ECMO (venoarterial extracorporeal membrane oxygenation) due to obstructive shock. CTPA scan showed bilateral pulmonary embolism, massive on right side involving right main pulmonary artery with filling defect of left pulmonary artery. She underwent pulmonary thrombectomy of the right penumbra with removal of the clot after which the patient showed significant improvement to the blood flow to the lungs. Patient was extubated on day 3 and suffered from Sheehan syndrome and hospital acquired pneumonia. Patient transferred to the ward on day 14. She was hospitalized till full recovery and discharged from the hospital on day 18 on warfarin. On follow up: patient was found incidentally found with an increasing in size pelvic hematoma to be treated conservatively.

Discussion: We present a case of massive PE developing the same day of cesarean section when the patient had exploratory surgery for hemorrhagic shock to highlight the importance of early diagnosis and management in cases where bleeding and thromboembolism do not exclude each other.

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Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 06

Multidisplinary Care for Parturient with Laryngotracheal Stenosis

Presenting Author: Mariah Dahmen, MD
Presenting Author's Institution: University of Minnesota

Introduction: Laryngotracheal stenosis is defined as partial or circumferential narrowing of the airway with potentially life threatening consequences, where a predetermined airway management plan is of utmost importance(1). We report the complex multidisciplinary peripartum management for a parturient with severe glottic insufficiency and subglottic stenosis who underwent urgent cesarean delivery due to evolving preeclampsia with severe features.

Case One: A 22 year old G1P0 at 34 weeks was admitted from clinic due to new onset preeclampsia with severe features. Her medical history was significant for difficult intubation secondary to childhood tracheostomy complicated by severe glottic insufficiency, moderate subglottic stenosis and hooding of the right arytenoid with chronic voice changes and inspiratory stridor (Image 1). She was morbidly obese with obstructive sleep apnea, asthma and diabetes mellitus. Despite multiple antihypertensive agents, her blood pressure remained uncontrolled and labor was induced. Shortly thereafter, she required uptitrating supplemental oxygen and her chest radiograph revealed a left sided pleural effusion and cardiomegaly. Bedside point of care ultrasound revealed B-lines in dependent regions. An urgent cesarean delivery was initiated due to concern for progressing preeclampsia. Airway examination demonstrated Mallampati grade III, large neck circumference, 6cm thyromental distance and adequate mouth opening. Difficult airway equipment was available, and a combined spinal epidural was completed with 11.25 mg of hyperbaric bupivacaine, 150 mcg morphine and 15 mcg fentanyl injected intrathecally, resulting in an uneventful primary cesarean delivery. Post-operatively, the patient recovered in the ICU where she required diuresis and intermittent noninvasive ventilation during periods of sleep due to hypoxia and hypercapnia. Etiology for her acute respiratory failure was deemed multifactorial. Formal post-operative echocardiogram revealed normal cardiac function.

Discussion: Parturients with a history of laryngotracheal stenosis require multidisciplinary planning and closed-loop communication between otolaryngologists, obstetricians, anesthesiologists and neonatologists for optimal outcomes. Our patient was offered laser treatment for subglottic stenosis during pregnancy, or repeat tracheostomy, but declined all intervention with the goal to preserve phonation. Physiologic changes of pregnancy including increased minute ventilation and maternal oxygen demand, coupled with decreased FRC and mucosal edema may cause clinically significant upper airway obstruction in those patients with preexisting disease2. In the event of urgent cesarean delivery, anesthesiologists should have difficult airway equipment prepared and neuraxial techniques should be favored when possible to avoid airway manipulation or prolonged invasive ventilation.

References: 1) D.J. Doyle (2019) Otolaryngol Clin North Am 52(6): 1127-1139 2) Miller (2022) Obstetric Medicine 15(3): 205-207

Image 1 Abstract.pdf

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 07

Anticipated Difficult Airway Management and Multidisciplinary Approach to a High-Risk Pregnancy

Presenting Author: Caelie Stewart, MD
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Co-Authors: Ciaran McDonnell, CCAA - Department of Anesthesiology, Royal Columbian Hospital, New Westminster, BC, Canada
Michelle Mozel, MSc - Department of Anesthesiology, Royal Columbian Hospital, New Westminster, BC, Canada

Introduction: Difficult airway management is a cornerstone of the practice of Anesthesiology. The Canadian Airway Focus Group defines a difficult airway as problems with face mask ventilation, laryngoscopy, insertion of supraglottic airway devices, tracheal intubation and/or front-of-neck access.(1) Bedside observations including reduced mouth opening, short thyromental distance and high Mallampati score can indicate a potentially difficult airway. Parturients have unique physiologic changes that can make the airway more challenging including airway edema, increased aspiration risk, accelerated onset of desaturation following apnea, and impeded laryngoscope handling by enlarged breasts.(2) Failure to secure an obstetrical airway can result in both maternal and fetal hypoxemia with devastating consequences.

Case One: A 39 year-old primiparous female with a large cystic hygroma/lymphaticovenous malformation of the neck, pulmonary hypertension, and mixed obstructive/restrictive lung disease from congenital bronchopulmonary dysplasia presented at 23 weeks gestational age (GA) with exertional dyspnea and increasing oxygen requirements. Airway history includes a previous Grade 4 view with video laryngoscopy and multiple prior tracheostomies with prolonged ventilatory wean (including once for perioperative airway obstruction). Respiratory function was expected to continue to decline as pregnancy progressed, therefore she underwent awake tracheostomy at 26 weeks GA with fentanyl and dexmedetomidine sedation, followed by scheduled Caesarian section at 28 weeks GA under spinal anesthesia with 0.75% bupivacaine, fentanyl and morphine. Both procedures were uncomplicated and the patient maintained spontaneous ventilation throughout. On postoperative day (POD) one, she developed hypercarbic respiratory failure and required emergency mechanical ventilation. After being treated for pneumonia, she was weaned from the ventilator, decannulated on POD15, and discharged from hospital on POD20.

Discussion: The possibility of an obstetrical patient requiring emergency airway management always exists. A review of anticipated difficult obstetrical airways found that only 66% of planned C-sections were carried out at the specified time, while the remaining 33% required emergency surgery.(3) Emergency surgery frequently occurs after hours when equipment and

personnel are limited. In this case of known difficult airway, early elective tracheostomy facilitated safe delivery.

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Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 08

Subglottic Stenosis Complicating Emergent Cesarean Delivery

Presenting Author: Sarah L. McCraney, MD
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Joshua Coleman, MD - Vanderbilt University Medical Center - - Nashville, TN
Bryan Wakefield, MD - Vanderbilt University Medical Center
Taylor Ziga, MD - Vanderbilt University Medical Center

Introduction: Subglottic stenosis is a potentially life-threatening condition that involves fibrosis of the upper airway, often presenting with dyspnea, cough, stridor, and progressive hoarseness.1 Affected women with known tracheal or subglottic stenosis often experience exacerbated symptom burden in pregnancy.1 We present this case as an example of a parturient with severe subglottic stenosis to educate anesthesia providers on perioperative management in the labor and delivery period with a particularly challenging airway.

Case One: A 22-year-old G1P0 at 34w0d presented as transfer with noisy breathing. Otolaryngology (ENT) evaluation revealed grade 3 subglottic stenosis. Given the chronicity and her clinical stability, no acute airway intervention was indicated, and she was discharged with planned cesarean section at term. However, she was readmitted at 35w5d in preterm labor with non-reassuring fetal status, and cesarean delivery was recommended. The primary anesthetic plan was neuraxial; however, given her known difficult airway, the operating room (OR) was prepared with jet ventilation equipment, small endotracheal tubes (ETT) 4.0, 4.5, and 5.0, bougie, exchange catheters, and video laryngoscopy (VL). ENT colleagues were present and had additional equipment prepared outside the OR. The case proceeded under combined spinal epidural anesthesia. Intraoperatively, she experienced nausea with emesis, likely resulting in aspiration. In recovery, she developed progressive desaturations and rapidly became unresponsive. She was intubated with VL and a 4.0 ETT and transferred to the intensive care unit. The following day she was taken to the OR with ENT for scope, dilation, extubation, and biopsy of a 5 cm area of stenosis and torn mucosa. She was discharged with scheduled repeat procedure outpatient with ENT.

Discussion: The incidence of failed intubation in obstetric patients is approximately 8 times greater than the non-obstetric surgical population,2 owed to significant physiologic and anatomic changes during pregnancy. By understanding these changes as well as comorbid conditions such as subglottic stenosis, providers can optimize perioperative care for difficult airways through anticipatory preparation and proper interdisciplinary involvement. Despite our careful preparation and multidisciplinary planning, this patient required an emergent intubation in a non-OR setting. We will discuss, in retrospect, how our anesthetic plan could be improved to avoid this scenario in the future.

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Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 09

Multidisciplinary Management of Repeat Cesarean Delivery in a Parturient after an Emergent Antepartum Tracheostomy

Presenting Author: Phillip Callihan, MD, PhD
Presenting Author's Institution: University of Virginia Health
Co-Authors: Jessica Sheeran, MD - University of Virginia Health

Introduction: Medical complexity in the pregnant population is increasing, and excellent care for these patients requires high-functioning multidisciplinary teams (1). We present a case of second trimester cardiac arrest with return of spontaneous circulation (ROSC) followed by tracheal stenosis requiring emergent tracheostomy involving multidisciplinary management for repeat cesarean delivery.

Case One: A 34yo G2P1001 at 19 weeks gestation with PMH notable for obesity (BMI > 70), type 2 diabetes, HTN, and OSA presented to the ED with progressive dyspnea and non-productive cough. Her prior pregnancy was complicated by preeclampsia, postpartum hemorrhage, and classical cesarean delivery. She was diagnosed with COVID-19 pneumonia and subsequently admitted to the ICU. Shortly after admission, she became increasingly agitated and removed her supplemental oxygen leading to a pulseless electrical activity (PEA) arrest. Advanced cardiac life support (ACLS) management was initiated, she was intubated, and ROSC was achieved after six rounds of chest compressions. Pulmonary embolism (PE) was the presumed diagnosis, although imaging was non-diagnostic for PE, and enoxaparin was initiated. Her clinical status improved and she was extubated four days following cardiac arrest. Daily fetal heart rate monitoring was performed and no pregnancy complications were detected. She later returned to the ED at 24 weeks gestation with chest pain and stridor. Bedside laryngoscopy showed tracheal narrowing and she underwent emergent tracheostomy in the OR with no pregnancy complications during her hospital stay. She then presented at 33 weeks gestation with headache, chest pain, and worsening shortness of breath and was diagnosed with preeclampsia. She was started on a magnesium infusion and developed symptomatic pulmonary edema, so the decision was made to proceed with repeat cesarean. Preoperatively, ENT was consulted and exchanged the uncuffed tracheostomy tube for a cuffed tube in preparation for potential general anesthesia in the event that neuraxial anesthesia failed, or in case of increasing respiratory compromise due to pulmonary edema. ENT was on standby to assist with her airway if needed during the procedure. She delivered a viable male infant via repeat cesarean following successful CSE placement.

Discussion: CSE was discussed as the best option for this patient, but there were concerns for extended surgical times with a BMI over 70 and history of classical cesarean, possible difficulty with CSE placement, and respiratory decompensation. The multidisciplinary team including ENT, MFM, and Obstetric Anesthesiology developed an effective plan, with contingencies, resulting in a positive outcome for this complex patient.

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Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 10

Anesthetic Management in a Patient with Obstructing Oropharyngeal Neurofibroma and Tracheostomy in the setting of NF type 1- A Case Report

Presenting Author: John W. Robison
Presenting Author's Institution: University of Mississippi Medical Center , Mississippi
Co-Authors: Ikechukwui Eriator, n/a - University of Mississippi Medical Center
Shelby Claire Liddell, n/a - UMMC
Emily Mallory, n/a - University of Mississippi Medical Center
Hunter Roth, n/a - University of Mississippi Medical Center

Introduction: Neurofibromatosis type 1 “NF-1” is an autosomal dominant neurocutaneous disorder. Anesthetic management of the pregnant patient with NF-1 is not well documented. It is known that NF-1 is a multisystemic disease which can be exacerbated during pregnancy. NF-1 is associated with a higher rate of intrauterine growth restriction, and cesarean sections. In the anesthetic management of the pregnant patient with NF-1, worsening hypertension, increased intracranial pressure, presence and size of neurofibromas, scoliosis, and vascular complications must be considered.

Case One: We present a case of a 30-year-old G2P2 patient with NF-1 presents for elective induction of labor at 37 weeks. Her past medical history included Neurofibroma with mass compression of the trachea requiring tracheal stent, obesity with BMI of 36 and L carotid dissection and pseudoaneurysm in 2020. On physical exam, this patient was a Mallampati 3, thyromental distance >3 fingerbreadths, both oral aperture and neck ROM were adequate. The Cardiovascular and pulmonary exams were within normal limits. MRI C-spine showed severe dextroscoliosis and kyphosis of the cervical spine with a large left paraspinal plexiform neurofibroma measuring 10.8 cm, which increased in size from prior imaging. The mass extends anteriorly from the vertebral bodies, crosses midline and extends along the left aspect of C5-T4. Due to the patient’s tracheal deviation and growth of the tumor on MRI, the decision was made for continuous epidural analgesia over general anesthesia. This patient would undergo uncomplicated epidural for labor. Per chart review, the patient and baby are doing well.

Discussion: Neurofibromatosis type 1 is an inherent risk in anesthesia management of the pregnant patient. In pregnancy, NF-1 can exacerbate hypertension, growth of neurofibromas, cause preterm delivery and cesarian sections. Neuraxial imaging is a major component of deciding management in this patient population.

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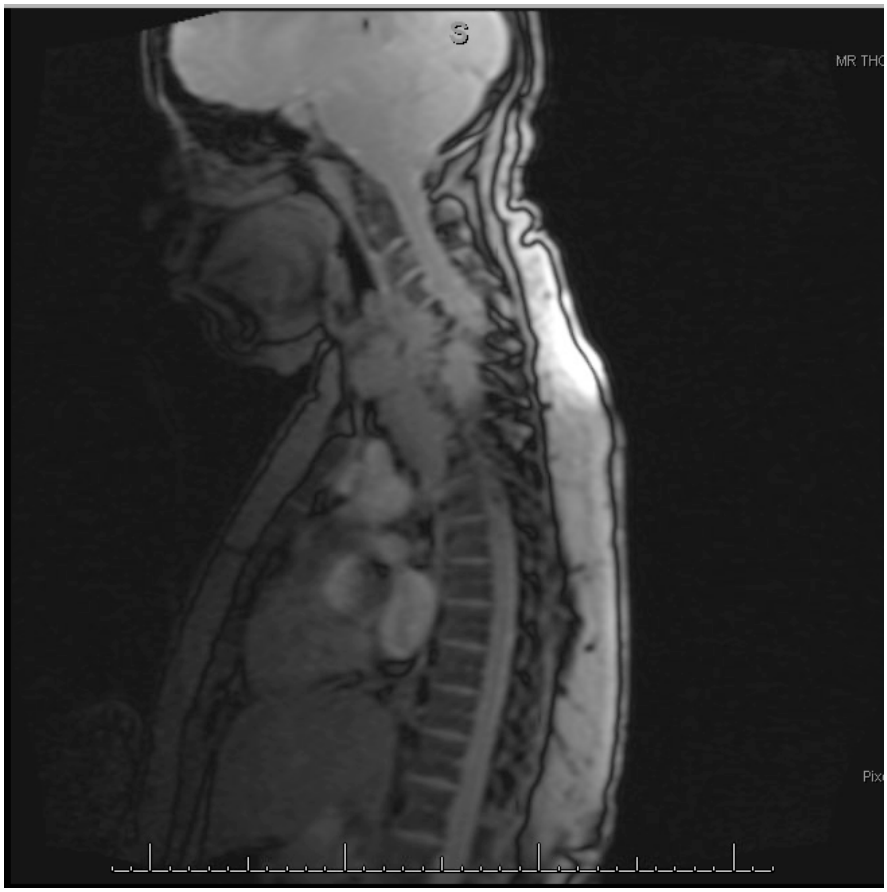

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 11

Conversion to General Anesthesia and a Failed Intubation

Presenting Author: Taylor Leathers, MD
Presenting Author's Institution: University of Kansas Medical Center - Kansas City, Missouri

Introduction: Physiological changes of pregnancy (increased airway edema and vascularity) make intubation difficult. Additionally, a decreased functional residual capacity and increased metabolic rate leave a shorter amount of apneic time before desaturation compared to non-pregnant patients1.

Case One: We present at 34-year-old G2P0010 at 37w1d presenting for induction of labor. Past medical history includes type 2 diabetes, BMI 62, and chronic hypertension with superimposed pre-eclampsia with severe features. Her airway exam included class 4 Mallampati with thyromental distance >3cm, full neck range of motion and good mouth opening. Her epidural was placed after 3 attempts and adequate sensory level was confirmed with ice periodically. Failure to progress was diagnosed after reaching 7cm cervical dilation and the patient was taken for cesarean section. Ice test revealed sensory level to T10 and was supplemented with 2% lidocaine and a sensory level to T4 was achieved. The patient was comfortable on incision but upon further surgical exposure was having sharp pain. At this time the decision was made to induce general anesthesia due to inadequate analgesia. The patient was preoxygenated and the anesthesia team performed a rapid sequence induction. Video laryngoscopy was chosen for initial intubation method however no identifiable airway structures were seen. An “anesthesia stat page” was called. Changes that were made included different providers, repositioning the patient’s head and attempting with a larger blade size. Despite these changes, the team could not intubate. At this time a laryngeal mask airway (LMA) was placed with adequate oxygenation and ventilation. When help arrived, there was a discussion regarding the potential to attempt intubation or to leave the LMA for the duration of the case. The team decided to finish the case with the LMA. The rest of the case proceeded without complication and the LMA was removed at emergence.

Discussion: This case highlights a rare situation where video laryngoscopy is unsuccessful. At our center, it indicated a need for provider knowledge of difficult airway equipment location on the labor and delivery unit and a subsequent QI project. The risk to using supraglottic airways in obstetric patients is the elevated risk for aspiration. However, three large-sample prospective observational studies reported their experience using LMAs in more than 4700 parturients and reported no cases of aspiration and only one case of regurgitation2. More studies are needed to assess safety of LMAs for parturients but they are certainly useful in emergent situations.

References: 1. Mushambi MC et al. Anticipated difficult airway during obstetric general anaesthesia: narrative literature review and management recommendations. Anaesthesia.

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Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 12

A Case of Peripartum Pneumomediastinum After Prolonged Labor
Presenting Author: Marisela Sandoval, n/a
Presenting Author's Institution: University of New Mexico

Introduction: Spontaneous pneumomediastinum, or Hamman syndrome,1 is a rare complication of the second stage of labor.2 It is generally self-resolving, and has an incidence of approximately 1:44,000 and 1:100,00 peripartum.3 Common comorbid conditions include lung pathologies such as asthma. Here we describe a case of spontaneous pneumomediastinum following a complex peripartum course.

Case One: Our patient was a 25 y.o. primiparous female with Di-Di twin pregnancy at 37w4d brought in by ambulance after delivery of Twin A at home, with Twin B not yet delivered after 5 hours of pushing. Her pregnancy was complicated by severe preeclampsia and asthma. She underwent urgent cesarean delivery under spinal anesthesia. She had significant intraoperative vomiting but surgery was otherwise uncomplicated. 10 hours post-op, she had a period of decreased responsiveness concerning for seizure. She also reported a hoarse voice and chest pain. Head CT showed no acute intracranial process but revealed multiple foci of retropharyngeal air. Chest CT showed small-volume pneumomediastinum (image 1), bronchovascualr pneumodissection, and bilateral supraclavicular soft tissue emphysema. CT with oral contrast showed no evidence of esophageal perforation. Troponin was initially elevated but downtrended on recheck. TTE and EKG were reassuring. The hoarse voice and chest pain resolved over the next 48 hours and she was discharged on POD 4.

Discussion: The pathophysiology of pneumomediastinum can involve either esophageal or alveoli rupture. The latter causes air dissection through bronchovascular sheaths into the interstitium of the mediastinum; a process known as the Macklin effect.4 Pushing during the second stage of labor and vomiting are both Valsalva maneuvers; increasing intrathoracic pressure and potentially precipitating this process. Transient troponin elevation can occur with pneumomediastinum5. Hoarse voice from retropharyngeal air is an unusual presenting symptom of postpartum pneumomediastinum, and this patient’s complex peripartum course highlights the need for a broad differential diagnosis and multidisciplinary teamwork.

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Pneumomediastinum.pdf

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 13

Thriving with THRIVE: The Use of Transnasal Humidified Rapid Insufflation Ventilatory Exchange (THRIVE) in a Morbidly Obese Pregnant Patient Undergoing Robotic Cholecystectomy

Presenting Author: Sara Feldman, MD
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Introduction: Transnasal humidified rapid insufflation ventilatory exchange (THRIVE) has been commonly used during difficult airway management to prolong time to desaturation and enhance clearance of CO2 (1,2). Pregnant patients with high body mass index (BMI) present unique challenges in airway management given their increased risk for difficult airway and diminished functional residual capacity. We describe a case during which THRIVE was used for pre-oxygenation, induction and intubation in a morbidly obese pregnant patient undergoing robotic cholecystectomy.

Case One: The patient is a 31-year-old G4P2012 at 24 weeks gestation with history of chronic hypertension, tobacco use and super obesity (BMI 59.34, weight 171.9 kg) who presented to the emergency department with epigastric pain. Laboratory findings revealed elevated amylase and lipase, and abdominal imaging was notable for pancreatitis, cholelithiasis and marked gallbladder wall thickening. General surgery was consulted and recommended a robotic cholecystectomy be performed urgently. The patient was made NPO and scheduled for the next morning. With standard ASA monitors, the patient was placed in Reverse-Trendelenburg positioning with left uterine displacement, and pre-oxygenated with THRIVE (Optiflow, Fisher and Paykel) high-flow nasal cannula 100% FiO2 at 60 L/min for 10 minutes to achieve an oxygen saturation of 100% prior to induction. The patient was then induced in rapid sequence with propofol, fentanyl, lidocaine and succinylcholine, and intubated with 7.0 mm cuffed endotracheal tube with Glidescope 3 blade in one attempt. Cricoid pressure and THRIVE was maintained during entire airway management until the ETT was secured. Oxygen saturation had a nadir of 98% during airway management, and ETCO2 was 38 mmHg immediately following intubation. Anesthesia was maintained with sevoflurane, propofol and remifentanil infusions, and muscle relaxation with rocuronium, and the patient had an uncomplicated robotic cholecystectomy. At the end of surgery, we deployed THRIVE as soon as the patient was alert and spontaneously ventilating, and the endotracheal tube was removed. THRIVE was started at 60 L/min and decreased to 30-40L/min for several minutes prior to weaning to room air before leaving the operating room.

Discussion: We successfully used THRIVE in a second-trimester pregnant patient with high BMI who required general anesthesia. THRIVE accomplished effective and comfortable pre-oxygenation. In awake patients, humidified gas decreases patient discomfort and limits mucosal injury and impairment of ciliary functions. During rapid sequence induction and

intubation of this high-risk pregnant patient, apneic oxygenation with THRIVE prevented oxygen desaturation and hypercarbia, conferring safety to the patient and her fetus, as well as providing additional time to secure the airway should the intubation have been difficult.

References: 1. Anaesthesia, 2015; 70(3):323-9. 2. Br J Anaesth, 2017; 118(4):610-617.

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 14

The Use of Transcutaneous CO2 Monitoring to Guide Ventilatory Management in Pregnant Patients Undergoing Laryngeal Surgery

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Co-Authors: Chakib Ayoub, MD, MBA - Department of Anesthesiology, Duke University, Durham, NC
John J. Ward, MD - Department of Anesthesiology, Duke University, Durham, NC

Introduction: It is not known what the upper limit of safe PaCO2 is during pregnancy, particularly for short periods of time, though we know maternal hypercarbia can lead to fetal acidosis (1). We describe two cases of pregnant patients undergoing laryngeal surgery in which transcutaneous CO2 (TcCO2) monitoring was employed to guide ventilatory management during two different airway management techniques.

Case One: A 27-year-old G2P0010 with GERD and migraines presents at 19 weeks gestation for urgent balloon dilation of severe subglottic stenosis. Airway notable for Mallampati grade III and audible inspiratory and expiratory stridor. Standard monitors were applied with the addition of TcCO2 sensor (SenTec AG). The patient was pre-oxygenated with high flow nasal device. Transnasal humidified rapid insufflation ventilatory exchange (THRIVE) (Optiflow Fisher & Paykel) was initiated at 70 L/minute for apneic oxygenation after induction of general anesthesia. THRIVE was used for 20 minutes and oxygen saturation did not drop below 98%. Balloon dilations were performed at minutes 13 and 17. TcCO2 peaked at 75 mmHg at 20 minutes, at which point the procedure was ended and automatic supraglottic jet ventilation was initiated to rapidly decrease the TcCO2 prior to LMA Supreme placement. After neuromuscular blockade reversal and awakening, the patient was taken to the recovery area where fetal heart tones were recorded and within normal limits.

Case Two: A 31-year-old G3P1011 with idiopathic subglottic stenosis requiring recurrent dilation procedures presents at 24 weeks gestation for scheduled laser excision and balloon dilation procedure. Airway exam notable for Mallampati grade II airway and mildly hoarse voice. Standard monitors were applied with the addition of TcCO2. The patient was placed in reverse Trendelenberg position and pre-oxygenated via face mask. After induction of anesthesia, the larynx was exposed with Ossoff laryngoscope and supraglottic manual high frequency jet ventilation (HFJV) was commenced for intermittent ventilation. Initial TcCO2 measurement prior to pre-oxygenation was 33 mmHg; TcCO2 peaked at 53 mmHg 16 minutes into the procedure, at which time the frequency of HFJV was increased to correct hypercarbia to minimize acidosis. The procedure ended after 26 minutes, and laryngoscope was removed and the patient was supported with mask ventilation until reversal of neuromuscular blockade and resumption of spontaneous ventilation. The patient was taken to the recovery area where

fetal heart tones were recorded and within normal limits.

Discussion: TcCO2 is a noninvasive continuous real-time measurement of tissue CO2. TcCO2 measurement aids in monitoring of ventilation and may be particularly important in guiding management in laryngeal surgeries for pregnant patients during which a tubeless technique with THRIVE or HFJV is employed.

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Figure 1.pdf

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 15

A case of advanced oropharyngeal cancer in a parturient requiring preterm delivery
Presenting Author: Jil Decker, MD
Presenting Author's Institution: Temple University Lewis Katz School of Medicine - Philadelphia, Pennsylvania

Introduction: Oral cancer in pregnant patients is a rare occurrence, and few cases exist in the literature [1]. This clinical scenario presents a unique set of difficulties for the care team, including timing and modality of delivery and anesthesia. The case below describes one such patient with advanced oral cancer and the challenges it presented.

Case One: The patient is a 20-year-old female, G2P0010, initially seen by the otolaryngology team at 19w4d due to concern for rapidly growing oral mass. She was diagnosed with stage IV squamous cell cancer of the tongue. She underwent hemiglossectomy, modified radical neck dissection with adjuvant chemotherapy and radiation, tracheostomy creation, and free flap with ENT and plastic surgery at 20w5d, followed by open gastrostomy tube placement at 22w0d. The patient's tracheostomy was decannulated at 22w3d. Throughout her pregnancy, the patient struggled with maintaining adequate nutrition, as well as difficulty attending her chemotherapy and radiation therapy appointments. Patient was admitted at 32w4d for nausea, vomiting, and failure to thrive. She was evaluated by both the Maternal Fetal Medicine and Obstetric Anesthesiology services at that time. The original plan was for delivery at 35 weeks to allow for radiation therapy but her inability to tolerate any oral or gastrostomy tube intake necessitated expediting her delivery. Extensive discussions were held between the MFM and OB anesthesia teams regarding modality of anesthesia and delivery. The anesthesia team expressed concern that the patient would likely be a difficult airway and that intubation would require an awake fiberoptic technique. There was also concern that if labor epidural analgesia was inadequate or if a high level was inadvertently obtained it would be difficult to perform a safe anesthetic and cesarean delivery under the resulting emergent circumstances. Decision was made to proceed with a slowly dosed epidural in the OR and primary cesarean delivery. The cesarean delivery was complicated by patient anxiety, persistent nausea and vomiting, and difficulty lying flat. Ultimately, through patient counseling and slow titration of epidural medication, adequate anesthesia was achieved and delivery occurred without any anesthetic or surgical complications. The patient was discharged to home on postoperative day 4, and was noted to have improved oral intake at that time.

Discussion: Advanced oral cancer in a parturient presents challenges for all members of the care team, especially the anesthesiologists providing care for delivery. Few cases exist in the literature to help guide the care of such patients. This case provides an excellent example of the importance of multidisciplinary communication and planning to ensure the care provided maximizes the safety of both the mother and the child.

References: 1. Sansare, K., Jadhav, T. S., Venkatraman, S., & Vahanwala, S. (2023). Oral cancer

in pregnancy: A systematic review. J Stomatol Oral Maxillofac Surg, 124(6), 101647.

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 16

Rescue Laryngeal Mask Airway for Difficult Airway in an Urgent C-Section Complicated by Massive Hemorrhage- 2 Cases

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Introduction: Difficult airway is a major cause of general anesthesia (GA) related morbidity and mortality [1]. Obstetric patients have an incidence of failed tracheal intubation five-to-seven times higher than the non-pregnant population [1]. Endotracheal intubation (ETT) is the standard of care, but laryngeal mask airway (LMA) is used as a rescue airway device [2]. We present two patients who underwent cesarean section under general anesthesia with failed ETT and subsequent rescue LMA.

Case One: 30 year-old G4P3 had a primary cesarean section for arrest of active phase. C-section was complicated by difficult intubation due to airway edema. LMA was placed during delivery. Adequate ventilation and oxygen saturation was achieved. However, hemorrhage occurred (2.5L) due to uterine atony, which required multiple blood products and fluids. Given the patient's continued bleeding and concern for airway edema, the decision was made to exchange the LMA to ETT. Fiberoptic intubation was performed via LMA. The initial attempts at passing the ETT were difficult due to LMA malposition and edema. After multiple attempts, a 6-0 ETT was placed. She was extubated over a tube exchanger 24 hours later.

Case Two: 25 year-old G4P2 presented with placenta previa, preeclampsia with HELLP, symptomatic Covid with cough and fever and morbid obesity (BMI 64). C-section was planned as a low dose combined spinal epidural to avoid general anesthesia due to symptomatic Covid and morbid obesity. Intraoperative placenta accreta complicated the C-section. After two failed attempts to pass the ETT due to airway edema, copious secretions, and quick desaturations, LMA size 4 was placed. Adequate ventilation and oxygen saturation was achieved. The procedure was further complicated by hemorrhage with activation of Massive Transfusion Protocol during Cesarean hysterectomy. She was extubated 24 hours later.

Discussion: Difficult intubation occurs in 3.3% of obstetric patients and is not anticipated in two-thirds of cases [2]. Supraglottic airway device has been recommended for rescue ventilation and airway maintenance. There is limited evidence and recommendations for intubation through fiberoptic scope following failed airway. Our two cases demonstrate the safe use of supraglottic airway device in a rescue situation with successful intubation through

the LMA under fiberoptic guidance.

References: 1. Hawkins, Joy L. “Maternal morbidity and mortality: Anesthetic causes.” Canadian Journal of Anesthesia vol.49, no. S1, June 2002. 2. Wong, P., et al. “Rescue supraglottic airway devices at caesarean delivery: What are the options to consider?” International Journal of Obstetric Anesthesia, vol. 42, May 2020.

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 17

Anesthetic Management of a Parturient with Idiopathic Subglottic Stenosis

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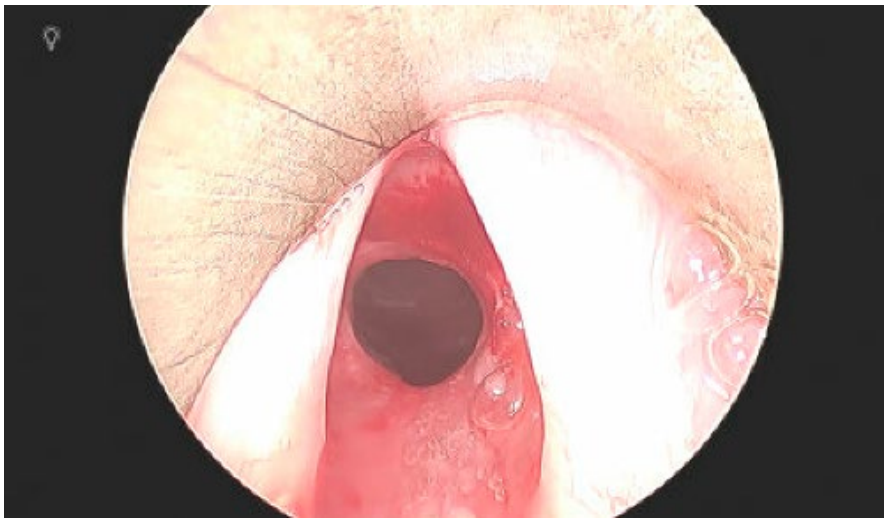
Presenting Author's Institution: University of North Carolina at Chapel Hill - Chapel Hill, North Carolina
Co-Authors: Kathleen A. Smith, MD - University of North Carolina

Introduction: Idiopathic subglottic stenosis is a rare disorder that primarily affects females 20-40 years of age (1). Pregnancy can progressively worsen symptoms and if left untreated, subglottic stenosis can lead to ischemic placental complications such as pre-eclampsia and intrauterine growth restriction (1).

Case One: This is a case of a 37-year-old G3P2022 at 35 weeks and 2 days who presented for microdirect laryngoscopy and subglottic dilation with otolaryngology (ENT). The patient initially presented in 2020 with a six-month history of stridor and associated shortness of breath. She was diagnosed with subglottic stenosis (SGS) and underwent laser incision and dilation. Her symptoms initially improved but recurred three years later- during her third pregnancy at 24 weeks gestation. Flexible laryngoscopy was performed at 34 weeks and revealed 30-40% SGS. A multidisciplinary plan with anesthesia, ENT, and maternal fetal medicine (MFM) was developed for a subglottic dilation at 35 weeks. The patient indicated she would accept a cesarean delivery at the time of surgery in the event of fetal distress. Intraoperatively, the patient was placed on continuous fetal monitoring with a cesarean delivery tray in the operating room and the MFM and NICU teams on standby. She was then adequately preoxygenated and a rapid sequence induction was performed with propofol, lidocaine, and approximately 1.2 mg/kg rocuronium. The patient was intubated using video laryngoscopy with a 4.0 microlaryngoscopy tube (MLT). The view was grade I with one attempt. A propofol infusion was utilized for maintenance of anesthesia given a history of postoperative nausea and vomiting and required periods of apnea. The patient was placed in gallows suspension by ENT and the MLT tube was removed from the airway for laser excision. With the initial apnea attempt, the patient had an episode of desaturation to 89% and the MLT tube was replaced under direct visualization. The etCO2 was 40 mmHg upon replacement of the MLT tube and the patient was hyperventilated prior to the second apnea attempt. During this time there was a brief episode of decreased fetal heart rate, but this quickly resolved. It was communicated to the ENT providers that the remaining apnea attempts would need to be shorter to prevent hypercarbia and fetal distress. After the final period of apnea, the etCO2 was 46 mmHg upon replacement of the MLT tube. The patient was hyperventilated to an etCO2 of 38 prior to extubation. The patient was reversed with neostigmine and atropine and was successfully extubated.

Discussion: This case illustrates the importance of preventing intraoperative maternal hypoxia and acidosis, which could lead to contractions and premature labor. Jet ventilation is safe in pregnancy and should be considered for procedures requiring prolonged apnea.

References: Damrose EJ, Manson L, Nekhendzy V, Collins J, Campbell R. Management of subglottic stenosis in pregnancy using advanced apnoeic ventilatory techniques. J Laryngol Otol 2019;133:399–403.



Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 18

Management of a Parturient with Airway Compression with Heliox During Cesarean Delivery

Presenting Author: Amy Zheng, MD
Presenting Author's Institution: University of Maryland School of Medicine - Baltimore, Maryland
Co-Authors: Shobhana Bharadwaj, MD - University of Maryland School of Medicine
James Kim, MD - University of Maryland School of Medicine
Bhavani S. Kodali, MD - University of Maryland School of Medicine

Introduction: We present a 34yo G6P3023 at 37w0d admitted for repeat cesarean section who required heliox due to a large thyroid goiter. She had a history of thyroid nodules diagnosed 8 years prior with no plans for intervention given normal thyroid hormone levels and no symptoms. She had worsening dyspnea and 4-pillow orthopnea a few weeks prior to presentation and could only walk short distances. A CTA performed to rule out pulmonary embolism showed an enlarged 5x6x3.8cm thyroid with rightward tracheal deviation with mild compression. ENT was consulted for airway evaluation. Flexible laryngoscopy showed a patent laryngeal inlet without obstruction with normal vocal cord movement. Her airway exam was notable for a visible goiter but was otherwise unremarkable. Radiology was contacted for their input on the narrowest part of the airway, which measured 10x12 mm located 4 cm below the glottis. An echocardiogram was obtained to rule out cardiac causes of her dyspnea and was unremarkable. Risks of neuraxial and general anesthesia were discussed with the patient including awake fiberoptic intubation.

Case One: Prior to the Cesarean section, a difficult airway cart and heliox were placed in the operating room. After placement of a combined spinal epidural, the patient was placed supine on a ramp elevating her head with a nonrebreather facemask with 10 LPM of oxygen. She was initially able to tolerate positioning; however, after delivery she expressed discomfort breathing and therefore was started on heliox with 70% helium/30% oxygen through a nonrebreather at 12 LPM with improved comfort through the rest of the surgery. Her SpO2 was 100% throughout the case. After surgery, she was kept in an upright position with a facemask with 8 LPM of oxygen. Heliox was kept in her room during recovery if needed. She had several episodes of desaturation to 70-80% during postoperative day (POD) 1 while sleeping but would recover when woken up and repositioned. She was briefly restarted on heliox to maintain her oxygen saturation above 92% but was quickly weaned off. She improved on POD2 and was discharged home on POD3.

Discussion: Careful airway management is of utmost importance in pregnant patients, who are 8 times more likely to have difficult airways than nonpregnant patients. Airway obstruction further adds to this life-threatening risk. When possible, maintaining spontaneous respiration and avoiding intubation is critical. Heliox is a mixture of helium and oxygen that can be used with nasal cannula, facemask, noninvasive ventilation, and mechanical ventilation

to treat airway obstruction as the lower density of helium reduces flow resistance. It can decrease airway resistance, reduce work of breathing, and improve ventilation in patients with airway obstruction. This patient was successfully managed utilizing heliox therapy.

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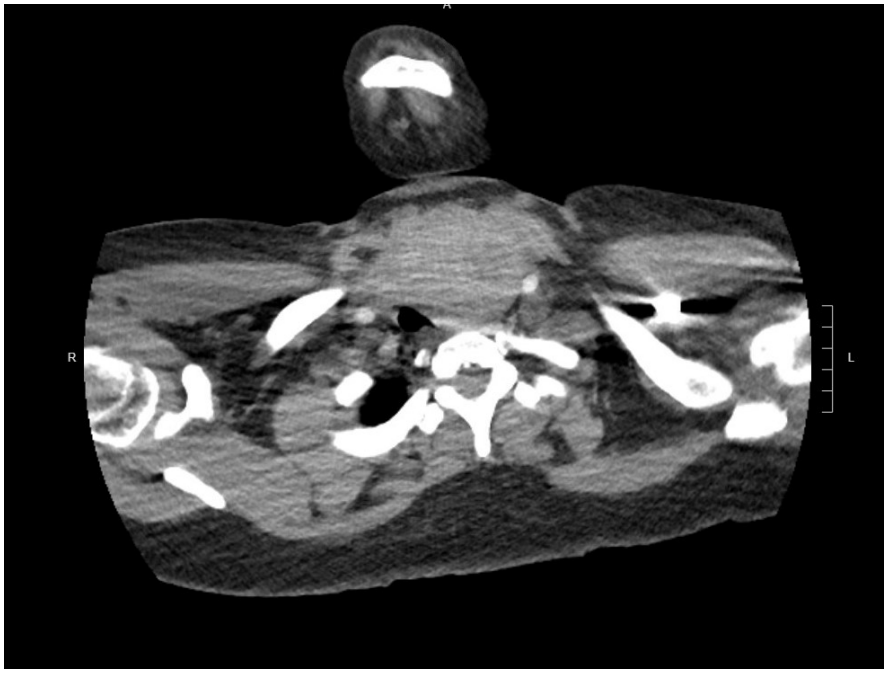

Abstract #: THUR - CR - BS 1 - Breakout Room 1 -All these airway issues and other disasters - 19

Management of a 23-week Pregnant Patient with Idiopathic Subglottic Stenosis Undergoing Laser Ablation Surgery

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Co-Authors: Shobhana Bharadwaj, MD - University of Maryland School of Medicine
Charles Lawson, MD - University of Maryland School of Medicine
Samuel Onyewu, MD - University of Maryland School of Medicine

Introduction: Idiopathic subglottic stenosis (ISS) is rare with an incidence of 1:400,000. Symptoms include cough, hoarseness, and dyspnea. These can become exacerbated in pregnant women and increase the risk of life-threatening airway compromise.

Case One: We present a 37yo G3P2002 at 23w0d with ISS who underwent laryngoscopy with laser ablation of subglottic stenosis. She had a 3-year history of cough and thick secretions attributed to allergies, though they didn't respond to antihistamines. She developed progressive dyspnea on exertion a year prior to presentation that worsened during pregnancy; by the end of 1st trimester, she was no longer able to complete activities of daily living. Her allergist again attributed this to allergies and she was given steroid courses and nebulizers with no effect. At 22w she began to have dyspnea at rest and stridor. She was evaluated by ENT at 22w4d and found to have 50% subglottic stenosis with her airway narrowed to 5mm. Given her acute worsening during pregnancy with concern that her respiratory status could further decline, she was recommended for urgent surgical intervention. After discussion with Maternal-Fetal Medicine, patient opted to defer antenatal steroids and undergo only pre- and post-procedure fetal monitoring. She received metoclopramide and sodium citrate for aspiration prophylaxis and was positioned in left lateral tilt. She was preoxygenated and then induced with fentanyl and propofol. After confirming easy mask ventilation, rocuronium was given. She was maintained on a propofol infusion and ventilated with jet ventilation and intermittently through a 5.0 endotracheal tube when her SpO2 declined to 95% to avoid any hypoxia. She tolerated the procedure without issue and had excellent airway patency at the end. She was reversed and extubated without issue. Postop fetal monitoring was stable from baseline. Her dyspnea felt improved postop and she was discharged home later that day.

Discussion: Careful airway management is of utmost importance in parturients, who are 8 times more likely to be difficult airways than nonpregnant patients. ISS is rare, even more so in pregnant women, but can pose a significant risk as the airway edema and mucosal congestion of pregnancy further exacerbate tracheal narrowing and increase the risk of difficult airway. Symptoms of ISS have been seen to worsen in pregnancy, prompting surgical intervention prior to delivery. If jet ventilation is required, maintenance of a higher FiO2 with

shorter inspiratory times and/or higher driving pressures is important to keep PaO2 and PaCO2 as close to baseline pregnancy levels as possible for fetal safety.

References: Fang S, Pai B H P. Successful management of subglottic stenosis in pregnancy. BMJ Case Rep. 2021 Mar 24;14(3):e236466. doi: 10.1136/bcr-2020-236466. PMID: 33762270
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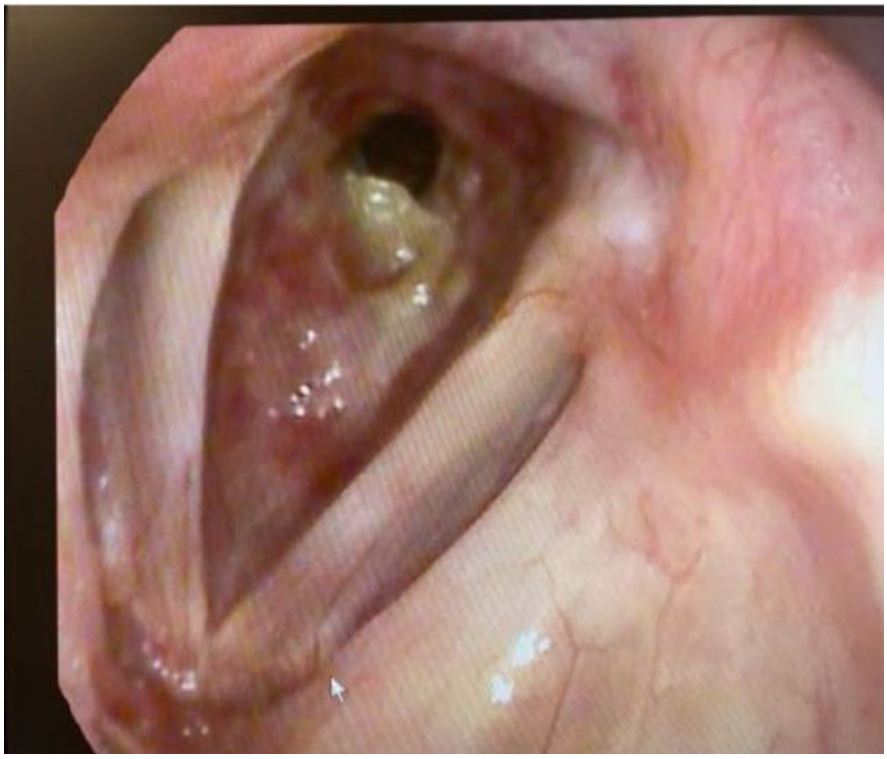

Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 01

Comprehensive Labor and Delivery in a Parturient with Cold Urticaria

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Presenting Author's Institution: New York Presbyterian / Weill Cornell Medical Center
Co-Authors: Katherine Ampolini, CRNA - New York Presbyterian / Weill Cornell Medical Center

Introduction: Cold urticaria is a Type I hypersensitivity reaction affecting 0.05% of the population. Exposure to cold temperatures, contact with cold objects, food, or beverages, or immersion in cold water can trigger mast cell and basophil degranulation, initially manifesting as raised lesions. This may be self-limiting; however, progression to angioedema and even anaphylaxis may occur.

Case One: A 32-year-old female, G1P0000, with a past medical history of asthma, eczema, and cold urticaria was admitted to labor and delivery at 39w3d for induction of labor due to preeclampsia without severe features. She had received a high-risk antenatal obstetric anesthesia consultation due to her history. She reported multiple reactions to cold including urticarial rashes and difficulty breathing. Her diagnosis of cold urticaria was confirmed by an immunologist. Based on the plan that was developed during her consultation, the patient's room was warmed, forced air warming devices were utilized, and all medications were warmed to room temperature before administration. An early CSE was placed. During placement, her skin was prepped using povidone-iodine that was warmed to room temperature. After neuraxial placement, the dermatomal level was assessed with light touch/pinprick instead of cold. She delivered vaginally without any evidence of her urticarial disease. Upon transfer to postpartum, all fluids and medications were warmed to room temperature, and her postpartum room was warmed before her arrival.

Discussion: Although rare, cold urticaria can have disastrous outcomes. Hypothermia is common among peripartum inpatients, and measures to maintain normothermia must be implemented. This patient's labor and delivery occurred without any adverse events due to the antenatal consult and extensive multidisciplinary plan that was followed closely. The plan's success required communication with nursing leadership, obstetrics, and environmental services. This plan included having epinephrine always immediately available, ambient air warming and warmed air devices, warming all medications, and avoiding cold items contacting patients. Postpartum ice-pack therapy is commonly offered by nursing, but needs to be avoided in these patients. Avoidance of general anesthesia is preferred due to impaired hypothalamic thermoregulation. Early neuraxial placement decreased the risks of needing general anesthesia. If general anesthesia is required, pretreatment with a second generation antihistamine and corticosteroids may be beneficial. Any histamine-releasing medications should be avoided. Anesthesia providers should avoid testing levels with cold temperatures if neuraxial placement occurs. Because this plan requires multidisciplinary involvement, an antenatal anesthesia consultation is essential and crucial to our patient's safe labor and delivery.

References: Agbenyefia, P., Shilliam, L. A., Stoicea, N., Roth, A., & Moran, K. R. (2017). Perioperative management of a patient with cold urticaria. Frontiers in Medicine, 4.

Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 02

A Case of Severe, Recurrent Thrombocytopenia in a Third Trimester Parturient

Presenting Author: Jessica Bonilla, DO
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Co-Authors: Benjamin T. Houseman, MD - Memorial Healthcare
Cecilia Nosti, MD - Memorial Healthcare

Introduction: Symptoms of thrombotic thrombocytic purpura (TTP) in parturients may overlap with HELLP and may be difficult to differentiate from other causes of microangiopathic hemolytic anemia[1]. Diagnosis and treatment of TTP is frequently delayed because diagnostic assays require significant processing time. Here we present a case of recurrent TTP in a third trimester parturient with limitations in access to care.

Case One: A 31-year-old G4P2 at 32 weeks EGA was admitted for elevated blood pressures (155/88) and visual disturbances. She had been admitted 18 days prior due to elevated blood pressures and thrombocytopenia but left against medical advice (Figure 1). Laboratory analysis on admission showed anemia, severe thrombocytopenia, mild renal insufficiency, and proteinuria. Magnesium, IgG, platelets, and steroid therapy were initiated, and the patient underwent cesarean section under general anesthesia due to fetal indications (QBL 1,066 mL, Apgar 7 and 9). By postpartum day (PPD) 4, her visual disturbances had resolved and platelet count improved, but her anemia and renal insufficiency persisted. MRI of the brain prior to discharge showed numerous small infarcts that were attributed to strokes in the setting of thrombocytopenia or an atypical presentation of PRES. Assay for ADAMTS13 drawn during the admission was diagnostic for TTP, but did not result prior to discharge, and she was lost to follow-up. She returned to the hospital on PPD 15 with headache, severe thrombocytopenia and worsening renal failure. Sedimentation rate was elevated and her ANA was positive, and repeat ADAMTS13 assays confirmed the diagnosis of TTP. Following plasma exchange and rituximab therapy, both thrombocytopenia and renal function improved. She was discharged home on PPD 23 with outpatient rituximab therapy scheduled. The patient returned on postpartum day 30 with hypertension and jaundice and reported missing her rituximab treatment. Recurrent immune TTP was treated with plasma exchange and rituximab, and she was able to resume outpatient treatment.

Discussion: Severe thrombocytopenia and anemia in third trimester parturients can result from a number of disease processes, including HELLP, hemolytic uremic syndrome, and TTP. While IgG, steroid therapy and delivery may temporarily improve symptoms and laboratory values, diagnosis is often difficult because disease processes can co-exist and assays take time to result. Here, the initial ADAMTS13 assay resulted after discharge and the patient was lost to follow-up. This case also illustrates the unfortunate impact of social determinants on maternal health. Our patient left AMA following her initial admission, was unable to follow-up with her hematologist for treatment of TTP, and missed outpatient rituximab therapy, resulting in recurrence of her TTP.

References: 1. Terry Gernsheimer, Andra H. James, Roberto Stasi; How I treat thrombocytopenia in pregnancy. Blood 2013; 121 (1): 38–47. doi: https://doi.org/10.1182/blood-2012-08-448944

A Case of Severe, Recurrent Thrombocytopenia in a Third Trimester Parturient Table.pdf

Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 03

Anesthetic Management of Acquired Hemophilia A in a Parturient

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Co-Authors: Michael Aguad, MD - Memorial Healthcare System
Maria Frosth, MD - Envision Healthcare Services
Benjamin Houseman, MD, PhD - Envision Healthcare Services
Taimoor Khan, MD - Memorial Healthcare System

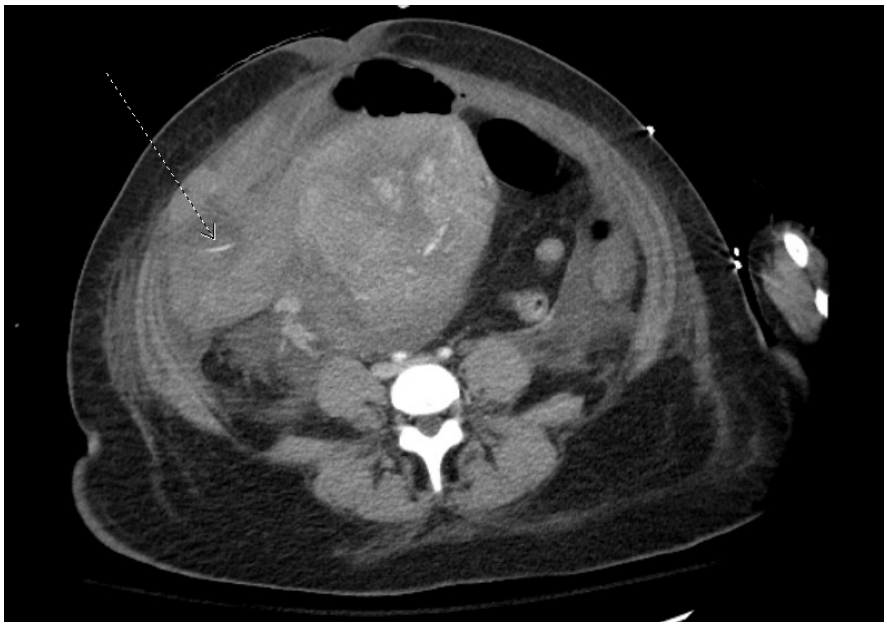
Introduction: Acquired Hemophilia A (AHA) in parturients accounts for 7-11% of cases and most commonly develops 1-4 months postpartum (1). Development of AHA during pregnancy is rare and is associated with maternal and neonatal morbidity. Here we describe AHA in a third trimester parturient and the resources required for optimal outcomes.

Case One: A 31-year-old G1P0 presented with spontaneous bruising, hemarthrosis, and gingival bleeding at 35w6d EGA. Workup showed prolonged aPTT with FVIII and FXII deficiency. Other coagulation parameters (PT/INR, fibrinogen, platelets, and thrombin) were normal. She was diagnosed with AHA and received 1000 units of Prothrombin Complex Concentrate (PCC) and prednisone with plans to deliver after 37w EGA. At 37w5d EGA she was admitted to labor and delivery with SROM. Recombinant Factor VIIa (rVIIa) was administered while awaiting factor levels. Neuraxial anesthesia was discussed but was ultimately deemed high risk, even in the setting of corrected bleeding times. Due to lack of cervical dilation after 24 hours, a decision was made to perform cesarean delivery under general anesthesia. She was given an additional dose of rVIIa, had QBL 700mL and delivered a healthy female infant. Additional PCC (2000 units) was given during recovery. On PPD1, rVIIa was discontinued and she received 2 units of PRBC for Hgb 6.4. A CT scan showed a large pelvic hematoma (Figure 1), and endovascular coil embolization of bilateral uterine and hypogastric arteries was performed. During the procedure she required 6 units PRBC, 4 units FFP, 1 unit of platelets, 1000 units of PCC, TXA and additional VIIa. Following the procedure, our facility was depleted of both PCC and VIIa. Moreover, the patient developed a large R groin pseudoaneurysm at the site of percutaneous intervention. A decision was made to transfer her to a large academic center for more rapid coagulation testing and a more robust supply of factor concentrates. Once her coagulation abnormalities resolved, she was discharged home with immunosuppression. She returned with fever and neutropenia, which was managed with antibiotics and initiation of emicizumab-kxwh. She received 2 units of PRBC on PPD16 but remained stable at follow-up visits. The infant showed no evidence of bleeding.

Discussion: Management of AHA focuses on hemostasis by repletion of factors and suppression of factor antibodies. This case illustrates the use of both PCC and VIIa to “bypass” factor deficiencies. The decision to discontinue VIIa in the post-partum period may have contributed to the development of hematoma. Peripartum care of patients with AHA requires extensive resources, and this case challenged resources available at our regional obstetric

center, requiring transfer to specialized facility.

References: 1. https://journals.lww.com/md-journal/FullText/2019/01180/Pregnancy_related_acquired_hemophilia_A_initially.53.aspx 2. https://pubmed.ncbi.nlm.nih.gov/17102646/ 3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10150309/



Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 04

Diagnosing Pregnancy-Associated Atypical Hemolytic Uremic Syndrome, A Case Report

Presenting Author: Ashley Wicker, MD
Presenting Author's Institution: University of North Carolina
Co-Authors: Courtney R. Hood, MD, MEd - Brooke Army Medical Center

Introduction: A 29-year-old G2P1000 at 37w4d presented to our hospital in early labor with multiple metabolic derangements, including an anion gap metabolic acidosis (AGMA), acute kidney injury, and elevated transaminases. Her pregnancy was complicated by well-controlled type 2 diabetes mellitus (T2DM), resolved intrauterine growth restriction, and obesity (BMI 35).

Case One: Intrapartum: The initial differential diagnosis for this patient included acute fatty liver of pregnancy (AFLP), euglycemic diabetic ketoacidosis (DKA), and HELLP syndrome. Laboratory abnormalities including elevated transaminases, creatinine, lipase, and inflammatory markers were consistent with a diagnosis of AFLP. Her recent history of nausea, vomiting, and right upper quadrant pain also made AFLP a likely etiology. The patient was not hyperglycemic on admission, however she did have a history of T2DM and presented with a significant AGMA and elevated beta-hydroxybutyrate. These findings could suggest the diagnosis of euglycemic DKA. Lastly, the elevated transaminases could indicate HELLP syndrome as the etiology, however the patient was normotensive, not thrombocytopenic, and had no evidence of preeclampsia. Ultimately, the decision was made to proceed with urgent cesarean delivery. Despite fluid resuscitation, the patient continued to be acidotic with worsening renal and hepatic injury. The fetus also developed a non-reassuring fetal heart tracing, with minimal variability and frequent variable decelerations. Her cesarean delivery was completed under neuraxial anesthesia and complicated by postpartum hemorrhage (PPH) due to uterine atony and persistent bleeding from her hysterotomy. The PPH improved with multiple uterotonics and O'Leary stitiches. Her neonate was resuscitated and transferred to the NICU following delivery. Postpartum: On postpartum day 1, transaminase levels had improved, but the patient developed significant thrombocytopenia, fevers, and laboratory evidence of active hemolysis. A peripheral smear revealed schistocytes. Hemolytic uremic syndrome (HUS) or thrombotic thrombocytopenic purpura (TTP) became the most likely etiologies for this patient. Her ADAMTS13 level was adequate, and pregnancy-associated atypical HUS became the most likely diagnosis. She was treated with eculizumab, with subsequent improvement in her renal function, anemia, and thrombocytopenia.

Discussion: Pregnancy-associated atypical HUS is a rare life-threatening disease associated with hemolytic anemia, thrombocytopenia, and renal failure. The disease is caused by an upregulation of the complement pathway leading to significant endothelial cell damage. Most cases improve with a complement inhibitor such as eculizumab. In this case, our patient had marked improvement with this treatment.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 05

Swimming in Dangerous Waters - The Case of a Parturient with Platelet Storage Pool Disorder

Presenting Author: Jhovan S. Kepple, BSc MBBS
Presenting Author's Institution: MetroHealth Medical Center - Cleveland, Ohio

Introduction: Platelet storage pool disorders (PSPD) are a rare group of bleeding disorders affecting platelet aggregation (due to a qualitative or quantitative deficiency in platelet granules). They can be inherited or acquired (1). Case reports of PSPD in parturients are scarce and there remains no consensus on ideal anesthetic management.

Case One: 26 yo G3P1 at 35w5d with PSPD who presented for IOL for severe preeclampsia (Pre-E). Planning included IV then oral TXA, DDAVP 30 min before interventions (epidural, stage 2 labor), crossmatched platelets and PRBCs. IOL began and IV magnesium started to prevent eclampsia. A baseline thromboelastogram (TEG) was normal. To minimize trauma, the epidural was placed by an experienced anesthesia provider after neuraxial ultrasound. After 17 hours of labor, the patient delivered via SVD. Misoprostol was given prophylactically, and her quantitative blood loss was 200ml

Discussion: Managing PSPD may include HLA-matched platelets, antifibrinolytics, DDAVP and optimizing coagulation factors (3,4,5). TEG is useful to guide need for platelet transfusion (2). Managing parturients with this illness includes having a clear plan prior to arrival and using an early multidisciplinary team (Anesthesia, Heme, OB) (2, 5). Additional strategies include reducing risk of bleeding and trauma to the mother and fetus by avoiding prolonged labor, intrauterine catheters, fetal scalp electrodes, vacuums, forceps, external cephalic version and reducing risk of chorioamnionitis. Case reports have documented uncomplicated deliveries via the vaginal and c-section routes. Patients may have no family history because PSPD has many inheritance patterns. These disorders are differentials for patients with a history of unexplained post-partum hemorrhage and menorrhagia. Estimates of the incidence of inherited platelet disorders are as high as 30% in those referred to Hematology for menorrhagia (5). Managing PSPD in the context of Pre-E was a case specific nuance. DDAVP is an accepted modality in managing PSPD but its use in patients with Pre-E is controversial due to its antidiuretic effect (risk of hyponatremia and hypertension).

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 06

Anesthesia Management of Severe Neutropenia in Pregnancy

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Presenting Author's Institution: UCSF
Co-Authors: Katherine Bartz, MD – UCSF

Introduction: Chronic neutropenia is an inherited or acquired rare disorder characterized by a blood absolute neutrophil count (ANC) below 0.5 x 10^9 /L. Pregnancy is a major concern for patients with severe chronic neutropenia due to increased susceptibility to infections (1). This case report describes the peripartum management of a patient with chronic neutropenia.

Case One: A 33-year-old G2P0 with chronic immune vs. idiopathic neutropenia presented for an obstetric anesthesia consultation. The patient was planned to be induced at 39 weeks gestation for GDMA2 and chronic neutropenia. Her neutropenia was initially diagnosed at the age of 20 after presentation of chronic upper respiratory tract infections and an ANC of 0.1. Prior to pregnancy, she never had significant life-threatening infections though her neutropenia worsened after becoming pregnant. In multidisciplinary discussions between anesthesia, OBGYN, hematology, and immunology, a plan was made to administer granulocyte colony stimulating factor (G-CSF) with a targeted goal of ANC > 1.0 and to provide GBS+ and neutropenia antibiotic prophylaxis prior to delivery. It was also decided that there was no absolute contraindication to neuraxial analgesia or anesthesia. The patient received three doses of G-CSF prior to induction with a starting ANC of 0.33, though she required additional dosages to reach an ANC of 1.0. She also received a five-day course of cefuroxime upon admission. The patient had an epidural placed using standard aseptic technique without any complications. The labor course was complicated by fetal intolerance of labor, chorioamnionitis, and arrest of descent, so the fetus was eventually delivered via urgent cesarean under neuraxial anesthesia. Her ANC at the time of delivery was 1.82, and she received cefazolin and azithromycin prior to incision. Her delivery was complicated by postpartum hemorrhage of 1.2 L. The patient was evaluated by anesthesia daily until she was stably discharged on postpartum day 2.

Discussion: Severe neutropenia in pregnancy precipitates multiple obstetric and anesthesia considerations. There are limited data on the risk of developing severe bacterial infections during pregnancy for women suffering from severe chronic neutropenia (1). Furthermore there are no guidelines available for the indications and limitations of neuraxial anesthesia, the use of G-CSF, or the role of prophylactic antibiotics (1,2). The ASA recommends the decision to select neuraxial techniques to be determined on a case-by-case basis. We demonstrate facilitation of labor epidural placement with emphasis on multidisciplinary management in such patients. Our patient had an uncomplicated delivery with administration of G-CSF to increase ANC, prophylactic antibiotics prior to neuraxial placement under aseptic technique, and daily evaluation of epidural insertion site for signs and symptoms of infection.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 07

Thrombocytopenia: Evaluation and Management of a Parturient at Term

Presenting Author: Michael A. Heller, MD
Presenting Author's Institution: CPMG

Introduction: Thrombocytopenia (TCP) affects up to 10% of pregnancies. Gestational TCP is common but both pregnancy specific and non-pregnancy related TCPs occur.1 SOAP published guidelines for management of parturients with TCP recommending the safety of neuraxial anesthesia when PLT counts are stable and >70k,2 while former recommendations suggested PLT transfusion when counts were 20-50k. A recent review suggests prophylactic PLT transfusions do not decrease bleeding risk.3 Reactions from PLT transfusions are also disproportionately high relative to other blood products. Prophylactic transfusions may increase risk of transfusion reactions without increasing clinical benefit. Such transfusions are indicated for life-threatening hemorrhage or urgent surgery because the response to PLT transfusion is short-lived.2

Case One: A 32 y/o G2P1 at term presented for induction of labor. She had been diagnosed with ITP, but PLTs were unresponsive to IVIG or steroids. During a prior pregnancy, she received a prophylactic PLT transfusion, a labor epidural, and had an uncomplicated vaginal delivery. This pregnancy, a diagnosis of ITP was questioned but still documented. Genetic testing revealed an autosomal dominant VUS mutation in ANKRD26 gene causing the TCP. A multidisciplinary team of hematology, MFM, and OB followed the patient and recommended IOL, prophylactic PLT transfusion, and an epidural when PLTs were >70K. Upon admission, PLTs were 44K and increased to 73K after two apheresis units of PLTs. Though the patient desired an epidural, her history revealed ED visits for significant bleeding after minor cuts, and a positive history for TCP in multiple family members. Therefore, the patient was not offered an epidural. Pain was managed with N_2O, and opioids. TEG analysis demonstrated an MA of 53.7 (range 52-70). After an uncomplicated delivery, adequate PLT count, no evidence of uterine atony, and a first-degree laceration, the patient suffered a PPH requiring additional PLT transfusion. Bleeding was ultimately controlled, and patient did well. Initially disappointed she was unable to receive an epidural, she understood after experiencing an unexpected PPH best attributed to her underlying TCP.

Discussion: Inherited TCPs are rare. PLT number, function, and bleeding severity varies.4 Guidelines discourage prophylactic PLT transfusions for epidural placement. While PLT counts >70K are considered safe if PLTs are stable, transfusions between 20-70K may not have clinical benefit. Prospective high-quality studies are needed to investigate the utility of TEG/ROTEM in pregnancy. PLT transfusions should be reserved for the life-threatening hemorrhage. Additionally, a multidisciplinary team should include anesthesia as early communication could improve the patient expectations.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 08

A Parturient with Factor VII Deficiency: A Case Report

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Introduction: Factor VII deficiency is a rare bleeding disorder, present in 1 in 500,000 people1. Limited cases of factor VII deficiency management during the intra- and postpartum period have been reported; thus patient care requires a multidisciplinary collaboration between obstetric, anesthesia, and hematology teams. Herein, we report a case of factor VII deficiency in a pregnant female with a history of postpartum hemorrhage (PPH) requiring packed red blood cell (PRBC) transfusions and arterial embolization, and discuss therapies for management.

Case One: The patient is a 27-year-old G3P1011 with history of factor VII deficiency and PPH, who presented at 39w0d for repeat cesarean section (RCS). Past medical history includes a CS during her first pregnancy in which she required 1 unit (u) of PRBC transfusion postoperatively; 1 week later she had significant PPH requiring 20u PRBCs and placement of uterine artery coil. At this time, she was seen by a hematologist and diagnosed with factor VII deficiency (factor VII level at 40%). On presentation for this CS, labs were remarkable for Hgb 11.9, factor VII 97%, PT 12.6. After discussion with hematology, she was given 2u of fresh frozen plasma (FFP) prior to delivery. In case of PPH, she would get recombinant factor VIIa (rFVIIa) every 2 hours until hemostasis. The CS was performed under general endotracheal anesthesia, with delivery of a viable infant and estimated 800 ml blood loss. No bleeding complications were noted in the postoperative period. On discharge, the patient had Hgb 8.4, factor VII 46%, PT 13.6. Patient had stable levels of PT for 2 weeks following discharge.

Discussion: As demonstrated in this case, management of factor VII deficiency during pregnancy is important as the uterus and placenta are rich in tissue factor, making hemostasis more dependent on factor VII and the extrinsic pathway1. Fixed standards of care protocols are needed for peripartum management. Management options include FFP and rFVIIa. FFP can be used for its low cost, easy availability, and effect expected for 4-6 hours after administration. However, it can have limited effectiveness due to risk of circulatory overload with overuse2. rFVIIa remains the most widely accepted therapeutic option for this condition.1 More studies are needed to assess thrombosis risk in FFP versus rFVIIa. Overall, this case presented a rare blood disorder that required careful consideration in peripartum care. Future research should address these gaps in standard management.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 09

Viscoelastic Test-guided Spinal Anesthesia for Cesarean Section in Factor VII Deficiency – A Case Report

Presenting Author: Shannon Haley, MD, PhD
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Co-Authors: Suzanne L. Huffnagle, DO, FAOCA, FASA - Thomas Jefferson University Hospital
Uzung Yoon, MD, MPH - Thomas Jefferson University

Introduction: No perioperative guidelines exist for obstetric anesthesia in factor VII deficiency (FVIID) patients. Viscoelastic testing offers better assessment of hemostatic function compared to plasma laboratory values1. Non-Activated rotational ThromboElastoMetry (NATEM) evaluates a patient's unbiased coagulation status, informing risk assessment.

Case One: A 28-year-old woman, G2P0100 with congenital FVIID was admitted at 38 weeks for elective cesarean delivery due to PTSD from a prior non-viable vaginal delivery. Her medical history included asthma, BMI 45 kg/m2, sleeve gastrectomy, partial hepatectomy. Preoperative workup revealed a FVII level of 31% without clinical bleeding/bruising, hemoglobin 11.7 g/dL, hematocrit 37.1%, and platelets 234 x109/L. Hematology recommended: no recombinant activated FVII (rFVIIa) if FVII 25%, 3 doses of rFVIIa (2mg q2h IV) for significant bleeding, 1g of tranexamic acid following delivery if rFVIIa was not administered. Initial NATEM indicated normal coagulation status. A 4-inch 24G Pencan spinal needle yielded free CSF flow with 12.75 mg 0.75% bupivacaine in dextrose,110.5 mcg hydromorphone and 8.5 mcg fentanyl injected intrathecally, producing a T4 level. Delivery occurred 3 minutes after incision; 5 IU oxytocin and 1g tranexamic acid were administered IV thereafter. QBL was 580 mL. Repeat NATEM after hemostasis and uterine closure again showed normal coagulation without fibrinolysis. The patient's recovery was uncomplicated with discharge home on POD 2.

Discussion: Spinal anesthesia may be considered in patients with FVII deficiency if viscoelastic testing is normal. In obstetric patients, viscoelastic testing reduces transfusions, estimated blood loss, cesarean hysterectomy, and postoperative ICU admission and hospitalization2. A systematic review showed that 32% of pregnant patients with FVII deficiency received FVII prophylaxis for delivery with a 2.9 OR for cesarean delivery and no difference in post-partum hemorrhage3. Another study identified 10 case reports of obstetric deliveries in patients with FVII deficiency, each with a unique approach in the absence of guidelines4. This ROTEM-based, goal-directed management adds to a small body of work evidencing the utility of viscoelastic testing in the obstetric anesthesia management of FVIID patients.

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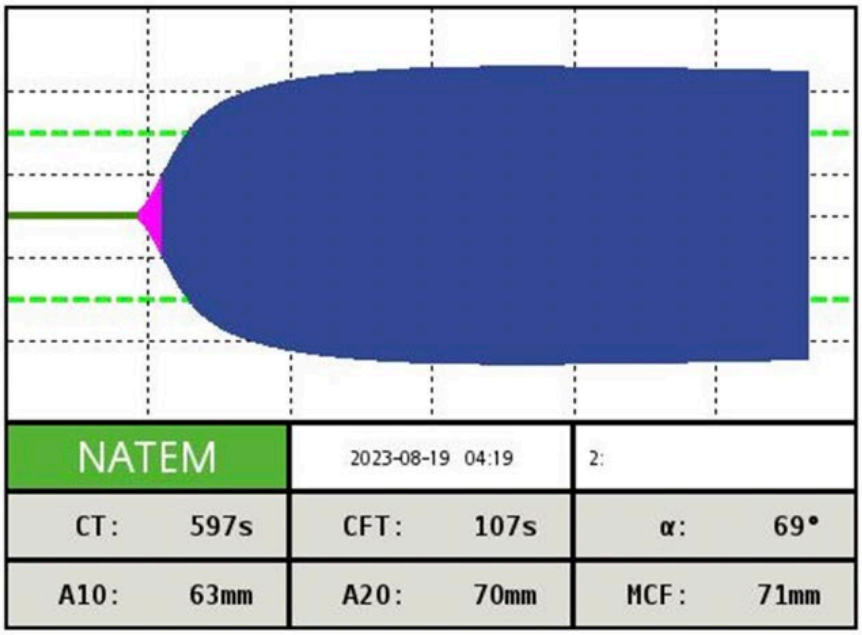
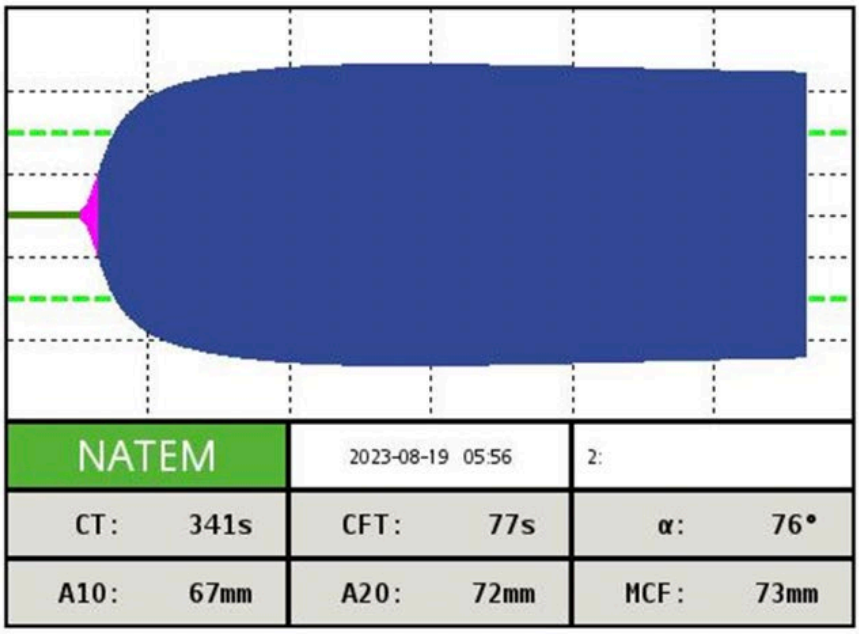
Baseline NATEM assay before cesarean section



NATEM assay after uterine closure



Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 10

Navigating Birth in a Patient with Bombay Phenotype: No Blood, Big Problem

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Introduction: Bombay blood group is rare, with an incidence of 1 in 10,000 in India and 1 in 1,000,000 in Europe1. Affected individuals lack the H antigen on red blood cells (RBCs). The H antigen is otherwise universally present on RBCs and is required for the addition of A and B antigens to the RBC surface1. Their ABO type will appear as O, and they commonly have nonspecific panagglutination on type and screen. They produce antibodies to A, B and H antigens, and cannot safely receive O+ or O- blood. If transfused, their anti-H alloantibodies will bind to donor's H antigens, putting them at risk for severe hemolytic transfusion reactions.

Case One: A 33-year-old G2P1001 with Bombay phenotype presented at 24 weeks gestation for routine prenatal care. Her type and screen resulted in panagglutination as it had during her first pregnancy in 2020. At that time, no further testing was completed, and she delivered at an outside facility without complications. Additional testing revealed anti-H antibody and she was diagnosed with Bombay phenotype. No family members had the Bombay phenotype. The Red Cross identified two compatible frozen red blood cell units in an adjacent state. These units would expire 24 hours after thawing, so preemptive thawing was not feasible. Her pregnancy management plan included: repletion of iron, vitamin B12 and folic acid supplementation to optimize her hemoglobin level, and fetal MCA doppler every two weeks to assess for hemolytic disease. Her pre-delivery hemoglobin was 13.3gm/dL. On presenting in spontaneous labor at 40w1d, she received a dural puncture epidural for labor analgesia. One dose of prophylactic methylergonovine and misoprostol were given upon vaginal delivery, and her estimated blood loss was 200mL. She was eligible for tranexamic acid, prothrombin factor concentrate, recombinant factor VIIa, and balloon tamponade devices, although these were not needed. Prophylactic cell saver was planned in the case of an intrapartum cesarean delivery, or if surgical intervention was needed. She was discharged home on postpartum day two after an uneventful recovery.

Discussion: Patients with rare blood types require extensive planning for blood loss management during peripartum period. For parturients with Bombay phenotype, delivery poses significant risk. They may only receive H antigen-negative blood (including autologous), which can be challenging to source. Pregnant patients are excluded from donating blood, even for autologous use, although rarely they may donate for intrauterine procedures2. Per FDA regulations, blood cannot be imported into the United States from other countries with

higher frequency of Bombay phenotype. These constraints make antepartum assessment of blood product availability imperative for patients with Bombay phenotype. Multidisciplinary discussions between hematology, blood bank, obstetrics, and anesthesiology teams are recommended to formulate a clear and detailed peripartum plan for blood management.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 11

Anesthetic Management of a Parturient with Alpha-Gal Syndrome

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Introduction: Alpha-Gal Syndrome is an IgE-mediated response to galactose-α-1,3-galactose (alpha-gal), an oligosaccharide found in mammalian products, such as meats and pharmaceutical ingredients, that has increased in prevalence in recent years.1-4 Reactions range from pruritus and gastrointestinal symptoms to angioedema and anaphylaxis. Reactions also vary in each person and with each exposure, making it challenging to identify.1-4 Given that medications commonly used in the obstetric and anesthetic management of parturients can contain alpha-gal, it is essential for obstetric anesthesiologists to understand Alpha-Gal Syndrome and its diverse presentations to apply the appropriate preventative measures.

Case One: We report the case of a 33-year-old G1P0 female who presented at 35 weeks gestation with Alpha-Gal Syndrome for high-risk obstetric anesthesiology consultation. Approximately 15 months prior she was diagnosed with Alpha-Gal Syndrome due to elevated Alpha-Gal IgE antibodies after a lone star tick bite. A multidisciplinary conference was held, and all possible obstetric and anesthetic medications were reviewed with pharmacy and nursing. When she presented for induction of labor due to gestational hypertension at 39 weeks, all possible medications were again reviewed with the pharmacy before administration. At that time, the propofol at our institution was flagged as containing preservatives likely to cause a reaction. Compatible propofol was rapidly obtained from a nearby institution to remain prepared for general anesthesia as a backup. All other possible medications were cleared as low risk for reaction. Standard epidural load with 0.125% bupivacaine and infusion of 0.0625% bupivacaine with fentanyl 2 mcg/mL was administered without complication for labor analgesia. The patient had an uncomplicated vaginal delivery and postpartum course.

Discussion: Parturients with Alpha-Gal Syndrome represent a vulnerable population in the perioperative setting. Optimal management focuses on prevention.1-3 Comprehensive planning and a multidisciplinary approach can allow for the avoidance of medications that may cause a reaction and the provision of safe, effective care.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 12

Perioperative Implications of Alpha-Gal Syndrome in a Patient for Scheduled C-section

Presenting Author: Stephen Ford, DO
Presenting Author's Institution: University of Kentucky Anesthesiology Department

Introduction: Alpha-gal syndrome (AGS) is an acquired IgE hypersensitivity of galactose-alpha-1,3-galactose, an oligosaccharide found in the tissues of non-catarrhine mammals. It gained recognition in 2007 as a cause of hypersensitivity reactions to Cetuximab, with reaction rates as high as 22% in TN and NC, compared to 1.2% in the general population. AGS is tick born, closely matching the regional distribution of the Lone Star tick in the U.S, but also prevalent in highly forested regions worldwide. It is acquired due to the alpha-gal oligosaccharide that remains in the tick's saliva and transferred when bitten. Serological conversion can take 3-6 months, so reactions may be delayed after the initial tick bite. Reactions can occur 4-6 hours after exposure to mammalian meat (related to digestion and transit of glycoproteins), and include itching, GI symptoms (nausea, diarrhea), urticaria, and anaphylaxis.

Case One: This is a case of a 25 y.o. G2P1 at 37w1d who presented 1 day prior to scheduled repeat C/S. Her PMHx includes tobacco abuse and GERD with a prior uncomplicated elective C/S with neuraxial block. She had a documented allergy to PCN (rash) and Azithromycin (rash). One year prior, she reported multiple episodes of anaphylactic reactions with no discernable cause. After multiple ED admissions, it was determined to be AGS based on elevated alpha-gal IgE titers. Alpha-gal IgE titers are both highly sensitive and specific. Since that time, she had followed strict dietary and medication precautions and reported no recent reactions. Titers checked 1 month prior showed elevated but down-trending IgE levels.

Discussion: After multidisciplinary discussion on the day of C/S, we formulated a list of medications to avoid. A combined spinal epidural was performed with hyperbaric bupivacaine and fentanyl. She was given IV dexamethasone, famotidine, and ondansetron. Morphine was avoided due to severe pruritus after her first C/S. Post-operative pain was managed with epidural analgesia to avoid PO pain medications. She was discharged on post-op day 2 without complications, with her own supply of Tylenol for analgesia. There are vast implications of AGS for perioperative management of patients due to the risk of having anaphylactic reactions with many PO and IV medications, as listed in Table 1. Preoperative preparation requires discussion with pharmacy about drug manufacturers and formularies to avoid triggering agents. Regional anesthesia and induction agents are safe, but it is important to ensure the entire perioperative team is informed of the implications in a patient with either known or suspected AGS.

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Perioperative Implications of Alpha-Gal Syndrome in a Patient for Scheduled C-section Table - Stephen Ford.pdf

Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 13

Management of a Parturient with Mast Cell Activation Syndrome

Presenting Author: Jayne Manigrasso, MD
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Co-Authors: Emily Naoum, MD - Massachusetts General Hospital

Introduction: Mast cell activation syndrome (MCAS) is a rare disease that may increase the risk of maternal morbidity in the peripartum period. Management of MCAS requires a multidisciplinary team including obstetric anesthesiologists, high-risk obstetricians, and allergy specialists.

Case One: The patient was a 39-year-old G2P0 with MCAS, history of anaphylaxis, idiopathic thrombocytopenic purpura (ITP), and a history of intraoperative death of two relatives of unknown etiology. Triggers for her MCAS included pain, anxiety, warmth, various foods, plastics, adhesives, and medications including non-steroidal anti-inflammatories 1,3. Her symptoms ranged from nausea and diarrhea to anaphylaxis including hypotension, oropharyngeal edema, and shortness of breath. Extensive planning occurred prior to the patient's induction of labor. Her baseline medications included fexofenadine, montelukast, famotidine, and levocetirizine, which were continued per her allergist. Prior to a procedure, she would receive prednisone and another dose of histamine receptor antagonists to decrease the risk of an MCAS reaction 2,3. In the event of an emergency, dilute epinephrine would be available at the bedside to administer intravenously. Anesthetic considerations in this patient included avoidance of neuraxial morphine due to the risk of histamine release 2,3. Her ITP raised concern that she may be ineligible for an epidural, as her platelet count was 90,000/μL and decreasing. Due to her ITP and MCAS, the patient was started on prednisone at 38 weeks gestation. Lastly, consideration was made regarding her family history. The family members were related, young, healthy, and died during outpatient surgeries, which was suggestive of malignant hyperthermia (MH). Therefore, one operating room would be equipped with MH precautions from the patient's admission until delivery. The patient was induced at 38 weeks 5 days gestation for gestational hypertension and MCAS. She was given stress dose steroids on arrival and had no MCAS flares during her labor course. She received an epidural for labor analgesia and had an unremarkable vaginal delivery. Her postoperative course was complicated by unilateral knee pain. The inpatient allergy team was consulted due to concern for an MCAS flare, and their assessment was that the patient's symptoms were not typical for MCAS, and her pain was likely due to her postpartum course. Her inability to take NSAIDs may have contributed to this. Her home medications were adjusted if a component of pain was secondary to MCAS.

Discussion: Mast cell activation syndrome is a condition that increases the complexity of care in the peripartum period. Given the risk of mast cell degranulation and a subsequent reaction, these patients require significant pre-admission planning and a multidisciplinary team to the provide the safest and most effective care.

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MCAS table.pdf

Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 14

Thrombotic Thrombocytopenic Purpura Resulting in Maternal and Fetal Mortality

Presenting Author: Maitri M. Shah, MD
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Introduction: Thrombotic thrombocytopenic purpura (TTP) is a type of microangiopathic hemolytic anemia (MAHA) that is caused by a deficiency of ADAMTS13. Suspicion of TTP should be treated as an emergency given that the mortality rate can be up to 90% without treatment. The majority of TTP cases in pregnancy present in the late third trimester, however presentation earlier in pregnancy is associated with greater maternal and fetal mortality. This case describes a patient that presented in her second trimester with an intrauterine female demise (IUFD) and suspected TTP, who unfortunately experienced cardiac arrest and death within 12 hours of admission.

Case One: A 22-year-old G1P0 presented to the L&D triage center with a one-day history of nausea, vomiting, and diarrhea. IUFD was diagnosed on initial ultrasound exam. On admission, she was hemodynamically stable (HDS) and afebrile. Initial labs revealed anemia and thrombocytopenia. Fibrinogen, ADAMTS13, LDH, and haptoglobin were subsequently ordered. These labs suggested a MAHA placing TTP high on the differential. The patient was withdrawn, but able to answer questions and HDS. 4 hours after admission, the RN had difficulty getting a blood pressure (BP) reading with an automatic cuff , so the decision was made to transfuse one unit of packed red blood cells and one unit of platelets. Manual BP recorded prior to transfusion was normotensive. Shortly after, the patient acutely decompensated and was transferred to the ICU. New labs revealed a lactate of 6.8 and PaCO2 of 19. Despite the significant lab abnormalities, the patient remained HDS and neurologically intact while the team was preparing to initiate plasma exchange (PLEX). 11 hours after admission, the patient went into cardiac arrest. CPR was performed for 1 hour, however the patient never regained a pulse and was pronounced deceased 12 hours after admission. ADAMTS13 levels resulted post-mortem and confirmed the diagnosis of TTP.

Discussion: TTP can be a devastating disorder that results in multiorgan failure secondary to microthrombi. The gold standard of treatment is initiation of PLEX. Because platelet aggregation is thought to be the primary cause of end organ damage, platelet transfusion remains. Although platelets are not recommended as treatment unless clinically important bleeding occurs, it is also not recommended to withhold platelets in the event of a hemorrhage out of fear of worsening the disease.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 15

Anesthetic Management for Cesarean Delivery in a case of Autoimmune Hemolytic Anemia

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Introduction: Autoimmune hemolytic anemia (AIHA) is an acquired hemolysis caused by the host's immune system acting against its own red cell antigen. Hemolysis and anemia during pregnancy can lead to IUGR, low birth weight and loss of pregnancy. It also creates fragmented cells and hypercoagulability in patients who are at a high risk of VTE due to physiological procoagulant changes. Anesthetic management is complicated due to the risk of bleeding, DIC, anemia and risk of Pulmonary Embolism. Considering its extreme rarity, very little evidence is available on how to manage pregnant women with immune-mediated hemolysis.

Case One: In 2019, the patient was diagnosed with hereditary spherocytosis and Direct Antiglobulin Test negative autoimmune hemolytic anemia. The patient refused splenectomy. Second line therapies like rituximab and IVIG were tried and failed. The patient was responsive to high dose steroids and was maintained with 60mg Prednisone. The patient presented to L&D at 35 weeks with IUGR and abnormal UA doppler. She was on 40 mg BID Lovenox for DVT prophylaxis. A month before presentation, she developed an episode of hemolysis due to flu, and Hb fell to 6.0. The current Hb was 9.0. As her tracings were Cat II, a C- Section was called. She was given 100mg of Hydrocortisone IV preoperatively. A spinal anesthesia with Bupivacaine, fentanyl and morphine was given. She had slow bleeding during surgery and required 2 doses of TXA and 2 U of PRBC. The patient did not develop hemolysis intra or post op and hydrocortisone was tapered and switched over to prednisone.

Discussion: 1.With falling Hb values, it is important to differentiate between hemorrhage and hemolysis by tracking intraoperative hemolytic markers. The management of hemolysis includes use of steroids and/or immunomodulators. The transfused RBCs have a lower half life and increase hemolytic markers. 2.These patients would have received multiple blood transfusions in their lifetime which increases the risk of RBC antibodies. Preoperatively, typed and cross matched blood must be ensured to avoid transfusion reactions and further hemolysis. 3.Stress dose steroids must be given prior to surgery to avoid intraoperative hemolysis. 4.Strict postpartum surveillance to watch for slow bleeding. 5.Management of AIHA patients in pregnancy is a rare condition and requires multidisciplinary management with MFM, Hematology and OB anesthesiology teams.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 16

Management of Acquired Hemophilia a Diagnosed During Pregnancy

Presenting Author: Maya Menon, MD
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Introduction: Acquired Hemophilia A is a rare autoimmune condition where the body produces antibodies against Factor VIII. This causes depletion of Factor VIII in the blood which is reflected in abnormally high PTT values and normal PT and INR. The condition is seen in old age and in pregnancy when the autoantibodies are produced in response to maternal exposure to fetal Factor VIII. This can lead to depletion of maternal Factor VIII and undiagnosed PPH. Presentation is similar to Hemophilia A except for the absence of hemarthrosis. Treatment if activated prothrombin complex concentrate, rFVIIa or recombinant porcine Factor VIII. Relapses are possible in subsequent pregnancies.

Case One: A 21-year-old patient coming for second C-section had a normal surgery with 600cc blood loss. On POD 1 she had 2200 mL of blood in hemoperitoneum which was evacuated by laparotomy. She continued to have serosanguinous discharge from the wound with repeat exploration and uterine artery embolization on POD 4. She received multiple blood, FFP and platelet transfusions. On POD 6, PTT was found to be >150s with normal PT and Fibrinogen levels. Factor VIII values were < 1% and Factor VIII inhibitors were 126. On POD 7, the patient started receiving Prednisone, Rituximab and Emicizumab. Her levels progressively improved and surgical site ooze was controlled. The patient received 16 U of PRBC, 4 U of FFP and 1 U of platelet by POD 13.

Discussion: Acquired hemophilia A is a rare differential diagnosis for PPH in pregnant women in the postpartum period. It requires steroids and immunomodulator drugs for treatment. Correct diagnosis can avoid unnecessary blood transfusions and mortality due to blood loss. While using Emicizumab, PTT should not be used to monitor coagulation as the drug can cause falsely shortened PTT values. Factor VIII assays are to be used for monitoring.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 17

A Case of Pancytopenia in a Parturient with Autoimmune Hepatitis undergoing Cesarean Section

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Introduction: Autoimmune hepatitis is an immune-mediated inflammatory disease of the liver that can progress to cirrhosis and even liver failure. Cirrhosis may worsen during pregnancy, leading to an increased risk of maternal and fetal morbidity and mortality. A rare complication of cirrhosis is pancytopenia, a reduction in all three hematopoietic cell lines, resulting in anemia, thrombocytopenia, and leukopenia.

Case One: We present the case of a 30-year-old G4P1 woman at 32.6 weeks gestation with a history of autoimmune hepatitis (AI) complicated by cirrhosis and pulmonary hypertension. The patient was found with severe pancytopenia at 7 weeks gestation and required a total of 19 units of packed red blood cells throughout the course of her pregnancy. CT imaging revealed a fibrotic liver, splenomegaly, and portal hypertension. Given the severity of her thrombocytopenia, the patient was deemed too high risk to receive neuraxial anesthesia. Multidisciplinary discussion concluded with plans for a scheduled cesarean section for breech presentation under general anesthesia. Hemodynamic stability during the procedure was maintained with large bore intravascular and central access and blood product administration. Her postoperative course was complicated by hepatic encephalopathy, sepsis, and continued need for blood products requiring intensive care unit admission.

Discussion: Managing patients with autoimmune hepatitis requires a comprehensive understanding of the disease, its impact on both liver function and hematological parameters. Hypersplenism is one of the major causes of cytopenia in cirrhotic patients and may pose a challenge to neuraxial techniques. An individualized, multidisciplinary approach is needed to optimize maternal and fetal outcomes in high-risk cirrhotic parturients undergoing cesarean section.

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A Case of Pancytopenia in a Parturient with Autoimmune Hepatitis undergoing Cesarean Section Table.pdf

Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 18

Klippel-Trenaunay Syndrome and Chronic Localized Intravascular Coagulopathy: Management of Labor and Delivery

Presenting Author: Leila Katabi, MD, MA
Presenting Author's Institution: University of Michigan - Ann Arbor , Michigan

Introduction: Klippel-Trenaunay syndrome (KTS) affects an estimated 1 in 30,000-100,000 live births. The syndrome is characterized by disturbed bone or soft tissue growth and vascular malformations.1 The presence of pelvic, uterine, vaginal, or lumbar vascular malformations can limit options for labor and delivery.2 Coagulopathy is common among patients with large vascular malformations. When coagulopathy is limited to the site of the lesion, it is termed localized intravascular coagulopathy (LIC). Slow blood flow through the lesion results in continuous coagulation system activation followed by fibrinolysis. Patients are at increased risk of bleeding and clotting and can further progress to disseminated intravascular coagulation.3 A study of pregnant women with KTS demonstrated increased risk of venous thromboembolic events and postpartum hemorrhage compared to the general pregnant population.1,4 In addition, about 50% of women experience worsening of symptoms with pregnancy.1

Case One: The patient was a G4P1 at 38w1d with KTS. She presented for induction of labor in order to hold prophylactic enoxaparin prior to admission. Her arterial venous malformations (AVM) involved the right arm, neck, and upper back. She experienced chronic LIC. She had an epidural for her first vaginal delivery at an outside hospital without any additional workup. She was counseled by the anesthesiology preoperative clinic and hematology service regarding her eligibility for neuraxial anesthesia and likely need for blood products. Despite her desire to avoid neuraxial anesthesia, lumbar MRI was recommended to assess for AVMs. Admission labs demonstrated fibrinogen 136 and platelets 97. The patient had not yet completed lumbar imaging and was sent for MRI prior to induction of labor. This showed an AVM of the midback with the inferior aspect ending at L1-2. Hematology recommended fibrinogen goal >150 for neuraxial anesthesia but no prophylactic transfusions for delivery. Ultimately, the patient chose to labor without neuraxial anesthesia and had an uneventful vaginal delivery. She was noted to have increased vaginal bleeding four hours after delivery. She was taken for dilation and curettage under general anesthesia. A small periuretheral tear was repaired and a Bakri balloon was placed. Her total blood loss was 1.7 liters. She received 4u pRBC, 8gm fibrinogen, 3u platelets, and 1gm tranexamic acid with ROTEM guided resuscitation.

Discussion: Vascular malformations in patients with KTS may limit options for labor and delivery, including candidacy for neuraxial anesthesia. Large vascular malformations may be associated with LIC, increasing the risk of bleeding and clotting. Multidisciplinary care is helpful for management of labor and delivery.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 19

May-Hegglin Anomaly in Pregnancy: Cesarean Section with Severe Thrombocytopenia

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Presenting Author's Institution: Rush University Medical Center - Chicago, Illinois
Co-Authors: Kraig Hammond - Rocky Vista University School of Osteopathic Medicine
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Introduction: May-Hegglin anomaly (MHA) is a rare autosomal dominant condition resulting from a mutation in the MYH9 gene, marked by thrombocytopenia, enlarged platelets, and distinctive inclusion bodies in leukocytes (2). The spectrum of presentations among MHA patients varies, encompassing minimal bleeding to extensive postoperative bleeding. Interestingly, despite the prevalence of severe thrombocytopenia in most cases, individuals typically exhibit intact platelet function, rendering them largely asymptomatic (3).

Case One: We present a 39-year-old G1P0 female with known history of MHA and familial history of demise during childbirth. The patient presented for cesarean section after failed induction of labor. Upon admission, hematology was consulted. Prior to the procedure, her platelets were 20 K/uL. The patient was brought to the operating room and induced with 200 mg of propofol, 100 mcg of fentanyl and 90 mg of rocuronium. After intubation, sevoflurane was used. The patient was given 0.3 mcg/kg of desmopressin as well as 1g of tranexamic acid. The infant was delivered shortly afterwards and a 10 unit oxytocin bolus with a 10 unit/hr infusion was started. Nitrous was started and sevoflurane reduced. The patient was given an additional 2u oxytocin IM as well as 250 mcg carboprost IM with immediate improvement of uterine tone. The patient required no platelet products to be transfused. During the procedure mild serosal oozing was noted. The patient emerged from anesthesia and was extubated without complications. Both mother and baby were discharged without any long-term complications or morbidity five days later.

Discussion: MHA is a rare genetic condition that commonly presents as marked thrombocytopenia, although platelet function is often normal (3). In patients requiring cesarean section or other surgical interventions who have known MHA, early identification can allow for platelets to be available for immediate transfusion and desmopressin administration. It is also important to recognize this case as being one of the few times where general anesthesia may be more appropriate than neuraxial in obstetric anesthesiology, although the latter has been documented in the literature (1).

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 20

Blood, Sweat, and Tears: Managing Anticoagulation in the Parturiant

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Introduction: Managing parturients on anticoagulation requires balancing risks of bleeding with risks of clinically significant clot formation and a plan should be tailored to each patients' unique circumstances. A patients preferred method of delivery and pain plan should also be prioritized when safety permits. In patients with mechanical heart valves requesting epidural for delivery, risk of valve thrombosis (reported from 0-6% annually) must be weighed against epidural hematoma (1 in 168,000 but is unknown in the presence of anticoagulation) and bleeding.

Case One: We present a case of a 32-year-old G8P1 female with a history of truncus arteriosus palliated with RV-PA conduit, mechanical aortic and pulmonic valves, and pacemaker dependent heart block, previously on warfarin but transitioned to LMWH for the pregnancy. Her prior delivery was managed with a remifentanil PCA but had inadequate pain control resulting in unresponsiveness requiring V-pacing and delivery in the cardiac unit. Given this, she requested an epidural for this delivery. After multi-disciplinary discussion, the patient took her last dose of therapeutic LMWH the morning before presenting to the hospital for induction of labor. An epidural was placed and heparin drip was started 1 hour post epidural placement. The heparin drip was discontinued when the patient was 6 cm dilated (in active labor) and the epidural was pulled after heparin had been discontinued for greater than 4 hours and PTT was within normal limits. Heparin drip was restarted 1 hour after epidural removal and the patient was eventually transitioned back to warfarin without complication.

Discussion: The prevalence of patients requiring anticoagulation in the peripartum period continues to increase. Studies have shown adequate safety profiles with epidurals in thoracic and cardiac surgery despite significant anticoagulation. Particularly unique to this case was the decision to stop heparin infusion once the patient reached active labor. To this authors knowledge, no studies exist that guide stopping heparin during active labor but in this case, anticoagulation was held for optimum balance of minimizing the risk of hemorrhage while attenuating risk of valve thrombosis. Nerve blocks would be a reasonable alternative to neuraxial anesthesia if desired. Managing anticoagulated patients peripartum requires a complex decision tree and minimizing risk factors when able.

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Abstract #: THUR – CR – BS 1 – BR 2 – Hematology – 21

What is Your Definition of Readily Available?

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Co-Authors: Thomas Lambert III, MD - Ohio State University Wexner Medical Center Department of Anesthesiology

Introduction: Delayed hemolytic transfusion reactions (DHTRs) typically occur more than 24 hours after a transfusion secondary to the recipient's response to donor RBC antigens. Hemolysis leading to life-threatening anemia can be fatal if not appropriately managed. Findings include fever, jaundice, increased LDH, and spherocytes on peripheral blood smear. Acute management for severe hemolysis includes administration of steroids, IVIg, rituximab, and the newer agent eculizumab, while long-term management is focused on avoiding future administration of blood products with implicated RBC antigens. Eculizumab is a costly anti-C5 monoclonal antibody that inhibits complement activation and erythrocyte destruction, minimizing intravascular hemolysis in patients with DHTRs in sickle cell disease (SCD).

Case One: Our patient is a 37-year-old G2P0101 female with SCD, mild pulmonary hypertension, and mildly reduced ejection fraction (45%) who presented at 35w3d with an acute pain crisis and new oxygen requirement and was admitted for worsening anemia with concern for pre-eclampsia. CTPE showed evidence of acute chest syndrome and acute pulmonary embolism for which IV heparin was initiated. She then developed profuse vaginal bleeding with concern for placental abruption. Maternal-fetal medicine obstetricians administered protamine sulfate to reverse heparin and declared the need for emergent cesarian delivery under general anesthesia. Hematology insisted that eculizumab was on immediate standby prior to incision, as blood transfusion without pre-administration was life-threatening in this patient. Pre-induction arterial line was placed. Once eculizumab was present in the room, anesthesia was induced via rapid sequence induction. Intraoperatively there was no evidence of placental abruption or significant bleeding, and she delivered a viable male infant weighing 1580g with APGARS of 7 and 9. She was extubated and taken to the PACU in stable condition.

Discussion: The emergent nature of this case along with lack of communication for preoperative planning created unique challenges. A complicating factor in this case was the time required to prepare the drug and have it readily available, as it takes over 30 minutes to reconstitute. Taking the patient into surgery without this medication in hand would have been reckless and put the safety of the unborn child above the safety of the mother. She had a DHTR two months prior requiring a long ICU stay, four weeks of rituximab and two doses of eculizumab. She nearly died at that time due to a drop in hemoglobin to life-threatening levels, and pre-medication with eculizumab by hematology on subsequent transfusions had helped prevent such an acute drop. Being prepared for any anticipated or unanticipated outcomes was key to managing this tenuous patient.

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Eculizumab MOA.pdf

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 01

Delayed Interval Hysterectomy for Placenta Percreta: A Case Report

Presenting Author: Paige Oates, MD
Presenting Author's Institution: SAUSHEC Anesthesiology

Introduction: Patients with placenta accreta spectrum are at risk of massive hemorrhage and damage to nearby structures at the time of delivery. There are multiple strategies discussed in the literature to mitigate some of these risks, with delayed interval hysterectomy emerging as an experimental but viable option for severe placenta percreta cases. In one retrospective study, patients in the delayed interval hysterectomy group had 50% less blood loss compared to the immediate hysterectomy group.1

Case One: We describe a 39-year-old G1P0 with a history of abdominal myomectomy and right salpingo-oophorectomy due to leiomyomas and endometriosis who presented with placenta percreta to the posterior bladder, lateral margins of the cervix and pelvic sidewalls. A Cesarean delivery was performed at 34 weeks gestation followed by a delayed interval hysterectomy 29 days later. The Cesarean was performed under an L2-L3 combined spinal epidural with two large-bore PIVs, an arterial line, and a phenylephrine infusion. Cell Saver and blood products were available. Prior to incision, bilateral ureteral stents were placed by Urology and a right femoral sheath was placed by Interventional Radiology for possible REBOA placement. A midline abdominal incision was made followed by a vertical fundal hysterotomy without disruption of the placenta. No uterotonics were administered. She remained hemodynamically stable on the phenylephrine infusion and her estimated blood loss was 800 mL. She was discharged on POD eight with the placenta in-situ and with plans to return in six weeks for a total abdominal hysterectomy. Instead, she returned to the emergency department 29 days later with complaints of abdominal pain, nausea and vomiting, but without signs of infection or sepsis. Imaging revealed a large, intrauterine hematoma and she underwent an urgent exploratory laparotomy with total hysterectomy and bilateral salpingectomy under general endotracheal anesthesia. Her estimated blood loss was 600 mL. She did not require a blood product transfusion and she was discharged on POD three.

Discussion: A delayed hysterectomy allows for regression of the morbidly adhered placenta and results in less blood loss at the time of delivery. However, the incidence of infection and/or delayed hemorrhage due to the retained placenta has not fully been described. Although she developed an intrauterine hematoma, her total estimated blood loss was only 1400 mL compared to the 3000 mL described by the immediate hysterectomy group by Zuckerwise, et al. This case highlights the benefits and risks of delayed interval hysterectomy and offers techniques for these high-risk cases, including possible REBOA placement.

References: 1. Zuckerwise LC, Craig AM, Newton JM, Zhao S, Bennett KA, Crispens MA. Outcomes following a clinical algorithm allowing for delayed hysterectomy in the

management of severe placenta accreta spectrum. Am J Obstet Gynecol. 2020 Feb;222(2):179.e1-179.e9. doi: 10.1016/j.ajog.2019.08.035. Epub 2019 Aug 27. PMID: 31469990.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 02

Placental Accrete Spectrum with Presenting Fetal Parts in the Bladder

Presenting Author: Neva P. Lemoine, MD
Presenting Author's Institution: Vanderbilt University Medical Center - Nashville, Tennessee

Introduction: The incidence of placenta accrete spectrum (PAS) is approximately 3 per 1000 deliveries, largely due to the increasing cesarean delivery rate.[1] Maternal morbidity is related to the depth of placental invasion and can predispose patients to uterine rupture through a previous uterine scar, an event that is potentially life-threatening due to massive hemorrhage.[1]

Case One: A 37-year-old G5P3103 at 21w2d presented for a scheduled gravid hysterectomy in the setting of PAS with uterine window and concern for uterine dehiscence. Her pregnancy was complicated by BMI 37 and type 2 diabetes. Past surgical history was notable for 4 prior cesarean deliveries and a laparoscopic cholecystectomy. A prenatal ultrasound noted lack of myometrium between the fetal head and the bladder serosa with fetal head appearing to bulge into the maternal bladder, worrisome for a uterine window or dehiscence of her prior hysterotomy scar. The placenta was anterior and there was loss of the clear zone lateral (to the left) of the cervix. On the day of surgery, the patient received a spinal with 150mcg of intrathecal morphine and 20mcg of Fentanyl for pain control. She then underwent a rapid sequence induction and uneventful intubation, followed by placement of a central line, arterial line, and large bore IVs. The patient was positioned in low lithotomy allowing Gyn-Oncology and Maternal Fetal Medicine to expose the uterus prior to Urology using cystoscope to insert ureteral stents in case of unexpected hemorrhage. General Surgery then placed a femoral arterial line for possible REBOA deployment. The team then proceeded with the gravid hysterectomy. Intraoperative findings were significant for adhesions from uterus to anterior abdominal wall and dense adhesions to the posterior surface of the bladder. The lower uterine segment was found to be extremely thin, and in places, indistinguishable from the overlying bladder. Amniotic membranes were noted to be exposed at the lower uterine segment and the fetal head was clearly visible. Operative course was complicated by cystotomy requiring extension and repair by Urology. Estimated blood loss was 2.7L, and the patient received 4u pRBC and 2u FFP. Bilateral TAP blocks were performed before extubation and patient was taken to PACU. The patient was discharged on postoperative day 6 after an uneventful recovery.

Discussion: Given the significant risk for maternal morbidity and mortality, counseling about all options, including pregnancy termination, is warranted when the diagnosis of placenta accrete spectrum is made in the pre-viable period.[2] A planned hysterectomy to prevent acute, life-threatening hemorrhage is a prudent option for patients that have completed childbearing. There are now many political and legal implications to performing a gravid hysterectomy in many states, however this procedure reduces maternal morbidity and

mortality in specific situations.

References: 1. PMID: 36122977 2. PMID: 32563821

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 03

Managing Two Similarly Challenging Cases of Placenta Accreta: The Importance of Multidisciplinary Planning.

Presenting Author: Alice Campeggi, MD
Presenting Author's Institution: Sapienza University of Rome
Co-Authors: Monica Rocco, Chief of Anesthesiology and Intensive Care Department at Sant'Andrea Hospital in Rome - Sapienza University of Rome

Introduction: Placenta previa accreta presents formidable challenges in obstetric care, requiring a multidisciplinary approach for optimal management and a substantial enhancement of patient safety. This comparative analysis delineates two challenging cases of placenta accreta diagnosed at MRI, both scheduled for total hysterectomy. The variation in how the scenario unfolded in these two cases illustrates the complexities of this condition and highlights the diverse clinical strategies employed. Despite the diagnosis of placenta accreta on MRI, both cases presented with placenta percreta.

Case One: Case 1 involved a 38-year-old woman diagnosed with placenta accreta, scheduled for cesarean section with total hysterectomy. A sequential transition from loco-regional to general anesthesia was employed. From a surgical point of view, while performing hysterectomy, despite what was shown on the MRI, the placenta appeared to be invading the bladder. Therefore a resection of the dome was performed due to placental involvement. Despite proactive measures to forestall hemodynamic instability, the patient experienced hypovolemic shock necessitating immediate transfusions (eight blood and four plasma units), vasoactive support, and transient manual aortic clamping for 20 minutes. This resulted in an extended period of intensive care and a prolonged hospital stay.

Case Two: Case 2 involves a 39-year-old woman scheduled for total hysterectomy, mirroring Case 1 scenario. Contrastingly, a meticulous multidisciplinary approach was undertaken in this case, involving interventional radiologists who inserted an embolization catheter introducer in the right common femoral artery ready for immediate uterine artery embolization. In the event of uncontrolled bleeding, which did not occur, the embolization would have been performed in the operating room. This comprehensive management approach yielded superior outcomes in terms of reduced blood loss, sustained hemodynamic stability, shorter hospital stay and diminished intensive care requirements.

Discussion: This comparison underscores the divergence in outcomes for two ostensibly similar cases due to distinct management approaches. From a safety standpoint, it highlights the imperative for a tailored multidisciplinary approach in managing this high-risk obstetric condition, accounting for individual patient profiles. This report contributes valuable insights into the critical role of collaborative strategies in optimizing patient outcomes in the context of placenta previa accreta.

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Alice Campeggi table.pdf

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 04

Multi-disciplinary Management for Placenta Accreta Spectrum with Secondary Abdominal Pregnancy: A Case Report

Presenting Author: Patricia Strutz, MD, MSCI
Presenting Author's Institution: Washington University School of Medicine in St. Louis

Introduction: Abdominal pregnancy is a rare and life-threatening condition for the mother and fetus. It is a condition that accounts for less than 1% of all ectopic pregnancies, yet has some of the highest morbidity and mortality, especially if diagnosed later in pregnancy. We describe a rare case of placenta accreta syndrome (PAS) with likely uterine rupture causing a secondary abdominal pregnancy.

Case One: A 35-year-old female was diagnosed with abdominal pregnancy at 21-weeks. Medical history includes hypertension, hypermobile Ehlers-Danlos syndrome, unicornuate uterus with rudimentary horn, history of incarcerated bladder, and history of two prior CS. After abnormal ultrasound imaging, MRI was obtained and demonstrated a singleton abdominal pregnancy in the central pelvis, with implantation of the abnormally heterogeneous placenta along the uterus, abdominal wall, colon and possibly the iliac vessels. Maternal Fetal Medicine facilitated care between Obstetric Anesthesiology, Gynecology, Interventional Radiology (IR), Urology, and Vascular Surgery for the anticipated cesarean-hysterectomy. The day before surgery, Urology placed bilateral ureteral stents and PICC was placed. Immediately prior to surgery, IR performed bilateral ovarian and uterine artery embolization and placed a resuscitative endovascular balloon occlusion of the aorta (REBOA). General endotracheal anesthesia was induced uneventfully, and a 14g IV and arterial line were placed. Four units packed red blood cells and four units of fresh frozen plasma were delivered in a cooler. After careful dissection, placenta was visually adhered to the posterior uterine wall, uterosacral ligaments, right pelvic sidewall, and posterior cul-de-sac and the fetus was extra-uterine. Using their hands, the Obstetricians detached the placenta without difficulty. The fetus, placenta, uterus, and cervix were removed en bloc without significant hemorrhage. The patient had an uneventful recovery on the floor and did not require blood product transfusion(intra- or post-operatively). She was discharged home on post-operative day 4. The pathology report suggests the patient had PAS involving prior CS scars and likely had uterine rupture causing abdominal pregnancy.

Discussion: Since abdominal pregnancy is rare, management is typically guided by case reports/small case series. Additionally, each patient is unique as procedure choice and timing vary due to placenta location, maternal hemodynamic stability, gestational age, and fetal status. Thus, patients with abdominal pregnancy should be managed at a tertiary care center to allow a variety of treatment options that can mitigate risk of hemorrhage.

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Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 05

Perioperative Management to Promote Maternal Recovery with Placenta Accreta Spectrum

Presenting Author: Jonathan Gougelet, MD
Presenting Author's Institution: University of Vermont Medical Center
Co-Authors: Erin Morris, MD - Department of Obstetrics, Gynecology and Reproductive Sciences, University of Vermont Medical Center

Introduction: Background: Placenta accreta spectrum (PAS) is a disorder of abnormal placentation in which trophoblast cells invade the uterine myometrium and beyond (1). Planned cesarean hysterectomy (C-Hyst) at 34-36 weeks is advised for these patients (1). PAS, associated with serious morbidity and mortality due to postpartum hemorrhage, is best managed in tertiary care settings with a multidisciplinary team that includes obstetric anesthesiologists (1-3).

Case One: Case description: A 41-year-old G2P1001 with placenta previa and suspected PAS, with a history of prior uterine artery embolization (UAE), myomectomy and cesarean delivery (CD) presented to L&D at 34w4d with limited vaginal bleeding. Given maternal-fetal stability, the patient was taken to the main operating room for C-Hyst the next morning. After an all-team huddle, a radial arterial line, 2 large bore IVs, T10-11 epidural and lumbar CSE were placed. FFP and PRBCs were in the room. CD via vertical midline incision under neuraxial anesthesia resulted in delivery of a female infant. PAS was confirmed and hysterectomy ensued under general endotracheal anesthesia. Ongoing massive hemorrhage resulted in an EBL of 30 liters. 49U PRBCs, 43U FFP, 9U platelets, and 2U cryoprecipitate were given intraoperatively. The patient was extubated on POD2 after abdominal washout and closure POD1. No more blood products were needed. Neuraxial analgesia included IT morphine followed by epidural morphine 2 mg re-dosing at 24 and 72 hours post-CD with thoracic epidural bupivacaine 0.125% infusion until 95H after CD. The patient had VAS pain scores < 5/10, breast pumped, ambulated to NICU often and took no opioids. After initial foley removal 52H post-CD, she required foley reinsertion that was removed 24H later. She discharged home POD7 without serious morbidity.

Discussion: Discussion: Massive blood loss in this case was fueled by the extensive venous collateralization from prior UAE. Prior planning, strong interdisciplinary communication, access to resources and aggressive resuscitation avoided serious maternal morbidity. Post-cesarean neuraxial analgesia promoted ambulation and maternal-infant bonding while minimizing opioid use. Care should be taken to balance analgesic effects of neuraxial opioid re-dose with consideration for effects on urinary function.

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Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 07

Against All Odds: Surviving Septic Shock and Massive Hemorrhage in a Patient With Placenta Accreta

Presenting Author: Jennifer Hoayek, MD
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Co-Authors: Yasmine Habli, MD - The University of Texas Health Science Center in Houston
Alice O'Brien, MD - The University of Texas Health Science Center in Houston

Introduction: Maternal sepsis and post-partum hemorrhage are leading causes of maternal and fetal mortality and morbidity. Physiological changes in pregnancy make the parturient more susceptible to infections and can mask the signs of sepsis. Cesarean hysterectomy (C-hyst) is frequently performed to manage postpartum hemorrhage due to placenta accreta and constitutes a complex procedure.

Case One: A 36-year-old G4P3 with placenta accreta was managed on the antepartum floor for premature preterm rupture of membranes (PPROM) with steroids and magnesium and planned for C-hyst at 34 weeks. On day 15 post-PPROM, at 28w2d, the patient became tachycardic to the 170s, with shortness of breath, fever and chills, and hypotension with a non-reassuring fetal heart-rate in the 60s. She was rushed to the operating room where rapid sequence induction was performed and pressors started immediately on induction. A 14 G and 16 G IV in the antecubital right and left arms were inserted in the OR along with a pre-existing PICC line and 20 G IV were used for resuscitation. A radial arterial line was placed for hemodynamic monitoring. Laboratory work showed a lactic acid of 14.9, white count of 5.8, Hb 12.5, Ht 38.5. The patient was noted to have acute severe hemorrhage from the placenta. She was given broad spectrum antibiotics, and massive transfusion protocol was initiated with a rapid infusion device. After the baby was delivered, the patient underwent hysterectomy, bilateral salpingectomy, left oophorectomy, iatrogenic cystotomy repair and bilateral ligation of hypogastric artery. The estimated blood loss was 40,478 ml, she received a total of 63 pRBCs, 66 FFPs, 9 jumbo platelets, 6 cryoprecipitate, 1.5 liters of albumin 5% and was maintained on phenylephrine, norepinephrine and vasopressin. The intraoperative period was also complicated by cardiac arrest. ROSC was achieved with EKG showing SVT after 1 cycle of CPR and 1mg epinephrine. She was defibrillated once to restore sinus rhythm. Hemostasis was difficult to achieve due to DIC, septic shock from chorioamnionitis and friable tissues. After successful hemostasis, the patient was packed and transferred off pressors, intubated to the ICU. At POD1 she was taken to surgery for exploration, removal of packing and abdominal closure. She was extubated a day later and deemed stable for transfer out of ICU on POD3. The baby was admitted to NICU after delivery.

Discussion: This complex case is a perfect example that prompt identification of patients at risk for hemorrhage, swift assessment and management of blood loss, appropriate monitoring

and vascular access, timely diagnosis of sepsis, communication and multidisciplinary coordination are key factors for successful resuscitation of the parturient with multifactorial shock.

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Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 07

Expectant Management in a Patient with Placenta Accreta Spectrum... What can go Wrong?

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Introduction: Placenta accreta spectrum (PAS) is a range of pathologies involving abnormal invasion of part or all the placenta into the myometrium of the uterine wall. PAS is potentially a life-threatening condition, as it can cause profound hemorrhage. In general, management strategy for delivery is cesarean hysterectomy with the placenta left in situ after delivery of the fetus, closure of the uterine incision, and immediate hysterectomy. Our institution has adopted an expectant management with delayed interval hysterectomy strategy for patients with PAS, in which after delivery of the baby, the entire placenta is left in situ, the hysterotomy is closed, and after verification of hemostasis, abdominal closure. A delayed hysterectomy will be performed approximately 5-7 days after the initial cesarean delivery, in anticipation of improving hemorrhage risks. Interventional radiology is also consulted for uterine artery embolization a day prior to the planned hysterectomy.

Case One: Patient is a 38-year-old G4P3 at 31 weeks and 5 days gestation with hypothyroidism and an obstetric history of three prior cesarean deliveries. She was admitted to the antepartum unit due to vaginal bleeding in the setting of placenta increta. After a multi-disciplinary meeting, a decision was made to proceed with a cesarean delivery at 32w4d. Patient underwent an uneventful delivery with placenta-left-in-situ (PLIS) with approximately 700 mL of blood loss. On POD #5, after the UAE, the patient started to experience tachycardia to the 130s with desaturations, SpO2 to 89% on room air. CTA was ordered, showing metallic densities scattered throughout the subsegmental pulmonary artery branches of all lobes of both lungs and acutely elevated right heart and pulmonary arterial pressures with right heart dilation, inferior vena cava and hepatic vein distention. A transthoracic echocardiogram was significant for moderate tricuspid regurgitation, moderate pulmonary hypertension. Due to the urgency of the procedure, the hysterectomy was performed on POD #7. Blood loss for the procedure was approximately 2.5L with transfusion of 4 pRBCs, 4 FFP, 1 platelet, and 1 cell saver. Patient was discharged on POD #19 after the initial cesarean delivery on home O2.

Discussion: In a 2014 review of placenta percreta management, total blood loss and large volume transfusions (>4 units) was decreased when comparing DIH to traditional cesarean hysterectomies. However, postoperative complications such as post-operative hemorrhage, post-operative infection, pulmonary embolism/cardiopulmonary arrest was greater in the PLIS arm. Therefore, patient selection and universal implementation of DIH should be exercised with extreme caution.

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Figure 1. Embolization material removed from uterine vessels s/p hysterectomy.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 08

Placenta Accreta Spectrum Disorder Complicating Second Trimester Pregnancy Loss

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Presenting Author's Institution: University of Virginia Health
Co-Authors: Phillip Callihan, MD, PhD - University of Virginia Health
Daniel Sheeran, MD - University of Virginia Health

Introduction: Placenta accreta spectrum (PAS) disorders are a well established cause of third trimester obstetric hemorrhage and contributor to maternal morbidity and mortality. PAS disorders are clinically relevant earlier in pregnancy, but early diagnosis is difficult (1,2). This report demonstrates a case of maternal morbidity due to an unknown PAS disorder complicating early pregnancy loss.

Case One: 35yo G8P7007 with history of seven prior cesarean deliveries (CDs) presented at 15 weeks gestation with fetal demise requiring D&E. During the procedure, the obstetrics team encountered hemorrhage which continued despite uterotonics, tranexamic acid, and a foley balloon. Her hemoglobin decreased from 12.7 g/dL to 7.8 g/dL, hematocrit from 37.1% to 23.4%, PT/INR was 14.7/1.3, and fibrinogen was 104 mg/dL. Interventional Radiology (IR) was consulted intraoperatively for embolization given hemodynamic stability and patient's desire for future pregnancies. However, the procedure was technically challenging and due to continued hemorrhage and coagulopathy hysterectomy was strongly considered. IR ultimately performed effective bilateral uterine artery and left internal iliac artery embolization. The total estimated blood loss was 2 liters requiring 2 units of FFP, 4 units of pRBCs, and 2 units of cryoprecipitate. She was admitted to the ICU due to hemodynamic instability and DIC. She was extubated on post operative day 1 and required 1 additional unit of pRBCs. The OBGYN team provided thorough counseling of her risk for PAS in future pregnancies focusing on serious maternal morbidity and possible mortality. Hysterectomy was recommended during her hospitalization, however she declined. She also declined contraception, and recently requested a Maternal Fetal Medicine consultation to discuss risk of PAS in future pregnancies.

Discussion: The severity of her bleeding after the D&E despite treatment with uterotonics, TXA, and a foley balloon in the setting of seven prior CDs was due to an as yet unrecognized PAS. This degree of hemorrhage was not expected, but was successfully addressed by a multidisciplinary team including Obstetrics, Anesthesiology, Interventional Radiology, and Surgical Critical Care. This case highlights the potential risk of PAS in early pregnancy when it might not be expected. Obstetric anesthesiologists must maintain a high index of suspicion for PAS in early pregnancy in patients with a history of multiple CDs. D&E for pregnancy loss in these patients should occur in a facility that has adequate blood bank resources, viscoelastic testing, interventional radiology, and critical care capacity.

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Placenta accreta spectrum disorder complicating second trimester pregnancy loss Callihan.pdf

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 9

Labor Analgesia and Hemorrhage Management in a Brugada SCN5A Heterozygous Patient

Presenting Author: Michael J. Furdyna, MD
Presenting Author's Institution: Brigham and Women's Hospital - Boston, Massachusetts
Co-Authors: David J. Combs, MD PhD - Brigham and Women's Hospital
Allison A. Mootz, MD - Brigham & Women's Hospital
Joeli Roth, MD - Brigham and Women's Hospital

Introduction: Brugada syndrome, an autosomal dominant condition typically caused by a mutation in the cardiac sodium channel gene SCN5A, is a rare disorder that poses multiple challenges for obstetric anesthesiologists.(1) Neuraxial anesthesia relies on sodium channel-blocking local anesthetics, which have the potential to trigger lethal arrhythmias even in previously phenotypically silent patients.(2) No consensus for neuraxial technique, agent, or dosing guides obstetric anesthesia practice, as prior literature is limited to less than 10 cases of neuraxial anesthesia with a range of local anesthetics. Multiple other agents, including ergot-derived uterotonics and propofol infusions, are known triggers.(3) We describe the care of a patient with phenotypically silent Brugada syndrome who had a vaginal delivery complicated by delayed postpartum hemorrhage.

Case One: A 31yo G1P0 at 37wks was transferred to our hospital in labor with ruptured membranes. Her family history included cardiac arrest and ICD placement in her father, sudden cardiac death in one sibling, and two living siblings with characteristic Brugada ECG patterns. Genetic testing showed she was heterozygous for a pathogenic SCN5A mutation but had no personal history of malignant arrhythmias. She desired an epidural for labor, for which we selected ropivacaine 0.08% + fentanyl 2mcg/mL delivered via programmed intermittent epidural bolus. This provided adequate analgesia with minimal motor block and clinician intervention. Continuous telemetry and serial ECGs revealed no concerning changes. After vaginal delivery, the epidural was removed, and she was discharged from the labor floor. She developed delayed postpartum hemorrhage of >1L, hemodynamic instability, and syncope. For dilation and curettage, we then placed an epidural dosed with lidocaine, which the patient tolerated well. Her remaining postpartum course was uneventful.

Discussion: Obstetric anesthesiologists managing parturients with Brugada syndrome need to balance multiple issues, including labor analgesia, hemorrhage, and anesthesia for operative interventions. As our institutional practice is to use PIEB with bupivacaine 0.0625% and fentanyl for labor, we selected our regimen for equianalgesic potency, similar pharmacokinetics, and reduced risk of cardiotoxicity. This allowed us to use a familiar and predictable dosing strategy without sizable deviations from practice that may introduce error. The use of a lidocaine epidural then allowed us to obtain adequate surgical anesthesia while avoiding the potential hemodynamic instability of spinal or general anesthesia. Data from our case report adds to the literature suggesting safe usage of epidural local anesthetics, including

doses required for labor and vaginal instrumentation, in pathogenic SCN5A carriers. Further testing in patients with ECG manifestations is warranted.

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Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 10

A Patient with Hypodysfibrinogenemia Undergoing Cesarean Delivery: Discordant Dose-Response and ROTEM Results.

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Co-Authors: David J. Combs, MD PhD - Brigham and Women's Hospital
Jimin J. Kim, MD, MSc - Brigham & Women's Hospital
Shakthi Venkatachalam, MBBS - Brigham and Women's Hospital

Introduction: Congenital fibrinogen disorders (CFD) are rare coagulopathies with an incidence of 1:1,000,000 and associated with increased risk of bleeding.(1) CFD can be divided into quantitative and qualitative disorders. Hypodysfibrinogenemia represents a small subset of CFD, characterized by low Clauss fibrinogen levels (low fibrinogen functional activity) and normal fibrinogen antigen (dysfunctional protein). The low fibrinogen level increases postpartum hemorrhage (PPH), spontaneous abortion, and placental abruption risk, while increased dysfunctional protein increases venous and arterial thrombosis risk.(2) Treatment with fibrinogen concentrate for delivery and prophylactic heparin postpartum are often utilized to prevent these complications.(3) Limited data exists in the literature to guide peripartum management of hypodysfibrinogenemia.

Case One: A 33yo multigravida at 38wk7d with hypodysfibrinogenemia presented for elective repeat CD. She was diagnosed prior to her first pregnancy due to a family history of dysfibrinogenemia. She had no history of abnormal bleeding. On presentation, her fibrinogen level was 135mg/dL and fibrinogen antigen was 423mg/dL. Based on prior data of fibrinogen levels and PPH risk, we selected a goal fibrinogen level of 200mg/mL prior to neuraxial placement and CD. Rotational thomboelastometry (ROTEM) measurements were performed to assess their correlation with her fibrinogen levels. Her FIBTEM A10 on presentation was 21mm (ref range: 14-30mm), which correlates to a Clauss fibrinogen of approximately 350mg/dL.(4) Despite repletion with 5.3g of fibrinogen concentrate based on manufacturer's dose equation, her fibrinogen level rose to 174mg/dL, less than half the predicted response of 255mg/dL. Further replacement with 3.3g of fibrinogen concentrate increased her fibrinogen level to 244mg/dL and FIBTEM A10 to 26mm, correlating to an approximate Clauss fibrinogen of approximately 420mg/dL. The patient subsequently underwent an uncomplicated CD under a spinal anesthetic. Quantitative blood loss was 464mL. The patient did not experience any significant bleeding or thrombosis postpartum.

Discussion: There is no defined fibrinogen threshold for safe neuraxial placement in pregnant patients. Our patient's dose response to fibrinogen concentrate did not follow the manufacturer's expected dose response, suggesting higher doses of fibrinogen concentrate may be required in patients with hypodysfibrinogenemia. Further work should be done to refine treatment protocols for this population. Furthermore, our ROTEM results confirm

Santos et al findings, which show an artifactual increase in FIBTEM A10 in hypodysfibrinogenemia. Interpretation of fibrinogen levels utilizing viscoelastic testing in the dysfibrinogenemia population should be performed with the awareness of its limitations.

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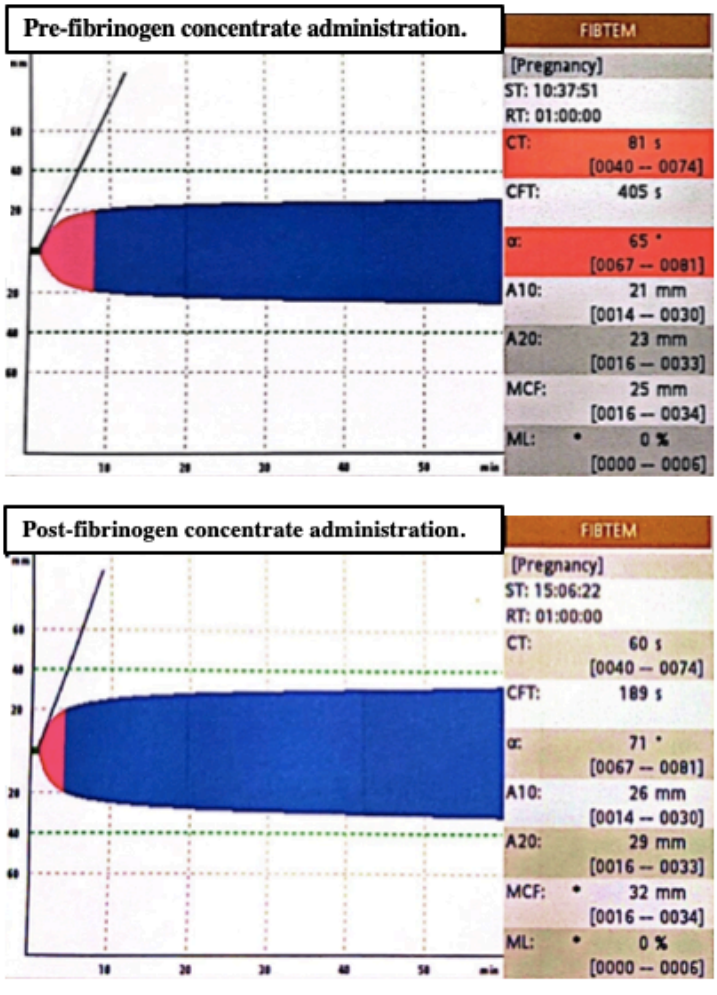

Figure 1. ROTEM FIBTEM results show a discordantly elevated A10 at 21 mm with a Clauss fibrinogen level of 135 mg/dL prior to any fibrinogen concentrate administration. The second panel shows a further increase post-fibrinogen concentrate administration of 8.6g, with a Clauss fibrinogen level of 244 mg/dL.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 11

Anesthetic Management of Two Parturients with Congenital Hypofibrinogenemia

Presenting Author: William Pinkston, DO
Presenting Author's Institution: Icahn School of Medicine

Introduction: Congenital hypofibrinogenemia (CH) poses a particular challenge to the anesthetic care of parturients due to its heterogeneous presentation and the paucity of literature in this population.1 CH is a rare condition that confers high risk of peripartum hemorrhage and requires a multidisciplinary approach.2,3 Here we present two cases of patients who were diagnosed with congenital hypofibrinogenemia in the third trimester of pregnancy and underwent successful vaginal delivery with the aid of rotational thromboelastometry (ROTEM).

Case One: A 40-year-old G2P0 with preeclampsia at 37 weeks was admitted for induction of labor. CH was discovered incidentally after a ground-level fall at 34 weeks. Hematology recommendations included transfusion of cryoprecipitate during labor with target fibrinogen > 200 mg/dL and tranexamic acid given at time of delivery. Initial fibrinogen level was 114 mg/dL and she was transfused with cryoprecipitate as needed. ROTEM studies were normal. She did not request neuraxial anesthesia and underwent successful vaginal delivery with tranexamic acid given shortly after delivery. She required transfer to the operating room for sedation due to repair of a 2nd degree perineal laceration and was transfused with an additional unit of cryoprecipitate. The total quantitative blood loss was 1004 mL.

Case Two: A 37-year-old G1P0 at 38 weeks was admitted for induction of labor. CH was diagnosed incidentally at 30 weeks gestation during evaluation of preterm labor. Her hematologist recommended transfusion of cryoprecipitate during labor with target fibrinogen > 150 mg/dL and tranexamic acid given at time of delivery. Initial fibrinogen level was 89 mg/dL. She was transfused with two units of cryoprecipitate and ROTEM studies were normal. An uncomplicated dural puncture epidural was placed. She underwent successful vaginal delivery with an additional two units of cryoprecipitate and tranexamic acid given immediately after delivery. Her total quantitative blood was 383 mL. A repeat fibrinogen level was 183 mg/dL and after a repeat normal ROTEM study, her epidural catheter was removed.

Discussion: Phenotypic expression of CH ranges from asymptomatic to recurrent major bleeding.3 However, parturients with asymptomatic CH are still considered very high risk for peripartum complications including major hemorrhage.1-4 The two patients presented here were asymptomatic and were able to undergo hematologic evaluation prior to delivery. These cases demonstrate the variable presentation of parturients with hypofibrinogenemia, the necessity of a multidisciplinary and individualized approach to treatment, and the utility of ROTEM to guide clinical management.

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Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 12

Anesthetic Management of a Patient with Multiple Coagulopathies Undergoing Cesarean Delivery

Presenting Author: Jil Decker, MD
Presenting Author's Institution: Lewis Katz School of Medicine at Temple University

Introduction: Managing a pregnant patient with immune thrombocytopenic purpura (ITP), anti-phospholipid syndrome (APS), chronic pulmonary embolism (PE), lupus, and HELLP syndrome requires many intraprocedural considerations, especially with regards to coagulation challenges. ITP is an autoimmune disease that results in the destruction of platelets, emphasizing the need for platelet monitoring and possible blood transfusion. APS, characterized by hypercoagulability, warrants balancing the risks of thrombosis. Chronic PE introduces ventilation-perfusion imbalances, necessitating close management of respiratory function. Integrating these considerations into a cohesive plan is difficult, as competing goals for coagulation between conditions requires difficult planning. Managing any one of these conditions in pregnancy is challenging, but when they exist simultaneously, careful planning is paramount.

Case One: Our patient is a 33-year-old G7P0151 female who presented at 31w5d due to back pain and thrombocytopenia. She has a history of SLE, ITP and antiphospholipid syndrome. On presentation, labs showed a decreased platelet count of 57K/mm3. Further, it was found that AST was elevated to 42U/L leading to concern for HELLP syndrome. During her hospital course, her platelet count continued to fall, nadiring at 18. On chest CT she was found to have chronic PEs. Given concern for worsening HELLP syndrome, her obstetric team recommended cesarean delivery. Patient was transfused with a pack of platelets prior to induction. She was induced using propofol and rocuronium; the airway was secured using video laryngoscopy and surgery immediately commenced. Following delivery of the fetus, the sevoflurane concentration was reduced to 1% and oxytocin was administered. The surgeons noted no uterine atony, but a significant amount of surgical bleeding. During the procedure, the patient received a total of 4 packs of platelets, 3 units of pRBC and 1 unit of FFP. Resuscitation was guided by platelet count, hemoglobin, and thromboelastography. Despite adequate doses of neostigmine, glycopyrrolate, and sugammadex, neuromuscular blockade reversal could not be achieved. She remained intubated and was transferred to the ICU for further stabilization. She was extubated on POD 1 and discharged on POD 5.

Discussion: The management of a pregnant patient with multiple competing coagulopathies posing a risk for both clot and bleeding is incredibly challenging, especially in the setting of a procedure that cannot be delayed. Our patient had bleeding concerns due to ITP, but also concerns for clotting due to holding anticoagulation, chronic PE, and APS. Furthermore, diagnosis of HELLP was impaired due to the competing pathophysiologic states, complicating the decision on delivery timing. The needs of the patient requiring emergent delivery did not

allow full optimization, but with multidisciplinary management and close monitoring we achieved a successful outcome.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 13

Tranexamic Acid: An Attempt to Conserve Fibrinogen

Presenting Author: Candice Cuppini, MD
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Co-Authors: Mahesh Vaidyanathan, MD, MBA - Northwestern University

Introduction: Tranexamic acid (TXA) has been shown to decrease the risk of death from bleeding in postpartum hemorrhage without an increase in adverse clotting events.1 The inhibition of fibrinolysis by TXA may have additional applications including minimizing fibrinogen consumption in ongoing hemorrhage and subsequently decreasing cryoprecipitate transfusion requirements.

Case One: We present the case of a 32 year old G3P2102 who presented for urgent cesarean delivery in the setting of a placenta previa with recurrent bleeding. Prior to her cesarean, she had lost approximately 500 ml of blood vaginally. During her cesarean delivery she lost 800 ml of blood and was diagnosed with a postpartum hemorrhage. Her vital signs remained stable throughout the procedure and laboratory investigations including a complete blood count, fibrinogen level and rotational thromboelastometry (ROTEM) were sent. On closure of the hysterotomy, the obstetrician was concerned for an ongoing coagulopathy based on the appearance of the surgical field. Given the stability of the patient's vital signs, no blood products were given. However, TXA was given. The initial FIBTEM was noted to be 19 mm with a fibrinogen of 344 mg/dL. After the administration of TXA the FIBTEM was 12 mm with a fibrinogen of 193 mg/dL. Cryoprecipitate was not administered given the patient was clinically stable. The patient remained stable throughout the postpartum period requiring no blood products. She was discharged home in stable condition.

Discussion: In this case, the patient's vital signs remained stable while the surgical field appeared consistent with a mild coagulopathy. Given the low risk of TXA administration and its potential benefits, TXA was given while laboratory investigations were pending. TXA inhibits fibrinolysis which has the potential to conserve rapid consumption of fibrinogen in obstetric hemorrhage. This could be evaluated in FIBTEM values before and after TXA administration. Our patient had an initial FIBTEM value of 19mm before TXA administration and with FIBTEM values of 12mm after TXA administration, likely reflective of her ongoing mild coagulopathy concurrent with the findings on the surgical field. However, further studies are needed to show if TXA may have additional applications including minimizing fibrinogen consumption in postpartum hemorrhage. This inexpensive medication which does not require refrigeration could provide benefit worldwide in reducing not only usage of blood but usage of cryoprecipitate.

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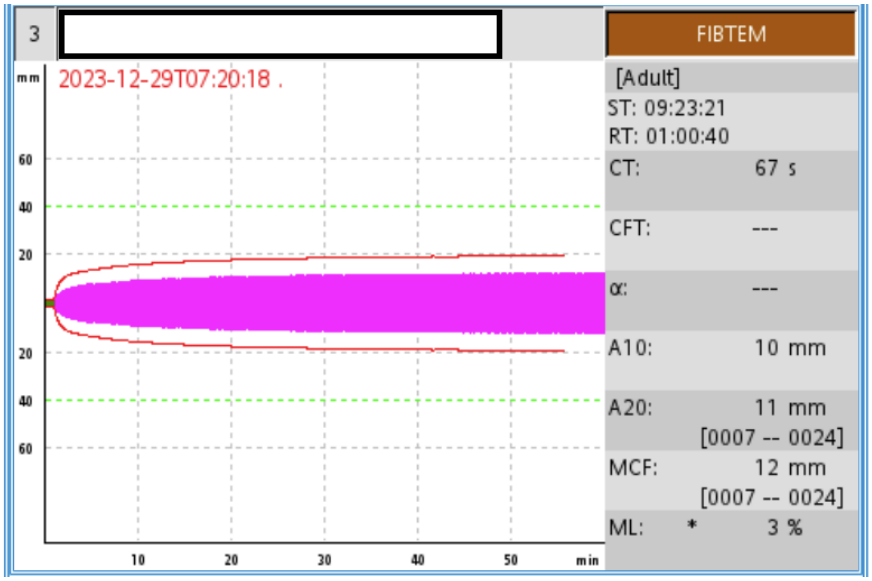

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 14

Management of Recurrent Extensive Deep Vein Thrombosis Surrounding Delivery

Presenting Author: Stephan Kienzle, MD
Presenting Author's Institution: Northwestern University Feinberg School of Medicine - Chicago, Illinois

Introduction: Thrombophilia and venous thromboembolism (VTE) during pregnancy present myriad challenges to the obstetric anesthesiologist regarding timing of anticoagulation, risk for sudden hemodynamic collapse, and, frequently, analgesia. We present a complex parturient with presumed May-Thurner syndrome and associated refractory pain.

Case One: A 31-year-old G13P3 with asthma, BMI of 44.75, unintentional dural puncture during prior lumbar epidural placement, and recurrent deep vein thrombosis (DVT) presented to labor and delivery at 29 weeks and 5 days gestation in the setting of extensive left lower extremity DVTs progressing distally from the level of the left common iliac vein. These had recurred after two prior catheter-directed thrombectomies, most recently 19 days prior, despite therapeutic anticoagulation. Preterm labor was induced due to concern for maternal and fetal morbidity associated with the escalating doses of IV hydromorphone required to control the pain secondary to her DVTs. Anticoagulation was transitioned from therapeutic low molecular weight heparin (LMWH) to an IV unfractionated heparin (UFH) infusion. A lumbar epidural was placed after discontinuation of UFH infusion for 6 hours and verification of normalized activated partial thromboplastin time and anti-Xa. A dural puncture epidural technique was used, and an appropriate analgesic level was achieved by bolusing of epidural bupivacaine. UFH infusion was resumed 1 hour following the procedure. During labor, the fetus developed non-reassuring heart tracings, and the patient's heparin infusion was stopped. She was taken emergently to the operating room for cesarean delivery under epidural anesthesia. The operation was uneventful with delivery of a liveborn infant, estimated blood loss of 550ml, and no evidence of cardiopulmonary compromise. The epidural catheter was removed 6 hours later with resumption of anticoagulation 1 hour after. The patient was transitioned from UFH to LMWH on post-operative day (POD) 1 and on POD 4 underwent thrombectomy and stenting of the left common iliac, external iliac, and common femoral veins.

Discussion: VTE is a leading cause of maternal mortality, accounting for 9.3% of maternal deaths. VTE in pregnancy often involves the left iliofemoral distribution due to compression of the left iliac vein by the right iliac artery, known as May-Thurner physiology, and is typically treated by LMWH or UFH. ACOG recommends holding anticoagulation prior to delivery due to concern for post-partum hemorrhage and considering placement of an IVC filter in high risk patients with VTE within 2 or 4 weeks of delivery. Anesthesia and obstetric society guidelines acknowledge that strict adherence to recommendations may not be possible in emergency situations that frequently occur in obstetric care and that these decisions require discussion

between the patient and an experienced multidisciplinary team.

References: ACOG Practice Bulletin No. 196: Thromboembolism in Pregnancy. Obstetrics & Gynecology. July 2018.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 15

Management of DAPT in Kawasaki Disease in Pregnancy: A Case Report

Presenting Author: Eleanor Kenny, MD
Presenting Author's Institution: McGaw Northwestern Feinberg School of Medicine

Introduction: Kawasaki Disease is a systemic vasculitis that often affects the coronary arteries. It is estimated that over half of patients diagnosed have transitioned to adulthood, resulting in an increasing number of pregnant patients with the disease.1 Management of pregnant patients with Kawasaki disease and coronary artery sequelae has been poorly established, particularly with regard to antithrombotic management. The literature describes this population remaining on aspirin therapy during pregnancy but not dual anti-platelet therapy (DAPT).

Case One: A 30-year-old G2P0010 at 37w0d with a history of Kawasaki disease presented as a transfer of care for medical optimization prior to delivery. She was diagnosed with Kawasaki disease at age six. Despite treatment with intravenous immunoglobulin and high dose aspirin, she developed several giant coronary artery aneurysms. Shortly thereafter, she developed a right coronary artery (RCA) thrombosis. She denied a history of myocardial infarction. She has been on various antithrombotic regimens for most of her life. Due to labile international randomized ratio, warfarin was discontinued many years ago. She has remained on DAPT with aspirin 81mg and clopidogrel since age 14 including during her pregnancy. She was evaluated by Maternal Fetal Medicine, Cardiology, and Obstetric Anesthesiology to undergo delivery planning. A transthoracic echocardiogram (TTE) revealed normal biventricular function and no wall motion abnormalities. She was scheduled for an induction at 39w0d with a plan to discontinue clopidogrel one week prior and to continue aspirin. A dural puncture epidural was placed uneventfully and confirmed with a fentanyl only test dose. Labor analgesia was initiated with incremental doses of 0.125% bupivacaine. She progressed to complete cervical dilation followed by a planned assisted second stage delivery in which a male infant was delivered without complication. She was monitored on telemetry postoperatively with no notable events. On post-partum day (PPD) 1, a repeat TTE was unchanged and she was restarted on clopidogrel. She was discharged on PPD 2.

Discussion: Patients with coronary artery aneurysms may be at increased risk for peripartum cardiovascular events such as myocardial infarction, arrhythmia, and subsequent heart failure and should be monitored closely during the intra- and post-partum period. The management of antithrombotic regimens has been poorly described and thus should be managed on case by case basis with pre-operative risk evaluation by anesthesiology, cardiology, and obstetric teams. This patient had a chronic RCA thrombosis and was therefore treated like the physiology of a chronic total coronary occlusion for which the decision was made for clopidogrel to be held temporarily. This allowed for the safe placement of neuraxial analgesia to assist with alleviating the hemodynamic stress of labor which may be poorly tolerated in

this population.

References: Inoue, R: JA Clin Rep 2020. PMID: 32895877

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 16

Uterine Window and Abnormal Vascularity - A Warning Sign for Morbidly Adherent Placenta

Presenting Author: Taylor Leathers, MD
Presenting Author's Institution: University of Kansas Medical Center - Kansas City, Missouri
Co-Authors: Sneha Chandra, MD - University of Kansas Medical Center

Introduction: Although ultrasound (US) evaluation is important, the absence of concerning US findings does not preclude the diagnosis of placenta accreta spectrum (PAS). In patients with clinical risk factors for PAS such as previous cesarean section (CS) and placenta previa, anesthesia teams must remain prepared for the potential for massive hemorrhage.

Case One: We present a 25-year-old G2P1 who arrived for RLTCS at 39 weeks and 3 days at an outside hospital. While there, the patient received an unknown dosage of spinal anesthetic. CS was halted when the uterus was visualized due to a thin uterine window and concern for PAS. The primary surgical team did not make a hysterotomy, closed her fascia with suture, stapled her skin and she was life flighted to our institution for surgical management. When we met the patient, she still had some residual sensory block from her spinal and denied incisional pain. A 22 gestational week US showed a marginal placenta previa with recommendation for follow up scan at 8 weeks. However, no follow up was found. Our anesthetic plan was described to the patient. We maintained precautions for PAS with a possible hysterectomy and massive transfusion. She consented for neuraxial anesthesia with possible conversion to general endotracheal anesthesia as well as central venous access, arterial access, and blood transfusion. Once in the operating room, we placed an epidural, then a right radial arterial line and right internal jugular central line were placed under ultrasound guidance and local anesthesia. 7cc of 2% lidocaine was given slowly through the epidural and sensory block to the level of T4 was achieved. The patient was placed in lithotomy position, prepped, draped and the surgical team proceeded to deliver the infant. Upon attempted placental delivery, morbid adherence was noted. We converted to general anesthesia as the surgical team prepared for hysterectomy. Maintenance of hemodynamics was achieved with transfusion in a 1:1:1 fashion and additional pressor support. Once the hysterectomy was complete, the estimated total blood loss was 2500cc. The patient was taken to the surgical ICU and extubated later that evening. Pain was well controlled with her epidural which was removed on POD 2. She was discharged on POD 3.

Discussion: Although specificity and sensitivity of ultrasound in the diagnosis of morbidly adherent placenta are relatively high, it is imperative for anesthesiologists to maintain concern for PAS in patients with prior risk factors or surgical clues prior to uterine incision1.

References: 1. Maged AM, El-Mazny A, Kamal N, et al. Diagnostic accuracy of ultrasound in the diagnosis of Placenta accreta spectrum: systematic review and meta-analysis. BMC Pregnancy Childbirth. 2023;23(1):354. Published 2023 May 15. doi:10.1186/s12884-023-05675-6

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 17

Anesthetic Management of Dysfibrinogenemia During Delivery

Presenting Author: Courtney Dorris, MD
Presenting Author's Institution: University of Kansas Medical Center
Co-Authors: Lyna Rehan, MD - University of Kansas Medical Center

Introduction: Management of uncommon diseases during pregnancy and its associated physiologic changes, can present many challenges. Dysfibrinogenemia is a rare coagulation disorder due to mutations in the fibrinogen gene resulting in abnormal fibrinogen function. Normally, fibrinogen gets converted to fibrin in the coagulation pathway and an insoluble fibrin clot is formed. Adequate clot formation is essential, particularly when blood loss is expected to be high, such as in delivery or surgery.

Case One: We present the successful delivery of a 28-year-old G3P0020 with dysfibrinogenemia. There is limited literature on parturients with dysfibrinogenemia. Thorough delivery planning was accomplished with references to the few case studies published and communication between hematologic, obstetric, anesthesia, and nursing teams. The patient had experienced two miscarriages around seven weeks gestational age prior to this pregnancy, including one significant hemorrhage with miscarriage that required transfusion of 20 units of cryoprecipitate before achieving hemostasis. This patient had low levels of fibrinogen and the fibrinogen that she had, did not function adequately. During her third pregnancy, recombinant fibrinogen was transfused weekly then biweekly to attain target fibrinogen levels >150. Despite no history of venous thromboembolism, enoxaparin and aspirin were given to the patient because of her increased risk due to pregnancy, dysfibrinogenemia, and transfusion of fibrinogen. Serial growth ultrasounds after 20 weeks gestational age and weekly ultrasounds with biophysical profiles were obtained after 32 weeks gestational age. The patient ultimately had a scheduled cesarean section at 37 weeks due to breech presentation. Thromboelastogram and fibrinogen level were obtained before delivery. Spinal block was performed and the patient had a successful cesarean section under adequate neuraxial anesthesia with about 800 mL estimated blood loss. Subsequent fibrinogen levels were >150 with no need for transfusion of fibrinogen during admission.

Discussion: Follow-up with the patient at six weeks post-partum revealed no other significant hemorrhagic events. After multiple miscarriages, the patient was uncertain if she would be able to successfully carry a fetus to term, but with comprehensive medical preparation, she delivered a healthy baby.

References: Langer, M. et al. (2021) Res Pract Thromb Haemost.16;5(8):e12619 Yan, J. et al. (2018) J Clin Lab Anal 32(3):e22319

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 18

Anesthetic Management of Multigravida with Placenta Accreta, Uncontrolled Hypertension, and Ascending Aortic Aneurysm

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Co-Authors: Roberto Blanco, MD - Department of Anesthesiology University of Minnesota
Iryna C. Chugaieva, MD - University of Minnesota

Introduction: Risk factors for aortopathy in parturients without heritable disorders are HTN and advanced maternal age(1). Hemodynamic, hormonal, and aortic wall changes of pregnancy predispose patients to aortic dissection (AD). AD risk is higher during 3rd trimester and puerperium. Tight BP management and surveillance are key

Case One: 37yo G7P5015 with bicuspid aortic valve and ascending aortic aneurysm, which had grown from 4.5 cm to 5.1 cm over 6 months, alongside CAD with mid-LAD stenosis, history of SVT, and poorly controlled HTN. Also C-section (CS) x5, anterior placenta previa, and suspected accreta. HTN remained uncontrolled despite Labetalol, Carvedilol, and Nifedipine. Multidisciplinary team included obstetrician, cardiologist, anesthesiologist, and cardiothoracic surgeon, with recommendations for CS at 37 weeks. Due to uncontrolled HTN and increasing aneurysm size, CS done at 34w, with CVTS on standby for VA ECMO, anticipating risks of aortic rupture and hemodynamic collapse. Anesthetic management aimed to mitigate cardiovascular instability and aortic rupture risk while maintaining fetal well-being. Radial artery catheter was inserted for continuous hemodynamic monitoring. Her pre-anesthetic blood pressure was recorded at 180/100 mmHg. Patient's BP was managed by carefully titrating continuous infusions of nicardipine and esmolol. Combined spinal epidural anesthesia with hyperbaric bupivacaine, fentanyl, and morphine at L3-4 was administered, achieving T4 sensory block. The neonate was uneventfully delivered and oxytocin started. Upon delivery of the placenta, a focal area of placenta accreta was observed. However significant vaginal bleeding (3.2L) required hysterectomy. Patient required 3UPRBCs, 2U FFP, and 2.5L of crystalloid, along with Hemabate and TXA. Surgery lasted 3.5 hours with patient remaining hemodynamically stable and subsequently transferred to the CVICU. Postoperative pain management involved continuous epidural administration of 0.2% ropivacaine with fentanyl. Her postoperative course was uneventful, leading to discharge on the fourth postoperative day. This case underscores the critical importance of a multidisciplinary approach in managing complex pregnancies with concurrent cardiac and obstetric challenges.

Discussion: Elective surgery before pregnancy is preferable in women with significant or worsening aortic dilation. In post-viable pregnancies, multidisciplinary management, surveillance and tight BP control are key. B-blockers might help obtain tight BP control, prevent progression, and reduce the risk of dissection.

References: ESG; AEPC; DGesGM; Regitz-Zagrosek V, et al. ESC Guidelines on the management of CV diseases during pregnancy. Eur Heart J. 2011 Dec;32(24):3147-97. doi: 10.1093/eurheartj/ehr218. Epub 2011 Aug 26. PMID: 21873418. Steven L. Lansman, et al. Aortic surgery in pregnancy. The Journal of Thoracic and Cardiovascular Surgery. Vol 153, Issue 2, 2017, PS44-S48. ISSN 0022-5223. https://doi.org/10.1016/j.jtcvs.2016.06.015.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 19

Anticoagulation Management in Patient with Mechanical Aortic Valve and History of Prior Valve Thrombosis Undergoing Induction of Labor

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Introduction: Pregnancy is a prothrombotic state, which is a particular challenge in patients already at a heightened risk of thromboembolic events, such as those with mechanical heart valves. We present a patient with a mechanical heart valve and thromboembolic event during pregnancy who underwent neuraxial anesthesia and induction of labor complicated by postpartum endometritis.

Case One: A 32-year-old G3P2002 presented to Labor & Delivery for term induction of labor. Her medical history was notable for a repaired ventricular septal defect and mechanical aortic valve, with a history of valve thrombosis and renal thromboembolism at 26 weeks gestation. She was seen by Maternal Fetal Medicine and Congenital Cardiology prenatally for complex care coordination. On admission, the patient's therapeutic enoxaparin was stopped, and a continuous heparin infusion was initiated with a PTT goal of 60-90. Her heparin drip was discontinued six hours prior to epidural catheter placement, and restarted one hour after placement. She underwent an uncomplicated induction of labor with spontaneous vaginal delivery approximately three hours following artificial rupture of membranes. Uterine atony was noted following delivery, which responded well to intramuscular methergine. Her epidural catheter was removed, and continuous heparin infusion was re-initiated eight hours postpartum. She was then transitioned to SQ therapeutic enoxaparin as a bridge to warfarin, and she was discharged home on postpartum day one. Her INR was trended outpatient. On postpartum day nine, the patient presented again with increased vaginal bleeding, fundal tenderness, and hyperechoic intrauterine contents on bedside ultrasound. Given concern for retained products of conception leading to endometritis, the decision to proceed with a dilation and curettage was made. The patient was started on parenteral antibiotics. Her warfarin was discontinued, and she was initiated on a heparin infusion. INR was trended with a goal of less than 1.5 before surgery. On postpartum day eleven, her INR was at goal, and her heparin infusion was paused for six hours before surgery. She underwent an uncomplicated dilation and curettage with an estimated blood loss of 200 mL. Post-operatively, heparin infusion was re-initiated and she was transitioned to therapeutic enoxaparin and warfarin in a similar fashion. The remainder of her postpartum recovery remained free of thrombotic or hemorrhagic complications.

Discussion: Successful anesthetic management in patients with mechanical heart valves requires complex coordination of anticoagulation to prevent thromboembolic events, while simultaneously considering opportunities for regional anesthesia and prevention of hemorrhage.

Abstract #: THUR – CR – BS 1 – BR 3 – When It Bleeds (Accretas, Abruption and Coagulopathies) – 20

Placental Abruption with Couvelaire Uterus with Profound Anemia

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Introduction: Severe placental abruptions can cause blood to extravasate into the myometrium, a life threatening phenomenon known as couvelaire uterus1. Early and aggressive management of a couvelaire uterus is necessary to prevent severe hemorrhage.

Case One: We present the case of a 41 year old G4P4 at 37 weeks who presented to triage for lightheadedness and vaginal bleeding. On arrival, the patient was hemodynamically stable although fetal bradycardia to 80 bpm was noted. Patient was taken for emergent cesarean delivery due to nonreassuring fetal status in the setting of suspected placental abruption. General anesthesia was induced via RSI and additional large bore IV access was obtained. With uterine exposure, the obstetric team noted the couvelaire sign, warning the anesthesia team of the risk of occult hemorrhage. Upon placental delivery, significant clot and bleeding consistent with abruption were confirmed. The case was complicated by significant uterine atony that minimally improved with the administration of methylergometrine and carboprost tromethamine. Tranexamic acid was administered and invasive arterial blood pressure monitoring was placed in the setting of ongoing hemorrhage. B-Lynch stitch was attempted without uterine atony resolution and was replaced by JADA device. The case was further complicated by a large hemoperitoneum, profound anemia with Hgb 3.8 gm/dl, and lactic acidosis (lactate of 3.6 mmol/L). Massive transfusion protocol was initiated, and a total of 5L crystalloid, 6 pRBCs, 2u FFP, and 1u of cryoprecipitate was given. Repeat Hgb after transfusion 7.2 gm/dl. Coagulation labs were consistent with DIC with an elevated D dimer, PTT of 47s, and fibrinogen of < 60 mg/dl. Adequate hemostasis was achieved after an EBL of 3.3L, and the patient was transferred to ICU. TEG obtained upon ICU admission found elevated CK K-Time with decreased angle, CFFMA, and CRT-MA. An additional 1u platelets, 1u RBCs, and 1u cryoprecipitate were transfused. Patient briefly hypotensive overnight, requiring norepinephrine. On POD1, the patient was extubated, and no longer required vasopressors. She was transferred to the floor on POD2 and was discharged on POD4 with a Hgb of 8.1 gm/dl.

Discussion: A couevlaire uterus is an exceedingly uncommon complication of placental abruption. An anesthesiologist should be aware it exists as it is particularly prone to atony and hemorrhage, and as the management can be difficult due to initial blood loss being masked within the uterus1. Successful control of placental abruption and couvelaire uterus requires timely recognition and initiation of massive transfusion protocol to avoid prolonged, profound

anemia and coagulation derangements.

References: 1. Lee YJ. 2022. doi: 10.1093/jscr/rjab618. PMID: 35070266; PMCID: PMC8769885.

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 01

Management of a Pregnant Patient on Dual Antiplatelet Therapy After Percutaneous Intervention: Cangrelor Bridging as a Path to Neuraxial Anesthesia for Delivery

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Co-Authors: Laurence E. Ring, MD - Columbia University
Richard Smiley, MD, PhD - Columbia University

Introduction: Acute myocardial infarction is a rare event in pregnancy (~1/10,000), but management with percutaneous intervention [PCI] and subsequent requirement of dual antiplatelet therapy [DAPT] for stent patency has implications for anesthesia type at delivery.1,2 In this case, we demonstrate a novel use for short-acting antiplatelet agents (cangrelor) to prevent stent thrombosis while still mitigating the risk of epidural hematoma associated with neuraxial anesthesia.

Case One: A 35-year-old G1P0 at 33w5d with a history of hypermobility Ehlers-Danlos syndrome presented to ED with chest pain. Initial findings included [1] elevated HS-troponin (138>443), [2] ST depressions in inferolateral leads on EKG, [3] hypokinesis of mid-distal inferior LV wall with LV EF 55-60% on TTE. Patient was given aspirin 324mg, and emergent left heart catheterization showed a coronary dissection (Ost to Prox LAD). A drug-eluting stent was successfully deployed, and DAPT was initiated with a traditional agent, clopidogrel. She was admitted to cardiac ICU for 5 days, and the Cardio-Obstetrics team set a tentative plan for C-section under general anesthesia at 37w in a cardiac OR with cardiothoracic surgery and ECMO on standby. Once she was transferred to OB High Risk unit, our team reviewed her case as well as the current literature and guidelines and proposed bridging with a short-acting antiplatelet agent, cangrelor, prior to delivery to minimize time off DAPT and allow for neuraxial anesthesia.3,4,5 Patient was transitioned to DAPT with cangrelor at 36w for planned C-section at 38w. Cangrelor was continued until 1am day of surgery, and and a single shot spinal anesthetic (at our standard dose: hyperbaric bupivacaine 12mg, fentanyl 15mcg, morphine 150mcg) was provided at 8am, with an arterial line and phenylephrine for blood pressure monitoring and support. Delivery was uncomplicated and concluded at 9:45am with EBL 1 L. She was admitted to cardiac ICU post-operatively for monitoring, and cangrelor was restarted at 9pm once deemed stable and appropriate by the ICU team. She was transitioned back to traditional DAPT the following day, and she was discharged home 3 days later.

Discussion: Cesarean delivery under general anesthesia is the presumed default for patients on DAPT, because holding traditional antiplatelet agents (e.g., clopidogrel) for the recommended week prior to neuraxial placement is not recommended given the risk of stent thrombosis. Cangrelor requires only a 3 hour hold prior to neuraxial anesthesia and can be restarted as early as 8 hours after catheter removal.6 By advocating for DAPT bridging with this short-acting antiplatelet agent, we provided the benefits of neuraxial anesthesia while still minimizing associated hematologic risks.

References: 1. Clin Res Cardiol. 2022;111(7):723-731. 2. Obstet Med. 2018;11(3):144-7. 3. SOAP Annual Mtg. 2021;96. 4. Minerva Anestesiol. 2023;89(4):362-363. 5. Obstet Gynecol Cases Rev. 2020;7:164. 6. Reg Anesth Pain Med. 2018;43(3):263-309.

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 02

Peripartum Management of Myocardial Infarction in Pregnancy

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Presenting Author's Institution: Massachusetts General Hospital, Department of Anesthesia, Critical Care, and Pain Medicine - Boston, Massachusetts
Co-Authors: Allison M. Faucett, MD - University of Colorado School of Medicine
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Introduction: In the last 20 years, the incidence of myocardial infarction (MI) has risen to 6.2 per 100,000 deliveries, due to increasing maternal age and a higher prevalence of cardiovascular risk factors in parturients (1). We present a patient with acute MI from spontaneous coronary artery dissection (SCAD) during pregnancy resulting in crash cesarean delivery (CD) while on extracorporeal membrane oxygenation (ECMO).

Case One: A 23-year-old G3P2 at 30 weeks gestation with history of obesity, gestational hypertension, and prior CD presents to outside hospital with three days of chest pain, nausea, and vomiting. Her EKG showed non-ST elevation MI (NSTEMI) which progressed to ST elevation MI (STEMI) in transit. Cardiac catheterization found no obstructive coronary artery disease (CAD) and SCAD of a distal branch of the circumflex artery. She was admitted to the cardiac intensive care unit (ICU) for management and discharged home on hospital day 7. Three days later, after experiencing a stressful event, she transferred back in cardiogenic shock. Interventional cardiology found no obstructive CAD and stable SCAD of the distal circumflex. Right heart catheterization showed RA 24, RV 53/36, PA 68/66, and PCWP 58. Left ventriculography showed diffuse severe global hypokinesis with markedly reduced left ventricular (LV) systolic function without appearance of stress induced cardiomyopathy. The patient was intubated for respiratory distress and admitted to the cardiothoracic ICU for Impella placement and veno-arterial (VA)-ECMO. LV ejection fraction (LVEF) was 20%. She underwent emergent bedside CD for terminal fetal bradycardia. Three days later, she was weaned off VA-ECMO and Impella the day after. She had persistent heart failure with LVEF 32% two weeks after delivery but was stable for discharge 3 weeks after hospitalization. She is currently medically managed by her local cardiologists.

Discussion: Pregnancy is an independent risk factor for MI, which is 3-5 times higher than in non-pregnant patients (1). It is most common in the 3rd trimester and postpartum. Treatment of STEMI in pregnancy includes diagnostic angiography with or without percutaneous coronary intervention (PCI) versus NSTEMI which includes medical therapy with dual anti-platelet therapy, anticoagulation with heparin or low molecular weight heparin, and beta-blockers. In SCAD, which presents as STEMI, there is high risk of iatrogenic extension of dissection with PCI. Medical management with aspirin and beta-blocker is recommended. Labor and delivery management depends on stability of parturient and fetus and ideally involves multi-disciplinary planning at a tertiary care center. Labor analgesia includes early placement of neuraxial. If anticoagulation cannot be stopped, alternative analgesic plans

should be utilized to reduce the catecholamine surge associated with labor. With CD, neuraxial is preferred over general anesthesia, if possible.

References: (1) Gedeon et al. Current Problems in Cardiology, Vol 47 Issue 11. 2022

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 03

Rheumatic Heart Disease and Placenta Accreta Spectrum Disorder: An ECMO-Assisted Cesarean Delivery and Subsequent Valvular Replacement

Presenting Author: Paul Vozzo, MD
Presenting Author's Institution: Columbia University
Co-Authors: Richard Smiley, MD, PhD - Columbia University

Introduction: Rheumatic heart disease (RHD) is a leading cause of morbidity and mortality in pregnancy within low and middle-income countries. (1) Placenta accreta spectrum disorder (PASD) is also a life-threatening disorder. (2) We present the case of a pregnant patient referred for management of severe mitral stenosis (MS) and PASD.

Case One: A 31 year old G3P1 patient with known RHD and an ultrasound suggestive of PASD presented at 25 weeks and 4 days gestation with increasing shortness of breath. She reported having rheumatic fever as a child in Bangladesh resulting in aortic and mitral stenosis. TTE revealed preserved EF, severely dilated LA, RV and RA with moderate AS, severe MS, severe TR with RVSP of 87mmHg. MRI revealed suspected placenta percreta. Over two days, multidisciplinary planning was undertaken by the OB and cardiac anesthesia teams, obstetrics, GYN oncology, cardiology, cardiac surgery and neonatology to determine the optimal approach to her delivery and valve replacement. It was decided that open heart surgery while still pregnant would be too risky. As these discussions progressed, the patient began decompensating, and waiting for delivery was also not an option. Ultimately, it was decided that the patient would have a C-section with likely C-hyst as soon as possible followed by valve replacement after a short recovery. The patient arrived to the OR with CVL/PAC already in place. An arterial line was placed, as was a dural puncture epidural, loaded with 20ml 2% lidocaine over the course of 30 minutes. During the load, the patient became hypotensive requiring increasing infusions of norepinephrine and vasopressin; her PAPs also had brief suprasystemic periods. VA-ECMO, which had been planned to be used in case of bleeding or pulmonary hypertensive emergency, was initiated under these non-emergent conditions. After ECMO initiation but before delivery, the patient was transfused 3U PRBC, 2U FFP and 1U platelets for starting Hct 28% and Plt 100k. Prior to delivery, the patient did require conversion to general anesthesia due to intolerance to the procedure. A successful cesarean delivery followed by hysterectomy was performed with EBL of 1L. The patient was extubated and brought to the ICU. The epidural was initially used for post-op analgesia but was removed on POD1 due to anticoagulation. On POD 3 she underwent successful aortic and mitral valve replacement, tricuspid valve annuloplasty, and VA-ECMO decannulation. She was extubated the next day and discharged home POD 17 from initial surgery. Her baby was discharged at postmenstrual age 38 weeks and 5 days.

Discussion: Severe MS and PASD are a potentially lethal combination. This case demonstrates the importance of a multidisciplinary approach to treatment at a high volume cardiac and obstetric quaternary care hospital.

References: 1 French KA, Circulation. 2018 2 Ihab M. AJOG 2005

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 04

Anesthetic Management of a High-Risk Cardiac Patient Undergoing Cesarean Section

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Introduction: Normal physiological changes of pregnancy involve increased preload which causes an increase in stroke volume and cardiac output. Preload increases during pregnancy and the peripartum period. For maternal cardiac patients, this poses a unique risk of cardiac decompensation. In the United States, the prevalence of maternal cardiac disease is increasing and is the leading cause of maternal mortality. Optimal care for these patients requires careful planning and coordination from a multidisciplinary team. We describe the management of a high-risk cardiac patient undergoing an elective repeat C/S.

Case One: The patient is a 34-year-old G3P01 at 35 wks gestation. Cardiac history includes severe MR and ischemic cardiomyopathy with EF30%, s/p CABG with recent PCI, on DAPT and lovenox. The patient was evaluated at an anesthesia clinic and admitted to the hospital preoperatively. Plavix and Lovenox were appropriately held for neuraxial anesthesia and surgery. An a-line and PIV access were obtained. A CSE technique with only intrathecal opioids was administered while avoiding intrathecal LA due to risk of hemodynamic instability. Epidural test dose was given (negative result) after which slow doses of LA (3 ml of 2% lidocaine at a time) to achieve T4 level. A levophed infusion was used to maintain blood pressure and crystalloid volume was minimized. CT surgery placed femoral venous and arterial sheaths for stand-by VA ECMO, which did not require heparinization. Repeat C-section proceeded without complications with expected EBL of 500ml by MFM. Pitocin infusion started after delivery of placenta per institution protocol. Methergine was avoided in the setting of cardiac disease and cHTN, Hemabate was thus the 2nd uterotonic of choice. At the conclusion of the surgery, the epidural catheter was removed, TAP block performed for post-op pain management, and 500ml of crystalloid administered with 200ml of urine output. The patient was transferred to cardiac intensive care on minimal levophed infusion (0.03mcg/kg/min per institution protocol). During the postoperative period, the patient did not require tracheal intubation, further vasopressor infusions, or ECMO. The patient was discharged home on postoperative day four without any complications.

Discussion: Maternal cardiac disease poses a risk of significant morbidity and mortality during the peripartum period. As described, multidisciplinary team planning involving obstetric/cardiac anesthesia, obstetrics/MFM, CT surgery, perfusion services, and cardiology is imperative to providing safe and high-quality care for these patients.

References: Meng ML, Arendt KW. Obstetric anesthesia and heart disease. 2021;135(1):164–183.

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 05

Perioperative Management of a Parturient with Double Outlet Right Ventricle

Presenting Author: Jessica Ng, MD
Presenting Author's Institution: Yale School of Medicine

Introduction: Double outlet right ventricle (DORV) is a rare congenital heart defect in which the pulmonary artery and the aorta both connect to the right ventricle (RV). Thus, the RV circulates oxygen poor blood throughout the body. A ventricular septal defect (VSD) always occurs with DORV. It permits oxygen rich blood to pass from the left ventricle (LV) to the aorta and pulmonary artery (PA), both located in the RV. However, this is insufficient to adequately oxygenate the body. Thus, surgical repair is necessary. Common symptoms include tachypnea, tachycardia, dyspnea, failure to thrive, and cyanosis. We describe a case of multidisciplinary management for a parturient with DORV for failed induction of labor (IOL) and subsequent cesarean delivery (CD) under neuraxial anesthesia.

Case One: Our patient is a 22 yo F, G1P0 at 37w7d with history of DORV with ventricular inversion, L-malposed great arteries, and VSD and ASD. Thus, the systemic RV is leftward and the subpulmonic LV is rightward, with both great arteries inverted and in the RV. She is s/p repair with subpulmonic LV to PA conduit and systemic RV complicated by extensive calcification and significant obstruction of the LV to PA conduit. This worsening cardiac disease increases the possibility of progressive RV dysfunction, significant tricuspid regurgitation, or development of significant further obstruction. The devised plan between the multidisciplinary teams of OB anesthesia, MFM and cardiology included trial for spontaneous vaginal delivery with low threshold for assisted second stage to avoid prolonged Valsalva, avoidance of HTN given her systemic RV and concern for RV dysfunction (methergine was avoided as a uterotonic), early neuraxial anesthesia placement, arterial and/or central line placement, levophed as vasopressor of choice, and strict I/Os. During IOL, an early combined spinal epidural (CSE) was placed with a reduced dose of intrathecal hyperbaric bupivacaine and fentanyl. An arterial line was placed shortly after the CSE to closely monitor hemodynamics. After a failed IOL due to NRFHT, she had a primary CD at 38w1d using in-situ epidural with 2% lidocaine, titrated slowly to achieve a sufficient anesthesia level. The procedure was uncomplicated. She was briefly monitored in the ICU and then transferred to the floor and recovered without any requirement of pressors or diuretics.

Discussion: DORV is a rare congenital heart defect that despite early surgical correction, continues to pose a multitude of complications, especially highlighted by the parturient due to the physiology of pregnancy. We present here a case with the successful outcome of a mother with DORV due to the careful coordination of a multidisciplinary team and the preemptive planning for early neuraxial and close hemodynamic monitoring.

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Publications, 2014.

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 06

Anesthetic Management of a Parturient with Severe Aortic Stenosis and Di/Di Twin Gestation

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Introduction: Cardiovascular disease (CVD) is the leading cause of maternal mortality in much of the developed world. Proper management is essential for improving outcomes in parturients with heart disease. Our case illustrates the complexity of creating a highly individualized treatment plan for a patient with severe aortic stenosis (AS), pre-eclampsia, and di/di twins.

Case One: A 44-year-old G2P0 female at 34w0d with a di/di twin gestation presented with preterm premature rupture of membranes. Her medical history was notable for class 3 obesity and asymptomatic severe AS incidentally diagnosed after a murmur was auscultated during routine prenatal care. Transthoracic echocardiography revealed a subaortic membrane causing fixed left ventricular outflow tract obstruction with an associated peak velocity of 4.6 m/s and a peak gradient of 83 mmHg following Valsalva maneuver. Her presentation was complicated by pre-eclampsia with severe features by blood pressure criteria. Normotension was achieved with two doses of labetalol, and a magnesium infusion was deferred in favor of maintaining euvolemia. Given the cephalic presentation of both twins, as well as the patient's complex heart disease, maternal fetal medicine planned for an augmented trial of labor followed by forceps-assisted delivery. Prior to initiating oxytocin, an arterial line was placed for close hemodynamic monitoring. A dural puncture epidural with slow titration of analgesia was administered to blunt the sympathetic response to pain. The first stage of labor progressed uneventfully and the patient labored down for an hour following complete dilation. With a trial of pushing, however, her pulse pressure narrowed with each successive Valsalva until the arterial line tracing became flat. Cessation of pushing led to a slow increase in pulse pressure with a gradual return to baseline within thirty seconds. The patient remained asymptomatic throughout labor and ultimately both twins were successfully delivered via forceps. She was discharged on postpartum day 3 and currently awaits cardiology follow-up.

Discussion: Parturients with pre-existing CVD have a risk for morbidity and mortality that is 100 times greater than their counterparts without heart disease1. Complications are largely attributed to poor accommodation of the physiologic changes of pregnancy. Left-sided obstructive lesions, such as severe AS, are often unable to tolerate the progressively high preload, low afterload state associated with pregnancy and the peripartum period2. These patients are prone to heart failure, arrhythmias, ischemia, and cardiopulmonary arrest. Close consultation with obstetrics, anesthesiology, and cardiology in a facility capable of providing

cardiac surgery and mechanical circulatory support if necessary is essential to best care for these high-risk patients3.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 07

Postpartum Spontaneous Coronary Artery Dissection, A Case Report

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Introduction: Spontaneous coronary artery dissection (SCAD) is an uncommon potentially life-threatening condition that presents with classical myocardial infarction (MI) symptoms in a younger age, female sex patient lacking most, if not all, cardiovascular risk factors. Despite increasing recognition in recent years due to the spread of routine angiography usage, postpartum SCAD remains uncommon with a prevalence of 1.8 in 100,000 pregnancies (1).

Case One: Here, we report a case of a 41-year-old G9 P6026 female with a history of polysubstance use disorder who underwent an uncomplicated cesarean section for non-reassuring fetal heart tones and placental abruption. On postoperative day 3, she was noted to have acute onset of severe, substernal chest pain and diaphoresis with precordial lead ST elevations on EKG classical for acute coronary syndrome and diagnosed with an urgent coronary angiography which identified a SCAD involving the mid-left anterior descending coronary artery. No operative intervention was done due to stable hemodynamics and high-risk profile postpartum, and the patient was admitted to the cardiac care unit for further observation and medical management. There were no further complications on magnesium sulfate infusion, aspirin, metoprolol tartrate, and nifedipine XL. Transthoracic echocardiography revealed a significantly reduced ejection fraction of 30-35% and impaired left ventricular relaxation. Patient was discharged on day 7 with aspirin, metoprolol succinate and nifedipine XL.

Discussion: Our case demonstrates how a high degree of suspicion of SCAD in an early postpartum patient was critical in preventing mortality. In this case, conservative medical management was limited by medication contraindications in breastfeeding, and aggressive intervention was limited by high maternal risk. Generally, typical post-myocardial-infarction medications such as antiplatelet therapy, statins, beta-blockers, ACE-inhibitors/ARBs, and/or calcium channel blockers should be used following SCAD. In our case, the statin was discontinued and ACE/ARB, mineralocorticoid receptor antagonists (MRA), and sodium-glucose cotransporter-2 inhibitors (SGLT) were withheld due to breastfeeding contraindications. Statins interfere with infant lipid metabolism; SGLTs can cause infant renal injury; and many ACE/ARB and MRA medications have limited data regarding breastfeeding safety. Patients experiencing pregnancy-associated SCAD should also be extensively counseled regarding the high maternal mortality risk of future pregnancy and offered forms of contraception or sterilization. Further research is required to evaluate methods of decreasing pregnancy risk in patients with a history of SCAD; however, we recognize the difficulty of research in this patient population.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 08

SCAD is Bad but Pseudoaneurysm is Worse

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Introduction: Spontaneous coronary artery dissection (SCAD) is the separation of the epicardial coronary artery wall due to intramural hemorrhage with or without intimal tear (1). While rare, SCAD is a leading cause of pregnancy related MI (2,3). Optimal treatment of SCAD in pregnancy remains controversial. Women who develop SCAD in pregnancy often have few or no risk factors for atherosclerosis (1,4). Risk is increased by advanced maternal age, multiple gestation pregnancy and history of preeclampsia. Given the high likelihood that SCAD will resolve with medical management, this is the preferred approach. Vaginal delivery with assisted second stage is recommended if feasible. PCI or CABG are reserved for severe cases due to frequency of iatrogenic complications and PCI does not protect against dissection extension (4).

Case One: A 27 yo G6P4014 at 28w6d with PMH of IV drug use presented with sepsis due to tricuspid and mitral valve endocarditis complicated by SCAD. ST segment elevation in the anterolateral leads prompted cardiac catheterization which showed SCAD of the left main extending into left anterior descending and circumflex arteries resulting in anterior wall hypokinesis and LV dysfunction (EF 35-40%). Endocarditis required treatment with 6 weeks of IV antibiotics for which she remained hospitalized. NST with non-reassuring fetal wellbeing prompted cesarean delivery at 31w0d. This was uncomplicated, completed in the cardiac OR under general anesthesia with arterial line and ECMO capability. One week later, she developed refractory chest pain and TEE showed LA pseudoaneurysm/dissection. The patient underwent CABGx2 (LIMA to diagonal branch, SVG-OM), mechanical MVR, and LA/LV aneurysm patch repair and was discharged after meeting appropriate criteria.

Discussion: During delivery with SCAD, hemodynamic stability is paramount. For vaginal or cesarian delivery, we recommend invasive BP monitoring and 5 lead EKG with ST analysis to monitor for signs of ischemia. Uterotonics must be used with caution. Boluses of oxytocin can induce hypotension, reducing coronary perfusion pressure, and methergine may lead to increased afterload, worsening myocardial oxygen demand. Though peripheral VA ECMO may

be an option for rescue, it could result in extension of coronary dissection due to retrograde flow. LA aneurysm/dissection are rare complications, particularly when they are non-iatrogenic. In our case, the location and timing of the aneurysm makes infarction the most likely etiology. Identification of LA pseudoaneurysm prompted surgical management of this patient's SCAD and mitral valve endocarditis, as she developed late complications of myocardial ischemia despite appropriate medical management. The high acuity of SCAD cases with the potential for devastating complications highlight the need for interdisciplinary teamwork and concrete guidelines for management.

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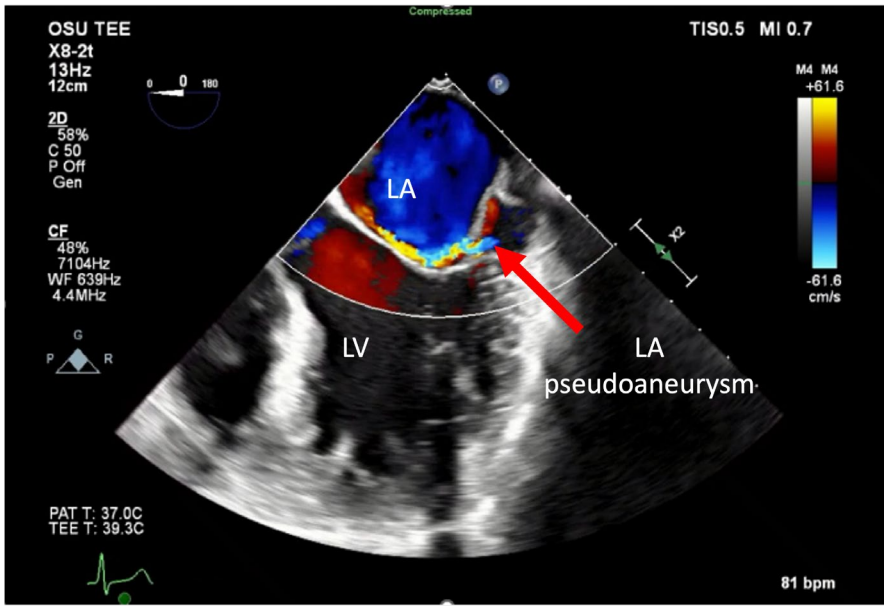

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 09

Obstetric Management of the Loey-Dietz Syndrome Parturient

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Introduction: Loey-Dietz syndrome (LDS) is an autosomal dominant connective tissue disorder with unique obstetric and anesthetic concerns. Aortic aneurysm is a common finding with significant implications in obstetric physiology. The risk of aortic dissection in LDS is increased at baseline, but can be as high as 6% in pregnancy, carrying the potential for significant morbidity and mortality for mother and baby. We present a case highlighting the essential peripartum management of LDS patients.

Case One: A 29-year-old G2P1001, diagnosed with LDS in 2014, presented for pre-induction anesthesia consultation at 37 weeks. She had a previous vaginal delivery of a healthy infant via epidural anesthesia 2 years prior, but had a history of significant familial complications with LDS, including complex aortic arch repair in her father and sudden cardiac death in her paternal uncle. She continued beta blocker therapy and followed closely with her cardiologist throughout pregnancy. MR aortic angiography at 30 weeks demonstrated main pulmonary artery dilation and stable aortic root dilation of 3.9 cm. Echocardiography demonstrated an ejection fraction of 60-65%. Serial full-body angiography, commonly recommended in LDS to identify high-risk vessels, showed no other concerns. She presented for induction at 38 weeks and 4 days after an uncomplicated pregnancy. Her management included inpatient evaluation by cardiology, maternal fetal medicine, and anesthesia, with plan for an assisted second stage delivery after early epidural placement to avoid large increases in blood pressure and contraction-related autotransfusions that could place stress on the dilated aortic root. As with her prior delivery, an epidural catheter was successfully placed and the patient delivered a healthy infant. Her 48-hour postpartum echo demonstrated stable aortic dilation of 4 cm.

Discussion: Our case reinforces that proper history, physical examination, and radiographic studies are crucial in management of the LDS parturient. The degree of aortic dilation, baseline cardiac function, and presence of other associated defects can guide timing and mode of planned delivery. Neuraxial anesthesia is an important consideration in these patients. Dural ectasia in LDS causes ballooning and distortion of the dural sac that can impede spinal anesthesia and may warrant antepartum evaluation with lumbar imaging. Feared peripartum complications, including aortic dissection, cardiac arrhythmias, uterine

rupture, teratogenic sequela of medical treatment, neuraxial failure, postpartum hemorrhage during surgical intervention, and much more need to be considered when determining the most appropriate plan for each LDS patient. Care should occur at a facility equipped to manage complications, as thorough preparation for all eventualities can promote smooth and successful parturition in these patients.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 10

Anesthetic Considerations for the Parturient with Brugada Syndrome

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Introduction: Brugada syndrome is a rare inherited disorder that predisposes affected individuals to life-threatening cardiac arrhythmias. It has been linked to multiple genes encoding for voltage gated sodium, calcium and potassium channels. While up to 72% of patients with Brugada syndrome are completely asymptomatic, the disorder is a known cause of sudden cardiac death. Although pregnancy is not a known trigger for Brugada arrhythmias, medication exposure during the anesthetic labor process poses a theoretical risk for affected patients and a clinical dilemma for anesthesia providers.

Case One: We present a 39-year-old multiparous female with a known gene mutation predisposing her to Brugada syndrome undergoing a trial of labor after cesarean (TOLAC). The patient was evaluated by Cardiology early in pregnancy who performed an ECG and recommended continuous telemetry throughout her labor course and 24 hours postpartum. To decrease the likelihood of arrhythmia, electrolytes were to be monitored and repleted as needed and any fever was to be treated with acetaminophen. For labor analgesia, a standard ropivacaine epidural infusion was planned. If a c-section was needed, the patient would have defibrillator pads placed in the OR. Spinal anesthesia with bupivacaine was judged to be a safe option. In the event of conversion to general anesthesia, etomidate was the induction agent of choice due to a theoretical risk of arrhythmogenicity with propofol. Finally, the anesthesia team identified pharmacologic agents to use in the event of an arrhythmia storm. Prior to scheduled induction the patient was found to have fetal malpresentation and she opted for a repeat c-section which was performed under spinal anesthesia as previously planned. Delivery was uncomplicated, and the patient was maintained in sinus rhythm throughout the peripartum and post-partum course.

Discussion: This case highlights the unique considerations for patients with Brugada syndrome, particularly for the anesthesiologist. Medications commonly used in the operating room and labor deck should be avoided, including propofol, methylergonivines, and potentially bupivacaine and lidocaine. These patients require pre-planning and a multidisciplinary approach.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 11

Anesthetic Management of a Parturient with Congenital Long QT Syndrome

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Introduction: Congenital long QT syndrome leads to anesthetic challenges because many medications can dangerously prolong the heart-rate corrected QT interval (QTc). This can lead to an increased risk for sudden cardiac death. Pregnancy leads to increased heart rate variability and has been shown to increase the incidence of prolonged QTc in patients with congenital long QT syndrome. While parturients with congenital long QT syndrome often have unremarkable peripartum courses, the potential for transformation into Torsades de Pointes and sudden cardiac arrest require additional precautions in both anesthetic and obstetric planning.

Case One: We report the case of a 25-year-old female G1P0 who presented at 37-weeks gestation. She was diagnosed with congenital long QT syndrome at age 16. The patient was started on Nadolol and remained on the medication until she had a loop recorder placed. Multidisciplinary care with maternal fetal medicine, obstetrics, and obstetric anesthesiology was initiated for delivery planning. It was determined that certain obstetric and anesthetic medications would be avoided or used with caution due to increased risk of developing prolonged QTc. Some contraindicated medications included: volatile anesthetics, succinylcholine, and ondansetron. Oxytocin should be used with caution, with large bolus doses avoided. A list of contraindicated medications was readily available to providers and posted on the labor room door. The patient had a scheduled induction of labor. She had an early epidural placement with a slow load of bupivacaine 0.125% for labor analgesia. The patient ultimately failed induction of labor with oxytocin augmentation and delivered via caesarean-section uneventfully. An emergency crash cart was readily available at all times. The parturient was continuously monitored on telemetry throughout the peripartum period with no episodes of prolonged QTc.

Discussion: A comprehensive, multidisciplinary approach to patient care with obstetrics, maternal fetal medicine, and obstetric anesthesiology can optimize parturients with congenital long QT syndrome for safe delivery of the fetus and peripartum care for the patient.

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acquired disorders of the QT interval. Br J Anaesth. 2018 Apr;120(4):629-644. Epub 2018 Feb 17. PMID: 29576105. 2. Kies, SJ et al(2005). Anesthesia for patients with congenital long QT syndrome. Anesthesiology, 102(1), 204–210. PMID: 20136804 3. Roston TM et al. Caring for the pregnant woman with an inherited arrhythmia syndrome. Heart Rhythm. 2020 Feb;17(2):341-348. Epub 2019 Aug 7. PMID: 31400520. 4. Garg L et al. Influence of Pregnancy in Patients With Congenital Long QT Syndrome. Cardiol Rev. 2017 Jul/Aug;25(4):197-201. PMID: 27054604.

Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 12

Anesthetic Management of Parturient with Severe Mitral Stenosis and Recent Flash Pulmonary Edema

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Introduction: A 33-year-old G2P1001 at 32 weeks gestation with past medical history significant for rheumatic heart disease, severe mitral stenosis, and cesarean section 5 years prior with postpartum course complicated by flash pulmonary edema requiring prolonged intubation, presented to the emergency department in acute respiratory distress. After further evaluation, she was found to be in fluid overload with diffuse B-lines on bedside POCUS exam. She was admitted to the Cardiac ICU for acute hypoxemic respiratory failure in setting of flash pulmonary edema due to severe mitral stenosis. She remained in CICU for 4 days where she was placed on a nitroglycerin drip for blood pressure control, aggressively diuresed, and weaned off of supplemental oxygen. An urgent multidisciplinary meeting was held between obstetric anesthesia, cardiac anesthesia, MFM, OB, cardiothoracic surgery, cardiology, and NICU team members. Mitral valvuloplasty was offered and declined by the patient. A plan was made to deliver the fetus at 35 weeks via cesarean section, or sooner if maternal or fetal conditions indicated.

Case One: Delivery occurred in the cardiac OR at 34 weeks gestation. Pre-induction arterial line was placed, as well as a multi-lumen access catheter (MAC) with Swan-Ganz. Once venous and arterial access was obtained, a low-dose combined-spinal epidural was performed without complication. The intrathecal dose consisted of 0.6mL of bupivacaine 0.75%/Dextrose 2mL, 0.15mg morphine, 10mcg fentanyl, and 0.1mg epinephrine. The epidural was loaded incrementally with 5mL 2% lidocaine while maternal hemodynamics were maintained via phenylephrine infusion. After surgical level of anesthesia was obtained, CT surgery placed femoral artery and venous access sheaths in event extracorporeal membrane oxygenation (ECMO) was required. The cesarean section was performed without complication, and the patient was taken to cardiothoracic ICU post-operatively for further monitoring. Her peripartum course was uncomplicated, and she was discharged from the hospital 4 days later.

Discussion: Mitral stenosis is a form of valvular heart disease marked by narrowing of the

mitral valve orifice. It occurs more commonly in females with onset occurring typically between the third and fourth decades of life with an estimated incidence of 1 in 100,000 (though prevalence is much higher in developing countries). Though many women may live asymptomatically, the physiologic changes that occur in pregnancy can result in quick decompensation with significant morbidity and mortality. This case discusses anesthetic considerations and multidisciplinary management of a parturient with severe, symptomatic mitral stenosis.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 13

Management of Cesarean Section Delivery in a Patient with Heart Failure with Reduced Ejection Fraction and Pericardial Effusion

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Introduction: Management of hemodynamics in obstetric patients with coexisting cardiovascular disease undergoing neuraxial anesthesia (NxA) for cesarean section (CS) presents unique challenges. This case discusses anesthetic planning and hemodynamic management of an OB patient with concurrent heart failure with reduced ejection fraction (HFrEF) and pericardial effusion during a CS performed under a modified combined spinal epidural (CSE).

Case One: A 34 year old P1001 with type 2 diabetes and chronic hypertension presented with twin gestation at 33 weeks for worsening dyspnea, cough, and headache. Initial assessment revealed tachycardia, tachypnea on nasal cannula, and hypertension. The patient was diagnosed with severe superimposed preeclampsia. Workup showed elevated B-type natriuretic peptide and pulmonary edema on chest x-ray. Transthoracic echocardiography revealed a mildly dilated left ventricle with global hypokinesis, ejection fraction of 30-35%, moderate mitral regurgitation, and a small to moderate sized pericardial effusion. Due to increasing oxygen requirement, preeclampsia with severe features, and breech fetal position, an expedited CS was planned. Prior to NxA, two 20G IVs, a central venous line, and arterial catheter were placed with epinephrine and dobutamine infusions in-line. A CSE was performed with 2.5mg of 0.5% isobaric bupivacaine, 15mcg fentanyl, and 100mcg morphine injected into the intrathecal space. A phenylephrine infusion of 1.5mcg/kg/min was required to maintain mean arterial pressure above 65mmHg. After five minutes, the sensory block level was inadequate at T10, prompting an additional 5cc of 2% lidocaine with epinephrine through the epidural catheter, resulting in an improved bilateral T5 block at 15 minutes. The case proceeded without complications, with no increased ventilatory, hemodynamic, or inotropic support needed. Post-partum course was uncomplicated with 1:1 nurse monitoring on labor and delivery.

Discussion: This case highlights the challenge of providing NxA in a patient with increased cardiovascular oxygen demand and cardiac output reliance on preload and afterload in setting of HFrEF and pericardial effusion. Although low dose bupivacaine has improved hemodynamic stability there is no consensus on what constitutes a “low-dose” or “cardiac CSE,” highlighting the need for personalized dosing strategy and future randomized controlled trials.[1] Our approach of using a low dose CSE with a subsequent epidural bolus was successful in avoiding

hemodynamic collapse while achieving adequate sensory level. Anesthesia preparedness and individualized low dose NxA is necessary to mitigate cardiovascular compromise in patients facing complex hemodynamic challenges.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 14

Multidisciplinary Approach for Cesarean Delivery in a Parturient with Fontan Circulation

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Co-Authors: Ina Du, MD, MPH - Louisiana State University Health Science Center

Introduction: The Fontan operation is intended for functional or anatomic single ventricle physiology, commonly diagnosed at prenatal evaluation or birth. This operation occurs as a three-stage palliation resulting in complete separation of pulmonary and systemic circulation. For forward pulmonary circulation, the patient is dependent on CVP greater than pulmonary arterial pressure. This results in a preload-dependent state, with reduced cardiac output and fixed PVR(1). With the hemodynamic changes in pregnancy, including increased plasma volume and cardiac output, patients with Fontan circulation may be unable to support the physiologic demands of pregnancy.

Case One: A 31-year-old G1P0 with history of tricuspid atresia with single ventricle s/p BT shunt followed by bidirectional Glenn and ventricle palliation via a lateral tunnel Fontan procedure. Patient subsequently developed Fontan related nodular hyperplasia of the liver. Additionally, patient has history of scoliosis. Patients functional status notable for normal LV function on TTE accompanied by a recent stress test with good exercise capacity. Prior to delivery, monthly multidisciplinary meetings with OB, MFM, anesthesia, and cardiology were held. Initial plan was IOL at 37-39wga with arterial line, continuous telemetry and close attention to volume status. Congenital TTE services from the Children's Hospital of New Orleans (CHNOLA) to be available and neuraxial anesthesia to be performed early with slow-dosed epidural with back-up plan for slow induction GETA and CS if neuraxial is unable to be obtained due to patient's history of scoliosis. In the event of maternal decompensation, plan for ECMO cannulation placement with transfer to CHNOLA for care. Patient presented in active labor @39w3d. On admission, TTE was obtained with euvolemia and good contractility. Prior to neuraxial, arterial line was placed and pre-load of 500mL administered. US-assisted epidural was placed with loading dose administered over 20 minutes. Three hours following epidural placement, fetal non-reassuring heart tones noted and proceeded to primary LTCS. Intraoperatively, patient started on 0.02mcg/kg/min of Norepinephrine for inotropic support. Postoperatively, patient was transported to ICU for monitoring with an uncomplicated postpartum course and discharge POD 4.

Discussion: The physiologic changes of pregnancy can overwhelm Fontan circulation, resulting in increased atrial wall stretch with risk of arrhythmia and heart failure. Though GETA has been utilized in previous case series(2), early epidural catheter placement with slow titration of local anesthetic is preferred regardless of delivery mode to minimize sudden changes in hemodynamics(3). In addition, multidisciplinary discussion should occur with a delivery plan in place by 28-33wga(1). With careful planning and management, successful delivery of parturients with Fontan circulation can be consistently executed.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 15

Emergent Total Hysterectomy in a Patient with Fontan Physiology Due to Delayed Postpartum Hemorrhage

Presenting Author: Daron Jacob, MD
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Introduction: This case describes a 33F with a complex cardiac history namely congenital heart disease corrected by a Fontan procedure and atrial fibrillation managed on warfarin who successfully underwent an emergent C-section due to breeched presentation, preterm labor, and profuse vaginal bleeding. She was discharged from the hospital but returned two weeks later due to vaginal hemorrhaging.

Case One: Patient is a 33F parturient with history of congenital heart disease (double inlet LV) s/p lateral tunnel Fontan procedure, coarctation of the aorta s/p left subclavian flap, paroxysmal atrial fibrillation on coumadin, SA node dysfunction + 3rd degree AV block s/p PPM w/ epicardial atrial and ventricular leads. She successfully underwent an emergent C-section due to breeched presentation, preterm labor, and profuse vaginal bleeding. She was discharged from the hospital but returned two weeks later due to profuse vaginal hemorrhaging. Due to diminished mental status, she was urgently intubated and taken to the ICU where conservative management of the hemorrhaging failed, including reversal of anticoagulation and intrauterine balloon tamponade. She was taken emergently to the OR for total hysterectomy where hemostasis was achieved with uterine removal. She was taken back to ICU postoperatively where she was later extubated uneventfully. Her resuscitation for the day totaled 10L blood products and 3L of other fluids. She was eventually discharged from the hospital without complications.

Discussion: A parturient with Fontan physiology requires a multi-disciplinary team for proper management, including a cardiac team on standby for possible ECMO cannulation. Due to the emergent nature of the situation presented in our case, a multi-disciplinary team was not able to be organized. Her physiology was taken into account in regard to her ventilator management and aggressive resuscitation. This case serves as a reminder to the audience of Fontan physiology and actions needed to maximize the possibility of a successful outcome.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 16

Anesthetic Management of a Patient with Complex Congenital Heart Disease and Cervical Spine Disease: Only Teamwork will Make This Dream Work.

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Introduction: Pregnancy can be a perilous for patients with complex congenital heart disease (CHD). They face the risk of worsening disease, including heart failure (HF) and arrhythmias.1 Many patients with CHD also have other medical conditions that make management challenging. A multidisciplinary cardio-obstetric team is key for safe care of both mother and baby.

Case One: A 34 yo black G4P0030 at 23w0d presented for pregnancy care with past medical history (PMH) of complex CHD, including coarctation of the aorta (CoA) and ventricular septal defect (VSD). Her CoA was repaired via end-to-end anastomosis, complicated by residual stenosis and multiple stents/dilations, with a residual gradient of 24 mmHg. Her VSD was repaired via left ventriculotomy, leaving behind a large LV scar and an LV ejection fraction (LVEF) of 30%. Her PMH was also significant for peripheral arterial disease (PAD) with lower extremity ischemia, complex spine disease with multiple cervical spine surgeries and residual myelopathy requiring intermittent wheelchair use, BMI of 41, obstructive sleep apnea, and asthma. At 23w3d an ultrasound showed cervical shortening and cerclage was offered. Neuraxial anesthesia was deferred given significant myelopathy. General anesthesia (GA) was induced with ketamine, propofol, and rocuronium. She developed intraoperative ventricular tachycardia and hypotension requiring norepinephrine, vasopressin, and dobutamine infusions to attain hemodynamic stability. Repeat TTE showed a further depressed LVEF of 10-15% with normal RV function. She presented again at 27w4d with worsening HF symptoms. Right heart catheterization showed PA pressures of 42/30(37) and a cardiac index of 2.8. Delivery was planned at 28w0d under GA due to myelopathy and symptomatic HF. A right sided arterial line was placed; induction proceeded with midazolam, fentanyl, propofol, lidocaine, and rocuronium; and a transesophageal echo probe was placed. Options for peripheral ECMO support were limited given her PAD. A 5 fr. sheath was placed in her left femoral vein and central arterial access was planned if needed, as femoral arterial targets were small. Following delivery, her PA pressure improved from 63/34 to 30/18, and LVEF improved to 20%. She received transversus abdominis plane blocks and was transported to the ICU. Her SvO2 values decreased to 47% on postpartum day (PPD) 2, improving with diuresis to 75%. She was discharged on PPD6. Her PP LVEF remained 25% despite guideline directed medication therapy. She was readmitted for atrial fibrillation 3 weeks postpartum.

Discussion: Multilayered complexity is common in parturients with CHD. These patients often

need procedures prior to delivery and require extensive planning. Multiple anesthetics give rise to multiple chances of irreversible deterioration in ventricular function, maternal mortality, and fetal loss.2 Knowledge of prior surgical procedures and co-morbidities can help increase the odds of successful management.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 17

Acute Myocardial Infarction in Pregnancy

Presenting Author: Julie-Ann Thompson, MD
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Introduction: In the Unites States, acute myocardial infarction occurs in 2.8 to 8.1 per 100,000 deliveries with a case fatality of 5%. There is an increased risk of coronary atherosclerotic disease among pregnant patients of advanced maternal age, active smokers, hypertension and hyperlipidemia.

Case One: The patient was a 39 year old G4P1021at 28 weeks with a medical history of opioid dependence, benzodiazepine and cigarette use, who presented with substernal chest pain radiating to the neck and right arm. Workup was significant for a troponin peak of 6.8, an EKG showing q waves in the inferior leads and a TTE showing inferior and inferolateral wall hypokinesia. Heart catheterization showed 100% occlusion of the RCA with collaterals from the LAD to the PDA. The lesion was felt to be subacute and she was managed medically with a heparin infusion. During her admission she had resolution of her chest pain and hemodynamic stability. On day two, the patient left against medical advice but was given Aspirin and Plavix with instructions to stop her Plavix 7 days prior to her scheduled C/S at 37 weeks. After confirming anticoagulation status, a left radial arterial line was placed a spinal dose was administered containing 1.6mL of 0.75% hyperbaric bupivacaine, 10mcg of fentanyl, 100mcg of duramorph and 50mcg of clonidine. A phenylephrine infusion was titrated to maintain the patient's preoperative mean arterial blood pressure and was discontinued after delivery of the neonate. Bilateral quadratus lumborum blocks were performed with 30 mL of 0.375% bupivacaine post operatively. The patient was monitored in the critical care unit on telemetry where she remained hemodynamically stable. She had adequate pain control with a multimodal pain regimen of acetaminophen, gabapentin, ketorolac and methocarbamol. She was discharged on post op day 4 without incident.

Discussion: An increase in oxygen consumption and metabolic demand during pregnancy necessitates adequate oxygenation and perfusion. In the setting of occlusive coronary artery disease with a history of infarction, maintenance of coronary perfusion pressure is crucial to the myocardium and this was achieved by the phenylephrine infusion. It was imperative that we avoid triggers for tachycardia such as inadequate pain control that could have led to cardiac compromise.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 18

Management of a Parturient with a History of Tachycardia-Induced Cardiomyopathy

Presenting Author: Jacob E. Moore, DO
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Introduction: Tachycardia-induced cardiomyopathy (TIC) is a reversible form of systolic and/or diastolic dysfunction caused by a prolonged elevated heart rate (HR). In pregnancy one of the physiologic responses to the increase in circulating volume is an increase in HR, making it important to have a good management plan for patients with a history of TIC.

Case One: A 25 y/o G1P0 with a history of anxiety and supraventricular tachycardia (SVT) presented at 36 and 1 day gestation for induction of labor (IOL) secondary to fetal growth restriction. She had undergone an ablation procedure for SVT in 2018 which was unsuccessful. She subsequently developed severely reduced ejection fraction (EF), required intubation, and an ICU stay. Cardiology started her on Metoprolol and Ivabradine with improved rate control and subsequent return to normal ventricular function. She maintained control on that combination. After becoming pregnant she visited her cardiologist who discontinued her Ivabradine and changed her metoprolol to labetalol secondary to concern for teratogenicity. She then developed an episode of sustained tachycardia (HR into the 150's) followed by an acute decrease in EF (25-30%) and ICU admission at 12 weeks' gestation. During admission, she resumed both metoprolol and Ivabradine with increased dosing. Over the following months, her heart function slowly improved with return to normal function just before IOL. At induction, she had her epidural placed early to allow gradual dosing. Throughout labor, her HR ranged 90-110. Then at ~ 12 hours into labor following artificial rupture of membranes the obstetricians began discussing cesarean delivery (C/S) as she was not progressing. At that time, the patient elected to undergo C/S. She was tachycardic into the 130's during the C/S, but despite that, the case was uneventful, and at the conclusion her HR improved. Her follow-up echo post-delivery showed normal biventricular function.

Discussion: This is an interesting case in the management of a laboring patient with a history of TIC. Knowing pregnancy can increase HR, and the concern if this occurs in a patient with a history of TIC it's crucial to have a management plan. It is also important to keep TIC in mind as associated symptoms of pregnancy may otherwise hide the signs of decreased ventricular function.

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Abstract #: THUR – CR – BS 1 – BR 4 – Broken Hearts – 19

Conservative Management of Complete Heart Block Detected During Labor

Presenting Author: Lucille Hu, MPH
Presenting Author's Institution: Case Western Reserve University School of Medicine

Introduction: Complete heart block in women of child-bearing age is rare, and incidental diagnosis during pregnancy is more so. There remain few established guidelines on management of patients presenting in labor with complete heart block.

Case One: A previously healthy 26 year old primigravida presented at 40w6d in active labor with bradycardia (30-40 bpm) and stable blood pressure. Post-epidural ECG showed complete heart block with stable junctional escape rhythm, and two doses of 0.4 mg atropine yielded minimal improvement (Fig. 1). No baseline ECGs were available, but medical history and antenatal course were unremarkable. Despite persistent bradycardia and intermittent heart block on continuous telemetry, mother and baby were in no apparent distress. After multidisciplinary planning, delivery proceeded with routine intrapartum care, standard ASA monitoring, and no indication for cardiac pacing. 0.8 mg atropine would be used for heart rate augmentation, with 5-10 mcg doses of epinephrine as needed. External patches were placed prior to delivery, and a late full-term female was delivered via forceps with the OR on standby. Maternal heart rate persisted in the 30-40s. Prophylactic oxytocin and misoprostol were used for postpartum hemorrhage prevention. Delivery was complicated by extensive vaginal lacerations contributing to estimated blood loss of 1L. The patient remained on continuous ECG until discharge. Continued heart block workup was unremarkable, resulting in permanent pacemaker insertion 9 months postpartum.

Discussion: IV atropine is first line for intrapartum bradycardia (1), and temporary pacemaker insertion is indicated for symptomatic patients. Most asymptomatic patients with complete heart block can be managed safely without pacing, monitored on continuous ECG with standby chronotropic support (2,3). As complete heart block may cause circulatory collapse, anesthetic management must prioritize hemodynamic stability, avoid bradycardia-inducing drugs and actively manage volume status (2). Epidural anesthesia is favored over combined spinal-epidural anesthesia to mitigate sympathetic surges (4). Assisted vaginal delivery is recommended to minimize Valsalva and reflex bradycardia. Ketamine and etomidate are the preferred induction agents if necessary (4). Overall, most patients with asymptomatic complete heart block have uncomplicated outcomes (3). Here, we conservatively managed a full-term primigravida with complete heart block, avoiding transcutaneous pacing. Hemodynamic stability was promoted through carefully-titrated epidural analgesia, operative vaginal delivery minimizing vagal response, and aggressive postpartum hemorrhage prophylaxis. Unexpected tears due to forceps delivery caused significant blood loss. Anticipating such events may be prudent for future management.

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Hu_Figure 1.pdf

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 01

Bilateral Erector Spinae Plane Catheters for Successful Labor Analgesia

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Introduction: Erector Spinae Plane (ESP) blocks have been used for labor analgesia, especially for the first stage of labor(1,2). We present a case of successful labor analgesia with bilateral (b/l) ESP catheters in a patient with contraindications to epidural analgesia.

Case One: A 24-year-old G3P2 at 22 weeks gestation was admitted for emergency incision and drainage of necrotizing fasciitis of perineum and then kept inpatient until delivery at 38 weeks. A year before admission, she had a gunshot wound leading to paraplegia complicated by epidural abscess and osteomyelitis from L1-L4, neurogenic bladder and pressure ulcers. Her admission was further complicated by pre-eclampsia with severe features. The pain management team was involved from the start in managing acute on chronic neuropathic leg pain as well as labor analgesia at 38 weeks of gestation. Her MRI at 18 weeks gestation showed stable complex epidural fluid collection, so the decision was made to place b/l ESP catheters. The procedure was performed uneventfully under ultrasound guidance at T12, the lowest possible visible level. 20 ml bolus of 0.25% bupivacaine was administered through each catheter directed craniocaudally. 2 CADD pumps were set to infuse at 2 ml/hr for catheter patency, and 20 cc 0.25% bupivacaine bolus on each side every 8 hours. Accidentally, the left ESP catheter got dislodged just before delivery. However, her pain was well managed throughout (VAS 0-2) labor. She delivered her baby uneventfully 24 hours after catheter placement and was discharged 15 days later.

Discussion: Offering adequate labor analgesia was a priority given her severe pre-eclampsia, chronic pain, and anxiety. The team recognized the limitations of ESP at T12 compared to ESP at L4 as demonstrated by others(1) for labor analgesia as well as traditional lumbar epidural. There was a significant chance that ESP at T12 might not cover the second stage of labor (S2-S4). Also, it couldn't serve as the primary anesthetic for an unplanned cesarean delivery if needed. The local anesthetic (LA) in ESP spreads over 3-6 vertebral levels in a craniocaudal direction(3). Celik et al(4) have shown by MRI that a single u/l ESP injection at L4 TP can spread LA up to S4 with b/l spread of LA and spread to the anterior and posterior epidural space. We used high volume and intermittent bolus over continuous infusion to keep the space patent and facilitate adequate spread of the block. Most likely the accidental dislodgement of the left ESP was covered by LA already present in the space and central spread from the right ESP catheter to provide adequate pain relief.

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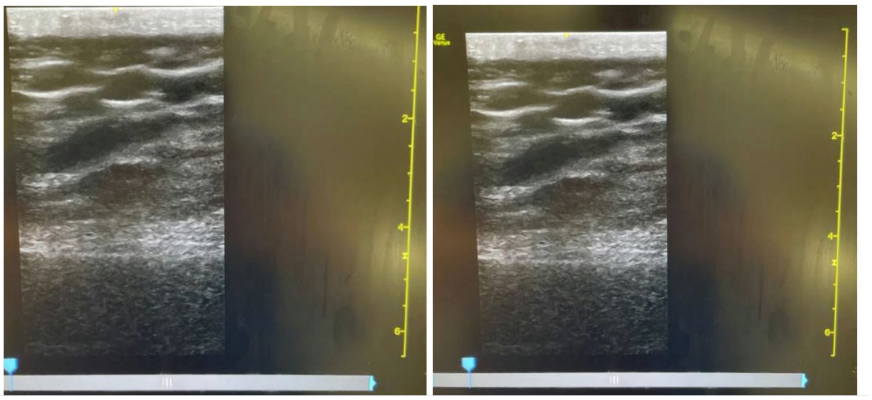

US guided Right and Left ESP block

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 02

A Case of Cosmetic Experimental Biopolymers Leading to Non-Neuraxial Management of Labor Analgesia

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Co-Authors: Stephanie W. Lee, MD, PhD - Massachusetts General Hospital, Department of Anesthesia, Critical Care, and Pain Medicine
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Introduction: Biopolymers such as silicone have been injected in body contouring procedures despite warnings against their use. These non-compacted biopolymers can migrate from the gluteal region to lumbosacral subcutaneous tissue of the spine, posing a risk to safe neuraxial anesthesia (1). We present a parturient with a history of gluteal augmentation using biopolymers and MRI evidence of migration to areas overlying the lumbar spine.

Case One: A 33-year-old G3P0 presented for an anesthesia consult for history of a cosmetic gluteal augmentation procedure with experimental biopolymers roughly 10 years prior in another country. The patient reported that she had been told by a surgeon from that country that these biopolymers could migrate and was encouraged to obtain imaging but had not done so. A lumbar spine MRI was subsequently ordered and showed subcutaneous nodularities at L5-S1 with soft tissue changes extending to L2-L3. After review of literature, she was counseled that she was not a candidate for neuraxial anesthesia during labor due to significant risk of introducing biopolymer material into her spinal or epidural space (1). She then presented at 41 weeks for induction of labor in the setting of late term gestation. Her pain was initially managed using nitrous oxide and subsequently a fentanyl patient-controlled analgesia pump (PCA). When she reached the second stage of labor, a pudendal nerve block was performed by the obstetrics team and provided relief. Approximately 22 hours after admission she had an uncomplicated spontaneous vaginal delivery. Fentanyl PCA was discontinued following repair of a second-degree vaginal laceration. She had an uncomplicated postpartum course and was discharged on postpartum day two.

Discussion: Literature describes unpredictable migration of biopolymers used in body contouring procedures. MRI is recommended as the best imaging modality to assess for migration as ultrasound typically only identifies larger particles and the particles are not palpable on physical exam (1). Unfortunately, these substances have also been associated with inflammation, edema, and necrosis at sites of injection and migration. Performing neuraxial anesthesia in a patient with known lumbar migration of biopolymers thus risks perforation and release of injected substances into the spinal or epidural space, exposing the nervous system to potential toxicity. Ultimately, more investigation is needed to understand the physiological consequences of biopolymers. Patients with a history of cosmetic surgery with non-compacted biopolymer injections should have MRI imaging prior to neuraxial

anesthesia and require careful coordination of care with education on both pharmacological and non-pharmacological methods of analgesia should they not be a candidate for neuraxial anesthesia.

References: (1) Amaya-Zúñiga et al.Col. J. of Anesth. 2021.

Lumbar Spine MRI T2.pdf

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 03

Shared Spaces: Ultrasound-Guided Labor Epidural Placement in a Patient with a Spinal Cord Stimulator

Presenting Author: Shayna Levine, MD MS
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Introduction: Spinal Cord Stimulation is an accepted technique for treating intractable pain. This technique is increasingly being offered to females of childbearing age who may become pregnant and require labor analgesia. It is important for obstetric anesthesiologists to be aware of this population who have special considerations in their analgesic management.

Case One: A 38-year-old female G7P4 at 38 weeks-gestation presenting for induction of labor. Medical history is significant for chronic back pain s/p multiple lumbar spine surgeries, and spinal cord stimulator (SCS) implantation. Post-surgical MRI showed SCS leads entering the spinal canal at T11-12 and extending to T7. The implantable pulse generator was in her left buttock. Obstetric history was significant for four vaginal deliveries with epidural analgesia prior to SCS implantation. High risk obstetric anesthesia evaluation was completed at 34 weeks' gestation. After extensive discussion of the risks and benefits, the patient desired labor epidural analgesia. The distance between T12 and L4 vertebrae was measured as 13 cm on MRI. Epidural placement at L4-5 interspace was planned to avoid risk of disrupting the leads. In the sitting position before epidural placement, ultrasound was used to identify the L4-5 and T12-L1 interspaces and confirm distances. Loss of resistance was obtained at 4cm, the catheter was advanced < 10cm in the epidural space, and secured at 9cm at skin. Patient proceeded to have an uncomplicated vaginal delivery with a functioning epidural and no anesthetic complications.

Discussion: There are theoretical risks for neuraxial anesthesia with an implanted SCS. This includes decreased efficacy of epidural analgesia, damage to hardware, as well as increased risk of infection. It has been shown that fibrous deposits form around implanted electrodes which may impede epidural spread and minimize analgesic effect (2). Although quite rare, infection of hardware in the setting of neuraxial anesthesia is an inherent risk. To date, there have been no reported neuraxial infections in patients with SCS receiving labor neuraxial analgesia making an estimated risk difficult to obtain (1,3). Antepartum discussion with informed consent is an important part of care. Prior lumbar spine surgery distorts the epidural space making epidural placement potentially difficult. Neuraxial ultrasound assessment aids in precise evaluation of the epidural space as well as the location of implanted hardware. This allows for access to the epidural space a safe distance away from implanted hardware while providing labor analgesia. Obstetric anesthesiologists should be aware of this clinical scenario as the use of SCS for chronic pain patients of childbearing age is increasing.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 04

Neuraxial Anesthesia for Repeat Cesarean Delivery in a Patient With a History of CRPS Type II Following Her Previous Delivery

Presenting Author: Shakthi Jayanthy Venkatachalam, MBBS
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Introduction: Postpartum complex regional pain syndrome (CRPS) is rare and anesthetic management of obstetric patients with a history of CRPS is limited to a handful of case reports describing both neuraxial and general anesthesia (1). We present a patient who developed lower extremity CRPS type II following her first cesarean delivery (CD) presenting for a repeat CD.

Case One: A 40-year-old G3P1 at 39 weeks' gestation presented for a repeat CD. Her first CD was seven years ago for arrest of descent and chorioamnionitis. A labor epidural was used for anesthesia. Her CD was complicated by atony treated with uterotonics. She presented to neurology eight weeks postpartum with pain, numbness and tingling in her right leg and bilateral leg weakness requiring a walker that started 1-week post-delivery. Exam of the right lower extremity revealed a dusky foot, calf atrophy, paresthesia and hyperesthesia in the lower leg, ankle and great toe flexor weakness, with normal deep tendon reflexes, and absent upper motor signs. MRI was negative; EMG revealed evidence of lumbosacral plexopathy. The Budapest Criteria were met, CRPS type II was diagnosed, and the patient was referred for physical therapy and prescribed nortriptyline. She had significant improvement over seven months with near full resolution of symptoms. Presenting for her repeat CD, she had minimal residual symptoms and was concerned about CRPS recurrence. Following a comprehensive risk-benefit discussion on general and neuraxial anesthesia, the patient chose spinal anesthesia. An uneventful spinal anesthetic with 1.8 cc of 0.75% hyperbaric bupivacaine, 15 mcg of fentanyl and 100 mcg of morphine provided bilaterally equal, adequate anesthesia for the CD, with no increased analgesic requirements, and no delay in resolution. The postpartum period was uneventful. On postpartum day 1, her spinal sensory and motor block had fully resolved. At the 1 and 6-week postpartum visits she reported no CRPS recurrence.

Discussion: Data on the peripartum incidence and anesthetic management of lower extremity CRPS is limited (1-4). Our report offers evidence for use of standard dose spinal anesthesia for CD in a patient with prior lower extremity CRPS post-CD and near resolution at the time of repeat CD. Peripartum CRPS is rare, but evidence supports symptom relief with sympathetic nerve blocks, spinal cord and dorsal root ganglia stimulation in non-obstetric cases (5). Recurrence is higher in younger patients having surgery at 10-30% (6). Sympathetic block and

neuraxial anesthesia may minimize recurrence in addition to maintaining perfusion and hemostasis, but data is lacking. We believe neuraxial anesthesia could benefit obstetric patients with CRPS rather than general anesthesia as reported in prior case reports; however, multidisciplinary, tailored management and close peripartum surveillance for recurrence are crucial.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 05

Dexmedetomidine Infusion for Effective Analgesia and Prevention of Spasticity and Shivering in a Patient with Spastic Cerebral Palsy After Failed Epidural Placement: A Case Report

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Introduction: Spasticity is a consequence of neurologic diseases, such as spina bifida, trauma, and multiple sclerosis. Spasticity can be profoundly painful, and can be triggered by a number of conditions such as pain, shivering, and stress. Shivering is common during labor and delivery and occurs in at least 50% of laboring women1. Several medications have previously been used to prevent and treat shivering. Recently, dexmedetomidine was shown to be effective in preventing shivering based on evidence with bolus administration during cesarean delivery;2,3 there is a paucity of evidence for use during labor or as a continuous infusion. We present the first case of dexmedetomidine infusion for the control of shivering and spasticity in a patient with neurologic disease.

Case One: MH is a 37-years-old G2P1 at term with a history of cerebral palsy requiring extensive dorsal rhizotomy in childhood leading to residual spasticity, chronically on baclofen outside of pregnancy. Previous neuraxial analgesia was ineffective, likely owing to extensive scarring of her epidural space. She also experienced painful spasticity triggered by contractions and post-delivery shivering. After comprehensive anesthesia consultation and discussion with the Obstetric team, in lieu of ineffective epidural analgesia, she was treated with IV fentanyl patient-controlled analgesia (PCA) and dexmedetomidine infusion (0.15-0.20mcg/hour, total infusion time 3.5 hours). Immediately after delivery, she received oral baclofen. She reported effective analgesia, experienced neither shivering nor spasticity, and was satisfied with her anesthetic care. There were no anesthetic complications, both maternal and neonatal outcomes were good, and the patient was discharged home on post-delivery day 2.

Discussion: Impossible neuraxial analgesia creates a challenge for the OB anesthesiologist. Spasticity can create a secondary source of pain, but treatment is limited in pregnancy (Table 1). This patient's baclofen was held for pregnancy, and she experienced severe spastic pain from shivering with her first delivery. Dexmedetomidine works through α2-receptors for treatment of shivering, spinal cord relaxation of motor nerves to reduce spasticity, and has an analgesic component which may have aided this patient. Dexmedetomidine was effectively used in conjunction with a fentanyl PCA to provide both analgesia as well as to prevent shivering. Clinical trials are required to determine the safety and efficacy profile of dexmedetomidine in a larger population of laboring women culminating with vaginal delivery.

References: 1. PMID: 18433676 2. PMID: 33293185 3. PMID: 30945105

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 06

Dexmedetomidine to Potentiate Epidural Analgesia During the Second Stage of Labor: A Case Report

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Wyatt McGilvery, BS - Riverside University Health Systems
Kenneth Nguyen, DO - Riverside University Health Systems
Ioana Pasca, MD - Riverside University Health Systems
Ashish Sinha, MD, PhD, MBA, MSEd - Riverside University Health Systems

Introduction: Labor epidural analgesia (LEA) is the gold standard for the treatment of labor pain and is crucial for the well-being of the parturient and fetus. However, sacral analgesic coverage proves difficult with lumbar LEA since, compared to lumbar and thoracic roots, the sacral roots are larger in diameter and are surrounded by thicker dura mater, creating distance from the tip of the epidural catheter. To achieve adequate sacral analgesia, alternatives include using a higher volume or concentration of local anesthetic at the cost of an increased risk of motor blockade. We report the use of epidural dexmedetomidine (DXM) as an adjunct to produce excellent analgesia with preservation of motor function during the second stage of labor.

Case One: Patient: A 28-year-old G4P2 parturient at 39w1d was admitted for induction of labor. Initial Epidural Infusion: She underwent epidural placement at the L4–5 level without complications and achieved satisfactory analgesia with a solution of ropivacaine 0.1% and fentanyl 2mcg/ml delivered as an intermittent bolus of 10ml every 40 minutes with patient-controlled boluses as needed. When labor progressed into stage two labor, the patient reported increasing groin pain. Secondary Analgesia Attempt: A 10ml bolus of the ropivacaine/fentanyl mixture was administered with continued poorly controlled groin pain that was severe and felt with contractions. Final Analgesia Attempt: DXM 2mcg was administered epidurally, followed by 5ml of the ropivacaine/fentanyl mixture. The patient reported rapid elimination of pain and maintained motor function until spontaneous vaginal delivery 64 minutes after DXM administration. After delivery, the patient had no pain during the incidental laceration repair.

Discussion: Conventional epidural solutions often fall short in mitigating pain during the critical second stage of labor. This case report supports the hypothesis that using DXM may allow improved analgesia without significant motor blockade during the second stage of labor. Combined with a local anesthetic and delivered via an epidural catheter, DXM expedites peak analgesia and extends the sensory block duration. In this case, the addition of epidural DXM resulted in a painless second stage of labor but preserved the ability to push with the contractions. This underscores DXM’s promising role as a pivotal adjunct in optimizing pain

management throughout labor, particularly in the second stage. DXM may be considered as an adjunct epidural treatment for analgesic relief during the second stage of labor. Further studies on DXM use in this setting would further delineate DXM's role in effective obstetric neuraxial anesthesia techniques during the second stage of labor. Studies evaluating the use of DXM in neuraxial anesthesia may provide greater insight on the pharmacologic implications of dexmedetomidine beyond its traditional clinical applications.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 07

Hips Don't Lie: Atypical Pain from Peripartum Pubic Symphysis Diastasis

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Introduction: Changes occurring throughout gestation can result in dramatic alterations to maternal anatomy and physiology. The pubic symphysis is a non-vascular joint supported by four ligaments and the muscles of the pelvic floor. Pubic symphysis diastasis (PSD), excessive widening of the pubic symphysis, is a relatively rare complication of vaginal delivery with an incidence ranging from 1/300 to 1/30,000.1

Case One: A 19-year-old female G1P1, 40w1d gestation, underwent induction of labor for PROM. 7 hours after induction, the patient requested epidural analgesia which was uneventful. There was subsequent vaginal delivery of a healthy infant with excellent analgesia. The delivery was complicated by postpartum hemorrhage treated with uterotonics and placement of a vacuum-induced hemorrhage control device. Two days following vaginal delivery, the patient complained of diffuse total body pain rated at 10/10, diffuse weakness, and lower extremity paresthesiae. She was unable to ambulate due to pain and weakness. A pain diagram indicated most severe pain anteriorly in a band stretching laterally across the suprapubic area between the left, right anterior-inferior iliac spines, and laterally across the L5 vertebral level. There was no report of change in bowel and bladder function. Exam showed a distraught woman very guarded in movements. There was diffuse tenderness over the lumbar sacral spine, abdomen, and pelvis, and diffuse bilateral distal lower extremity numbness to light touch. There was no saddle anesthesia. Motor exam showed reduced, bilateral, symmetrical 4/5 muscle strength for hip flexion and knee extension. MRI of the thoracic and lumbar spine showed no abnormalities. Spine surgery consultation recommended non-surgical management. Psychiatric evaluation opined that the patient did not meet any criteria for anxiety, depression, psychosis, or PTSD. The patient was placed on a multimodal pain regimen including acetaminophen, duloxetine, gabapentin, methocarbamol, and ibuprofen with only modest improvement in her pain and function. The following day a diagnostic procedure was performed. An pelvis x-ray revealed widening of the pubic symphysis. PSD was diagnosed and the patient was treated with an external compression belt with physical therapy begun. The patient had rapid improvement in her pain and function. The patient was safely discharged home four days after onset of pain.

Discussion: PSD has a low pre-test probability and numerous differentials. Here we present a atypical presentation of peripartum PSD. Rather than traditional pelvic girdle pain, the patient presented with diffuse total body pain, paresthesiae, and weakness on exam. Management for PSD begins with mechanical stabilization of the pelvis with external compression belts

along with pelvic floor strengthening exercises. Management includes ice, NSAIDs, and possibly glucocorticoids.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 08

Is Fentanyl Necessary? Using Intrathecal Dexmedetomidine Instead of Fentanyl in Spinal Anesthesia for Cesarean Delivery: 2 Case Reports

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Introduction: Intrathecal spinal anesthesia with bupivacaine, morphine, and fentanyl is a common practice for cesarean delivery (CD).1 Fentanyl is used as part of the spinal anesthetic for faster onset, denser blockade, less need for conversion to general anesthesia, as well as reduction in nausea, vomiting, and shivering. However, it carries risks such as pruritus, potential for addiction, and respiratory depression, hence, prompting research for alternatives. Dexmedetomidine (DXM) is a selective α2-adrenergic agonist with analgesic and sedative properties. It also acts synergistically with local anesthetics, like bupivacaine, by blocking the hyperpolarization-activated cation current.2 Possible benefits of DXM as an adjuvant for anesthesia include faster onset, denser blockade, and longer duration.3 Use of DXM may also reduce risks of pruritus, respiratory depression, and addiction.

Case One: A 33-year-old G6P3 woman, 39 weeks gestation with a history of 3 prior CDs, was scheduled for an elective CD. Spinal anesthesia was initiated with intrathecal administration of bupivacaine 0.75% 12 mg, morphine 150 µg, and DXM 2 µg. Acetaminophen and ibuprofen were given IV after delivery. No supplemental analgesics were required intraoperatively. The patient reported no nausea, emesis, or pruritis intraoperatively or postoperatively. The first rescue pain medicine was given 4 hours 41 minutes after placement of the spinal.

Case Two: A 40-year-old G3P2 woman, 37 weeks gestation, was scheduled for elective CD. She had 2 prior CDs and a tubal ligation reversal. Her current pregnancy was complicated by advanced maternal age, gestational diabetes, and uterine synechiae. Spinal anesthesia was initiated with intrathecal administration of bupivacaine 0.75% 12.75 mg, morphine 150 µg, and DXM 2 µg. Acetaminophen and ibuprofen were given IV after delivery. No supplemental analgesics were required intraoperatively. The patient reported no nausea, emesis, or pruritis intraoperatively or postoperatively. No prn pain medications were required for the first 24 hours after surgery.

Discussion: Effective pain control is vital for cesarean deliveries. These cases support the use of DXM as a substitute for fentanyl as it demonstrated rapid onset of anesthesia, dense blockade, and avoided conversion to general anesthesia. For these cases, there was no reported pruritis, nausea, vomiting, or respiratory depression. Future studies should further

prospectively explore its efficacy and safety.

References: See attachment.

pdf DXM replace fentanyl SOAP References.pdf

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 09

Anesthetic Management for Cesarean Section in a Parturient with Known Conversion Disorder

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Introduction: Functional neurologic disorders have been described in cases associated with both regional and general anesthesia (GA). We present a case of a patient with known conversion disorder following spinal anesthesia for cesarean section (C-section) presenting for repeat C-section.

Case One: A 39-year-old G4P3012 female at 38 weeks with history of HTN, known conversion disorder, and two prior C-sections presented for a scheduled repeat C-section. Her last delivery under spinal anesthesia, occurring five years prior, was complicated by poor pain control throughout the delivery and development of unexplained neurologic symptoms of dysarthria, unilateral weakness, and right facial drooping mimicking stroke symptoms. Her symptoms never resolved and recurred on a daily but self-limited basis, exacerbated by manipulation of the back, spine, or neck and the supine position. Preoperative evaluation by our team included lengthy discussion regarding the optimal and safest anesthetic plan for her delivery. Given her prior traumatic experience and symptom exacerbation with manipulation of the back, we agreed general anesthesia (GA) was reasonable to avoid triggers. Intraoperatively, the patient tolerated a slow recline to supine, communicating with hand signals during symptom recurrence, allowing for pre-induction prep/drape. Rapid sequence intubation was performed and surgery proceeded uneventfully. Multimodal analgesia included fentanyl, ketorolac, acetaminophen, and transversus abdominis plane blocks. Emergence was uneventful, and our patient reported satisfaction with her care.

Discussion: According to ASA practice guidelines, neuraxial techniques remain the preferred anesthetics for C-section. The decision to electively perform GA is typically reserved for patients with absolute or strong relative contraindications. The plan for GA in our patient was made in the hopes of minimizing repeat of the stressful situation that may have led to her conversion disorder. Although neuraxial remains standard of care, it is important to note there has been marked improvement over time in the safety of C-sections performed under GA. Some studies have suggested GA is a safe alternative for newborns. In addition, the availability of improved anesthesia equipment and difficult airway guides is thought to explain some of the decrease in morbidity and mortality associated with GA in obstetric patients. Despite improvements, it is still recommended to reduce avoidable GA in this population. Our patient's history of conversion disorder following spinal anesthesia presented a unique

challenge. Although it is still advised to avoid GA during C-sections when able, knowledge of continued improvement in outcomes under GA may help guide the multidisciplinary decision-making process.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 10

Mental Health and an Effective Obstetric Anesthesia Care Plan

Presenting Author: Robert Trainor
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Wandana Joshi - Baystate Anesthesia

Introduction: Obstetric care is not routine and often a multidisciplinary approach between OBGyn, Maternal-Fetal-Medicine, Primary Care, and Anesthesiology. Poor mental health in pregnant women is now well known to have detrimental effects on both the mother and the developing fetus.1

Case One: 38-year-old female, G6P2, in hypertensive emergency with severe preeclampsia complicated by multiple strokes at 23w+5d. Additional history includes: - sexual violence/trafficking - homelessness - substance use disorder - anxiety - PTSD - demyelinating disease The patient arrived with an initial blood pressure of 207/190. Psychiatry was consulted and deemed the patient did not have capacity to make medical decisions and was not permitted to leave AMA. She was given IV Hydralazine and agreed to undergo a planned cesarean section. The anesthetic plan was to proceed with neuraxial, however the patient became combative. The plan was amended to general anesthesia for patient and provider safety. The patient was induced and the airway secured. Post-induction, IV nicardipine was used to bring pressures to within normal limits. The obstetric team notified the anesthesia team that there was hemorrhage secondary to uterine atony. Pitocin Infusion had been started and the patient received IV TXA and IM carboprost. The anesthesia team switched from inhaled agent to TIVA and began a phenylephrine drip. Bleeding was controlled. A nicardipine drip was continued upon emergence and extubation. Care transitioned to the ICU team given the patient's reliance on the nicardipine drip.

Discussion: Poor mental health can lead to adverse outcomes such as preterm labor, low birth weight, early neonatal developmental disorders, and neurodevelopmental issues during adolescence. 2-3 Treating mental health issues during pregnancy involves a comprehensive and individualized approach. The mental health components of maternal care can often be discounted as to their importance in forming a constructive care plan. This abstract aims to discuss awareness of mental health and the critical role it plays. Understanding, valuing, and recognizing the effects of mental health is paramount to providing quality maternal, fetal, and neonatal care and essential in keeping patients safe throughout pregnancy.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 11

Anesthetic Considerations and Physiological Impact of Electroconvulsive Therapy in a Pregnant Patient with Catatonia

Presenting Author: Jovan M. George, DO
Presenting Author's Institution: Albany Medical Center - Albany, New York

Introduction: This case report examines the anesthetic management strategies, emphasizing risk for aspiration, in pregnant patients with psychiatric disorders undergoing electroconvulsive therapy, while ensuring maternal-fetal safety.

Case One: A 24-year-old and 14-weeks pregnant woman with history of mood disorders and catatonia was hospitalized for severe catatonia. Initial treatment with Ativan and Haldol were discontinued after patient developed extrapyramidal symptoms. With court permission, electroconvulsive therapy (ECT) was initiated. Prior to each session, patient maintained NPO status and received IV hydration, oral Bicitra 30mg and IV Glycopyrrolate 0.1mg. After pre-ECT fetal heart rate monitoring and left uterine tilt, general anesthesia was induced using IV Propofol 130mg and Succinylcholine 30mg. Following satisfactory sedation and muscle relaxation, an oral airway was placed and the patient was administered rapid succession of breaths through a bag valve mask. The oral airway was then replaced with a soft bite block and ECT was administered. Vital signs and depth of anesthesia were closely monitored throughout each ECT session. Patient's catatonic symptoms improved significantly with 8 ECT sessions lasting until 22nd weeks of gestation without any complications.

Discussion: The complexities of ECT in pregnant patients are linked to physiological changes in pregnancy. These include increased blood volume, systemic vascular resistance, and oxygen consumption, influencing anesthesia in ECT (1). Pregnancy-induced gastrointestinal changes like altered esophagus-diaphragm-stomach dynamics, delayed gastric emptying, and reduced esophageal sphincter tone, heighten aspiration risks (2). However, gastric pH and volume in women under 20 weeks pregnant are similar to non-pregnant women (2). The case highlights the need for meticulous anesthesia management in pregnant ECT patients, emphasizing aspiration prevention and airway safety. Individual risk-benefit analysis is crucial for ECT administration. This case supports ECT's safety and efficacy in treating psychiatric disorders during pregnancy, notably in drug-resistant catatonia, without adverse effects on mother or child (3). It underscores adapting anesthesia to pregnancy's unique physiological changes, ensuring maternal and fetal well-being during ECT. Tailoring anesthesia approaches in these scenarios is crucial for optimal outcomes and highlights the evolving nature of medical care in specialized circumstances like pregnancy.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 12

Uncommon Cause of Altered Mental Status in the Parturient with Polysubstance Use: Could it be the Thyroid?

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Introduction: While rare in pregnancy, overt hypothyroidism can increase risk of hypertensive disorders of pregnancy, non-reassuring well-being, IUGR, PPH, need for c-section and adverse neonatal outcomes. Myxedema coma is a rare life-threatening consequence of untreated hypothyroidism. Progression to myxedema coma in pregnancy has rarely been reported and often difficult to diagnose. Early recognition and treatment is paramount given the relatively high mortality rate. Presentation is non-specific and may mimic pre-eclampsia with hypertension, proteinuria, encephalopathy and generalized edema. There is often a precipitating event, including labor or infection (1).

Case One: 35-year-old G5P1031 at 35w4d with active polysubstance use (methamphetamines, cocaine, opioids, benzodiazepines), known severe preE, IUGR, hypothyroid, hepatitis C and bipolar presented with IUFD. During induction, patient became increasingly somnolent precluding her ability to consent for neuraxial anesthesia. Initial concern for ongoing drug use however only moderate improvement following naloxone. Following uncomplicated delivery patient remained hypothermic and increasingly obtunded. Labs significant for profoundly elevated TSH (124), elevated troponins and Covid + at which point concern for myxedema coma raised. Transferred to MICU for initiation of IV thyroid replacement. Hospital course complicated by aspiration PNA for requiring intubation/ventilation and withdrawal.

Discussion: It is important to maintain a comprehensive differential when evaluating a laboring patient with altered mental status, particularly in patients with substance use disorder and severe pre-eclampsia (Mg overdose, intoxication, hypercarbia, hypoxia, stroke, seizure, sepsis, PRES). Even with recent active substance use, one must rule out underlying medical causes (hypoglycemia, hypoxia, anemia, myocardial ischemia). Overt hypothyroidism/ myxedema in pregnancy is rare and can be difficult to diagnose but must be considered in any patient with known hypothyroidism. Given its high mortality, it is important consult endocrinology to initiate treatment early with transfer to ICU for close hemodynamic monitoring. Treatment includes IV levothyroxine and IV hydrocortisone. Anesthetic considerations include airway edema, intravascular volume depletion, catecholamine resistant cardiac depression, arrhythmia, coagulopathy and increased aspiration risk. (1,2)

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 13

Incomplete Spinal Anesthesia in a Term Patient with Dorsal Root Ganglion Stimulator- A Case Report

Presenting Author: Hande Bilen, MD
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Introduction: There has been an increased use in Spinal Cord Implants (SCI) as a treatment option for adults with chronic pain syndrome [1]. An estimated 50,000 SCI are implanted annually [2]. Therefore, it is not unusual to see patients with SCI in the obstetric population. This case report involves an unexpected failed spinal anesthetic in a patient with a dorsal root ganglion (DRG) stimulator.

Case One: A 38-year-old G1P0 measuring 157.5 cm with a body mass index of 28.8 presented for a scheduled primary cesarean delivery (CD) in the setting of a DRG stimulator for chronic pain from post-herpetic neuralgia. Her chronic pain physician recommended CD out of concern for DRG lead displacement with vaginal delivery and advised against an epidural catheter due to potential for catheter entanglement with DRG leads. She had 3 prior back procedures: spinal cord stimulator in 2018, DRG stimulator in 2022, and DRG revision in 2022. Her lumbar x-ray showed multilevel marginal intervertebral disc height loss with endplate sclerosis and multilevel facet arthropathy at L4-L5 and L5-S1. Spinal anesthesia was performed with intrathecal (IT) administration of 12 mg hyperbaric bupivacaine, 15 mcg fentanyl, 200 mcg epinephrine, and 150 mcg morphine. Placement was straightforward with aspiration of cerebral spinal fluid prior to and after medication administration, however, an inadequate dermatomal level of T7 to pinprick was achieved. Notably, there was a distinct difference in sensation to pinprick right above T7, which did not change with Trendelenburg positioning. General anesthesia was recommended prior to the start of CD, however, the patient refused despite knowing she would have inadequate coverage. She was able to tolerate the delivery of her neonate under spinal anesthesia but required GA once her uterus was exteriorized. She otherwise had good post-operative pain control, likely indicating the IT morphine dose was correctly administered despite having an inadequate dermatomal level.

Discussion: Given the ease of spinal placement, appropriate dosage, and distinct dermatomal level of T7, we suspect the patient may have had an anatomical deformity from her prior surgeries limiting the spread of her intrathecal dose of local anesthetic. Failed neuraxial anesthetics have been reported in this population with epidurals but not with spinals [4]. Restriction in placement of rescue epidurals to supplement failed spinals limit the ability for anesthesiologist to provide patients their ideal awake delivery. More research is needed to understand whether patients with spinal cord implantations are at risk for inadequate coverage due to post-surgical anatomical changes with an algorithm of how to best manage these cases.

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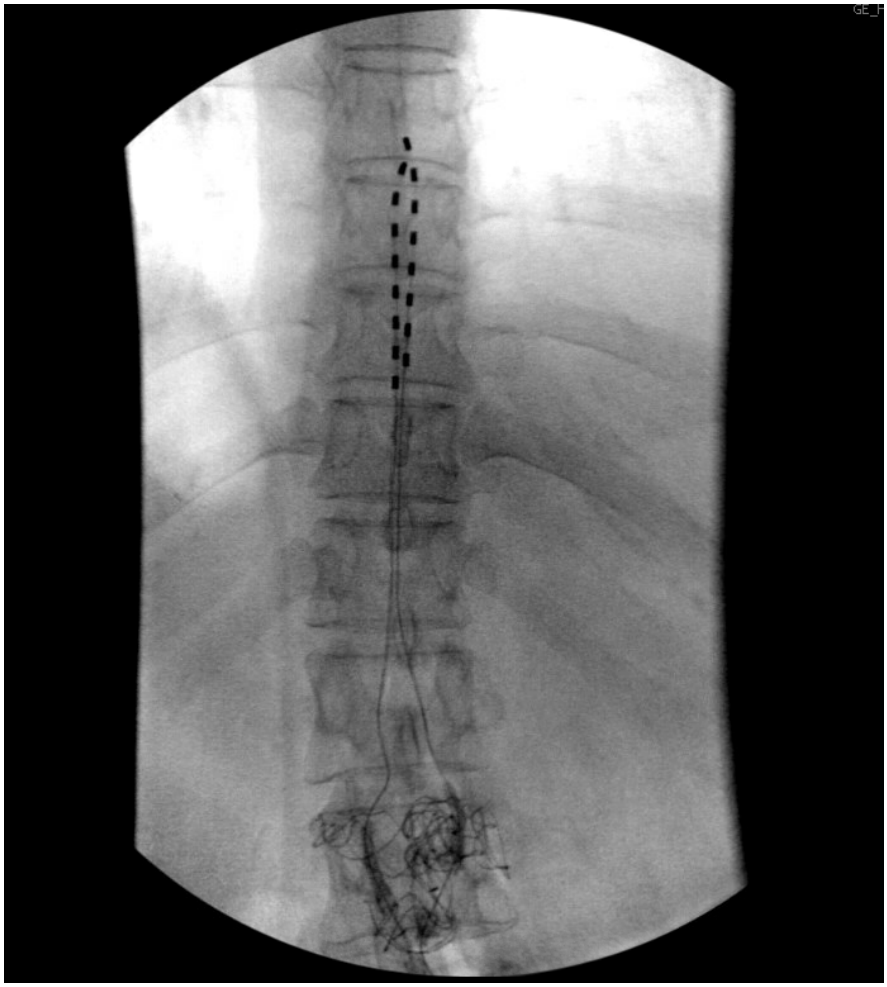

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 14

Medical Decision-Making in High-Risk Parturient without Capacity Requiring Cesarean Section

Presenting Author: Jessica Stockinger, MD
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Co-Authors: Burke Gallagher, MD - Medical University of South Carolina
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Introduction: Medical decision-making is complex in patients without capacity, let alone a high-risk parturient without capacity. Capacity has been defined by four criteria: understanding, appreciation, reasoning, and ability to make a choice 1. We present a highly medically complicated, super morbidly obese patient requiring an urgent cesarean section with severe psychiatric disease, rendering the patient unable to consent with no alternative surrogate.

Case One: A 33-year-old female G1 at 29w6ds with PMH of super morbid obesity (BMI 64.8), hypoxic respiratory failure with 5L home O2 use, schizophrenia, bipolar disorder, major depressive disorder, and drug use presented as a transfer of care for suspected preeclampsia and abdominal wall cellulitis. On arrival she was hemodynamically stable on her baseline O2. The fetus was breech with FHR in the 150s. UDS was positive for amphetamine. The patient had little understanding of the complexity of her pregnancy or the potential for imminent delivery. She was, at times, agitated and aggressive towards staff. Psychiatry was consulted for decision-making capacity. They found the patient unable to restate treatment options and unable to understand why she may need to decide on a delivery plan. Our risk management team determined she was not legally married, had no living family, and had been under the care of Department of Social Services as a minor. They determined that in an emergency, two physician consent would be necessary. Due to worsening respiratory status and recalcitrant blood pressures, at 30w1d, an urgent c-section was initiated under general anesthesia after two physician consent by the obstetric team. There were several contraindications to neuraxial, including the inability to consent as well as inability to tolerate the neuraxial placement, the c-section awake, or lying less than 30° as patient became profoundly hypoxic on transfer from bed to the OR table. Immediately upon induction of general anesthesia, the patient required high ventilatory support with PEEP of 12 and FiO2 100% to maintain SaO2 of >95%. After an otherwise uneventful c-section, the patient was transferred intubated to the ICU for further management. Her course was complicated by a prolonged ICU stay, the inability to wean from ventilation, and subsequent tracheostomy 21 days post-delivery. She discharged with home health for tracheostomy care 41 days post-delivery.

Discussion: This case highlights the complexity of medical decision-making in high-risk patients who lack capacity. This case required the difficult task of moving forward with an anesthetic that caused morbidity in a patient unable to understand the risk of the anesthetic.

While the benefit of having time for our multidisciplinary teams to investigate and advise us in this complex case cannot be understated, this is not always possible when emergencies arise, and emphasizes the importance of determining capacity and awareness of state laws and hospital policies in these complex situations.

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 15

Hypophosphatasia Syndrome- Neuraxial Anesthesia Considerations

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Co-Authors: Joseph Abro, MD - Medical University of South Carolina
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Introduction: Hypophosphatasia (HPP) syndrome is a rare inherited disorder of the gene encoding tissue-specific alkaline phosphatase. It is associated with pain, respiratory issues, impaired skeletal mineralization, change in calcium and phosphate metabolism, impaired growth and mobility, recurrent fractures, developmental delay, and seizures. Adults with HPP present clinically with short stature, osteomalacia, and fractures from minor trauma [1]. A common treatment for HPP is asfotase alfa. A 2021 case study suggests HPP patients undergoing treatment with 1mg/kg/day asfotase alfa resulted in spinal ligamentous ossification [2]. Current literature is limited regarding the safety of neuraxial anesthesia in this patient population. We present a patient with HPP syndrome desiring epidural labor analgesia.

Case One: A 36yo G1P0 with a past medical history significant for horseshoe kidney and HPP syndrome was evaluated at the preoperative clinic at 34 weeks gestation. Induction of labor was scheduled at 39 weeks. She desired neuraxial pain control during labor. Initial diagnosis of HPP at age 35 years old followed recurrent fractures with minimal trauma. Her treatment included multiple open reduction internal fixations of prior fractures and infusions of asfotase alfa at 2 milligrams per kilogram three times a week. Infusions stopped prior to conception. Upon evaluation, it was deemed that there was no absolute contraindication to neuraxial anesthesia, although limited literature exists. The plan was made to proceed with epidural labor analgesia. The patient arrived for induction of labor. A dural puncture epidural was placed at the level of L3-L4 using a 17-gauge Tuohy needle to access the epidural space at 5cm and a 19-gauge catheter secured at 9cm. She tolerated the procedure well and had no complications with epidural placement or use during the duration of her labor. The epidural catheter was removed with ease after successful spontaneous vaginal delivery without instrumentation.

Discussion: Hypophosphatasia syndrome can present with a multitude of signs and symptoms. There is limited data regarding the safety of neuraxial anesthetic management in patients with HPP. In a patient with HPP not currently undergoing asfotase alfa treatment, an epidural catheter can be utilized to assist with labor pain.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 16

Anesthetic Management of a Parturient with Osteogenesis Imperfecta Type 1 for Cesarean Delivery

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Co-Authors: Jose Diz Ferre, MD - Cleveland Clinic Foundation
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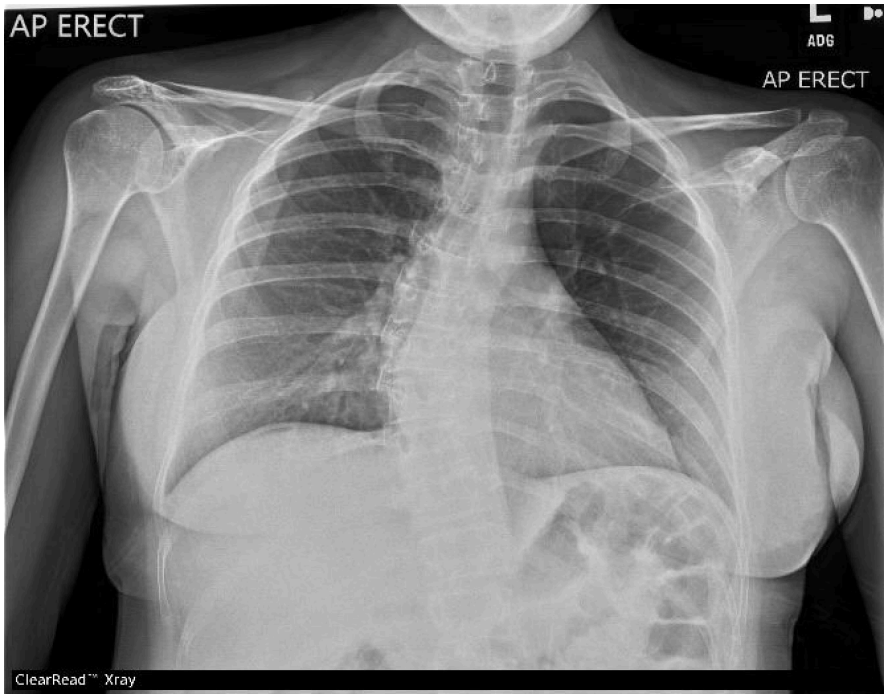
Introduction: Osteogenesis Imperfecta Type 1 (OI-1) is a rare autosomal dominant connective tissue disease characterized by normal but insufficient collagen production, resulting in fracture-prone bones, scoliosis, and mild short stature(1). Parturients with OI present several anesthetic concerns including skeletal anomalies, decreased pulmonary reserve, potential coagulopathy, and potential difficult airways(2). The ideal mode of delivery remains elusive, though C-sections are common due to the risk of maternal pelvic fractures during vaginal delivery. We present the case of a preterm primigravida with OI-1 who received spinal anesthesia for cesarean delivery of a fetus of unknown OI genetic status.

Case One: A 24-year-old lady, 155cm and 61kg, G1P0 at 36w3d gestation presented with an intractable headache and mildly elevated blood pressure. Her medical profile was significant for OI-1 with pathologic vertebral fractures at T2-3, L1, L5, dextroscoliosis, and history of migraines and easy bruising. She denied any hearing impairment, neck immobility, dental involvement, or cardiopulmonary symptoms. The decision was made to proceed with an elective primary cesarean section for pre-eclampsia with severe features. A spinal block at the L3-L4 level was planned, with 1.5mL 0.75% bupivacaine, 0.15mg morphine, and 15mcg fentanyl providing a T4 sensory level. Using adequate padding, the patient was positioned carefully. Blood pressure cuff cycle was set to every 5 minutes, and an arterial line was considered in case of hemodynamic instability. Vital signs remained stable using a brief phenylephrine (50-100mcg/min) infusion. The operation was complicated by postpartum hemorrhage with an estimated blood loss of 1.3L, managed supportively. She received a 24-hour magnesium infusion for seizure-prophylaxis, and reported resolution of her headache after delivery. On post-operative day 3, the patient complained of unilateral rib pain - this was evaluated by chest x-ray which was negative for fractures. Discharged on post-operative day 4.

Discussion: This case underscores the importance of a comprehensive approach in managing OI-1 pregnancies. Both neuraxial and general anesthesia have been described for cesarean delivery of patients with OI, with neuraxial providing the benefits of avoiding airway and cervical spine manipulation. In case spine deformities preclude neuraxial anesthesia and general anesthesia is required, multiple points must be kept in mind. Hyperextension of the cervical spine can lead to atlantoaxial dislocation or fractures, and depolarizing neuromuscular blockers should be avoided for risk of contraction-induced fractures. Additionally, dentinogenesis imperfecta may be present in OI-1, with increased risk of tooth

damage or loss during intubation.

References: 1. Marini JC et al. Osteogenesis imperfecta. Nat Rev Dis Primers. 2017;3:17052 2. Yan M et al. The Anesthetic Management of a Parturient With Osteogenesis Imperfecta Type I Undergoing Cesarean Delivery. Cureus. 2021;13(3):e13849



Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 17

Osteogenesis Imperfecta Type III

Presenting Author: Julie-Ann Thompson, MD
Presenting Author's Institution: Ochsner Clinic Foundation - New Orleans, Louisiana
Co-Authors: Roneisha Alexander McLendon, MD, MS - Ochsner Health - New Orleans

Introduction: Osteogenesis imperfecta is a genetic disorder that affects type I collagen production leading to musculoskeletal abnormalities. Manifestations of this disease is varied and can be classified by types I - VII with II being lethal and III being severe and progressively deforming.

Case One: The patient is a 29 year old G1P0 at 37w1d with a medical history of asthma and osteogenesis imperfecta type III who presented for a scheduled primary cesarean section. She had a height of 130 cm and a weight of 64 kilograms at the time of presentation. She has had multiple fractures associated with mild trauma and a total of six corrective surgeries of her extremities since childhood. She had an x-ray which showed a kyphotic curvature of the spine with multiple compression fractures and loss of vertebral body height; the L3, L4 and L5 vertebrae appeared normal. A right radial arterial line was placed to avoid potential trauma from the inflation of a non invasive blood pressure cuff. An ultrasound was utilized to identify the L3-4 interspace and the depth of the ligamentum flavum was noted at 6.5 cm. A combined spinal epidural was utilized and loss of resistance to saline was achieved at a depth of 7 cm. A spinal dose containing 0.6mL of 0.75% hyperbaric bupivacaine, 5 mcg of fentanyl and 0.05mg of morphine was administered. A test dose of lidocaine 1.5% with epinephrine was given via the epidural catheter with unremarkable results. All extremities were padded with foam and the patient was placed supine. A T5 level was achieved and the patient had an uncomplicated delivery by cesarean section.

Discussion: Type III osteogenesis imperfecta is the most severe phenotype. This can pose challenges for the care team as fractures may result from what may be a benign act. In this instance, there was concern that frequent cycling of a noninvasive cuff may lead to extremity fracture as the patient was already experience significant pain. Additionally, encountering any posterior aspect of a vertebra in the quest to perform a successful neuraxial procedure could result in damage to osseous structures. As it pertains to identification of an appropriate interspace, ultrasound proved to be more useful than anatomical landmarks when identifying a proper interspace. This imaging also helped to ensure that the interspace chosen was suitable for a 17G Tuohy needle and proved to be quite useful as the provider did not encounter any difficulty with placement.

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surgical patients with OI: a narrative review of literature. Regional anesthesia and pain medicine, 45(12), 993–999. https://doi.org/10.1136/rapm-2020-101576

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 18

Cesarean Section in Parturient with Klippel Feil Syndrome- Case Report

Presenting Author: Borislava Pujic Anesthesiologist
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Slavica Krusic Anesthesiologist - Ob & Gyn Hospital Narodni Front, Belgrade
Branislav Macut Anesthesiologist – CCV

Introduction: Summary: Klippel-Feil (K-F) syndrome is a very rare genetic medical condition (about 1 in 40,000 live births), which presents with the fusion of two or more bones in the cervical spine, an asymmetric face, short neck, and very limited neck mobility. This is the first case to present to our hospital.

Case One: Case report: A 21-year-old primigravida parturient with type II K-F syndrome was transferred from a regional hospital at 36 weeks of gestation for an elective cesarean delivery (CS). Her brother also suffered from the same disease. She had severe scoliosis of thoracic vertebrae, with a short neck, and Sprengel deformity of one scapula. An echocardiogram showed normal hearth ultra sound, and pulmonary capacity was normal, despite a history of heavy smoking (30 cigarettes per day). She had not previously undergone surgery. During pregnancy, she underwent genetic testing, and amniocentesis which revealed a normal baby girl. The anesthesiologist requested a preoperative chest X-ray and an MRI of her spine, in part to determine the lower end of the spinal cord, should spinal anesthesia (SA) be attempted. The result of the MRI was indeterminate, and the patient refused SA. Consultations with a neurologist, neurosurgeon, cardiologist, and physiatrist were obtained. CS was performed under general anesthesia (GA); propofol, remifentanil, and rocuronium were used for induction, with sevoflurane, and fentanyl for maintenance. Direct laryngoscopy was not attempted, rather a videolaryngoscope and bougie were employed for successful intubation. Following induction, ventilation proved difficult (SpO2 was 80%, and EtCO2 was 50-60 mmHg), leading to manual ventilation. Bilateral breath sounds were confirmed but widespread wheezing confirmed bronchospasm. She received bronchodilator therapy (phenoterol and ipratropium-bromide) via the endotracheal tube, and intravenous corticosteroids. Elevated blood pressure required urapidil for control. At the conclusion of surgery, sugammadex was given for neuromuscular block reversal. At the end of the CS, a Quadratus Lumborum Block (QLB) was administered. A healthy baby girl, weighing 2400g and measuring 47cm, was born with Apgar scores of 9/10 in the first and fifth minutes. The postoperative course was uneventful, and the patient was discharged home on Postoperative Day 3.

Discussion: Discussion: Patients with Klippel-Feil syndrome present specific anatomic challenges for the anesthesiologist. Both SA and GA may pose significant risks to the patient. This case carried a high level of risk but concluded successfully due to multidisciplinary

collaboration.

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Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 19

Anesthesia Considerations for Caesarean Section under GETA in Patient with Arthrogryposis

Presenting Author: John W. Robison
Presenting Author's Institution: University of Mississippi Medical Center, Mississippi
Co-Authors: Shelby Claire Liddell - UMMC
Alexander Nelms - UMMC
Michaella Scopel - UMMC
Blake Sowers - University of Mississippi Medical Center
Tim Ziethen – UMMC

Introduction: Arthrogryposis is a syndrome that describes contracture of multiple joints. Most are neurogenic, typically associated with neuromuscular disorders. While, the rest have connective tissue or mixed mechanisms.

Case One: A 38-year-old G2P1001 ASA 4 female at 36 weeks with a past medical history of advanced maternal age, arthrogryposis, scoliosis, gastroesophageal reflux disease (GERD), prior cesarean section (C/S), deep vein thrombus, and bowel obstruction status post exploratory laparotomy and lysis of adhesions presented to labor and delivery for repeat C/S and bilateral salpingectomy. On exam, she was a Mallampati III with a small mouth opening, limited neck range of motion, and significant musculoskeletal deformities. Anesthesia concerns included difficult airway visualization and endotracheal intubation, risk of respiratory depression, and GERD. Patient tolerated preoxygenation well and was intubated using a Glide scope on the first attempt with a grade III view using a 6.5 endotracheal tube. Rapid sequence induction was performed with a combination of Propofol, Lidocaine, Rocuronium, and Fentanyl. She received Sevoflourane throughout the case and her blood pressure was managed with Phenylephrine boluses. She received Oxytocin following delivery of the placenta. Neuromuscular blockade was reversed with Sugammadex. The patient was extubated and recovered well in the post anesthesia care unit. By postpartum day 3, the patient was discharged to home in stable condition.

Discussion: The most significant concern from an anesthesia standpoint in a contracted patient is securing the airway. Due to this patient's arthrogryposis, there were concerns for micrognathia, high-arched palate, and cervical spine instability. Succinylcholine, which has a quicker onset and shorter duration of action than rocuronium, was contraindicated in this patient due to her contractures and being wheelchair bound due to risk of hyperkalemia. We believed that the risk of aspiration outweighed the risk of hyperkalemia in this situation. Other considerations that we had were difficult or impossible regional blockaded secondary to the high-degree of spinal deformities and difficult position.

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arthrogryposis. Pediatrics. 1994 Nov;94(5):682-6. PMID: 7936896. 3. Bingham PM, Shen N, Rennert H, Rorke LB, Black AW, Marin-Padilla MM, Nordgren RE. Arthrogryposis due to infantile neuronal degeneration associated with deletion of the SMNT gene. Neurology. 1997 Sep;49(3):848-51. doi: 10.1212/wnl.49.3.848. PMID: 9305352.

Abstract #: THUR – CR – BS 1 – BR 5 – When it Hurts & Abnormal Bones – 20

SIADH, Oxytocin, Magnesium, and Potassium: An Electrolyte Balancing Act or Alphabet Soup?

Presenting Author: Jason J. White, MD
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Co-Authors: Kevin Davis, SRNA - Middle Tennessee School of Anesthesia
Judy Tan, CRNA - New York-Presbyterian/Lower Manhattan Hospital

Introduction: Syndrome of inappropriate antidiuretic hormone (SIADH) is characterized by unsuppressed release of antidiuretic hormone from the posterior pituitary gland. SIADH can be caused by multiple conditions including central nervous system abnormalities, malignancies, pulmonary disease, hormone deficiencies, human immunodeficiency virus, medication administration (including oxytocin) (1) and pain or surgical stress. In this report, we present the perioperative management of a parturient with a history of SIADH and hyperemesis gravidarum presenting for cesarean delivery at our small community hospital. Her care was complicated by the need to manage existing electrolyte imbalances and suspected hypovolemia while treating pre-eclampsia (PEC) and maintaining uterine tone. This case illustrates the complexities of balancing the management of hyponatremia and hypokalemia with the treatment of PEC and intraoperative management of a cesarean section. While SIADH is uncommon in parturients (2), the drugs administered in this case were not, and the effects of these medications on electrolyte and fluid balance are relevant for all obstetric anesthesia practitioners.

Case One: A 42-year-old G5P0131 at full-term gestation presented to our 180-bed community hospital complaining of two hours of vomiting and abdominal pain, and was found to be in active labor complicated by hypertension. She had a history notable for a prior cesarean delivery, hyperemesis gravidarum, and mild SIADH diagnosed early in her pregnancy. Sodium levels were followed closely during her second trimester, but at the time of delivery the most recent laboratory results available were from three months prior. She had no neurological symptoms of hyponatremia, although it could have contributed to her vomiting. A venous blood gas obtained on arrival to the operating room was notable for mixed metabolic and respiratory alkalosis (pH 7.63, pCO_2 26, HCO_3 27), hyponatremia (131 mmol/L), and hypokalemia (2.6 mmol/L). An uncomplicated repeat cesarean delivery was carried out under spinal anesthesia, with quantitative blood loss of 180 cc. During the procedure she received 1100mL lactated ringers and ondansetron, diphenhydramine and dexamethasone for treatment of nausea and vomiting. Upon delivery of a healthy child, an oxytocin infusion was started. Several hours postpartum, she was diagnosed with severe PEC due to elevated LFTs, and a magnesium infusion was started.

Discussion: Sodium and potassium levels required close monitoring throughout the postpartum period, as the patient was receiving both oxytocin, which is associated with hyponatremia (3), and magnesium, which was only available as a hypotonic solution. Serum

sodium and potassium levels throughout the patient's hospital course are summarized in the attached figure

References: References: (1) Kim GH. J Clin Med. 2022 Sep 30;11(19):5810. (2) Nawathe A et al. J Obstet Gynaecol. 2013 Jan;33(1):9-13. (3) Carlson-Hedges L et al. Obstet Med. 2023 Sep;16(3):196-199.

Figure for SOAP Submission (1).pdf

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 01

Anesthetic Considerations for Fetal Cardiac Intervention: A Case Report

Presenting Author: Claire Naus, MD
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Betul Yilmaz Furtun, MD - Texas Children's Hospital, Baylor College of Medicine

Introduction: Fetal cardiac intervention (FCI) is an option for fetuses diagnosed with HLHS with restrictive or intact atrial septum (HLHS-R/IAS). Fetal atrial septal stent placement, a minimally-invasive procedure for the pregnant patient, is performed percutaneously with ultrasound guidance in order to decrease the need for emergent intervention at birth [1,2]. We present anesthetic considerations for the pregnant patient and fetus, including the importance of setting expectations, providing anxiolysis, and outlining our approach to in utero resuscitation.

Case One: A 26-year-old woman, G1P0 at 29w, with a history of anemia and a fetus with HLHS-RAS, presented for FCI. Preoperative consultation included a detailed discussion of the anesthetic plan and fetal resuscitation. Two IVs were placed, and a CSE was performed. Anxiolysis was achieved through pharmacologic (midazolam, low-dose remifentanil infusion) and non-pharmacologic (music via headphones) means. Fetal anesthesia (IM combo: fentanyl, vecuronium, atropine) was administered after external version. Under continuous ultrasound guidance, a needle was inserted into the maternal abdomen, through the uterus, into the fetal heart, and across the atrial septum, through which a stent was deployed. Initially, there was good flow through the stent, but, within 30 minutes, reduced flow was noted. The patient returned at 30w for a second attempt. Anesthesia and surgery proceeded as above; however, following stent deployment, the fetus developed severe bradycardia due to a large pericardial effusion. The effusion was drained, multiple rounds of epinephrine, calcium gluconate, and sodium bicarbonate were administered to the fetus, and fetal CPR was initiated via compressions using the ultrasound probe on the maternal abdomen. The fetal heart rate recovered after 11 minutes with preserved flow through the new stent.

Discussion: This case demonstrates key anesthetic considerations for FCIs. Our anesthetic approach combines minimal sedation for anxiolysis and neuraxial anesthesia, which increases the likelihood of optimal fetal positioning and ensures maternal comfort if multiple punctures are required to rapidly drain a pericardial effusion [3]. These cases can be stressful for the pregnant patient as the fetus may require significant resuscitation [4,5]; thus, it is essential to provide adequate anxiolysis and set clear expectations. In addition, we worked with pharmacy to develop a fetal code box that provides easy access to resuscitation medications and allows for standardized dilutions appropriate for fetal dosing, reducing the likelihood of drug errors during high-stress situations. Other critical elements of our resuscitation strategy include

designating a code leader during the timeout, fetal CPR, and ensuring blood is available in case a fetal blood transfusion is needed.

References: 1. Circulation 2004;110:253-8 2. Prenat Diagn 2008;28:1023-8 3. Am J Obstet Gynecol 2016;215:276-286 4. Prenat Diagn 2020;40:415-423 5. Circulation 2014;130:638-45

Anesthetic Considerations for Fetal Cardiac Intervention_A Case Report_Naus.pdf

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 02

Challenges in Maternal Pain Management Following Minimally Invasive In-Utero Surgery for Fetal Myelomeningocole (fMMC)

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Presenting Author's Institution: New York-Presbyterian, Columbia, New York
Co-Authors: Laurence E. Ring, MD - Columbia University

Introduction: Fetal myelomeningocele (fMMC) repair is performed via open or minimally invasive fetoscopic repair, both resulting in severe maternal pain requiring prolonged post-operative pain control 1. Subsequent delivery typically occurs at 37 weeks gestation 2, via vaginal or cesarean delivery depending on method of repair. We present the case of a minimally invasive in-utero fMMC repair, who presented with preterm rupture of membranes (PPROM) within 3 weeks of fMMC repair.

Case One: A 19-year-old G1P0 presented at 25 weeks gestation for fMMC repair. Patient received oral indomethacin for tocolysis and a CSE for post-operative analgesia. General anesthesia (GA) was induced, followed by a standard protocol with 2 MAC of sevoflurane and MgSO4 for uterine relaxation. Postoperative analgesia was maintained with PCEA/PIEB (bupivacaine 0.0625%-fentanyl) for 72h with repeated daily epidural doses of morphine 3mg until day 4, with acetaminophen 4g/day until day 5. The epidural catheter was removed on day 5. Ten days later (POD16), she was admitted with PPROM and preterm labor with breech presentation. A CSE was placed for expectant management, possibly cesarean delivery (breech), and was pulled two days later as preterm labor seemed to have subsided. Three days later, an emergent cesarean delivery was indicated due to fetal bradycardia. A spinal anesthetic (hyperbaric bupivacaine 0.75% 12mg, fentanyl 15mcg, morphine .15mg) resulted in T4 level and incision was made, however before delivery, conversion to GA (propofol, succinylcholine, fentanyl 35mcg) was deemed necessary for severe pain. Post-cesarean pain was managed with ketorolac 30mg, standing q6h acetaminophen and ibuprofen, and prn oxycodone. In PACU, IV morphine 2mg and oxycodone 5mg were given, with a total of oxycodone 15mg on POD1.

Discussion: In our experience, this is the first case of emergent preterm cesarean delivery with a short interval between fMMC repair and delivery. Despite a confirmed T4 level after spinal, and no discomfort upon incision, pain necessitated conversion to GA, suggesting that a standard spinal anesthetic may not provide sufficient anesthesia or hypersensitization. Despite being a minimally invasive procedure, maternal pain management after fMMC repair poses significant challenges and requires prolonged multimodal approaches. Patients have received neuraxial analgesia for 72h, abdominal wall blocks, and in one instance, neuraxial analgesia was repeated after a week to provide adequate pain relief 1. We have previously reported severe acute pain at the time of delivery after fMMC, requiring enhanced postpartum doses of oxycodone 3.

References: 1. Two Surgeries in the Second Trimester: Fetal Myelomeningocele Repair Followed by Laparoscopic Cholecystectomy. SOAP Abstract 2021. 2. Neuroembryology Aging 2008;4(4):165-174. (PMID: 22479081) 3. Maternal Pain Management for Fetal Myelomeningocele Repairs: From Fetal Surgery to Delivery. SOAP Abstract 2021.

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 03

Correcting the Record: Anesthetic Management for a Patient with MELAS Syndrome and History of a Failed Spinal Undergoing Cerclage Placement

Presenting Author: James A. Conwell, DO
Presenting Author's Institution: Columbia University, New York
Co-Authors: Davida Grossman, MD - Columbia University

Introduction: Mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episodes (MELAS) is a rare disorder characterized by stroke events, lactic acidosis, dysphagia, dementia, myopathy, and epilepsy, with a prevalence of 0.18/100,000 births. (1) We present the anesthetic management of a patient with MELAS syndrome, chronic pain, and history of a failed spinal, undergoing cervical cerclage.

Case One: This 34-year-old G3P0111 had a history of myopathy and limb weakness in her teens, leading to multiple falls. The patient was found to have an elevated creatinine kinase and serum lactate. At age 24, a muscle biopsy was performed, demonstrating ragged-red fibers, and sequencing of mtDNA revealed a m.3243A>G mutation, consistent with MELAS. She had a temporal stroke in 2019 and an internal capsule stroke in 2020. Seizures were controlled with lacosamide and levetiracetam. Due to the myopathy and falls, chronic limb, back, and hip pain resulted in opioid dependence, with stool impaction and colitis requiring hemicolectomy in 2019. She underwent several recent EGDs for evaluation of dysphagia related to MELAS. During a prior pregnancy in 2016, a cerclage placement was notable for a total failure of spinal anesthesia, and she felt the entire procedure. At 27 weeks, in the setting of chorioamnionitis, she underwent an urgent cesarean with general anesthesia, prompted by the traumatic experience of the prior failed neuraxial anesthetic. She presented to us at 17 weeks for a cervical cerclage and was expecting a general anesthetic. After counseling on the risks of general anesthesia in the setting of MELAS syndrome (mitochondrial dysfunction and propofol use, increased sensitivity to volatile anesthetics, risks associated with neuromuscular blockade in the setting of myopathy and prior strokes, aspiration risk due to dysphagia), the patient agreed to a spinal anesthetic. We opted for a higher dose of longer-acting local anesthetic (hyperbaric bupivacaine 0.75% 12mg over chloroprocaine 3% 60mg, our current standard for cerclage) (2) with fentanyl 15mcg with a prophylactic phenylephrine infusion. As expected, this resulted in a T4 dermatomal level and allowed an uneventful cervical cerclage placement. The patient was discharged that day, and due to successful neuraxial, is agreeable to a single-shot spinal for her scheduled repeat cesarean delivery.

Discussion: There are few case reports of neuraxial anesthesia in obstetric patients with MELAS.(3-6) Specific anesthetic considerations for this patient were mitochondrial dysfunction, aspiration risk, chronic pain with opioid dependence, and a history of failed spinal. With this case, we raise awareness about MELAS, as well as the importance of shared decision-making for a patient with a previous traumatic experience.

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Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 04

Anesthetic Management of a Pregnant Patient on Fondaparinux Undergoing Urgent Fetoscopic Laser Surgery

Presenting Author: Alva Powell, MD
Presenting Author's Institution: Columbia University, New York
Co-Authors: James A. Conwell, DO - Columbia University
Laurence E. Ring, MD - Columbia University

Introduction: Pregnant patients with thrombophilia, recurrent pregnancy loss, and antiphospholipid syndrome are often prescribed anticoagulation.(1) We present the case of a 33-year-old on fondaparinux who underwent fetoscopic laser surgery (FLS) for twin-twin transfusion syndrome (TTTS).

Case One: This G2P0010 with an IVF monochorionic-diamniotic gestation at 22+5 weeks was admitted with stage IV TTTS. Her medical history is significant for obesity (BMI 39), and endometriosis. Though not formally diagnosed with thrombophilia, she was prescribed enoxaparin during pregnancy, to which she developed a rash. She was switched to fondaparinux 2.5mg SC daily, with most recent dose 48h before admission. Due to the severity of TTTS, an urgent FLS was decided. It is our practice to provide combined spinal epidural (CSE) anesthesia for these procedures, with hyperbaric bupivacaine 0.75% 10-12mg and fentanyl 15mcg, to provide sufficient level and duration of anesthesia. The epidural catheter is usually kept for 12-24h in case of complications. Our institution's guidelines recommend holding fondaparinux for four days before neuraxial anesthesia. A viscoelastic test (ROTEM) was performed to help assess surgical risk. Though it showed a hypercoagulable state (Figure 1), general anesthesia (GA) was decided because of the institutional guidelines. Rapid sequence induction for GA was performed with phenylephrine infusion. The intraoperative course was notable for the demise of twin A. The patient was discharged home the next day on fondaparinux and remains undelivered to date.

Discussion: Fondaparinux is a factor Xa inhibitor with 100% bioavailability. Steady-state is obtained after 3 to 4 daily doses, with a 1.3-fold increase in max concentration relative to a single dose. Its half-life is 17 hours in young patients and is excreted in urine unchanged.(2) There are reports of obstetric patients on fondaparinux 7.5mg SC daily who received neuraxial anesthesia after 36 h for a spinal anesthetic (3) and after 48 h for labor epidural placement.(4) Neither patient experienced a neuraxial hematoma. To our knowledge, this is the first report on the anesthetic management of a patient on fondaparinux for urgent FLS with ROTEM assessment. While a neuraxial anesthetic may have been provided given the elapsed 48h, it was decided that GA was preferable. Society guidelines do not provide consistent recommendations on the timing of neuraxial procedures in obstetric patients on fondaparinux, with ranges between 36-42h for epidural placement. (3-6) This case highlights the need for further studies on the PK/PD of fondaparinux in pregnancy and the use of viscoelastic testing in the setting of anticoagulation in obstetric patients.

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ROTEM for Fondaparinux Report V2 RL pdf.pdf

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 05

Delivery of Fetus with Upper Airway Obstructing Mass

Presenting Author: Blake Caracci, DO
Presenting Author's Institution: University of Kentucky - Lexington, Kentucky
Co-Authors: Matthew Tescula, DO - University of Kentucky
Robert Weaver, MD - University of Kentucky
Eric Wetherington, MD - University of Kentucky

Introduction: Fetal airway anomalies can provide many challenges to the care team, including catastrophic loss of the airway at delivery. Developing an algorithm for airway management at delivery ensures a multidisciplinary approach for safe delivery and care of the mother and child. We present a case that illustrates the coordination of care for management of these patients.

Case One: A 35 year old G3P1 at 38 weeks and 2 days with no significant past medical history presented after identification of fetal facial abnormality on routine US. Pediatric MRI revealed an oral mass extending from the lip into the mandible. A multidisciplinary discussion between MFM, Pediatric ENT, Obstetric & Pediatric Anesthesia, Nursing, and NICU lead to the development of a delivery plan in the antepartum period, including establishing an algorithm for the neonatal airway at the time of delivery. On the day of delivery, two adjacent operating rooms were secured, one for the mother and one for the child after delivery. Cesarean delivery was performed under neuraxial anesthesia. Pediatric ENT providers were available for possible fetal intubation on placental support to maintain oxygenation, however the child was deemed stable enough to cut the umbilical cord and to be transferred to the adjacent operating room for urgent pediatric ENT intervention. The Cesarean was completed without any major complications and with minimal blood loss. Once in the adjacent OR, a peripheral IV was secured in the infant with subsequent inhalational induction to maintain spontaneous ventilation. The infant was then intubated by the ENT team with an examination that showed two pedunculated oral masses. These were successfully excised and then the patient was transferred intubated to the NICU for further care.

Discussion: Delivery planning for fetal airway masses requires a multidisciplinary approach. There is a wide range of treatment options depending on the severity of airway obstruction, and can include EXIT procedures, neonatal intubations on placental support, and delivery with immediate ENT intervention. The creation of an airway management algorithm and coordination of care allowed the team to navigate the uncertainty present in this case and arrive at a good outcome for mother and infant. This illustrates the Anesthesiologists' role as leaders in the OR, as well as the importance of multidisciplinary antepartum planning for challenging cases. This case resulted in the development of a new protocol at our institution for evaluating fetal anomalies in the antepartum period and delivery planning.

References: 1.PMID: 23164184 2.PMID: 12413268

Caracci delivery of fetus with upper airway obstructing mass.pdf

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 06

The Ex-Utero Intrapartum Treatment Procedure for a Fetus with Massive Neck Mass

Presenting Author: Mengyun Zhao, MD
Presenting Author's Institution: Peking Union Medical College Hospital, Beijing

Introduction: The ex utero intrapartum treatment (EXIT) is a safe and effective procedure for relieving airway obstruction in fetuses combined with neck masses.

Case One: A 43-year-old primigravida at 36 weeks' gestation presented with a fetus in a breech position and combined with a large solid-cystic mass in the neck region. The mass encased the carotid artery with abundant blood supply. After preoperative multidisciplinary meeting, the surgical approach was decided to be fetal external version, followed by Cesarean section and EXIT procedure. Due to the size and proximity to the carotid artery of the neck mass, retrograde tracheal intubation or tracheostomy was not feasible, and establishing ECMO through the jugular veins was also not possible. Under general anesthesia, after opening the peritoneum, the obstetricians felt the breech presentation of the fetus and performed external version. The fetal head was delivered, revealing a large cystic-solid mass in the neck region. Under the umbilical circulation, we successfully performed the endotracheal intubation using a videolaryngoscope. Swelling of the epiglottis and arytenoid region and tumor invasion in the base of the tongue were noted, then a 3.0# reinforced endotracheal tube was gently inserted without the tube core coming into contact with the tumor. After confirming symmetrical lung breath sounds, the tracheal tube was secured. Subsequently, the fetus was delivered, and the umbilical cord was clamped. Two weeks later, the newborn underwent surgical resection of the neck mass, and then discharged in stable conditions.

Discussion: If an effective airway cannot be established in a fetus with massive neck mass, there is a high risk of hypoxia, acidosis, hypoxic brain injury, and even death. The EXIT is a life-saving procedure for such fetuses. The key to success lies in accurate preoperative assessment of the nature of the mass and the airway condition. A videolaryngoscope could be a practical method for fetus with external airway compression. And a reinforced endotracheal tube could safely pass through the narrowed airway segment, avoiding rupture or bleeding of the neck mass, while providing support to the tracheal structure and establishing a pathway for lung development after birth. Efficient multidisciplinary cooperation, including obstetrics, anesthesiologists, pediatrics, otolaryngologists, and operating room nursing staff, is essential.

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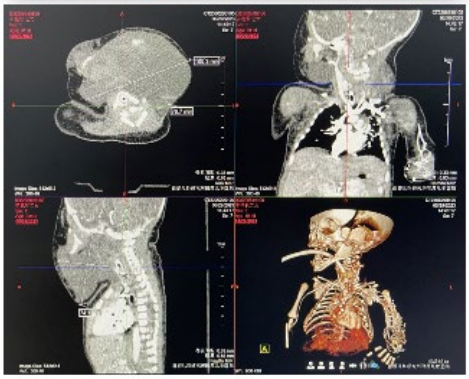

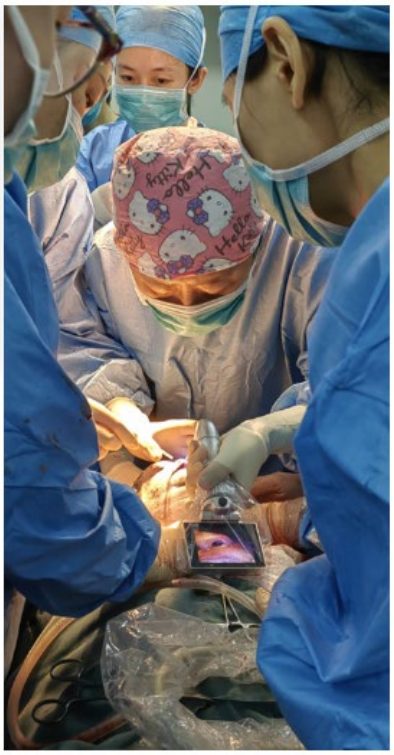

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 07

Maternal Isoimmunization and Fetal Anemia Requiring Intrauterine Transfusion and Conversion to Emergent Cesarean Delivery

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Introduction: Maternal isoimmunization is a frequently implicated etiology of fetal anemia and poses challenges in obstetrical management. While sonographic assessment of middle cerebral artery (MCA) velocity can be performed as a proxy for diagnosing fetal anemia, confirmation and treatment requires an invasive procedure known as percutaneous umbilical cord blood sampling (PUBS). While PUBS can be offered in a clinical or bedside setting under ultrasound guidance, practice has moved increasingly toward providing maternal neuraxial analgesia and performance in an operative setting.

Case One: A 38 year old G5P3013 with history of 3 cesarean deliveries and prior blood transfusion was found to have anti-c isoimmunization with critical titers of 1:8. She was followed for this condition in prior pregnancies with no requirement for PUBS. In this pregnancy, fetal antigen testing was positive for anti-c and serial MCA Doppler surveillance revealed concern for fetal anemia with MCA Doppler measurement at 1.6 multiples of the median (MoMs) at 32 weeks gestation (Figure 1). After receipt of corticosteroids for fetal lung maturity and confirmation of persistently elevated MCA Dopplers, a PUBS procedure was pursued in the operative suite under combined spinal-epidural (CSE) with a 10.5 mg bupivacaine spinal. During the procedure, the placenta was found to be anterior and sonography-guided needle entry into the umbilical vein at the umbilical cord insertion was successfully performed. The opening hematocrit was found to be 24%, confirming profound fetal anemia. 62 cc of O negative, CMV negative, HIV negative, c antigen negative, leukoreduced, irradiated blood with a base hematocrit of 80% was successfully transfused. At this time, there was noted to be a collection developing in the umbilical cord that tracked upwards toward the placenta and fetal bradycardia was noted at < 90 beats per minute. Bradycardia persisted and the decision was made to proceed with emergent repeat cesarean. Spinal analgesia was inadequate as 2+ hours had passed, and the epidural failed to setup quickly after 3% 2-chloroprocaine bolus. The patient was promptly transitioned to general anesthesia (GA) and successful cesarean section was performed. A viable infant was delivered weighing 2340 grams with APGARs of 7 and 9 at 1 and 5 minutes respectively. Evaluation of the placenta revealed a thrombus tracking from the cord through the base of the placenta, suspected to be a clot having formed in the Wharton's jelly. Mother and infant were both doing well at the routine postpartum visit.

Discussion: Maternal isoimmunization requires complex, interdisciplinary antenatal care. Where fetal anemia is identified, pursuit of a PUBS in a controlled operative setting with immediate availability of personnel for emergent cesarean is prudent, as even successful fetal transfusion can prove intolerant to a fetus. Using an epidural as the primary anesthetic may help prevent conversion to GA as the epidural in a CSE remains unproven.

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 08

To EXIT or not to EXIT: An EXIT to Tracheostomy Procedure on a Patient with a BMI Of 60, Pre-Eclampsia, Asthma and Gastroparesis

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Onyi Onuoha, MD - The University of Texas Health Science Center in Houston

Introduction: Ex-utero Intrapartum Treatment (EXIT) procedure is a method of maintaining utero-placental circulation during cesarean section to gain time to secure a potentially obstructed fetal airway. It is used to ensure uteroplacental gas exchange and fetal hemodynamic stability during a variety of surgical procedures performed to secure the fetal airway

Case One: This is the case of a 31year old G3P1 at 33w6d with a fetal diagnosis of Congenital high airway obstruction syndrome (CHAOS) with significant laryngeal atresia. Additionally, Pregnancy was complicated by morbid obesity (BMI 60), Type 2 Diabetes Mellitus uncontrolled on insulin, Pre-Eclampsia, asthma and gastroparesis . Due to concerns of immediate fetal respiratory compromise, we elected for a delivery via an EXIT procedure. The patient was counseled on maternal risks of EXIT including heightened risk of bleeding and she strongly desired to proceed. Due to significant concern from the surgical team regarding difficulty intubating the fetus, the decision was made to proceed with a tracheostomy in an attempt to decrease placental support time and risk of bleeding, by appropriately weighing risk-benefit. Anesthesia management included placing a T10 thoracic epidural pre-operatively for use after delivery. Upon arrival to the operating room (OR), an arterial line was placed for tight BP control in addition to two large bore PIVs. Blood was available in anticipation of blood loss. The patient was put under GA via RSI and tight BP control was maintained with phenylephrine infusion titrated to effect. Deep volatile anesthesia (above 1 MAC) sevoflurane was maintained in addition to remifentanil infusion to help with uterine relaxation, plus intravenous nitroglycerin boluses given after uterine incision. These measures were used to ensure a fully relaxed uterus . The patient was kept hemodynamically stable with preserved utero-placental perfusion for a total of 23 minutes as the tracheostomy was being performed. Fetal head was delivered while the EXIT to airway procedure took place. Fetal heart rate was recorded with ultrasound for reassurance of fetal status. After an airway was established, the remainder of the body was delivered. The concentration of volatile anesthetic was reduced after delivery, and oxytocin was appropriately administered, allowing for uterine contractility with no signs of uterine atony. The thoracic epidural was started as the gas was being weaned off. The patient was later extubated and the epidural kept in place for 48h allowing her to comfortably go to NICU and see her baby.

Discussion: This case illustrates an unusual presentation of fetal CHAOS with need for EXIT

procedure combined with significant maternal past medical history and the need for prolonged placental support making this carefully managed EXIT procedure extremely rare.

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Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 09

Ex Utero Intrapartum Treatment (EXIT) in the Morbidly Obese: A Case Report and Best Practices at a Tertiary Center

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Introduction: Improved antenatal care and more sophisticated imaging has led to better identification of pathology that may jeopardize cardiopulmonary status in the fetus and neonate. The EXIT procedure, whereby fetal gas exchange is maintained through persistent placental circulation while the fetus is ex utero, has been utilized as a bridge to more favorable physiologic support systems, which include definitive airway or even cannulation for extracorporeal membrane oxygenation (ECMO). We present a case of a morbidly obese (BMI 40) parturient with fetal anomaly suspected to be a teratoma in the cervical region extending into the mediastinum.

Case One: A 23 year old G2P1001 female, with history of anxiety and obesity, had findings of fetal neck mass on routine ultrasound that were confirmed with two separate MRIs prior to 37 weeks gestation. At 37+3/7 weeks gestation, the EXIT procedure was performed. The patient had a thoracic epidural at the T9-10 level, arterial line placed, and general anesthesia prior to large vertical incision of the skin. Ultrasound was used to confirm placental location, and a low uterine transverse incision was made on the uterus to allow exteriorization of the fetal head. Once the fetal airway was secured by pediatric anesthesia scrubbed in with a sterile C-MAC allowing easy positioning of the endotracheal tube, delivery of baby, placenta, and closure were executed. Thoracic epidural was used for postop pain control and the infusion was started during closure. Notwithstanding the multidisciplinary team needed, unique perioperative considerations in this procedure include the need for prolonged uterine relaxation to avoid premature detachment of the placenta before the baby's airway would be secured. This was achieved utilizing volatile at high rates. Nitroglycerine boluses and infusion were also readily available. The large surgical exposure was designed to accommodate easy delivery of the baby's head for intubation while partially ex utero.

Discussion: Maternal hemorrhage was a concern because of the aforementioned goals, hence the placement of an arterial line, which also allowed for tight BP control to avoid fetal distress secondary to maternal hypotension from the high MAC used. Whereas routine cesarian section is more often concerned about adequate uterine tone to achieve hemostasis quickly, the center-point of the EXIT procedure is maintaining the organic gestational extracorporeal membrane oxygenation (OGECMO) of the placenta until definitive artificial support systems are in place to sustain neonatal cardiopulmonary physiology.

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Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 10

The Unique Case of a Percutaneous Transuterine Fetal Cerebral Embolization to Treat Vein of Galen Malformation

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Co-Authors: Jerrie Refuerzo, MD - The University of Texas Health Science Center in Houston

Introduction: Vein of Galen malformation (VOGM) is a rare, life-threatening vascular malformation in the brain that often causes heart failure in neonates and can be life-threatening. Although often diagnosed in-utero, currently no in-utero treatment exists. While some do well with conventional treatment after birth, a significant number develop severe symptoms with fulminant heart failure (HF) after delivery with a high-risk of death.

Case One: This is the case of a 36-year-old G2P0 followed in the fetal center for high-flow VOGM, severe tricuspid regurgitation, and cardiomegaly. After review of imaging, the team was able to predict that the fetus had aggressive clinical presentation. Following multidisciplinary meetings, the strong desire of the mother to proceed, and fetal surgery safety board approval; in utero treatment of VOGM was offered to the fetus with predictably grim prognosis, on a compassionate care basis. The goal was to diminish flow through the malformation in attempts to diminish the risk of HF. The procedure was performed at 27w6d in participation of the MFM specialist, sonographer, neurointerventionalist and maternal-fetal anesthesiologist. Anesthesia management included continuous non-invasive blood pressure (NIBP) monitoring using clearsight and BP cuff, a Combined Spinal-Epidural (CSE) and fetal drug mixture preparation. Upon arrival to the OR, a CSE was placed with intrathecal bupivacaine 0.75% (11.25 mg), and fentanyl (15 mcg). BP goals were achieved by titrating a phenylephrine infusion to effect, contributing to the hemodynamic stability observed in our patient throughout the procedure. After placement, the mother was positioned in left lateral decubitus to avoid aortocaval compression, and intramuscular fetal anesthesia was delivered by the MFM specialist. Fetal Anesthesia was prepared by the anesthesiologist. It comprised of fetal drug mixture (Fentanyl, atropine, vecuronium) in addition to rescue Epinephrine and Atropine. The embolization was performed with ultrasound and continuous monitoring, accessing the fetal malformation by maternal percutaneous access and embolizing it with detachable coils. Additionally, the mother received a dose of midazolam while also listening to her favorite artist, which helped significantly relieve stress and anxiety. All through the procedure, we titrated the epidural to effect when our block started receding with 2% lidocaine allowing for constant comfort of mother while the procedure was being performed.

Discussion: This case illustrates an unusual presentation of a Fetal VOGM. Careful selection of candidates based on extensive review of fetal comorbidities, MRI scans and multidisciplinary and ethics board meetings, help predict which fetuses are likely to have aggressive clinical presentation and will allow to provide this procedure on a compassionate care basis

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Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 11

Anesthetic Considerations for a Parturient with Glycogen Storage Disease Type 1a

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Introduction: Glycogen Storage Disease Type 1a (GSD 1a) results from a deficiency in glucose-6-phosphatase, leading to the disruption of glycogenolysis and gluconeogenesis. Patients therefore are dependent on exogenous sources of glucose. The impact of this genetic disorder becomes prominent during extended fasting periods. This fasting intolerance may give rise to severe lactic acidosis, hyperuricemia, and hyperlipidemia.

Case One: A 33-year-old G2P1 female with GSD 1a presented at 38w4d. Surgical history includes prior cesarean delivery (CD) and a laparoscopic liver adenoma resection without any anesthetic complications. The patient was admitted the night prior for preoperative labs and observation during the NPO period. Baseline TEG, von Willebrand (vW) panel, platelets, and lactic acid levels were obtained. VBGs were obtained every two hours to monitor for lactic acid and blood glucose. The patient also wears a continuous glucose monitor (CGM). During the NPO period, the patient received a continuous infusion of D10-½ NS. Patient arrived to the OR with two PIVs. D10-½ NS was continued. A bolus line primed with 0.9% NS was used to deliver additional medications. When necessary, blood samples were also obtained from that same IV to assess lactic acid and glucose levels at one-hour intervals. The patient's CGM was also used. D10-½ NS rate was titrated as necessary to maintain a glucose level ≥80 mg/dL. Surgical anesthesia was achieved via spinal anesthesia. A phenylephrine infusion was started at 50 mcg/min to maintain baseline hemodynamics and prevent nausea from the sympathectomy. The CD was uneventful. Her postoperative course was uncomplicated.

Discussion: GSD 1a is associated with coagulopathy from platelet dysfunction and acquired vWF deficiency. Suggested management of bleeding are desmopressin and platelet transfusion. The patient was suitable for neuraxial anesthesia given the negative laboratory workup and history of bleeding issues. Strict glycemic control is necessary to prevent severe lactic acidosis, which is especially important while the patient is NPO. During the NPO period, the patient was given a D10-½ NS infusion to maintain a blood glucose ≥80 mg/dL. The patient’s CGM system allowed for surrogate monitoring of blood glucose. However, frequent VBGs were obtained to adequately monitor blood glucose and lactic acid levels. While the patient’s CGM system appeared to correlate with the glucose levels from the VBGs, there have been case reports in which hypoglycemia was not detected using CGMs. Therefore, it remains imperative to monitor labs. Due to frequent laboratory monitoring, a higher level of care and invasive access may be warranted. Antiemetic control is critical in the prevention of hypoglycemia. Therefore, consideration for a phenylephrine infusion to maintain blood

pressure may mitigate emesis.

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Table 1. Pertinent patient laboratory values

	Preoperative	Intraoperative		Postoperative
Coagulation				
PT	12.8			
aPTT	26.5			
INR	0.96			
Factor VIII	135			
VWF : Ag	109			
VWF R : Co	94			
ACT	105			
R-time	0.6			
K-time	0.9			
Angle	78			
Max Amplitude	77			
G-Value	16.9			
CBC				
Hemoglobin	9.1			
Hematocrit	28.2			
Platelet	163			
VBG				
Glucose	87	81	99	105
Lactic Acid	1.9	2.3	2.2	2.0

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 12

Cardiomyopathy Secondary to Carnitine Deficiency in Pregnancy

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Co-Authors: Roy Lei, MD - The University of Texas Health Science Center in Houston

Introduction: Carnitine deficiency is a metabolic disorder of fatty acid oxidation that can lead to cardiomyopathy and potentially result in sudden death.1 Long-chain fatty acids are converted into energy by mitochondria and is used to fuel the myocardium and other muscle groups.2 This complication seen in the peripartum setting can cause significant risk to both mother and baby.

Case One: A 28 y/o G5P3 at 33w3d presented for elective repeat cesarean delivery w/BTL in the setting of non-ischemic cardiomyopathy, which was suspected to be related to carnitine deficiency. Diagnosis of cardiomyopathy was discovered during routine work-up after the patient experienced heart palpitations during pregnancy, along with strong family history of cardiomyopathy. including the patient's 31-year-old sister having sudden cardiac death. Review of symptoms were positive for shortness of breath and fatigue. Initial TTE showed EF 35-40% which progressed to EF 33% with moderate to severe global hypokinesis of LV seen on TTE approximately one month later. Patient experienced three prior uneventful cesarean sections. An arterial line was placed and narcotic based CSE technique was used to avoid hemodynamic instability. The anesthesiologist performed an uneventful CSE using only 15mcg fentanyl and 0.15mg morphine as the spinal dose. Hyperbaric bupivacaine was not used. 12ml of lidocaine 2% were bolused via epidural catheter in increments of 5ml to achieve an adequate and sensory level. A standard phenylephrine infusion was used throughout the procedure for blood pressure control. No additional vasoactive or inotropic medications were required.

Discussion: Preoperative measures used included L-carnitine supplementation and avoidance of fasting longer than 2 hours. Due to potential for cardiac instability, intra-operative precautions were taken which included placement of defibrillator pads in the case of arrhythmia, placement of arterial and venous femoral catheters for access by CTS in the event ECMO was needed. In the event of converting to GA, MH precautions were followed with the avoidance of propofol and succinylcholine. Cesarean delivery was uneventful. Postpartum care occurred in the intensive care unit. Patient was discharged home on post-operative day four with life vest in place.

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Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 13

Hypercoagulable and Coagulopathic States in a Parturient with Klippel Trenaunay Syndrome: A Case Report

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Co-Authors: Roy Lei, MD - The University of Texas Health Science Center in Houston

Introduction: Klippel Trénaunay Syndrome (KTS) is a rare disease characterized by the triad of vascular malformations, varicosities, and soft tissue or bony hypertrophy. There is little literature regarding obstetric management and outcomes balancing the risk of thrombosis and hemorrhage with this condition. We present a patient with KTS who experienced postpartum hemorrhage due to hemostatic impairment after delivery and was successfully stabilized following cryoprecipitate infusion.

Case One: Patient is a 33 year old G2P0 on prophylactic enoxaparin known to have engorged varicose veins of the thighs, buttocks, and labia. CT demonstrated a large right lower uterine capillary-venous malformation that would have necessitated a high transverse scar if cesarean delivery were performed. A lumbar spine MRI was negative for vascular, soft tissue, and bony abnormalities. Patient presented for induction at 37w1d. A labor epidural was placed uneventfully. Her labor course proceeded normally with spontaneous vaginal delivery of a viable infant. An atonic lower uterine segment was noted, which responded to multiple uterotonics. Despite initial blood loss estimated at 800cc, friable vaginal tissue was visualized with persistent oozing at small vaginal wall lacerations for which vaginal packing was applied. At three hours postpartum, the patient reported increased rectovaginal pressure. Vaginal packing was saturated with blood with no palpable hematoma. Labs reflected a downtrend in hemoglobin and coagulopathy with a low fibrinogen level. A TEG6 was also obtained showing a low maximum amplitude (MA) < 4 from the Citrated Functional Fibrinogen (CFF) tracing. Given clinical bleeding and the abnormal TEG, the patient was transfused with one unit of cryoprecipitate. Serial labs showed normalizing coagulopathy, uptrending fibrinogen, and overall clinical improvement.

Discussion: The main hematologic concern in patients with KTS is thrombophilia, as venous stasis in the venous malformation leads to a prothrombotic state. However, bleeding can incite continuous activation and consumption of coagulation factors, leading to coagulopathy (3). Our case highlights the consumptive coagulopathy of KTS in the setting of uncontrolled hemostasis caused by uterine atony. If unrecognized, this disease process can progress to disseminated intravascular coagulation (DIC). To conclude, obstetric management of the coagulopathic complications associated with KTS is challenging as patients are at risk for postpartum hemorrhage but also ten times more prone to thrombosis. As our patient's diagnosis was already known to her medical team prior to delivery, following a TEG was vital for management guidance.

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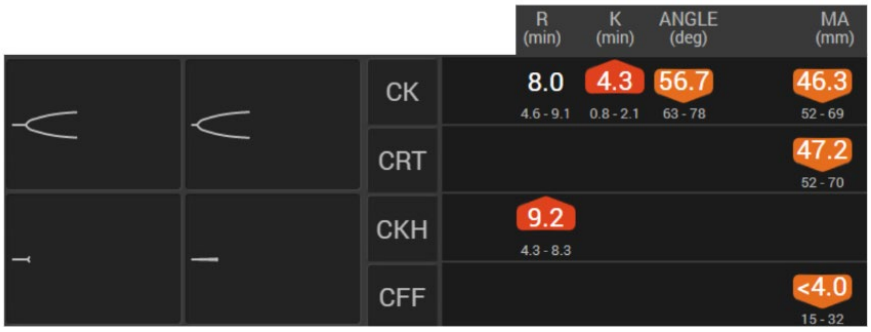

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 14

Successful Neuraxial Anesthesia in a Parturient with Klippel-Trénaunay Syndrome

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Introduction: Klippel-Trénaunay syndrome is a rare (2-5:100,000) and complex congenital neurocutaneous disorder that presents with limb hypertrophy as well as vascular malformations throughout the body. These vascular anomalies often occur on the skin, but may also be present in the spine, airway, and internal organs including the uterus and vagina. As such, complications may arise with neuraxial anesthesia, airway management, consumptive coagulopathy, and maternal hemorrhage. There is a paucity of literature regarding the pre-anesthetic work-up and management for the parturient with Klippel-Trénaunay syndrome.

Case One: We present the case of a 33-year-old G1P0 with a history of Klippel-Trénaunay syndrome. Medical and surgical history was significant for heterozygous prothrombin gene mutation, GDMA2, LGA fetus, and an uncomplicated cholecystectomy at age 31. After a multidisciplinary meeting with MFM, MRI imaging of the brain, thorax/abdomen/pelvis, as well as lumbar spine were obtained to assess for vascular abnormalities that would render neuraxial anesthesia or vaginal delivery contraindicated. No vascular anomalies were found in the lumbar subdural/epidural spaces or in the abdomen/pelvis. In addition, prior anesthesia records revealed uncomplicated endotracheal intubation and easy ventilation. The patient presented at 39w2d gestation for a scheduled induction of labor. Bloodwork including CBC, coagulation profile, and fibrinogen levels were confirmed to be normal. A dural puncture epidural was placed without complication for labor analgesia. She had NSVD with an EBL of 700mL. The epidural was removed without complication and she had an uncomplicated postpartum course.

Discussion: This case represents a rare instance where a parturient with Klippel-Trénaunay syndrome can successfully undergo an uncomplicated vaginal delivery with neuraxial anesthesia. A thorough collaboration between MFM and obstetric anesthesia and an extensive work-up including bloodwork and MRI imaging are necessary for delivery and anesthetic planning.

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Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 15

Management of Pulmonary Arteriovenous Malformations of Hereditary Hemorrhagic Telangiectasias in Pregnancy

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Introduction: Hereditary hemorrhagic telangiectasias (HHT) is an inherited disorder characterized by mucocutaneous telangiectasias and arteriovenous malformations (AVMs) of the pulmonary, hepatic, and cerebral circulations. Pregnancy in patients with HHT is typically uneventful; however, the most common complication is hemorrhage or stroke from an untreated pulmonary AVM (PAVM). 1

Case One: 33-year-old G2P1 at 27w4d with a history of obesity, gHTN, and pruritic urticarial papules of pregnancy presented with hemoptysis. CT revealed PAVMs. She then underwent urgent IR embolectomy of her bleeding RLL AVM. Four days later a scheduled IR embolectomy of a nonbleeding LUL AVM was completed. Postoperatively in the ICU, she remained stable, without further hemoptysis.

Case Two: 32-year-old G1P0 at 27w1d with a history of recent PNA, presented with acute hypoxic respiratory failure requiring HFNC. Thoracentesis and chest tube placement with 400 mL dark heme removal was completed. CT revealed multiple PAVMs. TTE was concerning for intracardiac shunt. She underwent uncomplicated urgent PAVM IR embolectomy, followed by a planned second-stage procedure, which was complicated by airway edema and epistaxis, resulting in reintubation on POD#0. Epistaxis resolved with topical hemostatic matrix kit and oxymetazoline. She was extubated on POD#1. Her chest tube was removed, she remained stable on room air and was discharged on POD#4 with plans for future IR embolectomies of remaining PAVMs.

Discussion: AVMs often enlarge and rupture during pregnancy due to increased blood volume, cardiac output, and venous congestion. Increase in estrogen and progesterone levels also exacerbate existing abnormal vasculature via TGF-beta 2. PAVMs may lead to hemoptysis, hemothorax, paradoxical embolic stroke, pHTN, and high-output cardiac failure. pHTN and high-output cardiac failure occur secondary to increased PAVM right-to-left shunting, which can be mitigated by minimizing PVR and maintaining SVR 2. Treatment of PAVMs preconception or in the second trimester after fetal organogenesis is preferred. IR embolization includes risks of fetal anesthetic and limited radiation exposure. Possible perioperative fetal complications must be weighed against maternal risk of untreated PAVMs. In symptomatic patients, the decision to treat is clear. In asymptomatic patients, current

guidelines recommend treatment of PAVMs given the high risk of maternal complications 3. Patients with unknown PAVM status and known but untreated PAVMs require proximal air filters and prophylactic antibiotics, given the risk for paradoxical embolism. HHT initial presentation may occur during pregnancy with varying degrees of severity. We present two cases of well-managed acute HHT complications and ongoing optimization through a multidisciplinary care approach involving diagnostic and interventional radiology, critical care, obstetrics, and cardiology.

References: 1. GIM. 2011;13(7):607-616. 2. Can J Anaesth. 2009;56:374-384. 3. Ann Intern Med. 2020;173(12):989-1001.

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 16

Anesthetic Considerations in a Parturient with Mitochondrial Disease

Presenting Author: Ayse Kula, MD
Presenting Author's Institution: Medical College of Wisconsin
Co-Authors: Meredith Albrecht, MD - Medical College of Wisconsin

Introduction: Mitochondrial diseases constitute a diverse group with varying genetic and phenotypic manifestations. It affects an estimated 1 in 5,000 individuals in the United States.1 Insufficient data exists on anesthetic management during labor and delivery for these patients. This case highlights anesthetic considerations for parturient with a history of mitochondrial disease.

Case One: A 21-year-old G1P0 with a history of mitochondrial disease was admitted for induction of labor. The patient's mitochondrial disorder stemmed from a heterozygous variant in the TWINKLE gene. The pregnancy was complicated by morbid obesity (BMI 44 kg/m2) and intrahepatic cholestasis. Upon admission to the labor and delivery floor, a Dextrose-Saline infusion was started as the maintenance fluid. Subsequently, at the patient's request, an epidural was successfully placed at the L3-L4 level without complications. A test dose of 3 ml of 1.5% lidocaine with epinephrine was administered, showing a negative response at 5 minutes. Subsequently, two 5 ml boluses of 0.125% bupivacaine were administered. An epidural pump with bupivacaine 0.1% and fentanyl 2 mcg/mL in a 250ml bag was initiated. Settings were adjusted for intermittent epidural boluses of 8 ml every 60 minutes, alongside patient-controlled 6 ml boluses every 20 minutes. Labor concluded with a healthy baby girl delivered via spontaneous vaginal delivery. Post-delivery course was complicated by grade 3 cervical lacerations and postpartum hemorrhage, necessitating surgical repair in the Operating Room.

Discussion: Managing labor analgesia in mitochondrial disease patients is challenging due to heightened sensitivity to specific medications and the risk of life-threatening lactic acidosis. Neuraxial anesthesia is preferred to avoid the metabolic stress associated with general anesthesia.1 The NPO duration should be minimized, and the administration of glucose-containing solutions should commence promptly, while avoiding lactate solutions. Propofol and volatile anesthetics should be used cautiously. Ketamine, midazolam, and dexmedetomidine are deemed safe. Succinylcholine should be avoided due to the risk of myotonia and hyperkalemia. Non-depolarizing muscle relaxants should be titrated due to increased sensitivity.2, 3 There is a potentially increased risk of bupivacaine toxicity, necessitating vigilant monitoring. Collaborating closely with a team of specialists to devise a comprehensive labor pain management plan is essential to ensure the safety of the mother and the baby.

References: 1. Zheng, Q., Wei, P., Zhou, J. et al. Case report: perioperative management of caesarean section for a parturient with mitochondrial myopathy. BMC Anesthesiol 17, 94

(2017). 2. Niezgoda J, Morgan PG. Anesthetic considerations in patients with mitochondrial defects. Paediatr Anaesth. 2013 Sep;23(9):785-93. 3. Brody KM. Anesthetic Management of the Patient with Mitochondrial Disease: A Review of Current Best Evidence. AANA J. 2022 Apr;90(2):148-54.

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 17

Combined Spinal Epidural in Chromosome 15 Deletion Complicated by Short Stature

Presenting Author: Xiao Lu Zhang, DO, PhD
Presenting Author's Institution: University of Alabama at Birmingham
Co-Authors: Annalese G. Neuenschwander, MD - University of Alabama at Birmingham

Introduction: The occurrence of chromosome 15 microdeletion such as q26 deletion is very rare. There are about 34 cases reported in the medical literature, and short stature and restricted growth are the most common signs (1). Although there is no literature reviewing pregnancy, mode of delivery, or neuraxial anesthesia in women with chromosome 15 microdeletion, generally caesarean sections are preferred for parturients with short stature due to cephalopelvic disproportion (2).

Case One: 26-year-old P0 female with past medical history of Chromosome 15q26.2q26.3 micro-deletion, short stature (52”), obesity (BMI 47), VSD s/p spontaneous close, PVC, and TMJ arthritis, presented for scheduled primary C-section given inadequate pelvis on exam. Patient also endorsed history of difficult spinal tap and ‘small airway’. She has had multiple prior abdominal surgeries (Nissen, g-tube, imperforated anus reconstruction). On physical exam, patient had small mouth opening and micrognathia, large tongue and Mallampati 4 with adequate neck range of motion. Combined spinal-epidural (CSE) was planned for the C-section and reduced bupivacaine dosing, 7.5mg (1mL of 0.75%) instead of standard 12mg, was used as the intrathecal dose to minimize risk of high spinal. CSE also allowed for subsequent catheter activation if patient has inadequate surgical level from reduced spinal dose or if C-section was prolonged in setting of adhesive disease following multiple prior abdominal surgeries. Ultrasound was utilized during CSE placement to identify correct level and midline given patient’s difficult spinal tap history and obesity. Given expected difficult airway, multiple video laryngoscope blades, fiberoptic and smaller endotracheal tubes were available in the OR. Patient has been consented for truncal blocks prior to extubation in case of general anesthesia. Given her recent unremarkable transthoracic echocardiogram, no additional monitoring was required beyond standard ASA monitors. CSE was placed in the OR successfully using 7.5mg hyperbaric bupivacaine, 15mcg fentanyl, and 100mcg morphine. Six minutes following intrathecal dose, the patient did not yet have an adequate T4 surgical level so an additional 5ml 2% lidocaine with 1: 200,000 epinephrine was bolused through the epidural catheter. After four minutes the patient had an adequate surgical level. Subsequent C-section was uncomplicated without additional need of epidural dosing. Both mother and baby did well and were discharged on post-operative day 3.

Discussion: Here we present the first case of successful C-section under CSE in patient with Chromosome 15 micro-deletion with short stature. Anesthetic management and consideration such as height-based spinal anesthesia dosing, difficult neuraxial placement, difficult airway will be discussed.

References: 1. Chromosome 15q26 deletions. (2013) Rare chromosome disorder support group. 2. Lange et al. (2016) Anesthetic management for Cesarean delivery in parturients with a diagnosis of dwarfism. Can J Anesth 63, 945–951.

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 18

Peripartum Management of Parturient with Carnitine Palmitoyl Transferase II Deficiency

Presenting Author: Jazib Hassan, MD
Presenting Author's Institution: University of Chicago

Introduction: Carnitine palmitoyl transferase II (CPT II) deficiency is a rare genetic anomaly characterized by muscle weakness and rhabdomyolysis due to impaired fatty acid metabolism (1). Management commonly involves dietary restrictions and minimizing fasting periods (2). Literature suggests patients with CPT II deficiency may have an increased risk for malignant hyperthermia and propofol infusion syndrome when under general anesthesia (1, 2). Additionally, case reports narrate prolonged neuraxial motor blocks in patients with this condition (1). We describe the anesthetic management of a parturient with CPT II deficiency.

Case One: Our patient is a 31-year-old G3P1011 who presented for induction of labor at 39w0d. Her medical history is significant for CPT II deficiency and non-alcoholic fatty liver disease. An early L3-L4 dural puncture epidural was placed successfully and a bupivacaine 0.0625% + fentanyl 2mcg/ml solution used for labor analgesia. She had an uncomplicated, spontaneous vaginal delivery. On postpartum day two, the patient reported muscle weakness and fatigue similar to previous episodes. Her neurological exam was normal, and her labs were unremarkable. The patient recovered on postpartum day three and was subsequently discharged home.

Discussion: Neuraxial anesthesia is the preferred analgesic choice for most parturients. However, in parturients with CPT II deficiency, the stress of labor, prolonged fasting, and metabolic alterations may contribute to muscle weakness and rhabdomyolysis. Neuraxial analgesia can be appropriate for these patients, as it may prevent prolonged exposure to the stress of labor. Secondly, it reduces the risks associated with general anesthesia. Early neuraxial placement, use of low-dose epidural solutions, and close monitoring are essential to achieving satisfactory outcomes and avoiding the potential complications of dense motor blockade, as demonstrated in our case.

References: 1. PMID: 37276780 2. PMID: 35363184

Abstract #: THUR – CR – BS 1 – BR 6 – Fixing Babies & Maternal Genetic Disorders – 19

Undiagnosed Myasthenia Gravis Leading to Postpartum Myasthenic Crisis and Respiratory Failure

Presenting Author: Jon Lucaj, MD
Presenting Author's Institution: Mayo Clinic - Farmington Hills, Michigan
Co-Authors: Mingchun Liu, MD - Mayo Clinic
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Emily E. Sharpe, MD - Mayo Clinic

Introduction: Myasthenia Gravis (MG) is an autoimmune disorder where antibodies bind to the post-synaptic membrane of the neuromuscular junction and induce weakness. This leads to fatiguability of skeletal muscles leading to ptosis, diplopia, dysphagia, respiratory weakness. We report an initially undiagnosed case of MG presenting during the peripartum period and complicated by a post-partum myasthenic crisis leading to respiratory failure.

Case One: An 18-year-old G1P0 at 37 weeks' gestation presented with diffuse weakness, dyspnea, dysphagia, flaccid dysarthria,and excessive salivation. The patient's medical history revealed a troubling two-year trajectory of progressive weakness post-viral infection, which necessitated her withdrawal from school from its severity and including significant weight-loss and malnutrition from dysphagia. Previous consultation with speech pathology, pulmonary, and ENT attributed her condition to an eating disorder and possible asthma. Following admission, consultation with obstetrics, neurology, otorhinolaryngology, and anesthesia was obtained. Although an EMG study showed decremental responses at 2 hertz stimulation, suggesting a neuromuscular junction disorder. Given the non-specific nature of her symptoms, her diagnosis remained uncertain and additional lab testing was performed. Due to worsening symptoms, labor was induced. Epidural analgesia was initiated with 0.1% bupivacaine with 2 mcg/mL fentanyl and maintained with PIEB. Patient had hypotension responsive to phenylephrine and tachycardia during labor, The fetal tracing was category II. Following forceps delivery without maternal expulsive efforts, the postpartum course was marked by an exacerbation of bulbar symptoms, with ICU admission, progressive hypoxic respiratory distress, and intubation required 48 hours after delivery. Although MG was likely, uncertainty over the presence of acetylcholine receptor (AChR) antibody-positive MG or muscle-specific kinase MG, delayed intervention as each subtype warrants different strategies. Following respiratory compromise, treatment with corticosteroids, pyridostigmine, and intravenous immunoglobulin (IVIG) commenced. On PPD 5, the patient was extubated and underwent plasma exchange therapy. Laboratory results returned confirming AChR antibody-positive MG. The patient was discharged on PPD 13 with a plan for ongoing intermittent IVIG therapy.

Discussion: During a myasthenic crisis, therapeutic strategies include respiratory support IVIG and plasmapheresis. Myasthenia gravis exacerbations are most frequent during the first year following diagnosis, and it is recommended for women to wait up to 2 years prior to getting

pregnant [1]. Effective multidisciplinary collaboration, continued medical immunosuppressant and anticholinergic therapy, along with vigilant surveillance, can improve outcomes for myasthenia gravis patients during the peripartum period.

References: 1. Varner M. Clin Obstet Gynecol. 2013 Jun;56(2):372-81.

Program Material
Friday, May 3, 2024

Case Reports & Research Abstracts #2 (Breakout Rooms)
Room 1 – ERAS
Room 2 - Hypotension + Vasopressors / Cardiac + Preeclampsia
Room 3 - Racial disparities + global health
Room 4 – PAS + PPH - Coagulation
Room 5 - Neuraxial Labor Analgesia
Room 6 – Morbidity, Drugs, and Non-CS Anesthesia

Opening Remarks
Dan Katz, MD & Jaime Daly, MD

Gertie Marx Research Competition (Main Stage)
Moderator: Cynthia Wong, MD
Panelists: Lisa Leffert, MD; Ron George, MD; Feyce Peralta, MD; Paloma Toledo, MD; Roshan Fernando, MD

Concurrent Sessions
Oral Research Presentations #1 (Main Stage)
Moderator: Rich Smiley, MD

Fred Hehre Lecture
Introduction: Jaime Daly, MD
Speaker: Barbara Scavone, MD

Concurrent Sessions
Sol Shnider Track #1 (Main Stage)
1. Wrangling the Experts: A Discussion of Challenging Topics in OB Anesthesia
   Moderator: Katie Arendt, MD
   Panelists: Lawrence Tsen, MD
   Joy Hawkins, MD
   Feyce Peralta, MD
2. Don't Forget the Neuraxial Adjuvants! Clonidine, Dexmedetomidine, Epinephrine, and Buprenorphine
   Moderator: Britany Raymond, MD
   Panelists: Dan Katz, MD
   Ruth Landau, MD
   Laura Sorabella, MD

Research Track #1 (Breakout Room)
How to Answer Important Questions in OB Anesthesia – The Optimal Study Design for Your Research
Moderator: Pervez Sultan, MD
Panelists: Anton Chau, MD; Ron George, MD; Jill Mhyre, MD; Cynthia Wong, MD

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 01

Optimizing preoperative fluid administration in Elective Cesarean Delivery Patients Utilizing Acumen IQ Non-invasive Monitoring Technology

Presenting Author: Melissa Brown, MD
Presenting Author's Institution: Cedars Sinai Medical Center - Los Angeles, California
Co-Authors: Katherine Gelber, MD - Cedars Sinai Medical Center
James Hammond, MD - Cedars Sinai Medical Center
Donald Lee, MD - Cedars Sinai Medical Center
Zhaoyi Tang, MD - Cedars Sinai Medical Center

Abstract:
Purpose: Scheduled cesarean deliveries (CD) most commonly utilize spinal anesthesia, which may result in hypotension and subsequent nausea/vomiting due to multifactorial hemodynamic changes. The Society for Obstetric Anesthesia and Perinatology Enhanced Recovery After Cesarean delivery protocol recommends prevention of hypotension with a combination of vasopressors and intravenous crystalloid preloading and coloading (1). As ideal fluid administration goals are not well established, a standardized approach is typically used for all CD patients. However, obstetric patients have physiologic considerations that may necessitate an individualized approach. Small studies in non-obstetric populations have shown promise with goal-directed fluid therapy (GDFT) utilizing non-invasive hemodynamic monitoring (2). This quality improvement initiative aimed to improve compliance of pre-spinal fluid administration and assess changes in outcomes among elective CD patients utilizing noninvasive continuous hemodynamic monitoring.

Methods: 61 elective CD patients received non-invasive continuous monitoring with the Acumen IQ cuff (Edwards Lifesciences, Irvine, USA). An individualized volume administration plan utilizing fluid responsiveness assessment with this device (n=30) was compared to our institution's standardized approach (n=31). Vasopressor infusion rates and boluses were recorded. Compliance was defined as the patient receiving the indicated amount of preoperative crystalloid and having the prophylactic phenylephrine infusion initiated before spinal placement. Additional outcomes included occurrence of nausea/vomiting and post-spinal hypotension as well as mean quantitative blood loss (QBL), urine output, and total fluids administered.

Results: Preoperative crystalloid administration compliance increased from 23% in the standardized group to 63% in the individualized group. Post-spinal hypotension was experienced by 65% in the standardized and 29% in the individualized group ($p=0.015$). 58% of the standardized group experienced nausea/vomiting versus 29% of the individualized group ($p< 0.01$). Mean QBL in the standardized group was 873 ml versus 602 ml in those individualized ($p=0.034$). There was no statistically significant difference between groups for total fluid administration and urine output.

Conclusion:
Healthy parturients presenting for elective CD can vary in fluid requirements and responsiveness to IV fluids. We observed an increase in compliance of pre-spinal fluid administration using an individualized GDFT approach with the Acumen IQ cuff, which allows for assessing patient needs in real-time. This individualized approach may also improve CD patient outcomes including post-spinal hypotension, nausea/vomiting, and QBL, although these findings warrant further investigation.

References:

1. Bollag L, et al. Anesth Analg. 2021;132(5):1362-77.
2. Ghisi D, et al. Acta Biomed. 2020;91(4):e2020182.

Memorandum - Policy on IRB Review of Non-Human Subjects Research.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 02

The Impact of an Enhanced Recovery Protocol on Postpartum Recovery Following Elective Cesarean Delivery: A Prospective Observational Study

Presenting Author: Kaede Watanabe, MD
Presenting Author's Institution: Saitama Medical Center, Tokyo
Co-Authors: Kazuo Ando, MD, PhD - Stanford University School of Medicine
Brendan Carvalho, MD - Stanford University
Nan Guo, PhD - Stanford University School of Medicine
Yusuke Mazda, MD, PhD - Department of Obstetric Anesthesiology, Center for Maternal-Fetal and Neonatal Medicine, Saitama Medical Center, Saitama Medical University
Pervez Sultan, MD, MD(Res), FRCA - Stanford Medicine

Abstract:
Background:
Enhanced Recovery After Surgery (ERAS) guidelines for cesarean delivery (CD), as recommended by SOAP, include strategies such as limiting the fasting interval and initiating multimodal analgesia[1]. Since March 2022, our institution's multi-disciplinary team has revised the ERAS protocol for CD to enhance postoperative analgesia and reduce fasting intervals. This study aims to evaluate the impact ERAS on quality of postpartum recovery.

Methods:
Following IRB approval, we enrolled patients scheduled for elective CD under neuraxial anesthesia to complete the ObsQoR10, EuroQoL (EQ5D3L), and Global Health Visual Analog Scale (GHS) from the day of surgery until the seventh postpartum day. The study was conducted in two phases: from Jan 2021 to Jan 2022, where patients were treated under the previous protocol (control group)[2], and from Sept 2022 to Dec 2023, where the ERAS protocol was implemented (ERAS group).
Our ERAS protocol included intraoperative multimodal analgesia with intravenous acetaminophen (1 g), rectal diclofenac (50 mg), along with the previously used intrathecal morphine 150 µg. Postoperatively, the analgesia regimen was updated to regular oral acetaminophen (1 g, four times daily) and celecoxib (200 mg, twice daily), with oral tramadol for rescue, replacing the previous intravenous standing acetaminophen and pentazocine for rescue protocol[2]. Another change was the introduction of early fluid intake, instead of waiting until the first ambulation.
The primary outcome was the difference in daily ObsQoR10 scores between the ERAS and control groups. Secondary outcomes included maximum pain scores within the first 24 hours postpartum, total morphine equivalent consumption within the initial 48 hours postpartum, time to first fluid intake, time to first ambulation, time to first intake of solid food, EQ5D3L scores, and GHS scores.

Results:

In our analysis, 52 patients in the ERAS group and 48 patients in the control group were included. Main results are presented in Table 1. ObsQoR10 scores were significantly higher (indicating better recovery) in the ERAS group compared to the control group on most postoperative days, pain scores in the first 24 hours and maximum pain scores were lower in the ERAS group. Additionally, the ERAS group exhibited significantly better recovery than control group in both EQ5D3L and GHS.

Conclusion:
The implementation of our ERAS protocol for CD, which included enhanced intraoperative multimodal analgesia and early fluid intake, resulted in significantly improved recovery outcomes compared to the control group. Future studies are needed to determine interventions with greatest impact on inpatient and outpatient postpartum recovery metrics.

References:

1. Anesth Analg. 2021;132:1362-77.
2. AJOG Glob Rep. 2023;3:100226.

SOAP2024Abstract_ERAS.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 03

Health Disparities in Obstetrical Care Before and After Implementation of an Enhanced Recovery After Surgery Protocol (ERAS)

Presenting Author: Abbey T. Gilman, BS
Presenting Author's Institution: Weill Cornell Medicine Department of Anesthesiology, New York
Co-Authors: Sharon A. Abramovitz, MD - Weill Cornell Medicine Department of Anesthesiology
Silis Jiang, PhD - Weill Cornell Medicine Department of Anesthesiology
Jessica Kim, MS - Weill Cornell Medicine Department of Anesthesiology

Abstract:
Introduction: Enhanced Recovery After Surgery (ERAS) programs aim to optimize the quality of care for all patients. ERAS programs generally don't monitor race and ethnicity in these programs. Previous ERAS adherence studies fail to report on adherence rates to individual ERAS elements or how each element of the program contributes to outcomes within different racial groups. These studies are limited to opioid use and don't capture all program elements. Our current aim is to evaluate racial/ethnic differences in adherence rates of an ERAS protocol and how this might affect disparities. We plan to investigate the components of the program that involve direct care from anesthesiologists.

Methods: We performed a retrospective observational study on cesarean deliveries in an ERAS program at two hospitals in a major metropolitan area from October 2016 to September 2020 (implemented program October 2018). Both hospitals utilized separate EMR and AIMS systems. Data was analyzed using automated algorithms and targeted chart reviews. We compared demographic characteristics by ERAS-CD adherence for protocol elements and used multivariable logistic regression models to estimate adjusted odds ratios for overall ERAS-CD adherence and for individual elements of warming fluids for hypothermic patients, Ketorolac, and Ondansetron, adjusting for hospital site and social deprivation index. Interaction were initially included to test for effect modification between racial group and pre- and post- ERAS implementation date and were included in the model if the likelihood ratio test indicated a significant improvement in goodness of fit.

Results: The sample consisted of 7,812 cesarean deliveries, with 59.4% pre-ERAS and 40.6% post-ERAS. The odds of Ketorolac administration in Black patients ($p< 0.001$) and warming fluids administration in Asian patients were significantly lower compared to white patients ($p< 0.001$). The interaction between race and ERAS implementation was significant for Asian patients; amongst Asian patients, those who had cesarean deliveries after ERAS protocol implementation had a significantly increased odds of receiving warming fluids if unable to maintain normothermia compared to those who had cesarean deliveries before ERAS protocol implementation ($p< 0.001$). There were no significant differences in the odds of Ondansetron administration amongst the racial groups studied. Overall ERAS adherence significantly

differed between the pre-ERAS and post-ERAS groups ($p < 0.001$) and the odds of adherence to each protocol element post-ERAS generally were statistically significant: warming fluids administration ($p < 0.001$), Ketorolac administration ($p < 0.001$), and Ondansetron administration ($p < 0.001$).

Conclusion: Adherence to individual elements of the ERAS protocol significantly differed between races. Monitoring adherence rates to different ERAS elements by racial and ethnic groupings is important to ensure that benefits of ERAS are equitably distributed.

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 04

Intraoperative Pain During Cesarean Delivery - Quality Improvement Project Part I: Quantification and Documentation

Presenting Author: Neva P. Lemoine, MD
Presenting Author's Institution: Vanderbilt University Medical Center - Nashville, Tennessee
Co-Authors: Holly Ende, MD, MS - Vanderbilt University Medical Center
Laura L. Sorabella, MD - Vanderbilt University Medical Center
Bryan Wakefield, MD - Vanderbilt University Medical Center

Abstract:
Introduction: Neuraxial anesthesia is the optimal choice for cesarean delivery (CD).[1] Unfortunately, women may experience pain during CD leading to poor satisfaction or possibly postpartum depression.[2] This quality improvement project aimed to quantify intraoperative pain during CD and create EMR documentation for this metric at our institution.

Methods: To establish a baseline incidence of intraoperative pain, we prospectively interviewed all CD patients from 9/14/23 to 12/5/23 on postoperative day 1. Weekends were excluded. Patients were asked whether they had intraoperative pain and if they had pain, to rate the maximum pain on a numeric rating scale (NRS) 0-10. We worked simultaneously with our hospital informatics group to develop: 1) an automated intraoperative pop-up prompt q20 min to document pain scores during CD; 2) an NRS (0-10) scale in our routine follow-up note for CD patients to rate their maximum pain during CD. After the EMR changes went live, we evaluated compliance with intraoperative and postoperative documentation and the incidence of intraoperative pain using NRS scores documented in the EMR (11/15/23-1/29/24).

Results: 276 CD patients were prospectively interviewed on routine postoperative follow-up. Seven (2.5%) patients reported intraoperative pain during cesarean delivery. 439 CD records were pulled from the EMR. 342 (77.9%) charts had documentation of intraoperative pain scores. 264 (60.1%) charts had a maximum intraoperative NRS documented on postpartum follow-up. Rates of intraoperative pain documented by these three methods are listed in the Table. Asking patients whether they experienced pain in the prospective interviews (yes/no) reduced the reported incidence of intraoperative pain. Timing of asking in the postpartum period and using higher NRS scores to define intraoperative pain reduces the reported incidence of intraoperative pain. Higher documentation noncompliance increased the reported rate of intraoperative pain.

Conclusions: The rate of intraoperative pain during CD varied markedly from 2.5% to 26.6% depending on multiple factors. How patients were asked, when they were asked, how we defined intraoperative pain by NRS and documentation compliance all influenced the incidence of intraoperative pain. Future directions for intraoperative pain studies include developing a standardized definition for intraoperative pain during CD to benchmark and

address this topic within and across institutions.

References:
1. PMID: 30985305
2. PMID: 27163790

QI Pain Table.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 05

Intraoperative Fluid Administration During Elective Cesarean Delivery and Maternal Outcomes for ERAC

Presenting Author: Phillip Callihan, MD, PhD
Presenting Author's Institution: University of Virginia Health
Co-Authors: Ashley Garneau, MD - University of Virginia Health
Siny Tsang, PhD - University of Virginia Health

Abstract:

Introduction:

Enhanced recovery after surgery (ERAS) protocols are intended to improve perioperative outcomes and promote return to function for patients following surgery. Recent recommendations suggest a volume of less than 3 liters would be the ideal volume in this setting. However, these recommendations are based on observations from non-obstetric ERAS (ERAC) guidelines and their applications to the obstetric population remain to be determined (1,2). The aim of this study was to determine the optimal volume of intravenous fluid during cesarean delivery as it relates to postoperative maternal outcomes.

Methods:

This is a retrospective data analysis of 645 patients who underwent elective cesarean delivery between 07/2017 and 12/2020 under spinal anesthesia in the setting of a well-established ERAC protocol. Outcomes: length of stay (LOS), quantitative blood loss (QBL), change in hematocrit (Δ HCT), 24-hour urine output (UOP) and complications within 30 days (blood transfusion, urinary tract infection, vaginal bleeding, wound infection, and postpartum hemorrhage). Statistics: Generalized linear models were applied to analyze the effects of IV fluids on the aforementioned outcomes. Total number of prior cesarean, history of gestational diabetes mellitus (g-DM), and gestational hypertension (g-HTN) were included as confounding variables.

Results:

Patients received a median 2167 mL (IQR = 1738 – 2499) of total intraoperative IV fluid. Considering there were few cases with LOS > 5 days, we limit the analysis to LOS < 5 days. Results showed LOS increases with increased IVF received; after adjusting for confounders; 1 L increase in IV fluid is associated with 0.09 day increase in LOS. There is a positive association between IV fluid and QBL (adjusted Est = 159.6, 95% CI=91.7-227.4), but not with UOP or ΔHCT. Increased IV fluid is also associated with higher odds of any postoperative complications (adjusted OR = 2.0, 95% CI = 1.2 – 3.3). Every 1 L increase in IV fluid is associated with an approximately two-fold increase in any postoperative complications.

Discussion:
For ERAC, a total volume of 2.5 L seems to be an adequate amount to be given without measurable adverse events and is overall in-line with SOAP recommendations (< 3 L). This study also suggests that patients are at some risk of postoperative complications if they receive 1 L in excess from the recommended amount.

References:

1. Sorabella L. et al., Enhanced recovery after surgery: Cesarean Delivery. Anesthesiology Clin 39 (2021) 743-760.
2. Bollag L. et al., Society for Obstetric Anesthesia and Perinatology: Consensus Statement and Recommendations for Enhanced Recovery After Cesarean. Anesthesia and Analgesia, May 2021. Vol 132 (5), 1362-1377.

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 06

Development and Validation of a Filipino Version of Obstetric Quality of Recovery-10 (ObsQoR-10-Filipino)

Presenting Author: Rafael Jacob Carandang, MD-MBA, DPBA
Presenting Author's Institution: The Medical City - Pasig City, National Capital Region
Co-Authors: Guada Marie Bonus, MD-MBA - The Medical City
Ma. Carmela Pablo, MD-MBA - The Medical City

Abstract:
Background:
The Obstetric Quality of Recovery-10 (ObsQoR-10) is a patient-reported outcome measure (PROM) that provides a holistic assessment on the quality of in-hospital postpartum functional recovery. Validated across several countries in various languages, it has shown great potential for widespread global acceptance in both clinical practice and research. We performed a translation and validation of the Filipino version of Obstetric Quality of Recovery-10 (ObsQoR-10-Filipino).

Methods:
Following the EuroQoL recommendations, ObsQoR-10-Filipino was developed and translated by independent medical practitioners fluent in Filipino. Forward and backward translation was done to develop ObsQoR-10-Filipino. Further refinement and validation of the Filipino version was done by having ObsQoR-10-Filipino questionnaires completed by women at day one post elective CD. Convergent validity was assessed by correlation of ObsQoR-10-Filipino with GHVAS and EQ-5D-3L; discriminant validity by correlation with good vs poor recovery (NRS of ≥70 vs < 70 mm, respectively). Reliability assessment was done using Cronbach's alpha, inter-item, split-half and test-retest correlation; and content validity by correlation with maternal age, gestational age, BMI, ASA classification, and estimated blood loss. Feasibility was tested by recruitment rate ObsQoR-10-Filipino.

Results:
One hundred twenty primigravid post-Cesarean delivery patients completed the ObsQoR-10-Filipino scoring tool at 24 hours post-op and 25 repeated it at 25 hrs post-op. ObsQoR-10-Filipino correlated strongly with EQ-5D-3L ($r = -0.636$ [95% CI -0.740 to -0.503], $P < 0.001$) and correlated moderately to GHVAS scores ($r = 0.387$ [95% CI 0.207 to 0.543], $P < 0.001$); discriminated well between good versus poor recovery with scores of 68.4±12.9 and 55.1±12.9 respectively with a mean difference of 13.3 (8.0, 18.6); did not correlate to maternal age, gestational age, ASA classification, and estimated blood loss. Reliability was acceptable: Cronbach's alpha 0.76; inter-item correlation >0.15; split-half reliability 0.96; and intra-class correlation >0.6; no floor or ceiling effects. Ninety-one percent of recruited patients completed the ObsQoR-10-Filipino.

Conclusion:

The ObsQoR-10-Filipino is a valid, reliable and feasible tool for assessing postpartum recovery in Filipino-speaking women undergoing elective cesarean delivery. It proves instrumental in evaluating the efficacy of pain management strategies and providing objective benchmarks for programs like Enhanced Recovery after Cesarean Delivery (ERAC). Future studies can be done to assess the scoring tool in vaginal delivery, outpatient settings and explore its translation into other Philippine dialects such as Cebuano, Hiligaynon, and Ilokano.

References:

1. Sultan P, et al. J Clin Anesth. 2020;63:109781.
2. EuroQoL. (2020). https://www.youtube.com/watch?v=H0_mDDYt47A&feature=youtu.be.
3. Mathias L, et al. Anaesth Crit Care Pain Med. 2022;41(3):101085.

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 07

Urinary Retention and Early Foley Removal after Cesarean Delivery with Neuraxial Morphine

Presenting Author: Jennifer C. Gage, MD
Presenting Author's Institution: Department of Anesthesiology, University of Vermont Medical Center - Burlington, Vermont
Co-Authors: Patrick C. Payne, MPH - University of Vermont

Abstract:

Introduction

SOAP Guidelines for Enhanced Recovery after Cesarean Delivery (ERAC) prescribe neuraxial long-acting opioid (NLO) and Foley catheter removal by 6-12 hours after cesarean delivery (CD).[1] Studies supporting early Foley removal often exclude the use of NLO, known to impair voiding function.[2,3] After implementation of ERAC with a standardized decision tree for straight catheter (SC) and Foley reinsertion (FRI), this project aimed to assess rates of "On-time" (6-12 h) vs "Late" (>12 h) Foley removal and impact on need for nursing voiding interventions (SC or FRI) with NLO.

Methods

This project was for monitoring of Quality Improvement, achieving IRB exempt status. All CD patients receiving neuraxial morphine (nMS) 0.1 mg IT or 2 mg epidural in the calendar year 2023 were included at a single academic institution. Exclusion criteria were postoperative magnesium or epidural infusions, and Foley removal prior to 6h after delivery. Electronic medical record data extracted were time to initial Foley catheter removal after newborn delivery (iFCR), occurrences of SC and FRI, nMS route, blood transfusion and preoperative labor epidural infusion. Statistical analysis was done using chi-squared, Fisher's exact test, and multivariable logistic regression.

Results

484 patients were included; the data are outlined in Table 1. The Foley was removed at 10.1 +/- 1.1 hours following delivery time in the On-time cohort vs 16.2 +/-5.5 hours in the Late removal cohort. There was no difference by route of nMS administration. The overall rates of nursing interventions for both SC and FRI were low and not altered by longer Foley retention. On multivariable analysis, there was no difference in On-time versus Late Foley removal by neuraxial route, labor epidural, incidence of straight catheterization, or Foley reinsertion. Patients that required a blood transfusion (OR 10.0 (2.2-45.5, p=0.003) were more likely to have late Foley removal.

Conclusions

Our data suggest that in patients receiving neuraxial morphine at the doses used, prevalence of post-cesarean voiding interventions is low and not improved with extended foley retention. ERAC recommended foley removal ≤12 hours should be emphasized.

References:

1. Bollag L, et al. Society for obstetric anesthesia and perinatology: consensus statement and recommendations for enhanced recovery after cesarean. Anesth Analg 2021; 132: pp. 1362-1377.
2. Kuipers PW, et al. Intrathecal opioids and lower urinary tract function. Anesthesiology 2004; 100: pp. 1497-1503.
3. Liang CC, et al. Effects of Postoperative Analgesia on Postpartum Urinary Retention in Women Undergoing Cesarean Delivery. J of Obstet Gyn Research 2010; 36(5):991-995.

		Foley catheter removal compliance			
		Overall	On-time	Late	Odds Ratio [p-value] (95% CI)
n		484	293	191	
Hours from delivery to foley catheter removal, mean (SD) [min, max]		12.5 (4.7) [6.3,50.0]	10.1 (1.1) [6.3,12.0]	16.2 (5.5) [12.1,50.0]	
Neuraxial morphine route, n (%)	intrathecal	289 (59.7)	181 (61.8)	108 (56.5)	1.1 [0.596] (0.71 - 1.8)
	epidural	195 (40.3)	112 (38.2)	83 (43.5)	
Patient had a straight catheterization, n (%)	No	438 (90.5)	261 (89.1)	177 (92.7)	0.47 [0.386] (0.086 - 2.6)
	Yes	46 (9.5)	32 (10.9)	14 (7.3)	
Foley reinserted after initial removal, n (%)	No	473 (97.7)	284 (96.9)	189 (99.0)	0.70 [0.297] (0.31 - 1.4)
	Yes	11 (2.3)	9 (3.1)	2 (1.0)	
Patient had a preop labor epidural, n (%)	No	336 (69.4)	209 (71.3)	127 (66.5)	1.2 [0.424] (0.74 - 2.1))
	Yes	148 (30.6)	84 (28.7)	64 (33.5)	
Patient had a blood transfusion for postpartum hemorrhage, n (%)	No	470 (97.1)	291 (99.3)	179 (93.7)	**10.0 [0.003] (2.2 - 45.)**
	Yes	14 (2.9)	2 (0.7)	12 (6.3)	

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 08

Best Practice at the Time of Labor Epidural Catheter Removal: Use of the Delphi Method to Create a Consensus-Based Educational Resource

Presenting Author: Jonathan P. O'Doherty, MBChB
Presenting Author's Institution: Brigham and Women's Hospital
Co-Authors: Allison A. Mootz, MD - Brigham & Women's Hospital
Noor A. Raheel, MD, MPH - Brigham and Women's Hospital

Abstract:

Introduction:

The removal of a labor epidural catheter is an important opportunity for patient assessment. While ensuring patient satisfaction, stability, addressing concerns, and counseling about recovery expectations are reasonable goals, a lack of consensus has precluded standardized education on best practice. Here we describe use of the Delphi method[1] to develop consensus on key considerations for epidural catheter removal and creation of an educational video and poster for anesthesiology trainees.

Methods:

A video of a mock epidural catheter removal was created. The video, a script of the patient-anesthesiologist interaction, and a corresponding survey were sent to the obstetric anesthesiology attendings and fellows at our institution. Participants were surveyed on clinical priorities, video feedback, and dialogue used when they themselves remove an epidural catheter via a free-text response. Survey 2 comprised all initial responses categorized into domains. Respondents were asked whether they agreed, disagreed, or were neutral that each specific element should be included. A survey 2 element that reached 60% agreement was considered consensus for best practice. A final 3rd survey listed elements where consensus was not reached along with comments from the previous survey. Participants asked to agree or disagree with the inclusion of each element. Only elements that reached 60% agreement were included.

Results:

The response rate to survey 1 was 15/20 (75%). By thematic analysis of responses, each priority or element was categorized into one of 7 domains (patient satisfaction, clinical evaluation, assessment of contraindications, anticipatory guidance, communication, patient safety, and other). Response rates to survey 2 and 3 were 14/15 (93%). Elements that achieved consensus from surveys 2 and 3 were considered best practice by expert consensus. These were incorporated into a digital educational resource, comprised of a poster (figure 1) and video for obstetric anesthesiology trainees.

Conclusion:

We utilized the Delphi method for expert consensus to create an educational resource for best practice at the time of epidural catheter removal. The Delphi method can be applied for

expert consensus-based tool creation to standardize local practice and potentially enhance trainee education. Further use of the Delphi technique to create educational tools in obstetric anesthesiology and evaluation of such tools is warranted.

References: 1 - Reale SC et al. Anesth Analg 2020.

Catheter Pulls on L+D (3).pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 09

Timing of Initiation of Non-Opioid Analgesics for Post-Cesarean Delivery Pain: A Before and After Comparison of Opioid Utilization

Presenting Author: Michael Wen, MD
Presenting Author's Institution: Brigham & Women's Hospital, Harvard Medical School
Co-Authors: Kara G. Fields, MS - Brigham & Women's Hospital
Samuel Justice, PhD - Brigham & Women's Hospital
John J. Kowalczyk, MD - Brigham and Women's Hospital / Harvard Medical School
Gavin G. Ovsak, MD MBA - Brigham and Women's Hospital
Noor A. Raheel, MD, MPH - Brigham and Women's Hospital

Abstract:
Introduction: Opioid use after cesarean delivery (CD) increases the risk of abuse and new persistent use.(1) Minimizing exposure is a priority as the opioid epidemic in the US continues to plague women in the postpartum period, with increases in overdose-driven maternal deaths and ongoing use at 1 year among women exposed to opioids de novo at hospital discharge.(2) The Enhanced Recovery After CD (ERAD) guideline recommends multimodal analgesia with nonsteroidal anti-inflammatory drugs (NSAIDS) and acetaminophen. Concurrent administration of these agents reduces total opioid consumption compared to staggered dosing, but optimal timing of administration with respect to spinal opioid dosing is unknown. Here we evaluate the impact of a standardized ERAD protocol that initiates non-opioid analgesia 2h after administration of spinal anesthesia. We hypothesize that post-spinal and concurrent dosing of non-opioid medication may lower opioid requirements for patients after CD.

Methods: All patients who underwent CD under spinal anesthesia at our institution 8 months before (Dec 15, 2022-Aug 15, 2023; preoperative PO acetaminophen and intraoperative IV ketorolac initiation) and 8 months after (Sept 15, 2023-May 15, 2024) implementation of the revised ERAD protocol (coadministration of acetaminophen and NSAID 2h after spinal dose) will be analyzed. Pre-intervention (staggered dosing) and post-intervention (concurrent postoperative dosing) patients were compared (per-protocol analysis). The primary outcome was mean postpartum opioid dose requirement for breakthrough post CD pain in morphine milligram equivalents (MMEs). Secondary outcomes included protocol compliance rate, % opioid use within 72h post CD, maximum and average pain scores.
Results: Our interim analysis captured 885 and 239 patients in the pre and post per-protocol groups, representing 96 and 56% compliance with dosing regimens, respectively. Mean total post CD MMEs were 32.6 (95% CI: 26.8-40.0) in the pre group vs 29.1 (95% CI: 16.4-28.0) in the post group (p=0.382) (Figure). MMEs at 48h post CD were 19.86 (95% CI: 15.68-24.05) in the pre group and 11.89 (95% CI: 9.24-14.55) in the post group (p=0.056). There were no differences in secondary outcomes.

Conclusion: With the known risks of peripartum opioid use, optimizing non-opioid analgesic for post-CD pain is an urgent maternal health priority. Our preliminary results show that concurrent administration of non-opioid analgesics 2h after spinal dosing compared to staggered perioperative dosing did not reduce post-CD opioid use, though final analysis is pending. Our anticipated analysis of 8 months in the post-implementation period will confirm whether an opioid-lowering impact is possible with a postoperative non-opioid dosing strategy. Such refinements of our ERAD protocols are warranted to lower preventable opioid-related maternal morbidity.

References:

1. Landau R et al. *Reg Anesth Pain Med* 2021
2. Forkin KT et al. *J Clin Anesth* 2022

Wen- Timing of initiation of non-opioid analgesics for post-cesarean delivery pain- Figure.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 10

A Comparison of Perioperative Temperature Monitoring Modalities During Elective Cesarean Deliveries for the Prevention of Maternal Hypothermia

Presenting Author: Nada Ismaiel, MD, MSc, FRCPC
Presenting Author's Institution: El Camino Health, California
Co-Authors: Brendan Carvalho, MD - Stanford University
Guo Nan, MD, PhD - Stanford University

Abstract:
Background: Impaired thermoregulation during Cesarean deliveries (CDs) causing perioperative hypothermia is associated with adverse patient outcomes [1]. These include coagulopathies and increased risk for postpartum hemorrhage, surgical site infections, delayed postpartum recovery and patient discomfort from shivering [2]. Current literature supports active perioperative warming strategies such as forced-air and IV-fluid warming to mitigate these risks [2]. While intraoperative temperature monitoring during CDs can help reduce maternal morbidity, the optimal perioperative temperature measurement modality for patients undergoing CD under regional anesthesia remains unclear. The aim of this quality improvement (QI) initiative was to compare perioperative temperature measurement modalities during CDs.

Methods: A sample of 30 patients undergoing scheduled CDs were recruited for this IRB-exempt QI initiative. Patients received standard neuraxial anesthesia and peripartum care, including active warming (IV and forced air) strategies. Temperature measurements were taken at 3 perioperative time points: at skin incision, within 15 min after delivery of the infant(s), and at skin closure. Three modalities were used to measure temperature at each time point: 1) temperature-sensing foley catheter, 2) oral temperature probe, 3) temporal skin temperature probe. Temperature modalities were compared using mean $\pm$ SD differences, correlation coefficients and Bland-Altman (BA) plots.

Results: The mean difference between oral and skin, and oral and bladder temperatures was 0.238 °C $\pm$ 0.380 and 0.368 °C $\pm$ 0.361, respectively. The overall temperature correlations between oral and skin, oral and bladder, and skin and bladder were 0.225, 0.588, and 0.198, respectively. BA plots comparing the measurement modalities are outlined in Figure 1. At the end of the procedure, the percentage of hypothermic temperatures (below 36 °C) by modality were 0% (oral), 10% (skin) and 26.7% (bladder).

Conclusions: The results found a weak correlation between oral and skin temperature measurements, and a moderate correlation with oral and bladder temperatures. The incidence of hypothermia varied based on the measurement modality. These findings need to be considered when comparing between institution's rates of hypothermia after CD to enhance overall patient safety.

References:

< [1] Sessler DI. Perioperative temperature monitoring. *Anesthesiology 2021*; 134 (1): 111-118.

[2] Cobb B, Cho Y, Hilton G, Ting V, Carvalho B. Active warming utilizing combined IV fluid and forced-air warming decreases hypothermia and improves maternal comfort during Cesarean delivery: A randomized control trial. *Anesthesia & Analgesia 2016*; 122 (5): 1490-1497.

SOAP2024 abstract figure_Ismaiel.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 11

Delphi Study to Develop a Core Outcome Set for Inpatient Pain Assessment After Cesarean Delivery

Presenting Author: Sarah Ciechanowicz, BMBCh MA MRes FRCA
Presenting Author's Institution: Stanford University School of Medicine, California
Co-Authors: Brendan Carvalho, MD - Stanford University

Abstract :

Introduction

Acute severe pain after cesarean delivery (CD) is associated with worse maternal morbidity. Current studies of postoperative CD pain report different outcomes, which reduces research efficiency and restricts data pooling.[1] The aim of this study was to reach international expert consensus on a core outcome set to measure and report acute pain after CD in clinical practice and research, including patient stakeholders with recent lived experience.

Methods

Core outcome set development was guided by the COMET initiative.[2] A list of initial outcomes was developed from a scoping review of the literature[1] (*n* = 37 outcomes) and postpartum patient focus group discussion (*n* = 2 outcomes). The 39 outcomes were then rated in a two-round online Delphi survey completed by 14 international experts, identified as authors of studies from the scoping review (n=9), other known experts (n=5) and 7 patients with recent lived experience of CD (n=21 stakeholders in total). English-speaking patient participants were recruited during their inpatient stay after planned or intrapartum CD. Outcomes were included if recommended by ≥70% of stakeholders during each Delphi round. Scores were given on a 1-5 Likert scale, 1-2 being 'critical for inclusion' with 3 being 'important but not critical for inclusion' and 4-5 being of 'limited importance or invalid' for inclusion. A final online 3rd round consensus meeting with patients and experts is planned in March 2024, and will result in a final core outcome set developed by April 2024.

Results

Twelve patients and 14 experts initially agreed to participate in the Delphi study. A total of 21 participants (14 experts and 7 patients) from five countries (USA, Iran, Poland, Ireland, Denmark) completed round one, and 12 experts and 4 patients completed round two (response rates of 81% and 76% in rounds 1 and 2, respectively). Following two rounds of a Delphi process, the number of outcomes has so far reduced from 39 to 8. The outcomes achieving ≥70% agreement for inclusion in round 3 are presented in Table 1.

Conclusions

Pain intensity and analgesic consumption for acute inpatient pain after CD were deemed critical to include in the two rounds. These findings are consistent with the most used metrics to evaluate post CD pain as identified in a recent literature review.[1] The Delphi so far indicates that pain interference, patient satisfaction, ability to care for the newborn, and maternal

adverse effects should be considered for evaluation of post CD pain.

References:

1. Ciechanowicz S et al. Int J Obstet Anesth. 2023 Sep 15:103927.
2. https://www.comet-initiative.org

TableDelphi.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 12

Utilizing Wearable Technology to Profile Early Postpartum Sleep Quality and Physical Activity: Actigraphy Findings from a Pilot Study

Presenting Author: Sarah Ciechanowicz, BMBCh MA MRes FRCA
Presenting Author's Institution: Stanford University School of Medicine, California
Co-Authors: Nima Aghaeepour, PhD - Stanford Univeristy
Brendan Carvalho, MD - Stanford University
Cedar J. Fowler, MD MPH PhD - Stanford University School of Medicine
Perman Pandal, MD - Stanford University School of Medicine
Chi-Hung Shu, MEng - Stanford University School of Medicine

Abstract:

Introduction

Poor sleep in the early postpartum period is associated with adverse maternal outcomes. Physical activity is associated with improved sleep, but few studies have been conducted in postpartum patients to characterize sleep and physical activity profiles before and after cesarean delivery (CD) using objective measures.[1,2] The aim of this study was to characterize sleep and activity following CD using wrist-worn Actigraphy. Secondary aims were to explore associations between physical activity and sleep following scheduled CD.

Methods

Following IRB approval, healthy (ASA 1-2) patients aged 18-50 years with uncomplicated, term gestation, singleton pregnancy, and scheduled CD under neuraxial anesthesia were approached for study participation. Consented patients were instructed to wear an Actigraph GT9X device on their non-dominant wrist continuously from 7 days prior to planned CD to 28 days post-surgery. Sleep metrics included quality, duration, disruption and efficiency. Physical activity metrics included average daily moderate to vigorous physical activity bouts (MVPA), METs and caloric expenditure. Granular data regarding sleep and activity were recorded and analyzed based on established algorithms and trend analysis using methodology previously described.[3]

Results

Among the 38 recruited patients, analyzable Actigraphy data was available in 19 patients. Sleep and physical activity before and after delivery are characterized in Figure 1. Trend analysis from day -7 to 28 demonstrated that most variables did not differ significantly, indicating at month 1, most physical activity and sleeping variables have returned to 3rd trimester levels. Some metrics of sleep improved in the first week postpartum, however, total sleep time worsened and had not recovered by day 28 compared to 3rd trimester. Physical activity levels dropped significantly immediately after delivery, then improved from day 0 to 28 post-surgery (Figure 1).

Conclusions

Study findings show that most physical activity and sleeping metrics have returned to 3rd trimester levels by 1 month postpartum. Several sleep metrics such as sleep efficiency and awakening after sleep were better in the first postpartum week than in the 3rd trimester of pregnancy, but total sleep continues to be significantly impacted at day 28 postpartum. Physical activity as expected decreases immediately after delivery compared to late pregnancy but returns to 3rd trimester levels by the end of the first postpartum month. Future studies are needed to identify risk factors for poor postpartum physical and sleep outcomes following CD, to compare metrics following different delivery modes.

References:

1. PMID: 30654747
2. PMID: 36791531
3. PMID: 35129529

FigureSleep.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 13

Incidence and Interference of Chronic Pain After Cesarean Delivery: A Systematic Review with Meta-Analysis

Presenting Author: Sarah Ciechanowicz, BMBCh MA MRes FRCA
Presenting Author's Institution: Stanford University School of Medicine, California
Co-Authors: Lindsay Blake, MLIS, AHIP - University of Arkansas for Medical Sciences
Brendan Carvalho, MD - Stanford University
Rebekah C. Reville Joy, BA (Hons), PGCert - NHS North West London ICB
Pervez Sultan, MD, MD(Res), FRCA - Stanford Medicine

Abstract:
Introduction: Chronic postsurgical pain (CPSP) is a common complication following non-obstetric surgery that can significantly impact patient recovery.[1] Cesarean delivery (CD) is the most performed inpatient surgery, with rates continuing to rise globally. Despite this, the true incidence of CPSP after CD in contemporary practice is unknown. This systematic review with meta-analysis updates the literature surrounding the incidence of CPSP after CD and its impact on health-related quality of life (HR-QoL).

Methods: We performed a systematic review with meta-analysis of prospective observational studies and randomized controlled trials. A 7-database literature search was used to identify studies reporting the incidence of scar-specific CPSP between 3 to less than 6 months following CD, which were published between Jan 2015 to Sept 2023. Identified studies were added to those included in a previous meta-analysis[2]. The primary outcome was incidence of scar-specific CPSP. Secondary outcomes were pain interference with maternal HR-QoL.
Results: 27 studies reported scar-specific CPSP between 3 to 6 months after CD. Meta-analysis with random-effects model (n = 9,173; 9 RCTs and 18 observational) revealed an incidence of scar-specific CPSP of 15.3% [95% confidence interval (CI): 11.8 to 18.8%]; I^2=96.82%; p< 0.001. Meta-regression analysis using the publication year as co-variate revealed a stable CPSP incidence from 2002 onwards. Functional and psychosocial issues including impaired general activities, the ability to sleep, mobilize, perform normal work and impaired mood were the main reported HR-QoL impacts of CPSP. We found high heterogeneity amongst studies and inconsistent reporting of chronic pain assessment and rating scales.

Conclusions: Scar-specific CPSP after CD occurs in 15.3% of patients and can interfere with maternal HR-QoL. Pain intensity data was limited due to some studies reporting averages of rating scales, including patients without pain. Further study is required to understand CPSP significance on early maternal morbidity and explore potential mitigating factors.

References:

1. PMID: 28349202.
2. PMID: 27635953.

MetaRegression.pdf

Abstract #: FRI – RA – BS 2 – BR 1 – ERAS – 14

Quality Improvement Methodology Used In Development Of Enhanced Recovery After Cesarean Delivery Protocols: An Exploratory Analysis

Presenting Author: Kelly Fedoruk, MD, FRCPC
Presenting Author's Institution: Stanford University - Stanford, California
Co-Authors: Brendan Carvalho, MD - Stanford University

Abstract:
Quality Improvement Methodology Used In Development Of Enhanced Recovery After Cesarean Delivery Protocols: An Exploratory Analysis

Study objectives: Enhanced recovery after cesarean delivery (ERAC) is recommended by professional societies and has been shown to improve maternal and neonatal outcomes (1, 2)< ![if !supportAnnotations] >[BC1]< ![endif] > . We aimed to identify the application and type of quality improvement (QI) methodology used in ERAC studies through analysis of published articles supplemented with a survey of investigators involved in performing the study.

Methods: We performed a literature search using 4 databases (MEDLINE through PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Web of Science, and Embase) to identify ERAC studies. Studies were considered if they compared an “enhanced” or “fast track” protocol, to a control group, and evaluated more than 1 system or outcome. Adopted QI methodology was evaluated through review of published methodology and supplemental files where available. A standardized questionnaire developed by the authors which was also sent to all corresponding authors of included studies to obtain additional methodological information.

Results: We identified 24 studies involving 14,486 patients undergoing cesarean delivery. We received completed surveys from 15 of the 24 authors, yielding a response rate of 62.5%. Survey questions and responses are summarized in Table 1.
Only 40% of authors reported use of defined QI methodology, the majority using the Model for Improvement (3). The QI components most commonly used by those not reporting use of a defined methodology were engagement with multidisciplinary key stakeholders (80%), use of key drivers (87%) and process mapping (60%). Most authors reported applying traditional statistical methodology when analysing results (73%), and 60% reported use of Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines. The mean duration of baseline data collection in non-RCT studies was 11 months pre implementation, and 9.9 months after implementation.

Conclusion: There is large variability in QI practices used when ERAC protocols were implemented in studies comparing ERAC versus no ERAC . A minority of authors reported use of a defined QI methodology, and there was no standardization in reporting this quality

improvement work. Next steps include designing a Delphi process to yield expert consensus regarding the optimal type of methodology that should be used to evaluate ERAC protocol implementation, and ideal time periods over which to determine their impact.

References:

1) PMID: 34390864
2) PMID: 35659963
3) Langley GL, Moen R, Nolan KM, Nolan TW, Norman CL, Provost LP. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance (2nd Edition)*. San Francisco: Jossey-Bass Publishers; 2009.

ERAC SOAP 2024 Table 1.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – ERAS – 15

Development of US Specific Multidisciplinary Guidelines for Enhanced Recovery After Cesarean Delivery Using a Delphi Approach

Presenting Author: Sarah Ciechanowicz, BMBCh, MA, MRes, FRCA
Presenting Author's Institution: Stanford Medicine - Palo Alto, California
Co-Authors: Pervez Sultan, MD, MD(Res), FRCA – Stanford Medicine – Palo Alto, California
Thomson Brook, MD - UT Health San Antonio
Brendan Carvalho, MD - Stanford University
Kareem Joudi, n/a - Brown University
Deepjot Singh, MD - Torrance Memorial Medical Center
Mark Zakowski, MD - Cedars Sinai Medical Center

Abstract:
Background: Existing enhanced recovery after cesarean delivery (ERAC) professional society recommendations lack intersociety collaboration, multidisciplinary expert input and involvement of patient stakeholders. This study aimed to develop a multidisciplinary set of ERAC interventions endorsed by relevant key US professional societies.

Methods: This American Society of Anesthesiologists (ASA) and American College of Obstetricians and Gynecologists (ACOG) led initiative received IRB approval from Stanford University. In total 19 stakeholders were invited to participate in this Delphi study, including 13 representatives from 8 US professional societies: ASA (1 representative), Society for Obstetric Anesthesia and Perinatology (SOAP; 2), ACOG (4), Society for Maternal Fetal Medicine (SMFM; 1), Society of OBGYN Hospitalists (SOGH; 1), Enhanced Recovery After Surgery Society (ERAS Society; 1), Association of Women's Health Obstetric and Neonatal Nurses ((AWHONN; 2), American Association of Nurse Anesthesiology (AANA; 1), and 1 physical therapist, 1 lactation expert and 4 patient representatives. A three-round modified Delphi approach was conducted (2 rounds of electronic questionnaires and a 3rd round of e-discussion), to produce the final set of recommended interventions. An initial list of 70 interventions was compiled based on a previously published systematic review of ERAC studies[1] and professional society guidelines/recommendations (ERAS Society, SOAP, and Healthcare Canada[2-5]). Consensus was obtained for the final list of interventions, with strong consensus defined as ≥70% agreement and weak consensus as 50–69% agreement.

Results: All professional societies that were approached provided content-expert stakeholders to participate, and all stakeholders completed all rounds of the Delphi process. A final set of 32 interventions (6 preoperative, 13 intraoperative and 13 postoperative) achieved strong consensus and 1 intervention achieved weak consensus (Table 1).

Conclusions: This US intersociety and multidisciplinary Delphi study resulted in a list of ERAC interventions. These interventions should be considered when implementing ERAC within US labor and delivery units.

References:

1. PMID: 32299662
2. PMID: 30240657
3. PMID: 30118692
4. PMID: 30995461
5. PMID: 33177330

Table 1.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 01

Keeping it in The Loop: Impact of Closed-Loop Vasopressor Systems on Maternal and Neonatal Outcomes- A Systematic Review and Meta-Analysis

Presenting Author: Jazib Hassan, MD
Presenting Author's Institution: University of Chicago
Co-Authors: Naida M. Cole, MD - Department of Anesthesia & Critical Care The University of Chicago
Muhammad Jafar Khan, MBBS - Hamad Medical Corporation, Qatar
Arunabha Karmakar, MBBS - Hamad Medical Corporation, Qatar
Mahwish Khan - VA Palo Alto Healthcare system

Abstract:
Introduction: Closed loop vasopressor systems for maintenance of intra-operative blood pressure are slowly gaining popularity. Although existing data generally indicate positive results with closed-loop technology, its efficiency and safety compared to human-enabled control are still uncertain (1). Previous studies have examined the impact of these systems on maintenance of a stable hemodynamic profile in parturients undergoing cesarean delivery with documented outcomes of both maternal and neonatal wellbeing (2). However, conclusive evidence of its benefit over conventional direct manual boluses or infusion by the anesthetist is lacking. We conducted a systematic review and meta-analysis to determine any difference in clinical outcomes in mothers treated with closed loop vasopressor systems.

Methods: A comprehensive search of major databases (PubMed, Scopus, Embase, Web of Science and Cochrane Library) was conducted to identify relevant studies published up to October 30, 2023. Studies investigating the use of closed-loop vasopressor systems for blood pressure control during cesarean delivery under spinal anesthesia were included. Data extraction and quality assessment were performed independently by two reviewers. The primary outcomes assessed were total fluids given, total phenylephrine and ephedrine dose, percent of patients with hyper- or hypotension as well as maternal and neonatal outcomes. This systematic review was registered with PROSPERO (CRD42023460053) on the 20th of September 2023.

Results: Following PRISMA guidelines, 3 randomized controlled trials (654 patients) were included for final analysis. There were less fluid, and vasopressors administered in closed-loop group but no significant difference between the two groups. Closed-loop system demonstrates reduced incidence of hypotension (risk ratio [RR] 0.7, 95% confidence interval [CI] 0.55-0.88, P=0.003, I^2=34%). Also, highest systolic blood pressure (mean difference [MD] -4.32, 95% confidence interval [CI] -7.30 to -1.34, P=0.005, I^2=0%) and lowest systolic blood pressure (mean difference [MD] 4.67, 95% confidence interval [CI] 1.46 to 7.89, P=0.004, I^2=0%) were observed more in the manual group. Additionally, there was a decreased incidence of nausea (P=0.01) in closed-loop system group but no significant change in

incidence of vomiting. Neonatal outcomes (APGAR scores and acidosis) were not significantly changed.

Conclusion: Closed-loop vasopressor system achieved better control of maternal hemodynamics with relatively less fluid and vasopressor administered after spinal anesthesia than manual vasopressor administration. Closed-loop vasopressor systems represent a viable option for blood pressure management during cesarean delivery under spinal anesthesia. However, further research is warranted to elucidate their comparative effectiveness and safety profile compared to conventional methods.

References:

< ! 1- Brogi, Etrusca., PMID: 27482773

2- Ngan Kee, PMID: 23015618

3- Sng, PMID: 24256483

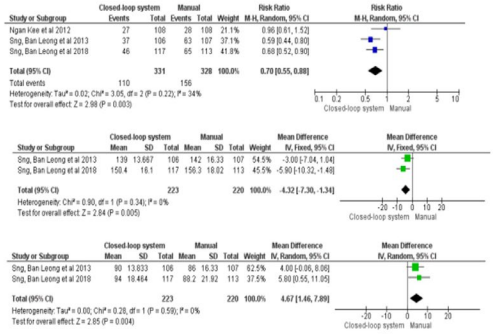

Figure 1. Forest plot for hemodynamic outcome: a) Patients with hypotension, b) highest systolic blood pressure c) lowest systolic blood pressure

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 02

Prolonged Corrected QT Interval Decreases the Incidence of Maternal Hypotension During Spinal Anesthesia in Cesarean Delivery: A Prospective Observational Study

Presenting Author: Jungmin Lee, MD.
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Co-Authors: Sang-Hwan DO - Department of Anesthesiology and Pain Medicine, Seoul National University Bundang Hospital, Seongnam, South Korea, Department of Anesthesiology and Pain Medicine, Seoul National University College of Medicine, Seoul, South Korea
Sangtae Kim, PhD, MD - Department of Anesthesiology and Pain Medicine, Chungbuk National University College of Medicine

Abstract:
Study objective: Cesarean delivery is commonly performed under spinal anesthesia. However, hypotension is a common side effect during spinal anesthesia. This study aimed to identify the relationship between the corrected QT interval (QTc) obtained via patient monitoring before spinal anesthesia for cesarean delivery and the incidence of hypotension during spinal anesthesia.

Design: Prospective, observational study.

Setting: Operating room.

Patients: Eighty-six parturients undergoing cesarean delivery under spinal anesthesia.

Measurements: According to the baseline QTc value on the patient monitor before anesthetic induction, the parturients were divided into groups with QTc values of ≥440 ms or < 440 ms. After combined spinal-epidural anesthesia, the incidence of hypotension was analyzed during cesarean delivery and the vasopressor requirements were compared according to the QTc groups. The area under the receiver operating characteristic (ROC) curve was measured to identify the QTc cut-off value with the optimal predictive performance.

Main results: The incidence of hypotension for the primary outcome occurring after administering the spinal anesthetic until the time of delivery was observed in 37 of 43 (86.0%) women with QTc < 440 ms and in 17 of 42 (40.5%) of those with QTc ≥440 ms ($p < 0.001$). The total amount of phenylephrine injected during 30 minutes significantly differed between the two groups (300 mcg [100–400] vs. 100 mcg [0–300], $p = 0.009$). The area under the ROC curve for spinal hypotension was 0.75 (95% confidence interval [CI] 0.64–0.86). The optimal QTc cut-off value determined by the highest combination of sensitivity and specificity to predict spinal hypotension was 441 ms.

Conclusions: The preoperative QTc values obtained from the patient monitor helped to predict hypotension during spinal anesthesia for cesarean delivery.

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Figure 2_JCA_20220806.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 03

Crystalloid and Phenylephrine for Prevention Hypotension

Presenting Author: Xin-Zhong Chen, Sr., MD
Presenting Author's Institution: Women's Hospital, School of Medicine, Zhejiang University - hangzhou, Zhejiang
Co-Authors: Fei Xiao - Jiaxing University Affiliated Women and Children Hospital

Abstract:
Background: Intravenous fluid administration and prophylactic vasopressor infusion are main methods for prevention spinal anesthesia-induced hypotension (SAIH) in cesarean delivery. The evidence regarding the impact of different volumes of crystalloid solution on the phenylephrine infusion dosage for preventing spinal anesthesia-induced hypotension remains inconclusive. In this study, we aimed to compare the median effective dose (ED50) of phenylephrine for preventing SAIH, while 10 or 20 mL/kg/h of crystalloid solution was coloaded.

Methods: Eighty healthy partrients undergoing elective cesarean delivery under combined spinal-epidural anesthesia were enrolled in the study. Subjects were randomly assigned to receive either 10 mL/kg/h (group 10) or 20 mL/kg/h (group 20) of lactated Ringer's solution. The first patient in each group received 0.5 μg/kg/min of phenylephrine infusion immediately after intrathecal injection. The dose of phenylephrine for the next patient varied with increments or decrements of 0.05 μg/kg/min based on the response of the previous patient. The ED50 of phenylephrine infusion to prevent spinal-induced hypotension for cesarean delivery were estimated using modified up-down sequential analysis with probit analysis applied as a backup sensitive analysis.

Results: The ED50 values for preventing SAIH were 0.30 μg/kg/min (95% CI, 0.29- 0.32 μg/kg/min) for group 10, and 0.19 μg/kg/min (95% CI, 0.16- 0.22μg/kg/min) for group 20, respectively. The estimated relative potency for phenylephrine in group 10 compared to group 20 was determined to be 1.52 (95%CI, 1.24-1.97), showing that there was a significant difference in the ED50 values between the two groups.
Conclusion: A negative correlation was found between the volume of liquid cohydration and the dose of preventive vasopressor in preventing spinal anesthesia-induced hypotension during cesarean delivery under the condition of this study. These findings may have significant implications for clinical practice and worth of further investigation.

References:

1 Massoth C, Töpel L, Wenk M. Hypotension after spinal anesthesia for cesarean section: how to approach the iatrogenic sympathectomy. *Curr Opin Anaesthesiol*. 2020;33(3):291-298.

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3 Xiao F, Shen B, Xu WP, Feng Y, Ngan Kee WD, Chen XZ. Dose-Response Study of 4 Weight-Based Phenylephrine Infusion Regimens for Preventing Hypotension During Cesarean Delivery Under Combined Spinal-Epidural Anesthesia. *Anesth Analg*. 2020;130(1):187-193.

ABSTRACT.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 04

A Pilot Study for Future Investigation to Define Hypotension in Cesarean Deliveries under Spinal Anesthesia to Predict Neonatal Outcomes

Presenting Author: Jack Wang, BS
Presenting Author's Institution: The Ohio State University
Co-Authors: Margo Bush, BS - Toledo University College of Medicine
Marco Echeverria-Villalobos, MD, FCCP - The Ohio State University
Marilly Palettas - The Ohio State University
Alberto Uribe, MD, MS, MPH - The Ohio State University
Yun Xia, MD - The Ohio State University

Abstract:
Introduction: There is a higher NICU admission rate in term pregnancies under elective cesarean delivery (CD) than vaginal delivery 14.1% vs 6.5%. Given intraoperative hypotension occurs in up to 71% of cases and results in fetal bradycardia and adverse neonatal outcomes[1], modifications to left uterine displacement (LUD) and medications have been made to maintain adequate blood pressure (BP). There are multiple definitions of hypotension without an evidence-based gold standard.[2] Our pilot study seeks to investigate the incidence of poor neonatal events and hypotension with measurements at the upper arm and left ankle with or without LUD for future studies.

Methods: This was a single-center prospective cohort study in elective CD under spinal(SAB) in patients age≥18, BMI≥35, and singleton term births without maternal cardiac diseases and fetal anomalies. BP was measured at the non-peripheral intravenous arm and left ankle at three-time points and two positions: before SAB, after SAB, and post-delivery with and without LUD. The anesthetic included 1.6mL 0.75% hyperbaric bupi+10μg fentanyl+100μg morphine with crystalloid co-loading and prophylactic phenylephrine infusion after SAB. The primary outcome is the incidence of maternal hypotension with SBP< 100 mmHg at the arm and < 80% of the baseline BP at the ankle and composite fetal outcomes. Demographic and clinical data were summarized overall and by hypertensive disorders of pregnancy (HPD). Mixed-effect regression analyzed blood pressure differences, and logistic regression identified predictors for poor fetal outcomes.

Results: Among the 97 enrolled subjects, hypotension in supine after SAB was 36% at the arm, similar in non-HDP and HDP (37% vs 35%), and 16% at the ankle, with a 9% difference between non-HDP and HDP (13% vs 22%). Incidence composed of poor fetal parameters, FAAAN include fetal bradycardia < 120, Apgar scores < 3 at 1 or 5 min, required airway support, and NICU admission was 12% (non-HDP) and 35%(HDP). The NICU admit rate was 12.4%. The odds of FAAAN are 3.97 x higher in HPD patients compared to non-HDP after adjusting for BMI (*P*=0.02). No statistically significant changes (Fig.1) were noted with LUD at 15^{o} except the MAP at arm before SAB (4.2 (95%CI: 1.1, 7.3), *P*=0.01). SBP (7.5 (95%CI: 2.6,

12.5)) & MAP ((5.9 (95%CI: 2.8, 9.0)) were significantly higher at the ankle post-delivery than before, but not at the arm (2.0 (95%CI: -2.9, 6.9), *P*=0.43).

Discussion: LUD did not affect BP measurements at the arm or ankle, resulting in more phenylephrine after SAB.[3] Higher BP at the ankle may result from higher aortic flow than higher venous return after the fetus's delivery. FAAAN associated with HDP supports keeping a higher BP than non-HDP women. Future investigations would determine an evidence-based definition of hypotension to predict FAAAN at the ankle and/or arm.

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Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 05

Delivery Timing in Patients With Pre-Existing Cardiac Disease and Hypertensive Disorders of Pregnancy

Presenting Author: Maura Jones Pullins, MD
Presenting Author's Institution: University of North Carolina - Chapel Hill - Durham, North Carolina
Co-Authors: Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA - Duke University Department of Anesthesiology
Johanna Quist-Nelson, MD - University of North Carolina - Chapel Hill
Sarah Snow, MD - Duke University Medical Center
Elizabeth Volz, MD - University of North Carolina - Chapel Hill

Abstract:
Introduction: Preeclampsia (PEC), a hypertensive disorder of pregnancy (HDP), is a leading cause of maternal morbidity and mortality.[1] Cardiovascular disease (CVD) is the leading cause of maternal deaths in the United States, with increasing prevalence in pregnant patients.[2,3] Patients with CVD are at an increased risk of both PEC and preterm delivery but the degree .of risk and impact of HDP on gestational age of delivery has not been described.[4] The aim of our study is to characterize delivery timing in patients with CVD who develop HDP.

Methods: After IRB approval, we used the Premier Database to conduct a retrospective cohort study of pregnant patients $\geq$18 years of age delivering between 10/1/2015 and 12/31/2020. Patients with CVD were divided into six categories: congenital, ischemic, aortic pathology, pulmonary hypertension, cardiomyopathy, and valvular. Patients with codes for multiple types of CVD were included in the analyses for each individual category. The exposure variable of interest was a diagnosis of a HDP. HDP were defined as PEC without severe features, PEC with severe features (sPEC) and gestational hypertension (gHTN). The primary outcome was gestational age at delivery. A multivariable mixed effects logistic regression model was used to compare risk of HDP and controlled for CVD type, age, payor, race, ethnicity, hospital type, location, and size, and comorbidities. A multivariable mixed linear regression model was used to compare gestational age at delivery. We controlled for the same covariates, and HDP, preterm labor, and preterm premature rupture of membranes.

Results: 20,021 of 4,606,247 patients with CVD in pregnancy were identified. Patients with with sPEC delivered the earliest, however those with comorbid CVD delivered between 33-34 weeks compared to delivery in the 35th week for those without CVD. Of patients with sPEC, those with ischemia, pulmonary hypertension, aortic pathologies, and cardiomyopathy delivered earliest, during the 33rd week of pregnancy. Among patients with CVD, those with

PEC without severe features delivered earlier than those with gHTN, with PEC deliveries occurring before 37 weeks (range 33.3-36.4 weeks gestation).

Discussion: Pregnant patients with CVD who develop PEC delivered preterm and earlier, typically by 2-3 weeks, than their counterparts without CVD. This suggests expectant management until 37 weeks was not as commonly conducted in patients with pre-existing CVD, most notably in those with pulmonary hypertension. This dataset does not allow for granularity to examine other factors that may have influenced delivery timing such as timing of HDP diagnosis or decompensation of underlying CVD in the setting of PEC. Patients with CVD should be counseled on the timing of preterm delivery if diagnosed with PEC.

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SOAPFigure.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 06

Preeclampsia Management with Nifedipine Verses Labetalol: Is There a Clear Winner?

Presenting Author: Ashley E. Vincent, MD
Presenting Author's Institution: Duke University
Co-Authors: Quinn Lanners, BS - Duke University
David Page, PhD - Duke University
Cynthia Rudin, PhD - Duke University

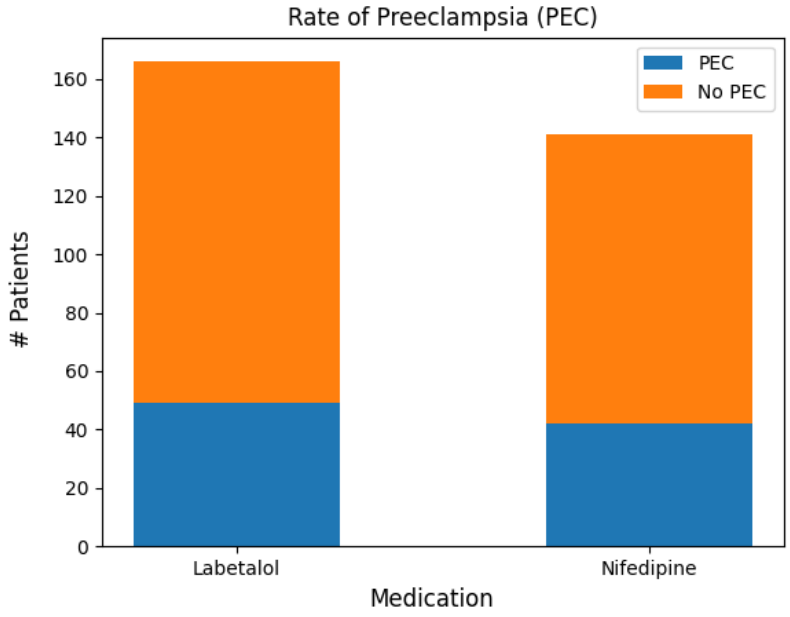
Abstract:
Introduction: Preeclampsia (PEC) is the most prevalent complication of chronic hypertension (cHTN) in pregnancy. ACOG recommends oral labetalol or nifedipine therapy for treatment of cHTN in pregnancy. Medications are selected based on patient-specific comorbidities such as asthma, heart disease, and headaches, without clear data to suggest one medication is superior to the other. The aim of our study was to use our electronic health records to investigate if there is a difference in the effectiveness of labetalol versus nifedipine on rates of PEC. We hypothesize that pregnant people with cHTN who are treated with calcium channel blockers when compared with beta blockers will have a lower risk of developing PEC.

Methods: After IRB approval, we used our medical records to create a cohort of people with cHTN who delivered between Jan. 1, 2016, and Apr. 30, 2023. We excluded patients with conditions that may predetermine the antihypertensive medication prescribed (severe asthma, congenital heart disease). We linked patients to the antihypertensive home medications they were prescribed from 280 days before their delivery date to 30 days after. We labeled a patient as having taken a medication during their pregnancy if it was on their chart for 30 consecutive days. We constructed a labetalol-only group and a nifedipine-only group, such that patients in the groups were only prescribed one medication, labetalol or nifedipine, respectively. Our primary outcome was a diagnosis of PEC by ICD code, and we required any patient who developed PEC to have had the medication in their chart for at least 30 days before the diagnosis of PEC. Our secondary outcomes were birth weight and gestational age. We used a two-sided z-test to compare the proportion of patients diagnosed with PEC in each group and to compare each group's average gestational age and birth weight. We report findings with 95% confidence intervals.

Results: The labetalol-only group had 166 patients of which 25.3% developed PEC. The nifedipine-only group had 141 patients of which 23.4% developed PEC. There was no significant difference in the rate of patients who developed PEC between the two groups (p=0.700). For the secondary outcomes, neither gestational age at the time of delivery, -0.2 days (p=0.935), nor the birth weight of the baby, -2.9 ounces (p=0.297) varied between the two groups.

Discussion: In our retrospective electronic health record cohort, there was no significant difference in the effectiveness of labetalol versus nifedipine on rates of PEC. It is possible that we missed identifying an effect due to the small sample size of our cohort which limited the power of our tests. Furthermore, this work did not control for patient characteristics– an effort that would be difficult given the already small sample sizes. Future work will aim to collect a larger sample size to overcome these drawbacks and further explore this question.

References:



Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 07

Management of Chronic Hypertension in Pregnancy after the CHAP Trial: How are we doing?

Presenting Author: Ashley E. Vincent, MD
Presenting Author's Institution: Duke University
Co-Authors: Quinn Lanners, BS - Duke University
David Page, PhD - Duke University
Cynthia Rudin, PhD - Duke University

Abstract:
Introduction: Chronic hypertension (cHTN) disproportionately affects Black people and is associated with severe morbidity. Preeclampsia (PEC) occurs in 25-50% of pregnancies complicated by cHTN. The CHAP trial showed that a BP goal of ≤140/90 reduced rates of PEC with severe features, preterm birth, placental abruption, and fetal or neonatal death. Consequently, ACOG/SMFM updated guidance on the management of cHTN in April 2022. We aimed to examine changes in antihypertensive management at our center before and after the 2022 guidance and to examine possible differences in patient race and provider prescription rates. We hypothesize that there will be higher rates of patients with cHTN taking antihypertensive medications after April 2022.

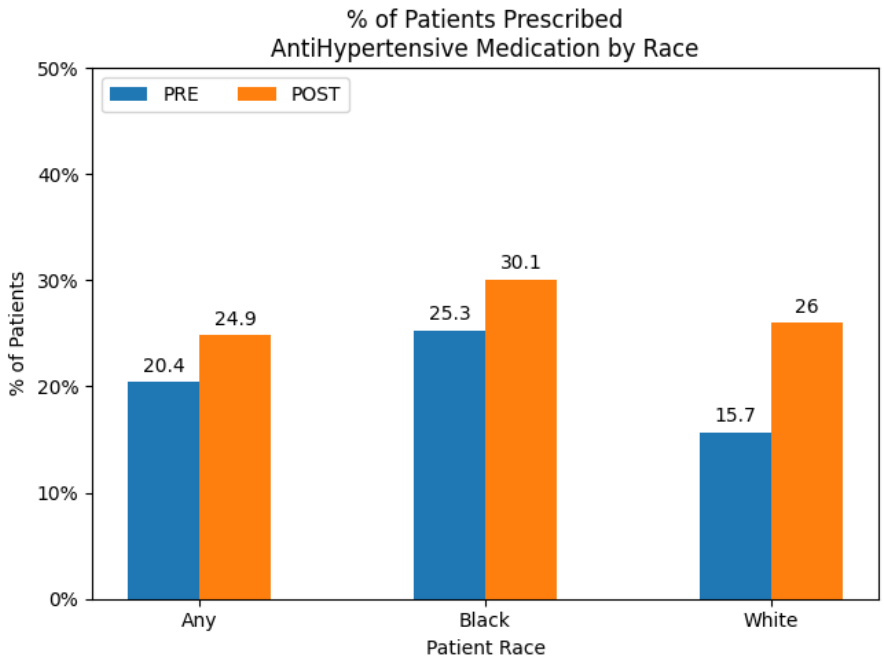
Methods: After IRB approval, we used our medical records to create a cohort of people with cHTN who delivered between January 1, 2016, and April 30, 2023. We linked each patient to all the antihypertensive home medications that they were prescribed from 280 days before their delivery date to 30 days after and required that the medication have a prescription start and end date ³ 30 days. Subjects were either in the pre-guidelines group (PRE) delivering before April 1, 2022, or the post-guidelines group (POST), delivering at least nine months after April 1, 2022.
We used a one-sided z-test to assess the antihypertensive prescription rate before and after the ACOG guidelines. We fit a logit model to predict whether a patient received treatment using their race, timing of pregnancy (PRE or POST guidelines), and the interaction term.

Results: The PRE group had 2056 people (Black: 47.7%, white: 40.2%) of which 20.4% were prescribed an antihypertensive home medication. The POST group had 229 people (Black: 40.6%, white: 43.7%) of which 24.9% were prescribed an antihypertensive home medication. Antihypertensive medications were prescribed at the same rate PRE and POST (p=0.057). Overall, Black patients in our cohort were 1.77 times more likely than white patients to be prescribed antihypertensive medications (odds ratio 1.77, p=0.000). However, we did not see a significant difference in the change of prescription rates between the PRE and POST groups based on patient race, odds ratio of 0.90 (p=0.734).

Discussion: We did not detect a change in prescription rates of antihypertensives for patients with cHTN after the 2022 ACOG guidelines. However, this may have been due to the limited

sample size of the POST group. Future work will have a larger POST group and control for vital signs and patient characteristics. There was a larger increase in POST prescription rates among white patients compared to Black patients. This may suggest white patients have more subtle elevations in BP on average; lowered BP thresholds for treatment affect white patients more than Black patients (i.e., Black patients were more likely to have BP values that met the older threshold).

References:



Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 08

Pre-eclampsia Causes Unique Changes in Plasma miRNA Profile of Mom and Baby Compared to Healthy Controls: An Exploratory Pilot Study

Presenting Author: Katelyn Scharf, MD
Presenting Author's Institution: University of Michigan - Ann Arbor, Michigan
Co-Authors: Shobhana Bharadwaj, MD - University of Maryland School of Medicine
Wei Chao, MD - University of Maryland School of Medicine
Katherine Goetzinger, MD - University of Maryland School of Medicine
Bhavani S. Kodali, MD - University of Maryland School of Medicine
zou Lin, MD - University of Maryland School of Medicine

Abstract:
Introduction: MicroRNAs (miRNAs) are small non-coding RNAs responsible for post-transcriptional regulation of gene expression involved in many physiological and pathological processes. Recent studies have also suggested that extracellular miRNAs can act as proinflammatory mediators via innate immune signaling.[1] In preeclampsia (PE), differential expression (DE) of plasma miRNAs were observed in pre-eclamptic women,[2,3] and specific miRNAs were associated with inhibition of angiogenesis and trophoblast proliferation in human umbilical vein cells.[2] The present study aims to further determine differences in the plasma miRNA profiles of pre-eclamptic mothers and babies compared to their healthy counterparts (Control – Con).

Methods: Blood samples were collected from both healthy and pre-eclamptic mothers, and corresponding fetal blood samples were collected from the umbilical vein at the time of delivery (n=5/group). Plasma RNA was extracted using miRNeasy serum/plasma kit and analyzed for small RNA sequencing by Norgen Bioteck Co. A fold change of >1.5 (PE/Con) was considered significant DE and used to create heatmaps comparing the following conditions: 1. control mom vs. pre-eclamptic mom; 2. control baby vs. pre-eclamptic baby, 3. control baby vs. control mom, and 4. pre-eclamptic baby vs. pre-eclamptic mom.

Results: Plasma RNA profiling showed that 54 miRNAs in PE mothers and 81 miRNAs in PE babies were upregulated compared to that of their healthy counterparts (**Fig. 1A-B)**. Of these upregulated plasma miRNAs, five (miR-660-5p, let-7i-3p, p, miR-550a-3p, miR-10527-5p, miR-500b-3p) were shared between the pre-eclamptic mothers and babies. Further, 81 miRNAs in PE mothers, and 72 miRNAs in PE babies had decreased expression compared to that of the counterparts (**Fig. 1C-D)**. Of these downregulated miRNAs, 17 were shared between the PE mothers and babies. Finally, similar to their control cohorts, pre-eclamptic mothers and their babies display distinct miRNA profiles when compared (data not shown). To determine whether there are specific miRNA species that are upregulated only in PE mothers, we compared their profiles to both PE babies and control moms. Four miRNAs (miR-139-3p, 363-

3p, 96-5p, 183-5p) were confirmed to be significantly increased and unique only to pre-eclamptic mothers.

Conclusions: Certain miRNA species are increased in PE mom and baby compared to their healthy counterparts. Five of these increased miRs are shared between PE mom and baby, and four increased miRs were unique to PE mom. These specific plasma miRNAs represent future targets of investigation into their pathogenic role and potential as biomarkers in pre-eclampsia.

References:

1. Science 2021; 24:12. 2. Am J Obstet Gynecol 2020;222:497. 3. Hypertension 2020;75:762.

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Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 09

Automated Non-Invasive Blood Pressure Measurement Underestimates Systolic Blood Pressure in Hypertensive Disorders or Pregnancy

Presenting Author: Amnon A. Berger, MD, PhD
Presenting Author's Institution: Beth Israel Deaconess Medical Center / Harvard Medical School - Boston, Massachusetts
Co-Authors: Samantha L. Armstrong, BS - Beth Israel Deaconess Medical Center
Yunping Li, MD - Beth Israel Deaconess Medical Center / Harvard Medical School

Abstract:
Background: Cardiovascular conditions are leading causes in maternal mortality in the US (15.5%).[1] Hypertensive disorders of pregnancy (HDP), complicate at least 10% of pregnancies, [1] and require accurate blood pressure monitoring for diagnosis and treatment.[2] Automated non-invasive (NIBP) blood pressure (BP) devices are most commonly used owing to their safety and ease; manual BP measurements are considered as accurate as invasive gold standard, but are cumbersome and time consuming. Increased vascular stiffness in HDP may hinder the accuracy of BP measurements. There is concern that automated NIBP measurement may not accurately predict arterial BP in preeclampsia (PEC),[3] despite the diagnosis relying on systolic (SBP) and diastolic (DBP) BP.

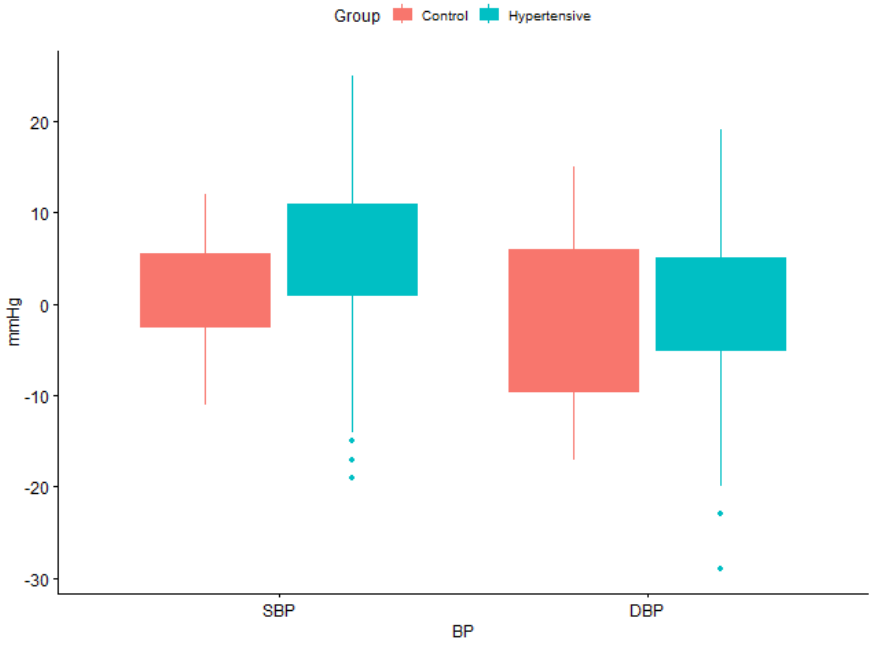
Objective: To compare the mean differences in BP measurements between automated and manual NIBP measurements. To assess whether the phenotype of HDP is associated with the degree of error.

Methods: An interim analysis of a Prospective Observational Cohort comparing manual and automated NIBP measurements in patients admitted to labor and delivery. A total of 60 of 120 patients have been enrolled. The main outcome is the mean difference in SBP between manual and automatic BP averaged over 3 measurements at 5-minute intervals. Groups were compared using Weld T-test, Kruskal Walis Rank Test and Gaussian Regression. $P< 0.05$ was considered significant.

Results: Sixty patients were enrolled and data from all patients were available for analysis; 13 were healthy controls, 9 had chronic hypertension (cHTN), 13 gestational hypertension (gHTN), 7 preeclampsia (PEC), 5 PEC with severe features by BP alone (sPEC-BP), and 13 sPEC. SBP was significantly different between the six groups (Median difference 2 mmHg in controls to 9 mmHg in sPEC, $P< 0.001$). When comparing controls to the combined cohort there was still a significant difference (Median 2 mmHg in controls vs 7 mmHg in HDP, $P< 0.001$). The difference was not significant when comparing PEC or sPEC to the rest of the cohort. There was no significant difference when comparing patients receiving magnesium, or other anti-hypertensive agents. A multivariate analysis did not find any significant confounders. Only a handful of patients had a SBP difference >10 mmHg, evenly distributed between groups.

Discussion: There was a significant difference in the measurement of SBP between control and hypertensive patients. It is encouraging that the median difference is only 7 mmHg, likely meaning that hospital-grade automated NIBP measurement is suitable for the management of most patients. These results can be used to further investigate the pathophysiology of HDP. The setting limited our trial such that all but one patient in the PEC and sPEC group were treated by antihypertensives prior to inclusion, while the minority of gHTN and cHTN patients were.

References: 1. PMID: 28697109
2. PMID: 32443079
3. PMID: 10561646



Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 10

Peripartum Antihypertensive Impact Neonatal Hypoglycemia and Postpartum Uterine Atony

Presenting Author: Amnon A. Berger, MD, PhD
Presenting Author's Institution: Beth Israel Deaconess Medical Center / Harvard Medical School - Boston, Massachusetts
Co-Authors: Samantha L. Armstrong, BS - Beth Israel Deaconess Medical Center
Alina Fischer, BS - Beth Israel Deaconess Medical Center
Megha Gupta, MD - Beth Israel Deaconess Medical Center / Harvard Medical School
John J. Kowalczyk, MD - Brigham and Women's Hospital / Harvard Medical School
Yunping Li, MD - Beth Israel Deaconess Medical Center / Harvard Medical School

Abstract:
Background: Hypertensive disorders of pregnancy (HDP) are common and are rising in prevalence. Treatment includes beta-blocking (e.g. labetalol) or calcium channel blocking (e.g. nifedipine) medications. Labetalol is a first-line therapy due to its mixed alpha and beta effects, proven efficacy, and safety, however, it readily crosses the placenta. Studies on long-term outpatient use suggest an increase in neonatal bradycardia, hypoglycemia, and intensive-care unit (NICU) admissions. Nifedipine may be superior in treating HDP but might precipitate uterine atony and postpartum hemorrhage (PPH). Prior results on these outcomes were limited to outpatient prescriptions not use during the delivering admission. Our aim was to evaluate the effect of antihypertensive use during delivery admission on maternal and neonatal outcomes, including uterine atony and PPH, neonatal hypoglycemia, bradycardia, and NICU admissions.

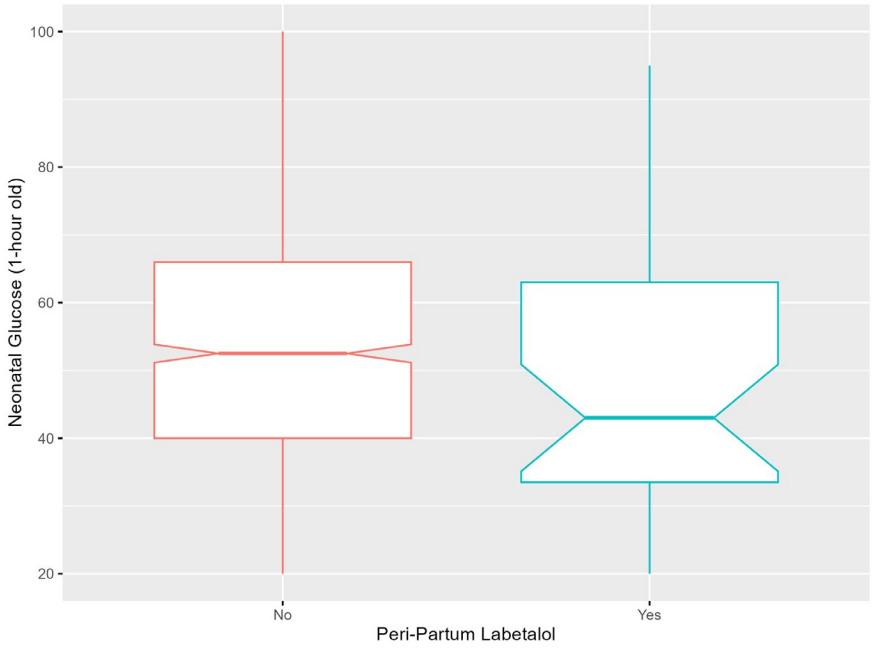
Methods: A single-center cohort study at a tertiary academic medical center, comparing the incidence of neonatal hypoglycemia at 1-hour and 24-hours post-delivery, bradycardia and NICU admissions in neonates, and additional uterotonic or antifibrinolytic maternal use. Labetalol and nifedipine exposures were analyzed independently. Primary outcomes included 1-hour neonatal hypoglycemia and maternal uterine atony. We calculated odds ratio (OR) and binomial and linear generalized models (GLM) to account for covariates. $P< 0.05$ was considered significant.

Results: We examined records for 26,058 parturients over 5 years (07/2016-07/2021) and analyzed 24,845 due to exclusion criteria and incomplete data. Full data was available for medication exposure. Partial data were available for component APGAR scores (22,066), NICU admissions (21,400), and hypoglycemia (4,820). Labetalol was given in 605 deliveries and nifedipine in 426. Labetalol was significantly associated with hypoglycemia at 1-hour ($P< 0.01$, OR 1.73, 95%CI 1.15-2.59), but not at 24-hours ($P=0.85$), bradycardia ($P=0.66$), or NICU admissions ($P=0.86$). Labetalol and nifedipine were both associated with uterine atony ($P=0.006$ and $P=0.03$, respectively), and increased blood loss demonstrated by decreased postpartum hemoglobin (1.37 g/dL, 95%CI 1.13-1.65, $p=0.001$; 1.55 g/dL, 95%CI 1.25-1.92, $p<$

0.001 respectively) while accounting for magnesium exposure and general anesthesia. These results remain significant in sensitivity analyses of only patients with HDP.

Conclusion: We found an association between labetalol exposure and neonatal 1-hour hypoglycemia and antihypertensives with uterine atony. While the former is independent of any other indicator of disease, the latter may be an expression of severity for the underlying disease. Neonates born to mothers receiving labetalol should be assessed for hypoglycemia shortly after birth. Further randomized studies are required to delineate causality from association.

References:
PMID: 35954977
PMID: 27577580
doi:10.1111/1471-0528.12428



Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 11

Association Between Preeclampsia Risk and Air Pollutant PM2.5 and Heavy Metals During Pregnancy Using National Health Insurance Claims Data of South Korea

Presenting Author: Yoon Ji Choi
Presenting Author's Institution: Department of Anesthesiology and Pain Medicine, Korea University Ansan Hospital, Korea University College of Medicine, Ansan, Republic of Korea
Co-Authors: Sang-Hwan Do - Department of Anesthesiology and Pain Medicine, Seoul National University Bundang Hospital, Seongnam, South Korea, Department of Anesthesiology and Pain Medicine, Seoul National University College of Medicine, Seoul, South Korea
Seung Hyun Kim - Department of Anesthesiology and Pain Medicine, and Anesthesia and Pain Research Institute, Yonsei University College of Medicine, Seoul, Korea
Keum Young So - Department of Anesthesiology and Pain Medicine, Chosun university medical college, Gwangju, Korea

Abstract:
Background: Exposure to higher concentrations of particulate air pollutants alone may increase the risk of adverse pregnancy outcomes, namely preeclampsia. The mechanism seems to be considered to be placental disorders caused by air pollutants, hypomethylation or methylation of related genes, oxidative stress, vascular index, and increased immune activation. The objective of this study was to investigate the association between exposure to air pollutants (PM2.5, CO, SO2, NO2, and O3) and heavy metals (Pb, Cd, Cr, Cu, Mn, Fe, Ni, and As) during pregnancy and the incidences of preeclampsia and eclampsia using national health insurance claims data of south Korea.

Methods: We used maternal (O80-O84) and their newborns data provided by the National Health Insurance Service from 2016 to 2019. Air quality and heavy metals exposure data during pregnancy were retrieved from Korea Environment Corporation, and atmospheric conditions were matched based on the mother's registration area. The concentration of air pollutants used in the analysis is the average concentration of the 2nd trimester of pregnancy and total concentration during the entire pregnancy. The two groups of patients were matched based on age, gender, and household income. Logistic regression models were performed adjusting for maternal age, infant sex, season of pregnancy, and household income.

Results: A total of 16,920 of preeclampsia and 592 of eclampsia data were extracted. The incidence of pre-eclampsia was higher in people over 40 years old (P< 0.001) and in working women (P< 0.001). It occurred more often in low-income groups (P< 0.001) and was more common in girls (P< 0.001). (P< 0.001). Pre-eclampsia occurred more often in low birth weight infants weighing less than 1kg and 1-2.5kg (P< 0.001). It occurred more frequently in premature infants with gestational age of 27 weeks or less and 27-36 weeks (P< 0.001), and occurred more frequently in twin fetuses (P< 0.001).

Pre-eclampsia occurred more often in mothers with pre-pregnancy hypertension (P< 0.001) and diabetes (P< 0.001). Additionally, the incidence rate was higher in those with kidney disease (P< 0.001), hyperlipidemia (P< 0.001), and infertility (P< 0.001). A similar pattern was seen in the case of eclampsia.
In analysis through regression model, PM2.5 [1.003 (1.001-1.006)] and Cu [1.011 (1.001-1.023)] showed an association with pre-eclampsia, and furthermore, PM2.5 [1.113 (1.007-1.23)] showed an association with eclampsia.

Conclusion: Increased PM2.5 and Cu exposure during 2nd trimester of pregnancy appears to be associated with the development of pre-eclampsia and eclampsia. Therefore, it is necessary to pay attention to health care against air pollution during pregnancy.
Figure 1. Spatial distribution of the air pollutant and heavy metal concentrations and the number of pre-eclampsia and eclampsia in South Korea.

figure_total.tif

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 12

Pregnancy and Neonatal Outcomes in Parturients with Pulmonary Hypertension

Presenting Author: Evan Liu
Presenting Author's Institution: Tufts University School of Medicine, Massachusetts
Co-Authors: Sarah Ahmed, MD - Massachusetts General Hospital
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Kathryn J. Gray, MD, PhD - University of Washington

Abstract:
Purpose: Pulmonary hypertension (PH) during pregnancy is associated with prolonged hospitalization, ICU admission, and one of the highest maternal mortality rates (1). PH is part of the obstetric co-morbidity index score (OB CMI) which summarizes maternal comorbidities and correlates well with adverse pregnancy outcomes (2). In the OB CMI, PH is weighted similarly to placenta previa and lower than preeclampsia with severe features, yet patients with PH have a very high rate of severe maternal morbidity (SMM). The factors associated with SMM beyond PH in this patient group are poorly investigated due to small cohort studies and limited data. While studies have validated the OB CMI as an effective tool for predicting SMM, its use in patients with PH has not been investigated (3). In this study, we explored outcomes of parturients with PH and investigated if the comorbidity burden correlates with the risk of prolonged hospitalization and ICU admission.

Methods: We identified patients with PH in the electronic health records of two large healthcare systems using International Classification of Disease- 9 and 10 codes from 1996-current who had a pregnancy that progressed more than 20 gestational weeks. Data was abstracted via manual chart review. We report descriptive summary statistics and regression analyses with a level of significance of $p< 0.05$.

Results: A total of 48 pregnancies among 45 women were identified. The average maternal age was 33.2 ± 3.4 years, and the mean pulmonary artery pressure was 59 ± 19 mmHg. The mortality rate was 4%, all of which occurred before the year 2000. The majority of parturients underwent cesarean delivery (56%) and received epidural anesthesia during labor (52%). The OB CMI at the delivery admission was 8 (interquartile range of 6-10), and the mean duration of hospital admission was 8.5 ± 7.1 days. Thirteen pregnancies resulted in ICU admission. Full results are presented in Table 1. Statistical analysis showed no relationship between the OB CMI and the duration of hospital admission or risk of ICU admission; similarly, there was no effect of race, ethnicity, maternal age, gravidity, parity, gestational age, or mode of anesthesia. The only predictor that was strongly associated with the duration of hospital admission and risk of ICU admission was maternal pulmonary arterial pressure ($p< 0.01$).
Conclusion: In our diverse cohort of parturients with PH, there were two maternal deaths and high incidence of prolonged hospitalization and ICU admission rate; those outcomes

correlated strongly with pulmonary arterial pressure. There was no relationship between those outcomes and the OB CMI. Additional studies are required to investigate if the severity of PH warrants higher weights in scoring patient comorbidity burden and more accurate risk prediction.

References:

1) Roos-Hesselink, *Eur Heart J*. 2019; PMID: 30907409
2) Easter, *Am J Obstet Gynecol.* 2019; PMID: 31229427
3) Metcalfe, *BJOG.* 2015; PMID: 25559311

Liu, Evan SOAP Abstract Table 1.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 13

Minimum Test Tradeoff Applied to Uterine Artery Pulsatility Index for Antepartum Prediction of Preeclampsia

Presenting Author: Zachary Janik, MD
Presenting Author's Institution: Johns Hopkins University School of Medicine
Co-Authors: Mellany Stanislaus, MD - Johns Hopkins University School of Medicine

Abstract:
Introduction: Globally, preeclampsia complicates 2-8% of pregnancies but accounts for a disproportionate rate of maternal morbidity and mortality. Accurate prediction and early detection of preeclampsia could lead to improvements in patient care. Numerous combinations of biomarkers, biophysical characteristics, and maternal factors have been evaluated for prediction of preeclampsia. The uterine artery pulsatility index (UtPI), a biophysical characteristic used to assess impedance to blood flow from the maternal side of the placenta, has been studied in these models, but the cost of using this tool has not been evaluated. Our study applies a decision analysis metric, the Minimum Test Tradeoff (MTT), to determine the minimum number of data collections (UtPI's) per true positive prediction of outcome (preeclampsia) to obtain positive expected utility of prediction.

Methods: We performed a non-systematic review of the literature for studies of prediction models for preeclampsia that included the area under the curve (AUC) of the receiver operating curve (ROC) for models with UtPI and without UtPI. We subdivided the data into 5 groups: delivery or diagnosis of preeclampsia <34 weeks, delivery or diagnosis of preeclampsia >=34 weeks, preeclampsia requiring delivery <37 weeks, preeclampsia requiring delivery >=37 weeks, or preeclampsia (unspecified gestational age for diagnosis or delivery). If multiple models were present within the same study, the model with the highest AUC in each subgroup was identified. The MTT for comparing two prediction models is: $1/[P\ (H(AUC_{model})]$, where $H(AUC) = AUC – \{½\ (1–AUC)\}^{½}$. P is the prevalence of preeclampsia in the specified population.

Results: Of the 111 studies we screened based on our Pubmed search, 27 studies met our inclusion criteria. These studies included a total of 6214 patients (2 studies did not include the sample size of each subgroup). The range of MTT by subgroup was: delivery or diagnosis of preeclampsia <34 weeks: 1000 to no benefit, delivery or diagnosis of preeclampsia >=34 weeks: 100 to no benefit, preeclampsia requiring delivery <37 weeks: 1200 to no benefit, preeclampsia requiring delivery >=37 weeks: 1000 to no benefit, or preeclampsia (unspecified gestational age for diagnosis or delivery): 100 to no benefit.

Conclusion: Accurate prediction of preeclampsia is important to allow for risk stratification and early intervention. With any screening test, it is critical to consider the cost (monetary and time) of each test compared to the benefit of the information gained. We found large

MTT's in all categories of subjects studied. A large MTT can rule out risk prediction with the additional measurement collected. Given the large MTT's for UtPI if AUC increased and that some AUC's decreased, we conclude that UtPI is likely not worthwhile for screening the general population for preeclampsia. Further study is required whether there may be a subgroup that could derive benefit from this test.

MTT Tables.pdf

Abstract #: FRI – RA – BS 2 – BR 2 – Hypotension + Vasopressors / Cardiac + Preeclampsia – 14

The Association of Food Insecurity with Hypertensive Disorders of Pregnancy: A National Health Interview Survey Analysis

Presenting Author: Brittany N. Burton, MD, MHS, MAS
Presenting Author's Institution: University of California Los Angeles (UCLA) Department of Anesthesiology
Co-Authors: Catherine Cha, MD - University of California Los Angeles (UCLA) Department of Anesthesiology
Tina Yu, MD - University of California Los Angeles (UCLA) Department of Anesthesiology

Abstract:
Introduction: Studies have identified race as a predictor of hypertensive disorders of pregnancy (HDP), however others have shown that U.S. born Black women are at higher risk of preeclampsia compared to Black women born outside of the U.S., suggesting race alone does not explain the disparity.[1] While food insecurity, a social and economic condition of inadequate nutrition, is one of the most researched social determinants of health,[3] there is a paucity of literature on the impact of food insecurity in pregnancy. The primary objective of this study was to examine the association between food insecurity and HDP using the National Health Interview Survey (NHIS).

Methods: We performed a cross-sectional analysis of 2021-2022 pooled data from the NHIS. The study population was women of child-bearing age (18-49 years old). The primary outcome of interest was hypertension versus normotension. The primary exposure was food insecurity versus food security. Pearson's Chi-square and independent sample t-test were used to compare characteristics for categorical and continuous variables, respectively. Hierarchal logistic regression models were developed to examine the association between food insecurity and HDP. The odds ratio (OR) and 95% confidence interval (CI) were reported.

Results: Of the 758 women included in the analysis, the rate of HDP was 12.5% and the rate of food insecurity was 8.5%. The prevalence of ethnic and racial composition was 17.0% for Hispanic ethnicity, 73.9% for White, 14.5% for Black/African American, 2% for American Indian and Alaska Native, 7% for Asian, and 2.6% for multiple races. The prevalence was 6.1% for hyperlipemia, 1.2% for cardiovascular disease, and 10.7% for diabetes mellitus. The odds of HDP were statistically significantly increased between women with food insecurity and women with food security (OR 2.31, 95% CI: 1.02-5.22) after adjusting for age, race, ethnicity, insurance status, and cardiovascular disease (Table 1).

Conclusion: We observed a 2-fold increase in the odds of HDP in women with food insecurity after adjusting for demographic (i.e., age, race, and ethnicity), socioeconomic status (i.e., insurance status), and cardiovascular disease. Further studies are needed to elucidate causes of these differences and identify strategies and interventions – the Special Supplemental

Nutrition Program for Women, Infants, and Children (WIC) and food pantries –to reduce these differences as it may be more feasible to address issues of food security among pregnant women.

References:

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 01

Effect of Race and Socioeconomic Status on Rates of Epidural Usage

Presenting Author: George Ghafari, Medical Student
Presenting Author's Institution: Zucker School of Medicine at Hofstra/Northwell - New Rochelle, New York
Co-Authors: Gregory Palleschi, MD - Northwell Health
Andrea Ruggiero, MS - Northwell Health

Abstract:
Introduction: Disparities in both access to and outcomes of healthcare are more prevalent in racial and ethnic minority populations. The literature shows that minority patients receive epidurals during labor at a lower rate than their white counterparts[1]. Our previous research highlights this disparity in the use of epidurals. This study aims to identify whether socioeconomic status (SES) within ethnic and racial minority groups influences rates of intrapartum epidural analgesia. We hypothesize that wealth does not compensate for the difference in rates of epidurals between racial groups.

Methods: This is a retrospective chart review. 7172 birthing people at a tertiary care center on Long Island were enrolled between January 1st, 2020 to December 1st, 2021. Patients were divided into groups based on SES (high versus low), using insurance type as a proxy. Patients were also divided into groups based on race. Rates of epidural usage were then compared across these groups. Statistical analysis was performed using chi-squared and logistic regression.

Results: In both the high and low SES groups, White patients received epidurals at a higher rate than their Black counterparts (Table 1). Black patients of low SES received epidurals at a lower rate than those of high SES (Table 1). All patients of low SES received epidurals at a lower rate than those of high SES (77.9% for high vs 71.6% for low SES, $p < 0.05$). Regression analysis shows that the White population on Medicaid received epidurals at a higher rate than the Black population not on Medicaid, with an odds ratio of 1.146, although this result was not statistically significant (p=0.106).

Discussion: The rate of epidural usage in both the high and low SES groups is significantly lower in Black patients compared to their White counterparts. Factors contributing to this discrepancy could include distrust in healthcare workers, lack of prenatal care in minority patients, and providers' implicit bias.[2] Our results show that, within a certain racial group, SES is related to rates of epidurals. The data indicates that Black patients of high SES still receive epidurals at a lower rate than White patients of low SES (74% for Black patients of high SES vs 76.1% for White patients of low SES), although we did not prove this with statistical certainty. Regression analysis further highlights this point, with White patients of low SES being 1.146 times more likely to receive epidurals than Black patients of high SES, although this result was

not statistically significant. We employed Medicaid (yes/no) as a proxy for SES which may be less accurate than other markers of SES (e.g.: household income).

References:

1. Ning Liu et al., "Social disparity and the use of intrapartum epidural analgesia in a publicly funded health care system", American Journal of Obstetrics and Gynecology
2. Laurent G. Glance et al., "Racial Differences in the Use of Epidural Analgesia for Labor", Anesthesiology 2007

Ghafari_Table1.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 02

Racial and Ethnic Disparities in Labor Epidural Analgesia Outcomes

Presenting Author: Shakthi Jayanthy Venkatachalam, MBBS
Presenting Author's Institution: Brigham and Women's Hospital - Westborough, Massachusetts
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Rie Maurer, MA - Brigham and Women's Hospital
Anarghya Murthy, BSc - Brigham and Women's Hospital
Gavin G. Ovsak, MD MBA - Brigham and Women's Hospital
Lawrence C. Tsen, MD - Brigham & Women's Hospital

Abstract:
Background: Racial and ethnic disparities exist in the use of neuraxial techniques for labor analgesia (1,2), however, it remains unknown if these elements affect the functional qualities of neuraxial labor analgesia. We hypothesized that, similar to utilization rates, functional outcomes of labor epidural analgesia would differ based on race and ethnicity.

Methods: In our single center retrospective cohort study, we reviewed parturients receiving labor epidural analgesia between 2015 and 2020. The primary outcome was the association between race and ethnicity and epidural catheter failure (ECF), as defined by replacement for vaginal delivery (ECF-VD) and replacement or conversion to general anesthesia for cesarean delivery (ECF-CD). Secondary outcomes included racial and ethnic differences in postpartum headache (PPHa), requiring treatment with Fioricet or an epidural blood patch, and postpartum neuropathy (PPN) on postpartum day 1. Background characteristics were compared with chi-square and Mann-Whitney U tests. Univariable and multivariable logistic regression examined the associations between race and ethnicity and ECF while adjusting for potential confounders. Odds ratios (OR) with 95% confidence intervals (CI) are reported.

Results: Of 25,394 parturients who received epidural labor analgesia, 55.6% were non-Hispanic white (White), 12.4% were non-Hispanic black (Black), 10.7% were Asian, 17.9% were Hispanic, and 3.4% were other/unspecified race. ECF was more likely among nulliparous women, those with higher BMI, and those with higher neonatal birth weight. Additionally, ECF was more likely when women underwent labor induction, augmentation, or cesarean delivery (CD). ECF was less likely in Asian women and those receiving a combined spinal epidural technique. Rates of limited English proficiency (LEP) were notable for Hispanic (21.6%) and Asian (10.3%) groups. Incidences of ECF-VD/ECF-CD were 3.6/7.0% for White, 3.6/7.0% for Black, 2.1/5.9% for Asian, 4.3/7.4% for Hispanic and 4.3/6.6% for other/unspecified groups. After adjusting for confounders (Table 1), Hispanic ethnicity was independently associated with increased odds of ECF-VD (adjusted OR 1.29; 95%CI 1.04-1.60) whereas Asian women had decreased odds of ECF-VD (adjusted OR 0.63; 95%CI 0.46-0.86). The incidence of PPHa was higher among Black and Hispanic women (8.1% and 7.7%, respectively) compared to

White women (6.3%) ($p< 0.001$). No racial or ethnic differences were detected in the incidence of PPN.

Conclusion: Racial and ethnic differences exist in the functional qualities of labor epidural analgesia. Limitations in our study include small sample size and the effect of maternal comorbidities on the outcomes studied. Further research may elucidate contributors to these observed differences, especially among patients with LEP.

References:

1 Glance Anesthesiology 2007
2 Rust AJOG 2004

Racial and Ethnic Disparities in Labor Epidural Analgesia Outcomes_Venkatachalam_SOAP2024.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 03

Development of an Obstetric Anesthesia Quality Improvement Framework for Low- and Middle-Income Countries: A Pilot Study in Vietnam

Presenting Author: Allison A. Mootz, MD
Presenting Author's Institution: Brigham & Women's Hospital - Boston, Massachusetts
Co-Authors: Michaela K. Farber, MD, MS - Brigham & Women's Hospital
Gavin G. Ovsak, MD MBA - Brigham and Women's Hospital
Bushra W. Taha, MD - Brigham & Women's Hospital
Hung Trong Mai, MD, MSc, PhD - Phu San Hanoi Hospital
Hien T. Vu, MD, MSc - Phu San Hanoi Hospital

Abstract:
Introduction: Over 95% of all maternal deaths occur in low- and middle-income countries (LMICs), and most are preventable.[1] Despite improvements in maternal health services in Vietnam, a LMIC, mortality rates are increasing.[1] Obstetric anesthesiologists are uniquely poised to enhance maternal outcomes. A quality improvement (QI) framework, focused on obstetric anesthesiology practices in LMIC hospitals, can provide insight into resource allocation, characterize maternal outcomes, and identify areas for improvement in delivering safe maternal care. This mixed-methods study aimed to develop and test a transferable framework to assess the quality of maternal health care at a high-volume (>40,000 deliveries/year) women's hospital in Vietnam.

Methods: A partnership between a quaternary academic hospital in the United States and a maternity referral hospital in Hanoi, Vietnam was established with the shared goal of promoting safe obstetric anesthesia practices and improving maternal care. Phase 1 of the study entailed a review of clinical practice challenges in Vietnam, collection of background information about the LMIC hospital, identification of stakeholders, and creation of a preliminary needs assessment (NA) survey (Figure 1). The NA survey was refined through qualitative assessment and tested as a pilot for further modifications in Phase 2. A final survey was completed in Phase 3 in anticipation of quantitative and qualitative analyses to guide QI interventions.

Results: A shared understanding of the historical, cultural, and medical context of the LMIC hospital in Phase 1 created a foundation of mutual respect and trust prior to a site visit, culminating in the design of a preliminary NA survey. In Phase 2, an on-site, iterative plan-do-study-act cycle (PDSA) was performed.[2] Through qualitative assessment via stakeholder meetings, focus groups, semi-structured interviews, and direct clinical observations, the survey was refined. PDSA-derived themes included the need for maternal risk assessment tools, QI initiatives, and tracking of maternal complications and morbidity. These themes informed the pilot survey design that was translated into Vietnamese and integrated within the hospital's system for data management.[3] The pilot NA survey was successfully conducted, and feedback was incorporated into a final survey to be disseminated to all hospital staff.

Discussion: We describe the process of developing a comprehensive maternal health NA at a LMIC maternity hospital through a collaborative and iterative process. The product is a transferable QI framework to which local contexts and priorities of a LMIC hospital can be applied. This standardized and scalable approach engages all stakeholders from the start, prioritizing site-specific identification of targeted interventions to reduce maternal morbidity and mortality in LMICs.

References:

1. WHO *Trends in Maternal Mortality* 2023
2. Taylor *BMJ quality & safety* 2014
3. Harris *J Biomed Inform* 2009

Mootz Development of an Obstetric Anesthesia Quality Improvement Framework for Low- and Middle-Income Countries A Pilot Study in Vietnam.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 04

Improving Obstetric Anesthesia Care in Low- and Middle-Income Countries: Results of a Pilot Needs Assessment Survey in Vietnam

Presenting Author: Gavin G. Ovsak, MD MBA
Presenting Author's Institution: Brigham and Women's Hospital, Massachusetts
Co-Authors: Jimin J. Kim, MD, MSc - Brigham & Women's Hospital
Allison A. Mootz, MD - Brigham & Women's Hospital
Cuong V. Tran, MD, MSc, PhD - Phu San Hanoi Hospital
Lawrence C. Tsen, MD - Brigham & Women's Hospital
Hien T. Vu, MD, MSc - Phu San Hanoi Hospital

Abstract:
Introduction: Obstetric anesthesiologists play an important role in improving maternal health outcomes. Needs assessments (NAs) focused on obstetric anesthesiology practices at hospitals in low- and middle-income countries (LMICs) may inform strategies to enhance maternal care. We conducted a pilot NA survey of an LMIC maternity hospital in Hanoi, Vietnam to evaluate resources and areas for improvement. This large hospital with >40,000 deliveries/year, offering both insured and public care, is poised to define the standard for safe maternal care in Vietnam. We report the results of a pilot NA in this setting.

Methods: An anonymous pilot survey was created with the hospital's REDCap[1] system and distributed via electronic communication with parallel in-person staff meetings. Over 3 days, 289 hospital staff were surveyed. Survey categories included participant demographics, maternal and anesthetic care, and maternal outcomes. Branching logic was used based on participants' self-identified hospital roles. Feedback via focus groups enabled site-specific modifications.

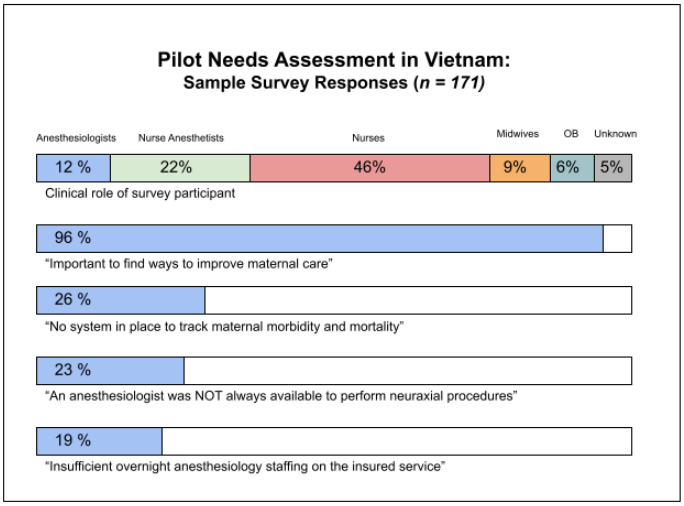
Results: Of 289 hospital staff surveyed, 217 (75%) completed the pilot survey. Barriers to participation included limited time and technical difficulties. Of the respondents, 171 (79%) were clinical staff and 46 (21%) were nonclinical. Of the clinical staff, 20 (12%) were anesthesiologists, 38 (22%) nurse anesthetists, 79 (46%) nurses, 15 (9%) midwives, and 11 (6%) obstetricians; 8 (5%) did not self-identify (Figure). Response time was 5-15 minutes. Notably, 23% reported a lack of consistent anesthesiologist availability to perform neuraxial procedures. Barriers to receiving neuraxial analgesia included cultural beliefs (86%), cost (82%), and patient education (67%). Barriers to tracking morbidity and mortality were lack of technical resources (74%) and medical staff (42%). Focus groups revealed a general reluctance to criticize practices, and that survey findings likely underestimated concerns at the hospital. Participants reported the survey was easy to understand and complete.

Conclusion: This successful pilot NA survey at a large LMIC maternity hospital yielded a rapid and robust response, conveying collective interest among staff in enhancing maternal care. Such buy-in is promising and suggests a receptive culture to engaging in meaningful quality

improvement initiatives. Our results indicate that better tracking of complications and morbidity and access to epidural analgesia are high priorities. These findings underscore the challenges of a high volume and high acuity site in a LMIC setting. Next, hospital-wide dissemination of the survey will capture perspectives from all stakeholders for consensus. This NA survey may catalyze targeted interventions. Success of this pilot holds promise that our collaborative efforts can improve standards of maternal care in Vietnam.

References:

1. Harris et al. J Biomed Inform 2009.



Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 05

A Perioperative Needs Assessment of a Tertiary Maternity Hospital in Freetown, Sierra Leone

Presenting Author: Anjan K. Saha, MD, PhD
Presenting Author's Institution: Columbia University Irving Medical Center - New York, New York
Co-Authors: Isabel Fan - Columbia University Irving Medical Center
Eddie Foday - Ministry of Health and Sanitation - Sierra Leone
Samba Jalloh, MBChB - Sierra Leone Medical Dental Association
Prashant Puttagunta - Michigan Medicine
Eric Rosen - Michigan Medicine

Abstract:
Background: Sierra Leone is one of the poorest countries in the world, with an estimated maternal mortality ratio (MMR) of 443 maternal deaths per 100,000 live births, the majority caused by preventable etiologies like hemorrhage, postpartum sepsis, and hypertensive disorders[1,2]. The high prevalence of preventable maternal mortality in Sierra Leone can largely be attributed to socioeconomic limitations that hamper the adoption of modern care paradigms[3]. Identifying and addressing the most pressing barriers to implementing modern obstetric and anesthesia care is critical to reducing maternal mortality in Sierra Leone. This study aims to identify the most significant challenges and needs facing perioperative maternal care delivery in Sierra Leone.

Methods: We conducted a facility-based, mixed-methods needs assessment of Princess Christian Maternity Hospital (PCMH), the largest public maternity hospital in Freetown, Sierra Leone. Qualitative semi-structured interviews with accompanying quantitative surveys were conducted in August 2023 during a site visit with four senior hospital staff members (an obstetrician/gynecologist, an administrator, an anesthesiologist, and a nurse). The interviews and surveys are adaptations on assessment tools developed by the Lancet Commission on Global Surgery (LCoGS)[4]. Interviews were analyzed by thematic analysis and used to develop a conceptual framework in NVivo.

Results: Our analysis revealed five major themes that characterize the challenges facing obstetric and anesthesia care delivery: (1) technology and equipment, (2) operations and governance, (3) consumable supplies, (4) workforce and labor, and (5) infrastructure (Figure 1). Sub-themes were interconnected within the larger conceptual framework, with infrastructural concepts serving as a node for interconnectedness.

Conclusion: Our thematic analysis demonstrates the need for coordinated systems-based strategies for sustainably improving maternal care in Sierra Leone. The convergence of major sub-themes on infrastructural concepts suggests that encouraging investment in infrastructure would be foundational to capacity building efforts aimed at enhancing maternal care. Short-

term strategies must also be considered to mitigate the most critical needs, which included drugs (e.g. halothane, ketamine, and fentanyl), surgical consumables and instruments, ventilators, blood supply, anesthetist training, and reliable back-up electricity.

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1. Statistics Sierra Leone. 2020. https://www.dhsprogram.com/pubs/pdf/FR365/FR365.pdf.
2. Lancet Glob Health. 2022;10(1):e114-e123.
3. UN Human Development. https://hdr.undp.org/data-center/human-development-index.
4. Implementation Tools. https://www.lancetglobalsurgery.org/implementationtools

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 06

Midazolam and Analgesic Medication Administration in Spanish-Speaking Patients During Cesarean Delivery

Presenting Author: Paul Vozzo, MD
Presenting Author's Institution: Columbia University
Co-Authors: Jane Fraipont, Student - Columbia. University
Jean R. Guglielminotti, MD, PhD - Columbia Univeristy
Richard Rangel Vargas, Student - Columbia University

Abstract:
Introduction: Intravenous medication (IVM) administration for pain during cesarean delivery (PDCD) is reported in up to 1 in 5 patients,[1] though anesthesiologists do not accurately identify PDCD.[2]
Data on IVM administration and management of PDCD in Spanish-speaking patients has not been evaluated, and one may suspect that barriers in communication surrounding PDCD and the ability to apply shared decision making may impact the decision and choice of medication administration.
This retrospective study was designed to test the hypothesis that patterns of IVM administration differed between Spanish-speaking and English-speaking patients.

Methods: Data were extracted from the EMR of all Spanish or English-speaking patients undergoing a scheduled, urgent or emergent cesarean delivery under neuraxial anesthesia between May and September 2022 in two affiliated hospitals (academic referral center and community hospital) with overall similar anesthesia practice.
Patient-preferred spoken language was identified in the EMR. Translator services are available 24/7 for Spanish-speaking patients. IVM was given at the team's discretion (N=25 anesthesia attendings supervising CRNAs, residents, and fellows). IVM was categorized as 1) midazolam alone, 2) analgesics alone (opioids, ketamine, dexmedetomidine, or combinations), or 3) combination (midazolam with analgesics). Conversion to general anesthesia (GA) was recorded. Crude and adjusted odds ratios for IVM were calculated according to patients' spoken language.

Results: During the study period, 877 patients underwent CD with neuraxial anesthesia; 567 were English-speaking and 310 Spanish-speaking (35%). IVM occurred in 203 patients (23.1%; 95%CI: 20.4,26.1) (Table 1). IVM was given in 25.2% of English-speaking vs 19.3% of Spanish-speaking patients (rate difference -5.9%; 95% CI: -11.5, -0.2). After adjustment there was not difference between groups (Table 1). There was no difference in GA conversion rate between English and Spanish-speaking patients (2.3% vs 3.2% respectively; p=0.54).

Discussion: Contrary to our expectation, we foumd no difference in patterns of IVM given for anxiolysis and/or analgesia during CD between Spanish and English-speaking patients in both hospitals covered by our anesthesia team. Though it appeared that Spanish-speaking patients might be less likely to receive analgesic medication, this was ultimately not the case, which is

reassuring. The retrospective nature of this study does not allow us to characterize patient-reported outcomes such as PDCD and satisfaction with anesthesia care. More research to evaluate the effect of language and barriers to communication between anesthesia providers and patients on the occurrence of PDCD and patterns of anxiolytic and analgesic administration is ongoing.

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Table 1 IV meds language.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 07

Does English Fluency Correlate with the Use of Sedatives and Analgesics during Cesarean Section?

Presenting Author: Kendall Jenkins, MS
Presenting Author's Institution: Boston University School of Medicine
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Mark C. Norris, Anesthesiologist - Boston Medical Center

Abstract:
Background: In the United States, 25 million individuals report limited English proficiency (LEP).[1] Language discordance between patients and healthcare providers is associated with poor clinical outcomes.[2] There are well-documented racial disparities in the provision of obstetric anesthesia care both in the provision of neuraxial labor analgesia[3] and in the treatment of maternal pain.[4] Less is known about the effects of LEP on the provision of obstetric anesthesia care. We anticipate that patients with LEP will receive a significantly different amount of sedative and analgesic medications during cesarean delivery than English speaking patients.

Methods: We conducted a retrospective chart review on all patients who underwent a cesarean delivery at an urban, safety net hospital in January and February 2023. Information was extracted from each patient's electronic medical record. Demographic data included race, ethnicity, preferred language, and interpreter requirement. Other information included obstetric history, mode of anesthesia, and all sedative and analgesic medications administered in the operating room. Descriptive statistics were calculated for demographic data. The primary statistical analysis used the Chi-square Test to examine the size and direction of any language-related effects on the frequency of intraoperative sedative/analgesic administration.

Key Findings: Our sample included 174 patients undergoing cesarean delivery, 55.2% (n=96) were LEP. The most common languages were English (n=77), Spanish (n=50), and Haitian Creole (n=33). There was no difference in overall use of sedative or analgesic medications between English speaking and LEP patients. However, English speaking patients were more likely to receive midazolam (RR 1.19, 95% CI 1.03-1.38, P=0.026).

Conclusions: We found no language-based disparities in the intraoperative use of analgesics but English-speaking patients were more likely to receive the anxiolytic midazolam. The reasons for this difference are likely multifaceted.

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Table - Abstract Final.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 08

Racial and Ethnic Disparities in Parturients Undergoing General Anesthesia for Cesarean Delivery: A Retrospective Cross-Sectional Study

Presenting Author: Caroline Thomas, MD
Presenting Author's Institution: University of Chicago
Co-Authors: Naida M. Cole, MD - Department of Anesthesia & Critical Care The University of Chicago
Allyson Dewey, BS - University of Chicago Pritzker School of Medicine
Chuanhong Liao, MS - University of Chicago
Ashish Premkumar, MD, PhD. - University of Chicago Department of Obstetrics & Gynecology, Section of Maternal Fetal Medicine
Paloma Toledo, MD, MPH, FASA - University of Miami

Abstract:
Background: General anesthesia (GA) for cesarean delivery is associated with higher rates of maternal morbidity than neuraxial anesthesia.[1] Black and Hispanic patients have higher odds of undergoing GA when compared to White patients.[2] Prior studies suggest that disparate GA rates in laboring patients may be correlated with disparities in rates of labor epidural analgesia use.[3] The objectives of this study were to evaluate differences in GA use by race and ethnicity (R/E), and to evaluate whether *in situ* epidural analgesia mitigated GA rate disparities in laboring patients at a hospital that primarily serves minority public aid patients in Chicago.

Methods: This was a retrospective analysis of 2,754 patients undergoing cesarean delivery at a single academic institution between 2013-2018. Electronic records of all patients undergoing cesarean delivery were queried for demographics, including self-identified R/E, clinical characteristics, obstetric data, anesthesia data, and maternal outcomes. The primary outcome was the rate of GA use by R/E. The secondary outcome was the association of *in situ* labor analgesia with need for GA, stratified by R/E.

Results: A majority of patients undergoing cesarean delivery (75.2%) were Black, 15.0% White, 5.2% Hispanic, 4.4% Asian, 3.9% multiracial, and 3.1% identified as other or declined to provide R/E information. A total of 1,513 (58.8%) patients were in labor at the time of their cesarean delivery, of whom 935 (61.8%) had neuraxial labor analgesia *in situ*. Six percent (6.6%) of cesarean deliveries were performed under GA. GA rates did not differ by R/E (P= 0.050) (Table 1). There were no significant differences in the R/E of the patients in labor at the time of cesarean delivery (P= 0.19) nor were there differences in the rates of labor epidural analgesia utilization by race in those who underwent cesarean delivery (P= 0.15). GA rates were higher in patients insured with public aid and were more likely to occur at a lower gestational age (P< 0.01). GA was associated with higher ASA physical status classification and emergent surgery (P< 0.001). Patients undergoing GA had higher rates of severe maternal morbidity, ICU admissions, and postpartum hemorrhage (P< 0.001).

Conclusions: No racial or ethnic disparities in rates of GA or labor epidural analgesia utilization were identified in the patient population of this safety net hospital. This finding is consistent with prior studies suggesting disparities in GA rates may be associated with disparate labor epidural analgesia utilization. The existing systems within this safety net hospital may act as a clinical practice model to successfully deliver equitable care, and the framework should be further evaluated and replicated. Future efforts should focus on determining factors that influence epidural usage amongst minorities to aid in mitigating GA risk on a population level.

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Lange PMID 28600029
Thomas PMID 38194235

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 09

Implementation of a Novel, Remote Obstetric Anesthesia Lecture Series for Anesthesiology Residents at Black Lion Specialized Teaching Hospital in Addis Ababa, Ethiopia

Presenting Author: Jordan A. Francke, MD MPH
Presenting Author's Institution: University of California, Los Angeles - Los Angeles, California
Co-Authors: Betelehem Asnake, MD - University of California, Los Angeles
Brhane Tesfay, MD - Black Lion Hospital
Aregawi Yoseph, MD - Black Lion Hospital

Abstract:
Lack of access to high-quality, specialized surgical and anesthesia care for obstetric patients is a cause of significant morbidity and mortality throughout low- and middle-income countries (LMIC). One study estimated that 21.1 million disability-adjusted life years are avertable by fully equipping LMIC with quality obstetric surgery and anesthesia resources. In 2017, the country of Ethiopia had the fourth highest maternal mortality globally. At St. Paul's Hospital in Addis Ababa, the country's largest labor and delivery services, the 2020 maternal mortality rate was 228.3 maternal deaths per 100,000 live births (LBs), a rate lower than many other Ethiopian institutions but still well above the United Nations' Sustainable Development Goal of less than 70 deaths/100,000LBs. Therefore, Ethiopian obstetric leaders have made calls to improve training, scale-up interventions, and measure progress made.

In this abstract, we describe to our knowledge the first implementation of a remotely delivered obstetric anesthesia lecture series, in this case in Ethiopia. Over the span of four weeks, a senior resident (mentored by anesthesiology faculty in both obstetric anesthesia and global anesthesia) delivered a total of eight hour-long lectures to anesthesia residents at the Black Lion Hospital in Addis Ababa, Ethiopia, the nation's largest referral hospital. Each lecture's remote audience consisted of between 38 and 50 residents from the three anesthesia training years. A survey was circulated at the end of the lecture series, with a total of 52 respondents out of 87 total residents (59.8% of all residents). The majority of respondents (44%) were first-year residents, followed by 20 (38.5%) third-year and 9 (17.3%) second-year residents. Of the respondents, forty-five (86.5%) agreed or strongly agreed with the statement, "I found the lecture series to be educational" and 42 (80.7%) agreed or strongly agreed that "the included information was relevant to my anesthesia practice in Ethiopia." Thirty-eight (73%) residents agreed or strongly agreed that the lecture series would change their practice of obstetric anesthesia. However, only 24 (46%) agreed or strongly agreed they learned as effectively remotely compared to in-person.

Virtual technologies have already been employed to deliver obstetric anesthesia simulation trainings, to deliver antenatal care, and formulate specialized obstetric anesthesia plans. Our preliminary survey findings suggest that a virtual obstetric anesthesia lecture series for residents in LMICs can also be successfully done, especially when implemented with guidance from local physician educators who understand the pedagogical needs and priorities of the

audience. Improving anesthesia providers' access to evidence-based specialized approaches to caring for obstetric patients will assist them in independently reaching their targets for reductions of maternal morbidity and mortality within their respective communities.

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 10

Facilitators and Barriers in Providing Obstetric Anesthesia Informed Consent for Patients with Limited English Proficiency: A Mixed-Methods Study

Presenting Author: Won Lee, MD, ScM
Presenting Author's Institution: University of California, San Francisco, CA
Co-Authors: Ronald B. George, MD - Department of Anesthesia and Pain Medicine, Mount Sinai Hospital, University of Toronto

Abstract:
Introduction: Obstetric anesthesiologists navigate unique challenges in providing informed consent to laboring patients, including the unpredictable progression of labor, the intensity of labor pain, and the emergent nature of some cesarean deliveries. Providing informed consent faces additional challenge if there is a language barrier. This study explores barriers and facilitators that shape informed consent practices among obstetric anesthesiologists

Method: A sequential explanatory mixed-method study involving a survey and interviews with obstetric anesthesiologists in the United States. Initial 22-item survey included questions related to interpreter availability, satisfaction, use, and reasons for non-use, as well as alternative communication methods. Qualitative insights were gathered through interviews, guided by the Capability, Opportunity, Motivation, Behavior (COM-B) model.

Results: Although participants were generally satisfied with their interpretation service, providers reported inconsistent use of professional interpreter to provide labor epidural and cesarean anesthesia consents. Participants also felt uncomfortable providing equitable informed consent to patients with significant labor pain ($p = 0.046$) and in emergency situations ($p < 0.001$). Qualitative analysis revealed barriers in Capacity (lack of interpreter training, interpreting challenges), Opportunities (workflow issues, antepartum discussions), and Motivation (misconceptions, inequity concerns). Participants expressed frustration with inaccuracies in interpretation, difficulties in navigating cultural nuances, and concerns about inequitable care.

Discussion: This study sheds light on multifaceted challenges obstetric anesthesiologists face in providing informed consent to patients with LEP. Clinicians highlighted the impact on analgesia options and potential disparities in care. Quality of interpretation and institutional policies also emerged as critical factors. Solutions include dedicated perioperative interpretation services, antepartum informed consent discussions, and language-concordant materials. The study emphasizes the importance of understanding practical hurdles and systemic factors to inform targeted interventions for improved communication and care.

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 11

Association of Race and Ethnicity in Post-Cesarean Pain Management Practice

Presenting Author: Erica Chung
Presenting Author's Institution: UCSF School of Medicine - San Francisco, California

Abstract:
Background: Effective pain management is crucial in postpartum care following cesarean delivery.[1] Provider biases and varying methods of pain assessment may contribute to disparities in analgesic use and pain evaluations among different patient groups.[2] Cultural differences between providers and patients may further add to complexity.[3] This retrospective cohort study explores these disparities based on race and ethnicity to identify potential contributors to divergent health outcomes.

Methods: The study includes patients who underwent cesarean deliveries at our institution between 2015 and 2023. The primary outcome is the total oral morphine equivalent (OME) per postpartum day (24-hour cycle). Secondary outcomes include pain levels, frequencies of patient-reported target pain goal assessments, and the proportion of assessments using the numerical rating scale (NRS). Patients who underwent cesarean-hysterectomy and patients with prolonged postpartum course (greater than 5 days) were excluded from analysis. Key covariates include self-reported race, ethnicity, preferred language, age, gestational age, type of anesthesia for cesarean delivery, and whether neuraxial morphine or regional anesthesia was administered.

Results: Compared to non-Hispanic White (NHW) patients (68.87 OME), non-Hispanic Black (NHB) patients were likely to receive more opioid medications (92.61 OME, 95% CI 78.45–106.76, *P*< .0001), while Asian patients were likely to receive less (53.27 OME, 95% CI 43.03–63.51, *P*< .0001). After adjusting for covariates, Asian patients were more likely to not receive any opioids postpartum compared to NHW patients (adjusted odds ratio [aOR] 1.34, 95% CI 1.16–1.55, *P*< .0001), while other racial/ethnic groups had nonsignificant differences (Table 1). Patients who received no opioids postpartum had fewer pain assessments (33.50, 95% CI 30.26–36.73, *P*< .0001) than those who did receive opioids (50.08). Patients with a low proportion of pain assessed via NRS (40% or less) were significantly more likely not to receive any opioids (OR 1.57, 95% CI 1.37–1.79, *P*< .0001).

Conclusion: Disparities in post-cesarean analgesia administration and assessment are associated with patients' race and ethnicity. Specifically, Asian patients had a lower likelihood of opioid usage postpartum compared to other racial/ethnic groups. Furthermore, the association between frequency of pain assessed using the NRS and opioid utilization suggest potential implicit bias introduced by pain assessment methods.

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1.

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Association of Race and Ethnicity in PostCesarean Pain Management Practice Table 1.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 12

A Survey of Obstetrical Anesthesia Health Equity Practices at Academic Centers in the United States (US)

Presenting Author: Eliana R. Weinstein, BS
Presenting Author's Institution: Albert Einstein College of Medicine
Co-Authors: Jaime A. Aaronson, MD - Weill Cornell Medicine Department of Anesthesiology
Sharon A. Abramovitz, MD - Weill Cornell Medicine Department of Anesthesiology
Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA - Duke University Department of Anesthesiology
Grace Lim, MD, MSc - University of Pittsburgh Department of Anesthesiology and Perioperative Medicine
Kristine Villegas, MD - Weill Cornell Medicine Department of Anesthesiology

Abstract:
Background: Anesthesiologists can play a major role in reducing health care disparities affecting maternal safety.[1-2] However, limited research has explored obstetrical anesthesiologists' perceptions of labor and delivery associated healthcare disparities. The objective of this study was to evaluate the perception of obstetrical anesthesia related health care disparities, drivers of disparities, and potential solutions to address inequities.

Methods: An online survey was emailed to division leads at ACGME accredited obstetrical anesthesiology programs in the United States. Descriptive statistics were used to characterize variable distribution. Descriptive statistics were used to characterize the distribution of each variable reported. Free text response data analysis was summative, in which all analysis was conducted at the end of the study and selective coding was used to integrate and refine the data into 6 primary themes.

Results: 149 surveys were delivered and 74 surveys were submitted (50%), with 57 participants (38%) completing the entire survey. 57% of centers reported perceived presence of obstetrical or obstetrical anesthesia related healthcare disparities. The majority of centers reported that they consider a patient's cultural preferences during clinical management, collect data on race and ethnicity, implement specific practices to address health care disparities, and analyze outcome data by social determinants of health to identify potential disparities. Most centers also reported specific quality improvement practices, anesthesia provider rounds or evaluations, cultural competence or diversity training, written patient information material provided in multiple languages, translator services, racially/ethnically diverse staff or providers, and providers that are bi- or multi- lingual. Thematic analysis of free text responses into drivers of obstetrical disparities mapped to 6 themes: language barriers, racism or bias, socioeconomic or social determinants of health differences, access or quality of care differences, provider-patient interaction related factors, and patient related factors.

Conclusions: Most academic obstetrical anesthesia center division leads reported the perception of the presence of obstetric or obstetric anesthesia related health care disparities.

Efforts should be made to further explore these potential drivers and devise solutions to this multifaceted, pervasive problem.

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2. White RS, Matthews KC, Tangel V, Abramovitz S. Enhanced Recovery After Surgery (ERAS) Programs for Cesarean Delivery Can Potentially Reduce Healthcare and Racial Disparities. *J Natl Med Assoc*. 2019;111(4):464-465. doi:10.1016/j.jnma.2019.02.001

SOAP Survey Study Table.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 13

Beliefs, Perspectives, and Experiences with Non-Use of Epidural Analgesia for Labor: A Breakdown by Race and Educational Background

Presenting Author: Eliana R. Weinstein, BS
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Co-Authors: Jaime A. Aaronson, MD - Weill Cornell Medicine Department of Anesthesiology
Sharon A. Abramovitz, MD - Weill Cornell Medicine Department of Anesthesiology
Ruth Gotian, EdD, MS - Weill Cornell Medicine Department of Anesthesiology
Danielle McCullough, MD - Weill Cornell Medicine Department of Anesthesiology

Abstract:
Background: Studies have identified variation in epidural usage by race, where non-Hispanic White women are more likely to receive neuraxial labor analgesia than Black or Hispanic women.[1] On the patient-level, maternal age, education, culture, pain perception, and parity may all be factors.[2] Our study aimed to provide a qualitative analysis of the factors important in pregnant people's decision to opt-out of neuraxial analgesia for labor, and to explore potential racial or education level differences.

Methods: We conducted semi-structured interviews with 32 women who delivered vaginally at a New York City hospital between October 1, 2022-May 30, 2023 who opted out of epidural analgesia usage. We used grounded theory to analyze data and group responses into themes. Subgroup analyses was conducted by racial category (White and non-White), and by highest education status attained.

Results: 50% of the participants were White and participants varied for highest level of education achieved, from high school or GED completed to doctorate attained. We grouped the factors participants considered when deciding to opt out of neuraxial analgesia for birth into five themes: preferences for a natural birth experience, an empowering and supportive labor environment, preparation or preparedness for a birth without medication, positive outlook on labor pain, and information, misinformation, knowledge gaps and fears about the epidural. Themes were consistent for White and Non-White women alike. White women were over twice as likely as non-White women to express a desire to take an active role in the birthing process or for mobility during labor. White women were also twice as likely to state they view labor pain as a natural part of birth. When identifying fears and side effects, White women were more likely to mention a fear of needles, faulty insertion, the epidural not working, and the unknown, as well as headache complication and potential effects on the baby. Non-White women were more likely to mention fear of back pain, paralysis or incorrect dosing. Non-White women were twice as likely to report using social media as an information source for labor pain management. Themes remained consistent across highest level of education statuses attained.

Conclusion: Themes as well as knowledge barriers transcended racial and educational strata in our sample. In our study, personal preferences, sense of support, outlook on pain and information/misinformation and fears did not vary substantially across racial or educational groupings. Further studies should investigate the causes of disparities in epidural usage.

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SOAP Table- Factors by Race and Education.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 14

Cognitive Aids for In-the-moment Communication with OB Spanish Speaking Patients

Presenting Author: Virginia Berry, MD
Presenting Author's Institution: University of Virginia
Co-Authors: Erlyn Rudico, MD - University of Virginia

Abstract:
Background: Central Virginia has a large growing population of native Spanish speakers, expected to increase by 240% by 2060. By then, one-third of the US population will be Hispanic [1]. In 2021-2022, UVA Health L&D had over 55 surgical patients a month who required a Spanish language interpreter. Although real-time interpretation is preferred, various barriers to this exist. In obstetric anesthesia, communication is paramount as patients are often awake during surgery, high stress moments occur rapidly, and good outcomes depend on quick diagnosis, treatment, and effective communication. Ineffective communication between clinicians and mothers during labor and birth have adverse consequences such as women not feeling in control, not being listened to, and perceiving poor or disrespectful care [2]. This creates a potential health disparity for Spanish speaking patients due to inherent delays of communication via interpreter.

Quality Improvement Aims: Our project aimed to improve communication in Spanish speaking women receiving obstetric care at UVA Health by improving providers' tools to be able to communicate in Spanish. We created two cognitive aids that are easily accessible to surgical and anesthesia physicians and staff: 1) an OB neuraxial infographic targeted at Spanish speaking patients for cesarean section and 2) a laminated ID badge Spanish cognitive aid.

Results: We provided two surveys to the anesthesia department, one prior to the intervention and one six months post intervention. Pre-intervention, 23% of respondents felt they had successfully communicated without an interpreter. Post-intervention, 74% felt that they communicated successfully through using the cognitive aids.

Discussion: Communication between anesthesiologists and patients is vital for successful outcomes. Given the large population of Spanish speakers in central Virginia, we aimed to improve communication in the obstetric setting through creating easily accessible cognitive aids to help during urgent situations and procedures. By implementing this change, we have begun to see more efficient and effective care for this patient population.

References

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Beneficiaries: A Randomized Controlled Trial. *Anesthesiology*. 2019;131(4):840-849. doi:10.1097/ALN.0000000000002868

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 15

Impact of No Pain Labor & Delivery - Global Health Initiative on Cesarean Delivery Rates: A Meta-Analysis

Presenting Author: Lauren V. Weber
Presenting Author's Institution: The Ohio State University Wexner Medical Center - Columbus, Ohio
Co-Authors: Alexandrea Garrett, MD - The Ohio State University Wexner Medical Center
Anjan K. Saha, MD, PhD - Columbia University Irving Medical Center

Abstract:
Introduction: Variation in culture, education, and resource availability present barriers to the indiscriminate use of neuraxial analgesia in China.[1] The scarcity in labor analgesia services partly contributes to China's high cesarean delivery (CD) rates, particularly for elective and unnecessary CD.[1] The No Pain Labor and Delivery Global Health Initiative (NPLD-GHI), comprised of multidisciplinary teams from major global institutions, has been invaluable in educating parturients and medical providers on safe and effective neuraxial analgesia.[1-4] We here assess the impact of the NPLD-GHI on neuraxial analgesia utilization and CD rates in China.

Methods: We conducted a meta-analysis after screening 37 articles on studies directed by the NPLD-GHI in China to evaluate CD rates and evaluated neuraxial analgesia utilization secondarily. Studies not directed by the NPLD-GHI were excluded. Due to known clinical and methodologic heterogeneity of studies, effect estimates were pooled using the Bakbergenuly-Sample Size random-effects model. Heterogeneity among studies was assessed using the Higgins and Thompson I^2 statistic. Results were reported as ORs and 95% CIs.

Results: Four studies[1-4] inclusive of 74,465 patients were evaluated. On pooled analysis, the NPLD-GHI was significantly associated with decreased CD Figure 1; OR 0.84; 95% CI, 0.81-0.87; P< 0.001), with low heterogeneity in the analysis (I^2=0). The NPLD-GHI was associated with a significant collective increase in neuraxial analgesia utilization across institutions (6.7% pre-NPLD-GHI, 47.8% post-NPLD-GHI; P< 0.05) by heteroscedastic unpaired t-test.

Discussion: The results suggest that the NPLD-GHI has been highly effective in reducing CDs in China and increasing the utilization of neuraxial anesthesia. Given the alarming rates of maternal and neonatal complications from elective CD, the NPLD-GHI may help to serve as a cornerstone to curtail morbidity and mortality. Further studies are needed to investigate the validity of these trends to assist in exploring the implementation of this directive in other regions of the world.

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 16

Introducing and Evaluating the Effectiveness of C/Safe, An Intervention to Improve the Quality of Maternal and Newborn Perioperative Care in Regional Hospitals In Ghana

Presenting Author: Mikaela Holthaus, Nursing student
Presenting Author's Institution: Nicole Wertheim College of Nursing and Health Sciences at Florida International University, Florida
Co-Authors: Judith Amenya, Midwife - Kybele, Inc.
Amy Cassidy, MD - Wake Forest School of Medicine
Margaret A. Chinbuah, Dr. - Kybele, Inc
Adeyemi Olufolabi, MD - Duke University Medical Center
Mert Tore, Dr. - Wake Forest School of Medicine

Abstract:
Introduction: Poor perioperative care in sub-Saharan Africa substantially contributes to maternal and newborn mortality. In Africa, maternal mortality rates following cesarean section (CS) are 50-times higher than in well-resourced countries; influenced by hemorrhage and unrecognized complications. Globally, CS rates are increasing, making perioperative safety an area of imminent concern. To date, global maternal safety efforts primarily focus on vaginal delivery, without adequate attention on perioperative care. C/Safe, a novel perioperative care bundle, was therefore developed to strengthen the quality of post-CS maternal and newborn care.

Methods: Structured observations of maternal and newborn care following CS were conducted in four regional hospitals in Ghana to understand local challenges. Patients were observed in the PACU for 90 min by a trained midwife unaffiliated with the hospitals. Baseline findings informed the development of C/Safe, a 2-day training program addressing team communication, postoperative monitoring, fundal checks, skin-to-skin care, breastfeeding, pain management, and accelerated oral intake. A 33-question written knowledge assessment was administered before and after training. Structure observations were repeated 6-12 months following training to determine if systems-level changes had occurred. Chi-square was used to analyze findings.

Results: 185 clinical observations were conducted across four hospitals before and 179 following training. During training, the average±SD percent of correct responses on the pre-test was 63±10 (range 13-92) (n=537) vs 83±9 (43-100) on the post-test (n=533). Written tests and clinical observations revealed deficiencies in knowledge and practice of evidence-based care standards among anesthesia and recovery room nursing staff. Examples included prolonged maternal fasting, extended supine position after spinal anesthesia to prevent headache, and limited knowledge of handovers, monitoring, fundal checks, skin-to-skin care and breastfeeding. Following training, handovers increased from 24% to 79% ($p < .01$). Only 41% and 7% of mothers had one or two fundal checks at baseline, compared to 88% and 57% post-training; 26% and 7% received three or four checks. Time to first fundal check after PACU

admission decreased from 47 to 11 min. Similar improvements were observed in vital signs monitoring. Breastfeeding increased from 24% to 70% ($p < .01$), as did skin-to-skin care from 26% to 69% ($p < .01$). NICU admissions decreased from 50% to 39% ($p < .01$). Post-training, 97% of CS utilized spinal anesthesia; 83% included spinal morphine. Pain and nausea were treated in 92% and 100% of observed cases and PACU oral intake became customary.

Conclusion: Perioperative care is a neglected area of maternal-newborn health in Africa. C/Safe was introduced to over 500 healthcare providers in Ghana and was effective in promoting higher standards of evidence-based care.

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Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 17

No Difference in Epidural Labor Analgesia Replacement Times in Black Women Versus Non-Hispanic White Women: A Retrospective Single-Center Observational Study

Presenting Author: Savanah Hardcastle, BS
Presenting Author's Institution: Vanderbilt University School of Medicine - Nashville, Tennessee
Co-Authors: Jacob Clifton, BS, MEcon - Vanderbilt University Medical Center
Holly Ende, MD, MS - Vanderbilt University Medical Center
Ashley Lewis, MD - Piedmont Hospital
Stephanie K. Woodward, MD - Vanderbilt University Medical Center
Taylor Ziga, MD - Vanderbilt University Medical Center

Abstract:
Introduction: Disparities exist for epidural labor analgesia use and use of neuraxial anesthesia for cesarean delivery (CD).[1] These disparities reduce maternal birth satisfaction and increase maternal risk. [2,3] We compared times from first administration of breakthrough pain medication (top-off) to epidural replacement between Black women and non-Hispanic White women to evaluate for disparity in our epidural management.

Methods: IRB (231188) approved this retrospective study. All labor epidural analgesic records were electronically pulled from 1/1/18-12/31/22. Cases were included for self-reported race/ethnicity of black and non-Hispanic white women. Spinal instrumentation cases were excluded. Predefined top-off medications given ≥60 min. from initial epidural note and ≥1 min. before replacement marked the top-off time. Any epidural note ≥60 min from the initial note was defined as an epidural replacement. Secondary outcomes included epidural replacement rates and patient satisfaction. Epidural replacements <60 min were not included as this was 'failed epidural initiation'. We adjusted for confounders of race and epidural replacement rates using logistic regression. Model covariates included mode of delivery, ASA classification, BMI, total OB assessments, labor duration, and neuraxial technique. We also performed a 24-hour survival analysis of time from top-up to epidural replacement.

Results: There were 10719 cases with 11393 epidural placements. In total, 2,615 (23.0%) epidural placements involved black patients, while 8,778 (77.0%) involved white patients. The overall top-off rate was 43.5% (n=4,951) and 5.9% of epidurals were replaced (n=674). There were 434 (3.8%) epidurals with a top-up followed by a replacement within 24 hours. After adjusting for confounders, no association was detected in the hazard of epidural replacement (i.e., instantaneous replacement rate within the next 30 min of labor) (Hazard Ratio 0.83; 95% CI 0.65, 1.05; p= 0.12). We did not detect a significant association between the incidence of epidural replacement and patient race (Odds ratio 0.88; 95% Confidence Interval 0.72, 1.07; p=0.21). Our secondary analysis revealed that both race (p< 0.01) and epidural replacement (p< 0.001) were associated with increased odds of lower postpartum satisfaction.

Discussion: In this single center study where there are standardized protocols for epidural management,[4] we did not detect an association with race and time to or rate of epidural replacement. Despite this, Black women and those who had their epidurals replaced were less satisfied with our anesthetic care. Future studies should evaluate the generalizability of these findings and explore interventions that improve women's experience with our care.

References:

1 PMID: 34054060
2 PMID: 30985305
3 PMID: 31264207
4 PMID: 33931311

Demographic Data.pdf

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 18

Hospital-Level Factors Associated with Rates of General Anesthesia at Cesarean Delivery

Presenting Author: Arielle Coughlin, MD
Presenting Author's Institution: Icahn School of Medicine at Mount Sinai

Abstract:
Objectives: General anesthesia for cesarean delivery has been associated with adverse maternal and neonatal outcomes, and prior studies have demonstrated that black women are more likely to receive general anesthesia at cesarean delivery.[1,2] One recent study suggested that racial disparities in general anesthesia at cesarean delivery might be mitigated when neuraxial anesthesia catheter placement.[3] Here, we attempt to characterize what hospital-level characteristics associate with rates of general anesthesia for cesarean delivery in New York City.

Methods: We used de-identified data from New York State Hospital Maternity Information and the New York State All Payer Hospital Inpatient Discharges from 2017 to establish hospital-level characteristics pertaining to obstetric patients including total cesarean delivery volume, cesarean delivery rate, neuraxial analgesia rates for vaginal delivery, payer mix, racial demographics, and All-Patient Refined (APR) severity of illness mix. Bivariate relationships were assessed using Pearson correlation coefficients, and a multivariable linear regression model was used to assess for relationship of the above variables to the rate of general anesthesia for cesarean delivery.

Results: We included data from 116,022 deliveries in 36 different hospitals in New York City. In a linear regression model including the log of the total cesarean delivery volume, the percentage of patients who had neuraxial analgesia for vaginal deliveries, the percentage of deliveries for privately insured patients, the percentage of deliveries for patients identifying as black, and the percentage of patients delivered who had “Minor” illness severity, the only variable statistically significantly correlated with the rate of general anesthesia for cesarean delivery was the percentage of deliveries for privately insured patients at the hospital (coefficient= -0.0744, p=0.0218). The percentage of deliveries for black patients trended towards significance (coefficient=0.0342, p=0.0899).

Conclusions: These data suggest that previously demonstrated economic and racial disparities in obstetric anesthesia[1] can also be seen at the hospital-level, and that the rate of general anesthesia for cesarean delivery may be an important target for quality improvement for hospitals that serve a larger percentage publicly insured patients or black patients.

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2. Thomas CL, Lange EMS, Banayan JM, et al. Racial and Ethnic Disparities in Receipt of General Anesthesia for Cesarean Delivery. *JAMA Netw Open.* 2024;7(1):e2350825. doi:10.1001/jamanetworkopen.2023.50825

	Coefficients	*tandard Erroi*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4.13417811	4.2224166	0.97910237	0.33562725	-4.5016335	12.7699897	-4.5016335	12.7699897
Log of total cesarean #	0.4975932	1.69714518	0.29319424	0.77146157	-2.9734584	3.96864482	-2.9734584	3.96864482
Cesarean Rate	-0.0414117	0.07174628	-0.5771969	0.56826079	-0.1881493	0.10532589	-0.1881493	0.10532589
Neuraxial Rate (Epi/Spinal) for V	0.04216182	0.04326938	0.97440317	0.33791473	-0.046334	0.13065764	-0.046334	0.13065764
% Pvt Insurance	-0.0744304	0.03069163	-2.4251041	0.02176145	-0.1372018	-0.011659	-0.1372018	-0.011659
% APR Severity of Illness Minor	-0.0427669	0.03468919	-1.2328599	0.22752907	-0.1137143	0.02818044	-0.1137143	0.02818044
% Black Deliveries	0.03420264	0.01949175	1.75472399	0.0898683	-0.0056625	0.07406774	-0.0056625	0.07406774

Abstract #: FRI – RA – BS 2 – BR 3 – Racial Disparities + Global Health – 19

Maternal Satisfaction with Anesthetic Experience and Perceived Importance of Anesthetic Outcomes in a Diverse New York City Hospital

Presenting Author: Amanda R. Tomlinson, MD
Presenting Author's Institution: The Mount Sinai Hospital
Co-Authors: Yaakov Beilin, MD - Icahn School of Medicine at Mount Sinai
Diana M. Ruiz, BS - Icahn School of Medicine at Mount Sinai
Lucy Shang, BA - Icahn School of Medicine at Mount Sinai
Rachel Sue, BS - Icahn School of Medicine at Mount Sinai

Abstract:
Patient experience during birth and obstetric anesthesia care is critical, impacts maternal satisfaction, but is still an under-explored topic. Most studies have included predominantly white patients of higher socioeconomic status.[1,2] US studies analyzing the role of race, only compared white and black populations.[3] We aim to assess factors impacting maternal satisfaction and directly measure patient satisfaction at a large tertiary care hospital in New York city.
This is a cross sectional single site survey study. Study participants all received anesthesia care for their vaginal delivery (VD) or cesarean delivery (CD. Surveys were administered in Spanish and English. The survey included questions about patient experience with anesthetic care during the birth process, if participants experienced any of ten adverse outcomes (see table). Participants were asked to rank outcomes based on importance (1 being most important to avoid, 10 being the least) and additionally were asked to give a relative value to each item ranked by allocating a dollar value to each item totaling $100, with higher monetary allocation denoting greater importance of avoiding that outcome to the participant. Additionally, patients were asked to rate their overall satisfaction (0% - 100% satisfied). We plan to enroll 200 patients; 100 VD and 100 CD.
57 surveys were completed, 39 having a VD and 18 CD. The average age of enrolled patients was 31.8 years for VD and 35.2 years for CD. Average parity for VD was 2.3 and 1.4 for CD. 55% of participants identified as White, 24% as Black, 7% as Asian, 14% as Other/prefer not to answer. 32% of participants identified as Hispanic/Latino. Avoiding pain during labor/surgery was the most important priority for all patients (Table). Average satisfaction with anesthetic care in the VD group was 94% (SD 12.53) and average satisfaction in the CD group was 91.6% (SD 11.9)
Investigating satisfaction among the obstetric population is important both for implications on clinical care and patient experience. The body of evidence shows that there is more to maternal satisfaction than analgesia alone This study could potentially identify gaps in care negatively impacting maternal satisfaction, providing insight for potential for quality initiatives and informing future research questions.

References: 1. Harding A, et al. Cureus 2022
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Vaginal Delivery	**% (N)**	**Average dollar amount allocated to avoiding the below outcomes**	**Cesarean Delivery**	**% (N)**	**Average dollar amount allocated to avoiding the below outcomes**
Pain during labor: some pain and discomfort including waves of spasm and painful uterine/ abdominal cramps	59% (23)	$42.77	Pain during surgery: pain and discomfort while the surgeon is doing the cesarean section, including waves of spasm and painful uterine/ abdominal cramps	28% (5)	$42
Itching all over your body	56% (22)	$7.62	Itching all over your body	50% (9)	$8.4
Leg weakness: excessive leg heaviness that affects your ability to walk and turn in the bed during/after labor	54% (21)	$4.14	Leg weakness: excessive leg heaviness that affects your ability to walk and turn in the bed after surgery	50% (9)	$4.72
Pain after delivery: body pain including waves of spasm and painful uterine/ abdominal cramps	49% (19)	$0.20	Pain after surgery: including surgical incision pain. Movement makes the pain worse and no position makes the pain better	72% (13)	$9.38
Shivering uncontrollably	46% (18)	$5.76	Shivering uncontrollably	72% (13)	$4.72
Nervousness and anxiety during labor	38% (15)	$13	Nervousness and anxiety during surgery	55% (10)	$5
Sleepiness during labor	36% (14)	$6	Sleepiness during surgery	44% (8)	$4.72
Nausea	28% (11)	$7.14	Nausea	55% (10)	$6.67
Vomiting	26% (10)	$6.14	Vomiting	39% (7)	$9.3
Excess pain medication: The amount of pain medication was more than the amount needed to achieve desired pain relief	3% (1)	$3.72	Excess pain medication: The amount of pain medication was more than the amount needed to achieve desired pain relief during surgery	11% (2)	$4.67

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 01

Anesthetic Management and Outcomes Following Cesarean Hysterectomy for Placenta Accreta Spectrum

Presenting Author: Alexandra Bickett
Presenting Author's Institution: Duke University
Co-Authors: Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Vijay Krishnamorthy, MD PhD - Duke University Medical Center
Tetsu Ohnuma, MD, MPH - Duke University Medical Center
Karthik Raghunathan, MD - Duke University Medical Center

Abstract:
Background: Cesarean hysterectomy for placenta accreta spectrum (PAS) is associated with increased risk of post-partum hemorrhage and severe maternal morbidity (SMM). The current literature lacks large multicenter studies of cesarean hysterectomy in the US. The aim of our study is to describe anesthetic management and outcomes following cesarean hysterectomy for PAS and assess factors associated with ICU admission and transfusion of more than 4 units packed RBCs (transfusion SMM as defined by the CDC).

Methods: We conducted a retrospective study to identify patients with a diagnosis of PAS who had cesarean hysterectomy using delivery hospitalizations in the Premier Inc. Database (10/1/2015- 6/30/2021). We collected information about patient demographics, anesthetic technique, hospital characteristics, SMM events, transfusion requirements, post-operative outcomes, use of REBOA, and severe maternal morbidity (SMM) events excluding hysterectomy using ICD-10 diagnosis codes. Descriptive statistics were used to describe the cohort and outcomes according to anesthetic technique. Risk of ICU admission and transfusion SMM events associated with patient and hospital characteristics was modeled using mixed effects logistic regression models with random intercept for hospital.

Results: We included 2146 patients who had PAS and hysterectomy codes in the analysis. Of those, 42% had general anesthesia, 36% combined neuraxial and general anesthesia, 14% neuraxial anesthesia and in 8% of cases the anesthetic technique was not clear. A description of the cohort and outcomes according to anesthetic technique is displayed in the table. A code for placenta accreta was present in 66% of cases, increta in 13% and percreta in 21% of cases. REBOA was used in 2% of cases. SMM events (excluding hysterectomy) occurred in 54% of cases, non-transfusion SMM events in 25% of cases and a transfusion SMM in 44% of cases. Median [IQR] for hospital stay was 5 [4,8] days, and 45% of cases were admitted to ICU. In the multivariable model, the following factors were associated with transfusion SMM: year of admission [OR (95% CI): 0.83 (0.77, 0.90)], blood loss anemia [2.2 (1.6, 3.1)], and hospital location in the West [0.38 (0.19, 0.76)] or Midwest [0.51 (0.27, 0.97)] as compared to the South. The following variables were associated with ICU admission, placenta percreta [2 (1.5, 2.7)], Asian race [2.11 (1.2, 3.7)] neuraxial anesthesia [0.33 (0.22, 0.50)], year of admission

[0.42 (0.39, 0.46)], coagulopathy [3.09 (1.94, 4.91)], hospitals with 100-399 beds (as compared to those with 500 or more beds), fluid and electrolyte disorders [2.41 (1.24, 4.69) and blood loss anemia [1.73 (1.26, 2.37)].

Conclusion: General anesthesia was the most commonly used anesthetic technique for cesarean hysterectomy for PAS. SMM events were common in this patient population with transfusion SMM being the most common.

PAS Study Table_AH.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 02

Factors associated with need for blood transfusion in patients undergoing Cesarean Hysterectomy for Placenta Accreta Spectrum: A Multicenter Retrospective Cohort Study

Presenting Author: Hannah Zang
Presenting Author's Institution: Duke University School of Medicine - Durham, North Carolina
Co-Authors: Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Andrew Padilla - Duke University School of Medicine
Nicole Zanolli - Duke University School of Medicine

Abstract:
Background: Placenta accreta spectrum (PAS) is a rare condition where the placenta becomes abnormally attached to the uterine wall. PAS complicates approximately 3 per 1000 deliveries in the United States, and its incidence is rising due to increasing rates of cesarean delivery. Cesarean hysterectomy is commonly performed in patients with PAS to avoid life threatening bleeding but can still be associated with significant blood loss. We performed this retrospective study to assess factors associated with need for blood transfusion in women undergoing cesarean hysterectomy for PAS.

Methods: We identified patients in the Multicenter Perioperative Outcomes Group (MPOG) database who underwent cesarean hysterectomy for PAS between January 1, 2015, and December 31, 2021. We extracted information about patient demographics, medical and obstetric comorbidities, anesthetic technique, need for blood transfusion, and post-operative outcomes including length of stay and admission to the intensive care unit (ICU). Using the case viewer function, we subsequently performed manual chart review for each case to collect additional information including a confirmation of anesthetic technique and indication for cesarean hysterectomy. Log-linear models were used to examine association between patient characteristics and need for blood transfusion. Factors with a p-value less than 0.2 in univariable analysis were included in an initial multivariable model and a final model was chosen based on Akaike Information Criterion (AIC) using backward selection.

Results: We identified 878 cases of cesarean hysterectomy for PAS from 43 institutions in the MPOG database. Of those, 66% were accreta, 16% increta and 18% percreta. Over half of the patients (54.8%) required intraoperative red blood cell transfusion, with a median volume of 950 ml [IQR 575,1750] transfused. 29% received FFP, 12% platelets and 9% cryoprecipitate. General anesthesia was used in 29% of cases, neuraxial anesthesia in 28% and 42% of patients received a combination of neuraxial and general anesthesia. In the final multivariable model (table), the following factors were associated with need for transfusion: combined general and neuraxial anesthesia, placenta previa, coagulopathy, and fluid and electrolyte disturbance. On the other hand, obesity was associated with reduced need for transfusion.

Conclusions: Blood transfusion is required in over half of cases of cesarean hysterectomy for PAS. Interestingly, degree of invasion or nonscheduled cases were not associated with increased need for blood transfusion, while the use of combined neuraxial and general anesthesia was associated with increased need for transfusion. The use of this combined technique could be a surrogate for more extensive surgery.

Zang.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 03

Is the "Double Stick" Worth it? Assessing the Merit of Thoracic Epidural Plus Lumbar Spinal Anesthetic for Patients with Placenta Accreta Spectrum Undergoing Cesarean Hysterectomy

Presenting Author: Dayley Keil, MD
Presenting Author's Institution: University of California San Diego - San Diego, California
Co-Authors: Elsie Bigelow, MD - University of California San Diego
Rodney Gabriel, MD - University of California San Diego

Abstract:
Placenta accreta spectrum (PAS) disorders are increasing and affect 1 in 500 pregnancies.[1] At our institution, cesarean hysterectomy (C-Hyst) for PAS is preferentially performed under neuraxial anesthesia for cesarean delivery (CD), with or without conversion to general anesthesia for multivessel embolization and hysterectomy. We aim to compare postoperative analgesia and functional recovery following lumbar combined spinal epidural (CSE) to thoracic epidural and lumbar spinal anesthetic, the "double stick" (DS).

This was a retrospective cohort study of patients with PAS who underwent C-Hyst from 2018 to 2023 at a single institution comparing DS to CSE. Primary outcomes included total opioid consumption (morphine equivalents, MEQ) and pain scores on postoperative days (POD) 0-4. Secondary outcomes were time to Foley removal and first ambulation, incidence of delayed bowel recovery, and hospital length of stay (LOS). We compared continuous and categorical outcomes using Wilcoxon rank-sum and chi-squared tests, respectively. P-value < 0.05 was considered statistically significant.

All 26 eligible patients were included in the analysis, 12 CSE and 14 DS. Age, BMI, gravida para, and rates of prior CD were similar between groups. Patients in the DS group were more likely to undergo delivery in the hybrid operating room with embolization (85.7% vs 25%, p=0.008) at an earlier gestational age (33.4 weeks vs 35.5 weeks, p=0.008), likely due to more severe pathology (71.4% vs 33.3% PAS Grade 3, p=0.11). The DS cohort had decreased median opioid consumption on POD0 (0mg vs 37.5mg, p=0.02), decreased maximum NRS scores on POD0 (2.5 vs 5.5, p=0.04), and decreased average NRS scores on POD0 (1.2 vs 3.4, p=0.04). The DS cohort had longer time to ambulation (1 vs 0 days, p= 0.002). Foley removal was later in the DS cohort, (median 1 vs 1 day, mean 4.9 vs 0.8 days P=0.03), but this was affected by 3 patients in the DS cohort with bladder invasion and cystotomy repair requiring Foley retention for >14 days. Higher opioid consumption on POD4 in the DS cohort did not reach statistical significance (48.8mg vs 0mg, p=0.06). There were no differences in return of bowel function or LOS.

Patients who underwent C-Hyst for known PAS were more likely to receive a "double stick" (thoracic epidural for postoperative analgesia and spinal for CD) if they had more invasive disease (PAS Grade 3). The DS group had decreased pain scores and opioid consumption on POD0, but no differences in pain outcomes on POD1-4. The DS group had slightly longer time

to first ambulation. Time to Foley removal was similar, allowing for surgical needs. In conclusion, larger sample sizes are needed, but the thoracic epidural may not confer enough benefit for patients undergoing C-Hyst to justify a second neuraxial procedure.

References:

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PAS Double Stick Abstract Table.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 04

Using Basic Code to Reproduce a Thromboelastogram Waveform, A Precursor to AI Prediction of Coagulation.

Presenting Author: Jay Bisen
Presenting Author's Institution: Northwestern University Feinberg School of Medicine

Abstract:
Thromboelastography has developed as a timely, specific, and holistic test for the coagulation pathway with significant value in the management of post-partum maternal hemorrhage. The true value in thromboelastography resides in the real-time visualization of the curve that is created as the clotting process proceeds ex-vivo. If the visualization can be pulled up in the OR in real-time, decisions can be made in less than 10 minutes regarding what products are needed and when to transfuse. However, EHR's are not designed to save the images of this data easily and often institutions chose not to save the images due to the informatics complexities of doing so. This decision results in the visual value of the data created by the laboratory test being lost for research into image analysis, particularly of the waveform created by the clotting process. It also leaves a lot to the imagination when results are presented for case review or publication.

In an attempt to resolve the lost visual dynamic of the thromboelastogram, we propose software that can reproduce the image using simple computer code and calculations associated with a simple user interface. We used python script to create both the reproduction of the thromboelastogram image and the user interface seen in the attached image. In order to create the curve between the CFT and A10 we used cubic spine interpolation, and the line between CT and CFT is a line tangent to the two time points at the alpha angle. The graphic user interface (GUI) allows you to input the data points that are output into your EHR flowsheet rows, select the type of output you would like (PDF, TiFF, JPEG, etc.), and save the image to a file or series.

We believe this simple program will benefit many providers in comparing waveforms over time, teaching about these valuable waveforms, and reproducing interesting waveforms for presentation and publication without significant investment in IT integration of thromboelastogram output into their EHR's. However, the real value in this simple program is that is allows for rapid expansion of data for visual machine learning. Now, historical data without the saved visual component can be converted and analyzed easily. This simple and rapid availability of data allows for machine learning of the images to train algorithms for prediction. Our intention is to convert 1000's of historical thromboelastograms into recreated images and train an AI algorithm to predict A20 and MCF utilizing data points collected within the first 5 minutes of waveform generation. This project is a great example of what simple code can do to convert static limited data into complex and consumable data that can then be leveraged for modern analysis and possible predictive technology.

App Images.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 05

Variability in ROTEM Values with and without the Administration of Tranexamic Acid in Labor and Delivery

Presenting Author: Hande Bilen, MD
Presenting Author's Institution: McGaw Medical Center of Northwestern University - Chicago, Illinois

Abstract:

Introduction: Postpartum hemorrhage (PPH) is the leading cause of maternal death worldwide [1] and accounts for >10% of maternal deaths in the United States [2]. Studies looking at ROTEM-guided transfusion strategies in PPH have shown improved clinical outcomes and a reduction in the amount of transfusion products used [3-5]. Tranexamic acid (TXA) has become an important part of PPH resuscitation after the WOMAN trial showed a reduction in death due to bleeding with early TXA administration [6]. There are no published data, however, to support the use of ROTEM to guide the administration of TXA [7]. Our retrospective study looks at the variability in ROTEM values with and without the administration of TXA. It is hypothesized that there will be no variability in ROTEM values regardless of TXA administration and that ROTEM does not need to be sent to guide TXA administration. Additionally, we hypothesize that there will not be a difference in adverse outcomes in patients who were given ROTEM-guided TXA versus those who have been given TXA without the use of ROTEM.

Methods/Results: We obtained IRB approval to conduct a retrospective study between 1/1/2019 and 10/25/2023. We requested data on all pregnant patients who received TXA and/or had ROTEM sent at the time of their delivery or during their post-partum admission. We will compare the ROTEM and coagulation values in patients who received TXA to those who did not receive TXA. We identified 20,000 patients that qualify for our study who are pending confirmation of timing of TXA administration and ROTEM collection. All data will be analyzed prior to poster submission.

Discussion: Prior studies in the trauma population have shown a change in ROTEM values with TXA administration [8]. During PPH, the question still exists regarding when to administer TXA. The WOMAN trial showed that TXA administration should not be delayed and should be given together with uterotonics, as there are no adverse events seen in patients who received TXA [6]. However, data were collected from low-resource countries and validity of the data to high-resource settings is yet to be investigated. Currently, there are no guidelines regarding TXA administration during delivery [7]. In order to use labs to guide TXA administration, we first need to know if TXA affects coagulation labs such as Fibrinogen and ROTEM in pregnant patients. By understanding the effect of TXA on lab values, we can either confidently give TXA without needing to send labs or use labs to guide our TXA administration.

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Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 06

Availability and Use Patterns of Fibrinogen Concentrate on Labor and Delivery Units - A Survey of the Society for Obstetric Anesthesia and Perinatology Centers of Excellence Designees

Presenting Author: Alexander G. Samworth, MD
Presenting Author's Institution: Northwestern University Feinberg School of Medicine
Co-Authors: Elizabeth Lange, MD - Emory University
Carmen Lopez, MD - McGaw Medical Center, Northwestern University
Robert J. McCarthy, PharmD - Rush University

Abstract:
Introduction: Coagulopathy, though rare in obstetric hemorrhage, is hallmarked by hypofibrinogenemia (< 200mg/dL). Hypofibrinogenemic patients have 12-fold increased odds of progression to severe obstetric hemorrhage.[1] Hypofibrinogenemia can occur rapidly in obstetric hemorrhage and emphasis has been placed on early identification and correction. Fibrinogen replacement can be achieved with the transfusion of fresh frozen plasma (FFP), cryoprecipitate, or fibrinogen concentrate. Each has advantages and disadvantages. The objective of our study is to assess current use patterns of fibrinogen concentrate on the labor and delivery units of SOAP Centers of Excellence Designees.

Methods: In this IRB-approved study, an electronic survey was sent as an official SOAP email to the seventy SOAP Centers of Excellence Designees in the United States and Canada. The survey remained open for six weeks, with reminder emails sent at two and four weeks. No identifiable information was collected from survey respondents. Data were analyzed using standard descriptive statistics.

Results: Twenty-eight (40%) of a possible seventy centers responded to the survey. Practice setting was primarily academic (82%). Delivery volume ranged from less than 2500 (14%) per year to more than 6000 (26%). Delivery volume did not correlate with availability of fibrinogen concentrate in institution (rho=-11, *P*=0.56) or on the obstetric unit (rho=0.03 *P*=0.89). Fibrinogen concentrate was available for use on labor and delivery at 17 (61%) centers and was a part of 15 (94%) of these centers obstetric hemorrhage protocol. It was typically prepared by anesthesia personnel (82%) and was available in less than 10 mins (76%). Cryoprecipitate was available in less than 20 mins at only 1 (6%) of these centers. There was no consistent dose amongst respondents. Cost and an unfamiliarity with reconstitution were the most cited barriers to use.

Discussion: Though fibrinogen concentrate has been shown to correct hypofibrinogenemia in obstetric hemorrhage, it remains less commonly available for use by obstetric anesthesiologists.[2] This survey study showcases that in centers where fibrinogen concentrate is available, it is more readily available than cryoprecipitate. While most centers where fibrinogen concentrate is available have it incorporated into their hemorrhage protocol, the

dose used is variable. While the practice of using fibrinogen concentrate is more common as evident by our survey, the variability in dose and use in obstetric hemorrhage emphasizes the need for future studies to determine ideal dosage and role in obstetric hemorrhage protocols.

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Samworth Fibrinogen Concetrate Table 1.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 07

Tranexamic Acid in Postpartum Hemorrhage

Presenting Author: Manny Vallejo, MD
Presenting Author's Institution: West Virginia University
Co-Authors: Christa Lilly, PhD - West Virginia University
Anna L. Zukowski, MD - West Virginia University

Abstract:
Objectives: The study aimed to assess the effectiveness of universally administering prophylactic TXA intraoperatively during c-sections at decreasing maternal morbidity and mortality.

Selection Criteria and Method: A retrospective analysis of c-sections at a large tertiary care academic hospital in the United States was conducted, examining gravimetric quantification of blood loss (QBL), administration of uterotonic and hemostatic agents, rate of red blood cell transfusions, rate of thromboembolic events, mortality, and associated social determinants of health and demographic data. This analysis compared cases before and after the institution of a policy to administer prophylactic TXA to all c-section deliveries without contraindication. One gram of TXA is administered at the time of umbilical cord clamping. Anonymized data was extracted from a commonly used electronic medical record. A total of 360 patients were randomly selected via random number generator for both the *before* and *after* groups, resulting in 720 patients. Postpartum hemorrhage (PPH) was defined as perioperative blood loss of 1000ml or more for a cesarean section. Primary outcomes included blood loss, thromboembolic events, number of uterotonic and hemostatic agents administered, blood transfusions, and the diagnosis of PPH by the obstetric team. Chi-square analysis with fisher's exact p-values were used for categorical data (e.g., blood transfusion status), and non-parametric Mann-Whitney Wilcoxon (M-W) difference tests were used for interval data (e.g., QBL).

Results: Prior to the policy ("*before policy*"), TXA was administered in 26.7% of cases, while after policy initiation ("*after policy*"), TXA was administered in 90.8% of cases. In the *before policy* group, the average QBL was 896.4ml (SD=521.0), and in the *after policy* group, the average QBL was 771.1ml (SD=405.6), M-W $p = 0.0004$. Statistically significant decreases were also found for blood transfusions, n=24 (6.67%) to n=4 (1.11%), exact $p = 0.0001$. Differences were also found for an increase in the average number of agents administered intraoperatively: *before policy* M=1.92(SD=1.35), *after policy* M=2.28(SD=0.80), M-W $p < 0.0001$. No thromboembolic events or deaths were observed in either group.

Conclusions: Universal prophylactic TXA administration during c-sections was associated with reduced perioperative blood loss and lower rates of blood transfusion, without an increase in thromboembolic events or mortality.

Discussion: Hemorrhage remains the primary cause of mortality in the perioperative period for individuals undergoing cesarean sections. Standardizing the administration of tranexamic acid may reduce blood loss and potentially decrease the risk of death from hemorrhage, although no deaths occurred during this study. Costs and risks of TXA administration were not addressed in this study. Nevertheless, it is possible that TXA may be better utilized in patients at risk for PPH or in other clinical settings.

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 08

Identifying Perioperative Maternal Risk Factors Associated with Haemorrhage during and after Caesarean Section in Africa.

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Co-Authors: David G. Bishop, MBChB, MMed, FCA, PhD - University of Kwazulunatal, Robert A. Dyer, BScHons MBChB FCA PhD - University of Cape Town

Abstract:
Background: Mothers in Africa undergoing caesarean delivery are 50 times more likely to die, compared to mothers in high-income countries. It is unclear whether there are identifiable preoperative and intraoperative risk factors that are independently associated with haemorrhage during and after caesarean section in Africa.

Methods: This was a substudy of mothers undergoing caesarean delivery in the African Surgical Outcomes Study. Multivariable logistic regression was used to describe the association between intraoperative haemorrhage ≥1000 mL and preoperative risk factors, as well as the association between postoperative haemorrhage requiring intervention following caesarean section, and perioperative (pre- and intraoperative) risk factors known or suspected to be associated with obstetric haemorrhage.

Results: Intraoperative haemorrhage ≥1000 mL occurred in 296/3747 (7.9%) of patients and was independently associated with the following: ASA 4 ($p< 0.001$), placenta praevia ($p< 0.001$), ruptured uterus ($p< 0.001$), antepartum haemorrhage ($p< 0.001$), and increasing parity ($p=0.017$). Clinically significant postoperative haemorrhage occurred in 266/3629 (7.3%) of patients and was independently associated with ASA 4 ($p< 0.001$), placenta praevia ($p=0.042$), intraoperative bleed ≥ 1000 mL ($p=0.004$), hysterectomy ($p= 0.002$), systolic blood pressure < 80 mmHg post-delivery ($p=0.004$), and general anaesthesia ($p=0.037$).

Conclusion: This study identified independently associated risk factors for bleeding during and after caesarean section in Africa that should be included in future quality improvement interventions. During caesarean section, appropriate selection of anaesthesia technique, and management of bleeding and blood pressure have the potential to modify risk.

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Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 09

Impact of the 2017 Revised Japanese Obstetric Hemorrhage Management Guideline on Tranexamic Acid Use in Cesarean Delivery: An Interrupted Time Series Analysis

Presenting Author: Hiroshi Yonekura
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Abstract:
Background: Tranexamic acid is integral in managing hemorrhage during cesarean deliveries, ensuring hemostasis. In Japan, the obstetric hemorrhage management 2012 guideline was revised in 2017, adding administration of tranexamic acid for postpartum hemorrhage. The tranexamic acid recommendation was retained in the 2021 guideline revision, reflecting a growing consensus on its importance in obstetric care. Despite guideline updates, the extent to which these guidelines influence clinical practice is not fully understood. This research aims to delineate the temporal patterns in tranexamic acid administration during cesarean deliveries subsequent to the 2017 guideline revisions and to examine the impact of obstetric hemorrhage management guideline implications in Japan.

Methods: An interrupted time series analysis was performed on data from patients who received cesarean deliveries from April 1, 2012, to August 31, 2021. Data was sourced from Japan's nationwide health insurance claims database, which contains information on reimbursement for more than 10 million insured individuals. The obstetric hemorrhage management guideline was revised in April 2017. We assumed a three-month period for transition and implementation, thereby designating the implementation period as April to June 2017: second quarter 2017 (2017Q2). The primary outcome was use of tranexamic acid for cesarean delivery.

Results: Out of the 98,067 cesarean deliveries initially identified, 91,166 cases were included in the final analysis. The study cohort was divided into pre-implementation (30,964 cases) and post-implementation (60,202 cases) groups, based on the introduction period of the obstetric hemorrhage management guideline (2017Q2). The mean age of the patients was 33.7 years; 33.6 in the pre-implementation group and 33.8 in the post-implementation group. Tranexamic acid was administered in 15.8% (95% confidence interval [CI] = 15.1 to 16.5%) of the cases. In the pre-guideline implementation cohort the rate of tranexamic acid usage decreased (quarterly percentage change: -0.4%; 95% CI: -0.48 to -0.33, P< 0.001). In the post-guideline

implementation cohort, the usage rate of tranexamic acid increased by 0.48% (95% CI: 0.36 to 0.60, P< 0.001) per quarter (Figure 1).

Conclusions: This interrupted time series analysis revealed a significant upward trend in the administration rate of tranexamic acid following the implementation of the obstetric hemorrhage management guideline, reversing the previous downward trend. Our findings could reflect the impact of the implementation of revised guidelines on the use of tranexamic acid for postpartum hemorrhage. This study contributes to the understanding of current practices in obstetric hemorrhage management.

Figure 1_abstract_Hiroshi Yonekura.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 10

Type And Screen: Transfusion Ratio: A Single Center Exploration of a Novel Quality Metric

Presenting Author: Alla Yarmosh, MD, MCR
Presenting Author's Institution: Stanford University
Co-Authors: Lynn Squires, MD FRCPC - Stanford Medicine

Abstract:
Introduction: Postpartum hemorrhage is a leading cause of morbidity and mortality in the United States (1). Blood product stewardship is crucial to quality improvement and involves a meticulous balance of cost-effectiveness and risk stratification strategies. Determining the acceptable frequency of pre-delivery type and screen (TS) and crossmatch tests is controversial for obstetric patients (2). Patient blood management systems have emerged to guide these decisions. Metrics, such as a crossmatch: transfusion ratio have been suggested (3). Emergency intrapartum blood transfusions are often not amenable to time consuming crossmatching, so we are exploring the utility of a TS: transfusion ratio at our large academic center. We performed a single center audit to determine the proportion of transfused patients with an active TS at time of intrapartum packed red blood cell (pRBC) transfusion (TS: transfusion ratio), as well as the proportion of transfusions that involved type specific or non-type specific blood.

Methods: Compiling state transfusion databases, departmental quality improvement logs, and institutional blood bank records, we identified parturients who received at least one pRBC transfusion from January 1 to December 31, 2022. Intrapartum transfusion patients (active labor or Cesarean, prior to post-partum transfer) were included in our analysis. We calculated the primary outcome, the TS: transfusion ratio, by cross-referencing electronic medical records and transfusion service records to identify the presence of an active TS at the time of transfusion. Secondary analysis included the proportion of patients receiving type specific transfused pRBCs versus those receiving compatible, but non-type specific pRBCs.

Results: In 2022, 4816 patients delivered at our facility, with 179 (3.72%) receiving at least one pRBC transfusion. Of these, 87 (48.6%) required an intrapartum transfusion. 60 of these patients had a pre-transfusion TS, yielding a TS: transfusion ratio of 0.69 (60/87). Of the intrapartum transfused patients, 44 (50.6%) were given compatible, but non-type specific blood. Notably, 27 (31.0%) of the intrapartum transfused patients lacked an active TS at the time of transfusion. Among these, 5 (18.5%) received type-specific blood despite not having an active TS. Of the 360 total intrapartum transfused units, 178 (49.4%) were non-type specific.

Conclusion: Our institutional audit revealed a TS: transfusion ratio of 0.69 for 2022. This should be further explored and compared to other centers to identify a benchmark for enhancing blood testing efficiency on labor and delivery. Cost effectiveness of limiting pre-delivery TS versus the risk of transfusion without an active TS (transfusion reactions and

alloimmunization) should be quantified to determine the impact of this potentially new quality metric. Optimizing strategies to decrease non-type specific transfusions are warranted.

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Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 11

A Single Center Evaluation of a Transfusion Risk Stratifying Algorithm for Guiding Type and Screen Ordering in Peripartum Patients

Presenting Author: Lynn Squires, MD FRCPC
Presenting Author's Institution: Stanford Medicine - Palo Alto, California
Co-Authors: Kelly Fedoruk, MD, FRCPC - Stanford University

Abstract:
Introduction: Maternal hemorrhage requiring transfusion is a marker of severe maternal morbidity (1). Many obstetric centers have attempted to balance the competing goals of cost efficiency, prevention of transfusion complications and optimization of blood utilization with type and screen (TS) ordering policies using risk stratification (2). We performed an audit to evaluate compliance with our institutional algorithm.

Methods: Obstetric patients who received at least one packed red blood cell (PRBC) transfusion between January 1 and December 31, 2022 were identified via local blood bank records, quality improvement logs and state reporting databases. Our center introduced an obstetric risk assessment algorithm for TS decision making in 2010 (3). Patients who met algorithm criteria for obtaining a TS were identified. The algorithm considers obstetric history (uterine scars, multiparity, multiple gestation, prior postpartum hemorrhage, trial of labor after cesarean), obstetric complications (abruption, chorioamnionitis, Hemolysis/Elevated Liver Enzymes/Low Platelets Syndrome, abnormal placentation), coagulopathy, anemia, and planned general anesthesia. The proportion of transfused patients who were identified as needing a TS via our algorithm was calculated. To assess compliance, we compared this to the number of patients who received a pre-transfusion TS. A subgroup analysis was performed for patients who received PRBCs intrapartum (time from admission for delivery until transfer to postpartum).

Results: There were 4816 deliveries at our institution in 2022 and 179 (3.7%) received at least 1 PRBC transfusion. Table 1 outlines our results. Only 72/179 (40.2%) of transfused patients met the algorithm's indication for a TS but 150 (83.8%) patients had a TS at time of transfusion. 87 patients were transfused during the intrapartum period. 60 (69.0%) of these patients had a TS ordered despite only 36 (41.3%) meeting criteria. Overall, the algorithm was only followed in 49.7% of transfused patients.

Conclusion: Our audit revealed that while most patients who received transfusions had an active TS, very few of these were guided by our institutional algorithm meant to risk stratify patients. This highlights the challenges with TS algorithms in obstetric patients. It also emphasizes the importance of evaluating quality improvement initiatives comprehensively including repeat assessment after adoption, as our algorithm does not align with current practice. Possible contributors to the disparity in compliance may include a changing obstetric population and clinical practice leading to the inability to account for all risk factors. Next

steps at our institution include an updated cost analysis of the algorithm, exploration of novel risk factors (such as the duration of induction or labor), and potential changes to our TS risk stratification.

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Squires, A single center evaluation of a transfusion risk stratifying algorithm for guiding type and screen ordering in peripartum patients.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 12

Single Center Implementation of a Postpartum Pharmacologic Thromboprophylaxis Protocol

Presenting Author: Ann M. Bruno, MD MS
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Co-Authors: Amanda Allshouse, MS - University of Utah
Christine Warrick, MD - University of Utah

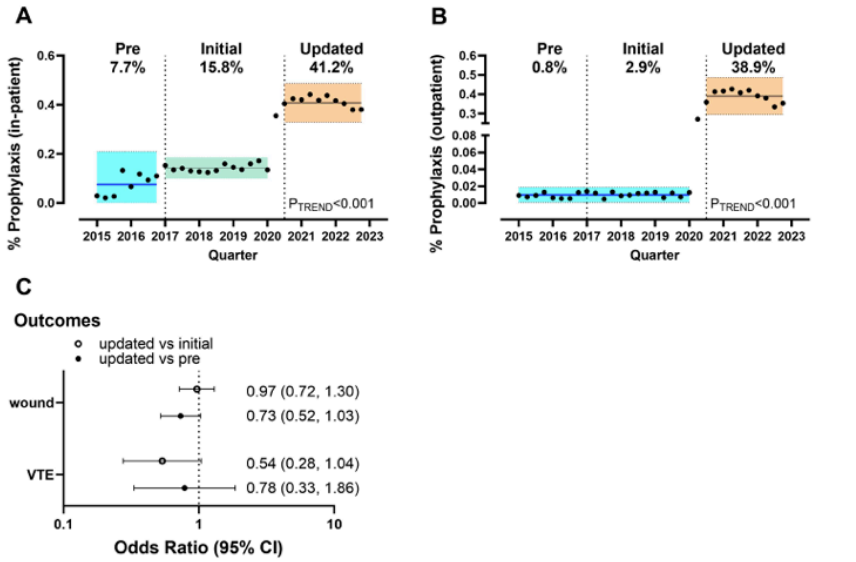
Abstract:
Objective: We aimed to evaluate changes over time in the rate of pharmacologic prophylaxis following implementation of a postpartum venous thromboembolism (VTE) prevention protocol. Secondarily, we aimed to evaluate the association between protocol implementation and rates of VTE and wound complications.

Study Design: Retrospective cohort study of patients delivering from 2015-2022 at a single academic institution. Those with an antepartum VTE or receiving therapeutic anticoagulation were excluded. An inpatient thromboprophylaxis protocol was implemented in January 2017 and further updated in July 2020 to expand risk factors and length of therapy to the outpatient setting (total of 14 days). The cohort was divided into three time periods: pre (1/1/15 – 12/31/16), initial (1/1/17 – 6/30/20) and updated (7/1/20 – 12/31/22) protocol. The primary outcome was inpatient heparin-based pharmacologic prophylaxis. Secondary outcomes included outpatient pharmacologic prophylaxis, VTE (pulmonary embolism or deep vein thrombosis), and wound complications after cesarean delivery (hematoma, seroma, surgical site infection) through 6 weeks postpartum. Baseline characteristics and outcomes were compared across the three protocol periods. Logistic regression modeling estimated the association between our outcomes and the updated protocol period compared with prior periods.

Results: Overall, 22.6% (95% CI 22.1-23.0 %) of 34,217 included deliveries received inpatient pharmacologic prophylaxis: 7.7% (7.1-8.2%) pre, 15.8% (15.2-16.4%) initial, and 41.2% (40.4-42.1%) during the updated protocol period. The rates of inpatient and outpatient prophylaxis increased significantly over time ($p< 0.001$ test of trend; Figure). Delivery in the updated protocol period was not associated with differences in VTE (pre: 0.1%, initial: 0.2%, updated: 0.1%) nor wound complications (pre: 3.4%, initial: 2.7%; updated: 2.7%).

Conclusion: Single center implementation of a postpartum prophylaxis protocol resulted in increased use of inpatient and outpatient pharmacologic prophylaxis over time without changes in rates of VTE or wound complications.

Figure. Changes over time in primary and secondary outcomes from 2015 to 2022



Trends in quarterly rates of inpatient pharmacologic prophylaxis (A) and outpatient pharmacologic prophylaxis (B) over time. Quarterly rates are presented using run chart methodology with line plotted as mean with 3 standard deviation band and percentages are reported for each period with comparisons by chi square test of trend. (C) Modeling for VTE adjusted for presence of two or more venous thromboembolism institutional protocol moderate risk factors (body mass index ≥40 kg/m^2, multifetal gestation, tobacco use, estimated blood loss >1L or blood transfusion intrapartum, scheduled cesarean delivery, preeclampsia, chorioamnionitis, preterm birth <37 weeks, advanced maternal age, family history of VTE, stillbirth, prolonged labor >24 hours, low-risk thrombophilia) or presence of one or more venous thromboembolism institutional protocol major risk factor (history of VTE, body mass index ≥40 kg/m^2, high-risk thrombophilia, nephrotic range proteinuria, cesarean-hysterectomy, unscheduled cesarean, cancer, systemic lupus erythematosus, inflammatory bowel disease, sickle cell disease, intravenous drug use, cardiovascular disease). Modeling for wound complications adjusted for risk factors for VTE, as well as presence of gestational or preexisting diabetes mellitus and chronic hypertension.

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 13

Individual Patient Data Meta-Analysis of Tranexamic Acid Pharmacokinetic Data for Postpartum Hemorrhage

Presenting Author: Sebastian M. Seifert, MD
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Co-Authors: Allison Dunn, PhD, MS - University of Maryland School of Pharmacy
Mina Felfeli, ECFMG - The George Washington University School of Medicine and Health Sciences
Amber Geer - London School of Hygiene & Tropical Medicine
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Haleem Shakur-Stil, PhD - London School of Hygiene & Tropical Medicine

Abstract:
Background: Tranexamic acid (TXA) decreases blood loss when given to patients with postpartum hemorrhage (PPH), particularly in low resource settings [1]. The risk of PPH increases with increasing body mass index, but the implications of body mass for optimal dosing are uncertain [2-4]. **Aims:** 1) To describe the pharmacokinetics (PK) of tranexamic acid in a large, heterogeneous population of pregnant women and 2) to assess whether weight-based dosing is needed.

Methods: We conducted an individual patient data meta-analysis of four pharmacokinetic studies (NCT: 04274335, 03287336, 00872469, 02797119) in pregnant women receiving either intravenous (IV), oral, or intramuscular (IM) TXA. A population PK analysis was performed using nonlinear mixed-effects modeling in Pumas (version 2.4, Pumas AI, Baltimore, MD, https://pumas.ai/) to fit the collected TXA concentration-time data for the studies. A stepwise approach was used to select the structural model and identify covariates that explain the observed variability in TXA PK. Age, body weight, height, and study location were used as covariates. The final model was used to assess dosing strategies.

Results: A total of 211 pregnant women who received between 0.35 and 4 grams(g) of TXA provided 1,303 TXA plasma concentrations for model development. A two-compartment model with first-order elimination and first-order absorption most adequately described the TXA concentration-time profile with the following PK model parameter estimates: total body clearance 7.84 liters/hour (L/hr; 32.6% between-subject variability [BSV]); volume of the central compartment 20.9L (24.2% BSV); volume of the peripheral compartment 18.5L (42.2% BSV); 1st order absorption rate constant for oral route 0.28/hr (16% BSV) and for IM route 3.40/hr (61.6% BSV); bioavailability for oral route 0.48 (41.1% BSV) and for IM route 0.95 (35.1% BSV); absorption lag time for oral route 0.117 (125% BSV); allometric scaling exponent for clearance (0.821) and volume (0.433) parameters; additive residual unexplained variability 0.145 miligrams/L; and proportional residual unexplained variability 28.9%. Body weight was the only statistically significant covariate identified that impacted TXA plasma concentration

and was incorporated using a power function centered around 80 kg (range 47—156 kg, BMI 18—56 kg/m^2) in the final model. Final model simulations using a virtual population (n=1000) revealed that weight-based and fixed-dosing regimens within this weight range gave similar plasma TXA exposures (Figure).

Conclusions: Weight-based dosing did not significantly change TXA exposure within 47—156 kg compared to a fixed dose. Therefore, a 1g IV dose of TXA should maintain the plasma level above a minimum threshold of 10 ug/mL for pregnant women 47—156 kg, BMI 18—56 kg/m^2 for at least 2 hours.

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Seifert SOAP TXA image.pdf

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 14

Integration of A Quantitative Blood Loss and Hemorrhage Alert System for Vaginal Delivery: A Before and After Comparison to Evaluate Postpartum Hemorrhage Outcomes Over 8 Years

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Co-Authors: Kara G. Fields, MS - Brigham & Women's Hospital
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Noor A. Raheel, MD, MPH - Brigham and Women's Hospital

Abstract:
Introduction: Postpartum hemorrhage (PPH) is on the rise in the United States and remains the leading cause of preventable maternal morbidity and mortality. Strategies to expedite the detection and management of PPH are warranted. A quantitative blood loss (QBL) system (Stryker, Kalamazoo, MI) was initiated on our labor and delivery (L&D) unit in 2018, with integration of an automated iPhone (Apple, Cupertino, CA)-based alert system for QBL > 500 mL in 2020. The QBL device increased our rate of PPH diagnosis (Lumbreras), and a 500 mL PPH alert triggered meaningful PPH interventions by the anesthesia team (Villelas). However, evidence that QBL lowers PPH-related morbidity is lacking. We aimed to determine the impact of QBL and automated PPH alert integration on maternal PPH-related outcomes.

Methods/Materials: A single-center, retrospective before and after study of all vaginal deliveries on our L&D unit from January 2015 through December 2023 was conducted. After IRB approval, data for all singleton vaginal deliveries at term gestation were extracted from the electronic medical record (EMR) from 3 distinct 2-year periods separated by transitional months: pre-intervention (Jan 2015-Dec 2017; period 1), after implementation of QBL (Feb 2018-Dec 2020; period 2), and after addition of the PPH alert system (Jan 2021-Dec 2023; period 3). The primary outcome was measurement of hemoglobin (Hgb) on postpartum day 1. Secondary interventions were classified as early or late relative to onset of PPH. Early: administrion of tranexamic acid (TXA), methylergonovine, carboprost, fibrinogen, misoprostol, or vasopressor. Late: surgical procedures (dilation and curettage, Bakri/Jada tamponade device placement, hysterectomy), blood transfusion, and intensive care unit (ICU) admission.

Results: A total of 8693, 10839 and 11223 deliveries were captured during periods 1,2, and 3, respectively. For the primary outcome of Hgb measurement on postpartum day 1, multivariable logistic regression showed an OR of 1.21 ($P < 0.001$) for period 2 vs. 1, and 1.21 ($p < 0.001$) for period 3 vs. 1. Secondary outcomes are in the Table.

Conclusion: Use of QBL for the diagnosis and management of PPH after vaginal delivery is advocated, though its benefit to lower maternal morbidity from PPH remains unclear. Anesthesiologists do not attend vaginal deliveries, therefore QBL with alerts may theoretically expedite care. In our study, introduction of QBL with an alert system was associated with higher rates of postpartum Hgb checks and pharmacologic interventions along with a higher transfusion rate. Additional outcome measures such as acute kidney injury and postpartum anemia may further elucidate whether QBL lowers PPH-related morbidity.

References:

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Table. Comparison of hemoglobin measurement and early and late PPH interventions before and after QBL implementation

Outcome	Adjusted OR (95% CI)	P value
Postpartum hemoglobin check, n (%)		
Period 2 vs. 1	1.21 (1.13, 1.29)	< 0.001
Period 3 vs. 1	1.20 (1.12, 1.28)	< 0.001
Any late intervention*, n (%)		
Period 2 vs. 1	1.39 (1.12, 1.73)	0.003
Period 3 vs. 1	1.37 (1.10, 1.70)	0.005
Any early intervention**, n (%)		
Period 2 vs. 1	0.91 (0.85, 0.98)	0.012
Period 3 vs. 1	0.97 (0.90, 1.04)	0.362
Blood loss >/= 500 mL (Laura), n (%)		
Period 2 vs. 1	2.46 (2.25, 2.68)	< 0.001
Period 3 vs. 1	1.77 (1.62, 1.94)	< 0.001

OR = Odds ratio, CI = Confidence interval

Multivariable logistic regression models adjusted for mother age, mother BMI, pre-delivery hematocrit, parity, race/ethnicity, gestational age, and birth weight

*D&E, Bakri/Jada tamponade device placement, Hysterectomy, Transfusion of RBCs, ICU admission

**TXA, methergine, hemabate, fibrinogen, misoprostol, vasopressors

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 15

Decreased Dose-Response to Fibrinogen Concentrate in Parturients During Postpartum Hemorrhage: A Retrospective Study

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Michael J. Furdyna, MD - Brigham and Women's Hospital
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Noor A. Raheel, MD, MPH - Brigham and Women's Hospital

Abstract:
Introduction: Post-partum hemorrhage (PPH), defined as 1L of blood loss after delivery, is the leading cause of maternal morbidity and mortality worldwide.(1) A fibrinogen level <200mg/dl is a leading predictor of PPH progressing to severe PPH requiring transfusion, and early administration of fibrinogen concentrate (FC) has been shown to decrease complications and death.(1,2) The study used to develop the equation for FC dosing was performed in 14 non-pregnant patients with hypofibrinogenemia.(3) We previously showed a lower dose-response in parturients with hypofibrinogenemia.(4) In this retrospective study, we compared the dose response to FC during the active PPH (aPPH) phase and the post-resuscitation (PR) phase of PPH in the pregnant population.

Methods: We examined our database for all parturients from 2015-2023 who received FC within 24h of delivery with documented pre- and post-dose fibrinogen levels. We excluded patients who received co-administration of cryoprecipitate, have a history of congenital fibrinogen disorders, or had chronic abruption or IUFD without PPH. Stages of hemorrhage were divided into 1) aPPH phase (PPH to final red blood cell transfusion) and 2) PR phase of PPH (after all blood products were given through 24 hours post-delivery). The primary outcome was paired comparison of observed Fibrinogen Change (oFC) versus the manufacturer's expected Fibrinogen Change (eFC) after each dose. Additional analysis compared the two phases of hemorrhage.

Results: A total of 351 doses of FC were identified among 167 patients. 96 total doses were included in the final analysis. The overall median oFC was 15.0 [-25.5-51.0] vs median eFC of 29.3 [22.6-43.8] (p=0.0003). Similarly, the aPPH group had an oFC of 10.5 [-28.5-46] vs eFC of 28.5 [22.2-46.1] (p=0.0001). In contrast, there was no difference in the PR group. The dose response in the aPPH group was significantly less at 0.6 [-1.9-2.4] compared PR group 2.4 [2.2-3.6] (p=0.011). In the aPPH group, 40.9% of patients had a negative response (or decrease in fibrinogen level) after FC administration compared to negative responses in the PR group (p=0.019).

Discussion: This study demonstrates a substantial discrepancy in fibrinogen dose-response between aPPH compared to PR PPH phases, with under-dosing of FC during aPPH. A 3-fold

higher dose requirement during the aPPH phase than predicted based on manufacturer protocol was determined. Our findings suggest that more predicted dose response in the PR phase may reflect intrinsic fibrinogen recovery. Recognizing temporal differences in fibrinogen dose response during PPH is critically important for expeditious correction of coagulopathy and may lower morbidity and improve maternal PPH-related outcomes.

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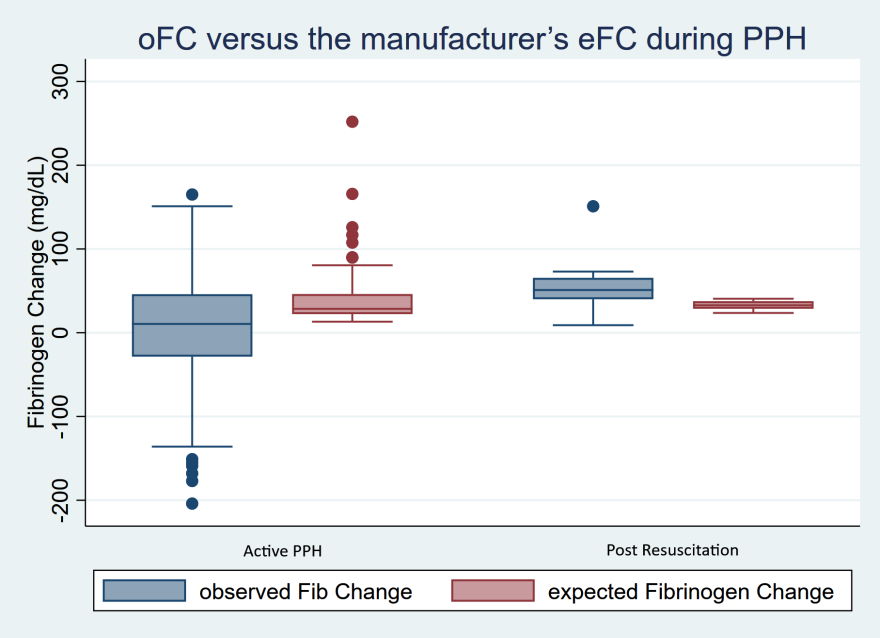

Abstract #: FRI – RA – BS 2 – BR 4 – PAS + PPH – Coagulation – 16

Trends of Tranexamic Acid (TXA) use in High-Acuity Obstetric Patients in a High-Resource Setting

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Abstract:
Background: The use of tranexamic acid (TXA) for the treatment of postpartum hemorrhage (PPH) has increased globally since the WOMAN trial of 2017 demonstrated a 19% reduction in the risk of bleeding-related death.[1] Its applicability to high-resource settings has been questioned.[2,3] TXA has been recommended for PPH by the American College of Obstetricians and Gynecologists (ACOG), and 2 studies found an increase in its use in the US following this guideline.[4] ACOG does not recommend prophylactic TXA for cesarean delivery (CD) due to limited evidence.[5,6] In our single-center retrospective study, we evaluated trends and outcomes in TXA use for treatment and prevention of PPH in a high-resource setting.

Methods: We identified all deliveries at our institution between 05/2015 and 12/2023. Data from electronic health records were collected for patient demographics, delivery characteristics, comorbidities, pertinent therapies, and laboratory studies. TXA usage was categorized as “1-dose TXA”, ‘2-doses TXA” and “Prophylactic TXA”. We defined prophylactic TXA administration as occurring within 6 minutes of delivery or multiple doses given for patients with hematologic disorders. The primary outcome was rate of TXA use the year of (2017) vs. 2 years after (2019) publication of the WOMAN trial. We also compared the effect of TRAAP[4] and TRAAP2[5] on prophylactic TXA for vaginal delivery (VD) and CD, respectively, and overall trends.

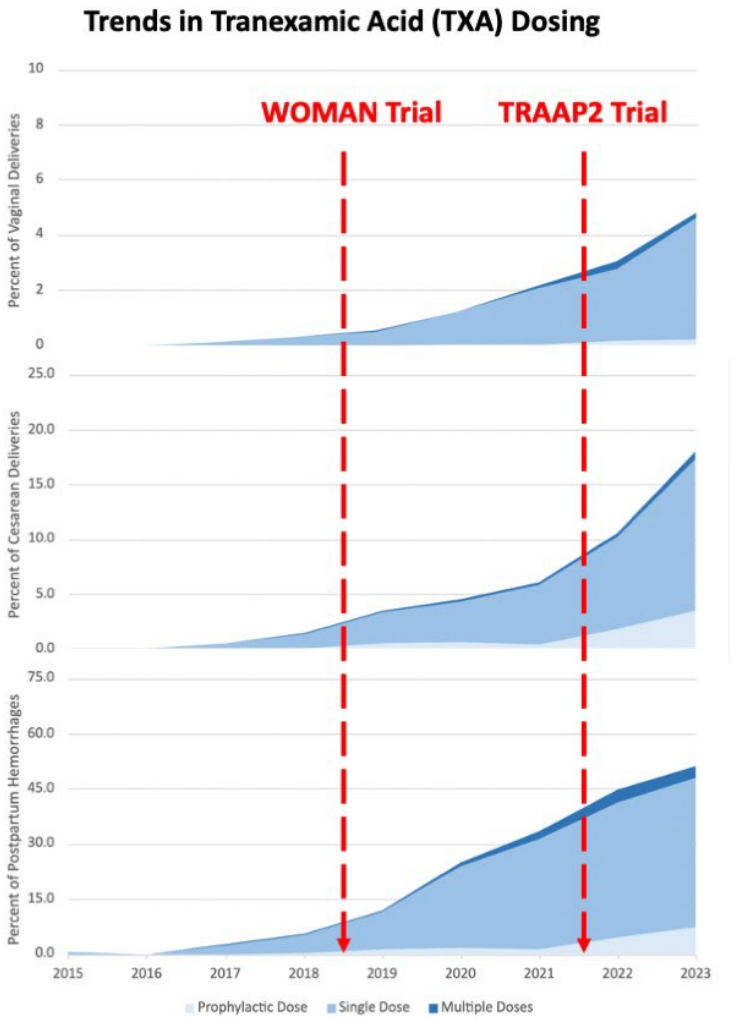
Results: We identified 55,306 deliveries, of which 1247 patients received TXA. TXA use in PPH increased after the WOMAN trial (2.6% in 2017 compared to 11.8% in 2019; p=0.0001). Prophylactic TXA for VD did not increase after the TRAPP trial. Prophylactic TXA for CD increased after the TRAPP2 trial with a rate of 0.4% in 2017 compared to 3.4% in 2019 (p=0.0001). Overall trends in TXA usage are summarized in the Figure. TXA usage in PPH cases increased from 0% in 2015 to 49% (p< 0.0001) in 2023. During 2023, TXA use was 3.8% and 17.5% for VD and CD. There was an increase in PPH and pRBC transfusion from 2015 to 2023 (data not shown).

Conclusion: We evaluated the usage and impact of TXA in a high-resource setting. The use of TXA has increased substantially during our study period. Significant increases in TXA use

occurred after the publication of the WOMAN trial and TRAPP2 trials. Our marked increase in TXA use with no demonstrable change in PPH-related outcomes is consistent with the known diminished benefit of TXA in higher-resource settings.

References:

1. Shakur *Lancet* 2017
2. Ahmadzia *J Thromb Thrombolysis* 2020
3. Kowalczyk Curr Opin Obstet Gynecol 2024
4. Sterling *J Thromb Thrombolysis* 2023
5. Sentilhes. *N Engl J Med* 2018
6. Sentilhes *N Eng L Med* 2021



Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 01

Changes in Velocimetric Indices of Uterine And Umbilical Arteries Before and After Combined Spinal-Epidural Analgesia in Laboring Women

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Kumpalin yada, MD - Mount Sinai Hospital Toronto

Abstract:
Introduction: Combined spinal-epidural (CSE) for labor analgesia has been used for many years. Despite its advantages, some studies have reported a higher risk for fetal bradycardia after CSE.[1] Variations in blood flow produced by sympathetic block is hypothesized to be the principal root cause, which could occur faster in CSE than epidural analgesia. Maternal and fetal blood flow can be assessed using Indices from continuous wave Doppler ultrasound to monitor uterine artery (UtA) and umbilical artery (UmA) velocity waveforms to detect changes over time. Velocimetry data: systolic/diastolic (S/D) ratios, pulsatility index (PI), and resistance index (RI) can provide a measure of the resistance of uteroplacental and fetal umbilical vascular bed. The primary objective of this study was to investigate the changes in UtA and UmA blood flow indices before and after the initiation of CSE. Secondary objective was to determine the association of these indices with fetal bradycardia. We hypothesized that the blood flow in UtA and UmA is reduced after CSE, which may be responsible for fetal bradycardia.

Methods: This prospective observational study was done in term pregnant laboring women, ASA< 4, with no fetal anomalies or fetal heart rate (FHR) abnormalities before providing analgesia. CSE was performed with a spinal dose of 0.7 ml bupivacaine 0.25% + fentanyl 15 mcg. Doppler measurements in both UtA and UmA were obtained before and after CSE (at 10 and 30 min) during the relaxation of the uterus. Primary outcome was UtA and UmA velocimetric indices after CSE. Data were analyzed using mixed models using STATA 14.0.

Results: Data from 18 patients were analyzed. We found a significant increase in left UtA PI (p=0.02) and right UtA PI (p=0.04) indices over time; similar results were obtained for RI and S/D ratio (except for S/D in left UtA). However, no significant changes were observed in UmA PI (p=0.31), RI (p=0.19), S/D ratio (p=0.12) or FHR (p=0.7) (Fig 1). One episode of fetal bradycardia was reported, which was resolved with minor interventions (left tilt and fluids).

Discussion: Changes in UtA blood flow with CSE showed a similar trend to that reported in epidural anesthesia, where the indices increased 150-200% in UtA after starting epidural

infusion.[2] However, the trend in UmA Doppler measurements showed stability over time. Clinical correlation of these findings is required.

References:

1. Grangier L. et al. Adverse side effects and route of administration of opioids in CSE analgesia for labor: a meta-analysis of randomized trials. IJOA 2020;41:83-103.
2. Chen LK. et al. The effects of continuous epidural analgesia on doppler velocimetry of uterine arteries during different periods of labor analgesia. BJA 2006;96:226-30.

Figure 1.pdf

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 02

Assessment of Sensory Block During Labour Epidural Analgesia: Prospective Cohort Study Investigating Upper and Lower Sensory Block Levels io Ice & Pinprick In Patients Experiencing Pain During Labour

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Xiang Y. Ye, MSc - Department of Biostatistics, University Health Network

Abstract:
Introduction: Previous studies have shown two levels of sensory block to cold[1,2] and pinprick[(in press)] during epidural analgesia for labour, namely upper and lower sensory block levels (USBL and LSBL). A sensory block up to dermatome T10 is thought to be required for adequate labour analgesia. We hypothesized that the LSBL to either cold or pinprick would be below T10 in patients experiencing pain during labour epidural analgesia. We also hypothesized that upon receiving a top-up and re-establishment of effective analgesia (a) the LSBL would be at or above T10 or (b) the USBL would increase to T10 or above T10 if USBL was below T10 before receiving a top-up.

Methods: This was a prospective cohort study conducted after obtaining REB approval and written informed consent. After receiving an epidural test and loading dose, epidural analgesia was maintained with a PIEB plus PCEA regimen with bupivacaine 0.0625% and fentanyl 2 mcg/mL: PIEB 10mL every 40 min, PCEA 5mL, lockout 10 min, hourly maximum 30 mL. Patients experiencing pain > 1/10 (VNRS 1-10) and requesting rescue analgesia were offered a manual top-up (10mL bupivacaine 0.125%, followed by 5mL bupivacaine 0.25% every 10 minutes until adequate pain relief, defined as VNRS ≤ 1/10). Catheter replacement was considered in those not responding to 3 top-ups. The USBL and LSBL to cold and pinprick were assessed before (in pain) and after the top up(s) when effective analgesia had been established (no pain, VNRS ≤ 1/10). Data were summarized using descriptive statistical methods. The USBL and LSBL before and after the top-up associated with return to pain-free status were compared using the Wilcoxon sign rank test.

Results: We enrolled 30 patients. Median [IQR] block levels before and after top-up are shown in Table 1. The median LSBL to cold increased by two segments after top-up, moving from T12 (in pain) to T10 (without pain). The median LSBL to pinprick increased by one segment after top-up, moving from T12 (in pain) to T11 (without pain). The median USBL to

cold and pinprick increased by one segment after top-up and was above T10 for both pre top-up and post top-up.

Discussion: Our study confirms previous data showing two levels of sensory block (USBL and LSBL) to both cold and pinprick during labour epidural analgesia. Patients experiencing pain during maintenance of analgesia show LSBL to cold and pinprick below dermatome T10. However, after top-up and return to a pain free state, only LSBL to cold returns to T10. We suggest that LSBL to cold should be the recommended form of block assessment during labour analgesia. The role of USBL assessment remains to be clarified; we suggest that it may be useful in predicting successful spread of local anesthetic and adequate surgical anesthesia should a cesarean delivery be required.

References:
1) Can J Anesth 2022;69:750-5; 2) Can J Anesth 2022;69:1471-6

Table 1 Sensory block levels.pdf

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 03

Effectiveness of Clonidine and Dexmedetomidine Adjuncts for Labor Epidural Analgesia Initiation: A Randomized Double-Blind Fentanyl-Controlled Non-Inferiority Trial (The CLASSIER Trial)

Presenting Author: Yunseo "Linda" Park, BS
Presenting Author's Institution: University of Pittsburgh
Co-Authors: Valeria Altamirano, BA - University of Pittsburgh
Mutasim Makeen, MD - University of Pittsburgh
Robert J. McCarthy, PharmD - Rush University
Catherine Bergeron, MD - University of Pittsburgh
C. Tyler Smith, MD - University of Pittsburgh

Abstract:
Introduction: Modern epidural labor analgesia (ELA) combines a low concentration local anesthetic with a lipophilic opioid.[1] However, some patients (e.g., opioid use disorder) may desire options excluding exposure to any opioid.[2] The purpose of this trial was to compare the effectiveness of ELA initiation with clonidine, dexmedetomidine, or fentanyl (usual care) adjuncts for analgesia outcomes.

Methods: A prospective randomized double blind active controlled non-inferiority trial was conducted after IRB approval (STUDY22030095). Healthy subjects with term singleton gestation were enrolled. Subjects were randomized to either Group C (clonidine 60mg), Group D (dexmedetomidine 20mcg), Group F (fentanyl 100mcg). All received study drug plus ropivacaine 0.1% 10mL at ELA initiation. ELA was maintained using standardized clinical protocol using programmed intermittent epidural bolus (PIEB) with patient-controlled labor analgesia (PCEA). Pain scores were measured by 0-10 numeric rating scale (NRS) every 15 minutes. Total doses, patient satisfaction, side effects, obstetric and neonatal outcomes were measured. The primary outcome was pain intensity burden measured by area under the curve (AUC) for the first 30 minutes (PI-AUC_{30}) analyzed by noninferiority testing. The noninferiority margin δ was set as the median of fentanyl group + 30 representing a 1-point NRS difference per unit time across the 30-minute period. A *P*-value < 0.05 defined statistical significance. Post-hoc comparisons were made using Dunn's test with Bonferroni correction for multiple comparisons.

Results: There were 69 subjects included in the final analysis. PI-AUC_{30} differences for clonidine vs. fentanyl was 62.3 score*min (Bonferroni adjusted 95% CI 2.5 to 87.5, *P*=0.009) indicating that clonidine was inferior to fentanyl. PI-AUC_{30} differences for dexmedetomidine and fentanyl was 34.5 score*min (15.9 to 72.5, *P*=0.317). The difference between clonidine and dexmedetomidine was 27.7 score*min (12.5 to 47.5, *P*=0.226). Pruritus in the first 30 min occurred in 10/23 (43%) of Group F but in no subject in Group D or C (P< 0.001). There were no differences between groups for total local anesthetic doses, supplemental boluses, patient

satisfaction scores, side effects, and labor duration. Mode of delivery and neonatal outcomes were not different between groups (Table 1).

Conclusion: For initiation of epidural labor analgesia, noninferiority of clonidine or dexmedetomidine compared to fentanyl could not be demonstrated at the doses used in this study.

References:
1 Eur J Anaesthesiol 2000;17:542
2 Addiction 2023;118:1093

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Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 04

Exploration of the Optimal Programmed Intermittent Epidural Bolus Volume with Dural Puncture Epidural Technique for Labor Analgesia: A Biased-Coin Up-And-Down Sequential Allocation Trial

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Co-Authors: Yingcai Song, MD - Shanghai Key Laboratory of Maternal Fetal Medicine, Department of Anesthesiology, Shanghai First Maternity and Infant Hospital, School of Medicine, Tongji University, 201204 Shanghai, China.
Zhendong Xu - Shanghai Key Laboratory of Maternal Fetal Medicine, Department of Anesthesiology, Shanghai First Maternity and Infant Hospital, School of Medicine, Tongji University, 201204 Shanghai, China.

Abstract:
Background: Dural punctured epidural (DPE) technique and programmed intermittent epidural bolus (PIEB) are gaining popularity in labor analgesia owing to their advanced features[1-3]. However, optimal PIEB settings for DPE remain unclear. When employing the DPE technique, which involves dural puncture, the parameter settings for PIEB may differ from those used in conventional epidural technique. The bolus volume is a key parameter in PIEB settings. With a small volume, the potential enhancement of analgesia resulting from drug translocation through dural puncture may be masked. A large volume can facilitate greater movement of medication into the subarachnoid space, which may result in higher sensory block levels or hypotension. Consequently, we conducted this study to determine the effective PIEB bolus volume for 90% of patients (EV90) followed DPE.

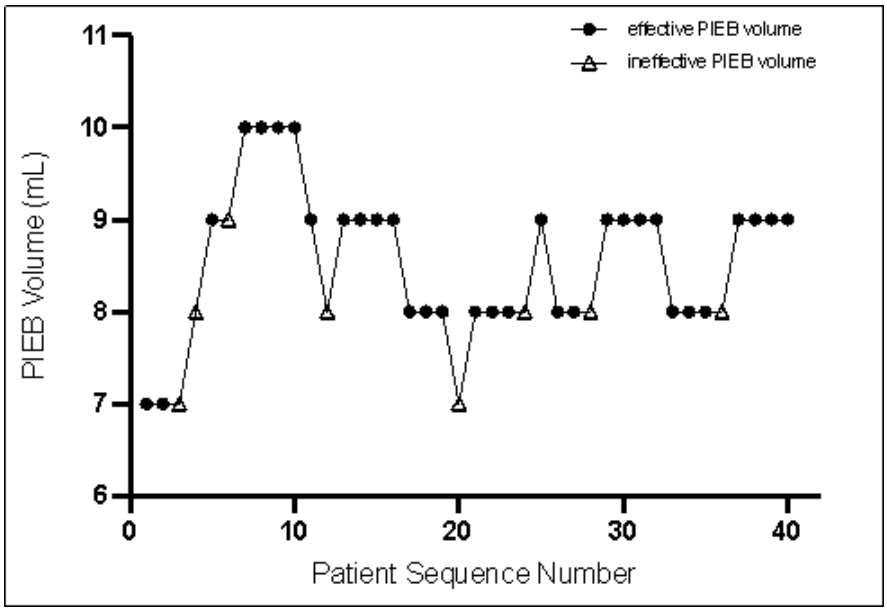
Methods: 40 nulliparous women requiring labor analgesia was recruited. After DPE using a 25-G Whitacre needle, an epidural catheter (19-gauge, wire-reinforced, multi-orifice) was threaded into the epidural space. Epidural labor analgesia was initiated with 12 mL of 0.1% ropivacaine with 0.3 μg/mL sufentanil after a test dose of 1.5% lidocaine 3 mL. This was followed with PIEB using the same solution at a fixed 40-min interval, starting 1 h after epidural initiation. The bolus volume for the first woman was 7 mL, and was adjusted for subsequent women based on the biased coin up-and-down design (groups 7–12; bolus volume 7–12 mL). The primary outcome was effective analgesia, indicated by no need for patient-controlled or manual boluses within 6 h after analgesia initiation or until complete cervical dilation, whichever came first. The secondary outcome inclided Numerical Rating Scale, Bromage scores, sensory blockade level and adverse events.

Results: The EV90 was 9.2 mL (95% confidence interval [CI]: 8.5–9.9 mL) using the truncated Dixon and Mood method and 8.8 mL (95% CI: 8.6–9.8 mL) using the isotonic regression method. Adequate analgesia rates were 50%, 68.8%, 93.8%, and 100% in groups 7, 8, 9, and

10, respectively. None of the patients experienced a motor block. Hypotension occurred in two women, one each in groups 8 and 9, but neither required vasopressors.

Conclusions: In the combined use of DPE, with a fixed 40 min interval, the EV 90 of PIEB for ropivacaine 0.1% with sufentanil 0.3 µg/ mL was nearly 9 mL.

References: 1 Chau A, et.al: Dural Puncture Epidural Technique Improves Labor Analgesia Quality With Fewer Side Effects Compared With Epidural and Combined Spinal Epidural Techniques: A Randomized Clinical Trial. Anesth Analg 2017.
2.George RB, et.al: Intermittent epidural bolus compared with continuous epidural infusions for labor analgesia: a systematic review and metaanalysis. Anesth Analg 2013.
3.Song Y, et.al: Effect of Dural Puncture Epidural Technique Combined With Programmed Intermittent Epidural Bolus on Labor Analgesia Onset and Maintenance: A Randomized Controlled Trial. Anesth Analg 2021.



Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 05

Comparative Study of Labor Analgesia Onset with Injection of Loading Dose Through the Epidural Needle Versus Catheter: A Prospective, Double-Blinded, Randomized Clinical Trial

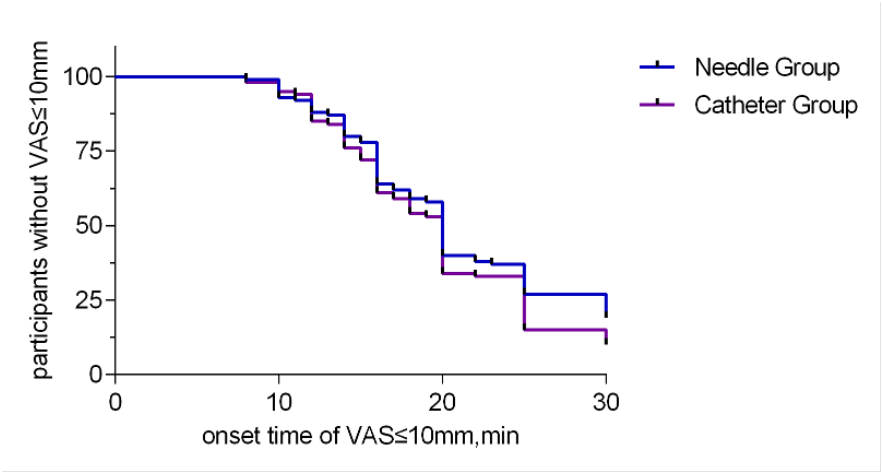
Presenting Author: Lihong Sun, MD
Presenting Author's Institution: Women's Hospital, School of Medicine, Zhejiang University, Zhejiang

Abstract:
Background: The rapid onset of epidural analgesia is the most urgent concern of the parturient. The local anesthetic and opioid were commonly administrated through the catheter to the epidural space. Studies have shown that drugs administrated through the epidural needle might enhance the spread of medication within the epidural space. There is a lack of studies comparing the onset of labor analgesia with a large-volume loading dose of local anesthetic with the two different methods of drug administration. We hypothesized that a high-volume loading dose of ropivacaine combined with sufentanil through needle injection into the epidural space would hasten the labor onset.

Methods: Therefore, we designed a prospective, double-blind, randomized controlled study to compare the onset of labor analgesia with the two different methods of drug administration. After written informed consent was obtained, 200 nulliparous women who requested epidural analgesia were randomly allocated into the needle group (n=100) or the catheter group (n=100). In the needle group, the loading dose of 15 ml of 0.1% ropivacaine with 0.3ug/ml sufentanil was administrated through the epidural needle before the catheter insertion, and in the catheter group, the same drug was administrated through the epidural catheter. The primary outcome was the onset time of labor analgesia, which is defined as the time from the loading dose administration to the adequate analgesia. Adequate analgesia is defined as visual analog scale (VAS) ≤10mm during uterine contraction. The median time to achieve adequate analgesia was assessed by Kaplan-Meier analysis. Secondary outcomes included sensory block level, ropivacaine consumption, motor nerve block, maternal and fetal outcome, mode of delivery, duration of labor, the patient's satisfaction.

Results: The main finding of our study was that there was no significant difference in the time to VAS≤10mm between the needle group and the catheter group needle group:20(16-30) minutes; catheter group: 20(15-25) minutes (P=0.232). There was no significant difference between groups in the sensory block level, ropivacaine consumption, motor nerve block, maternal and fetal outcome, mode of delivery, duration of labor, and the patient's satisfaction.

Conclusions: The loading dose administrated via epidural needle did not shorten the onset time of enough labor analgesia compared with that via epidural catheter.


participants without VAS≤10mm
100
75
50
25
0
0
10
20
30
onset time of VAS≤10mm,min
Needle Group
Catheter Group

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 06

Predictive Value of Neutrophil-to-Lymphocyte Ratio on Admission for Intrapartum Maternal Fever in Parturients Undergoing Epidural Analgesia: A Propensity Score-Matched Analysis

Presenting Author: Kunyue Li
Presenting Author's Institution: Zhengzhou University Third Hospital and Henan Province Women and Children's Hospital, Henan
Co-Authors: Tao Wang, PhD - Zhengzhou University Third Hospital and Henan Province Women and Children's Hospital

Abstract:
Backgrounds: Inflammation relates to the initiation of intrapartum maternal fever[1] This research sought to identify the predictive value of neutrophil-to-lymphocyte ratio (NLR) on admission for intrapartum maternal fever in parturients undergoing epidural analgesia.

Methods: This retrospective study included 814 full-term parturients with single-fetus vaginal delivery admitted to a single institution from December 2021 to June 2023. Parturients were categorized into Fever (239 cases) or No Fever group (575 cases) according to whether the maximum axillary temperature during labor reached ≥37.5℃. Baseline characteristics, biochemical indicators, and delivery variables were retrieved from institutional databases. Propensity score matching (PSM) was applied to address the impact of covariates. Univariate and multivariate regression analyses were implemented in sequence to find out the influencing factors of intrapartum fever. The relationship between NLR and intrapartum fever was assessed by three logistic regression models. The receiver operating characteristic (ROC) curve was applied to determine the sensitivity and specificity of NLR for intrapartum fever.

Results: After PSM, 236 parturients were in both groups respectively. In the adjusted multivariate regression analyses, NLR and duration of epidural analgesia(EA) were independent risk factors for intrapartum fever (Table 1). The ROC curve indicated that the area under the curve (AUC) of combined indicator (NLR+ duration of EA) was higher than that of NLR(AUC=0.583) and duration of EA (AUC=0.689), reaching 0.702(95%CI:0.655,0.749; sensitivity:72.50%, specificity:61.9%) (Table 2, Figure 1).

Conclusions: The NLR on admission is an independent risk factor for intrapartum fever, with limited predictive power. The combination of NLR and duration of epidural analgesia is a valuable predictor for intrapartum maternal fever.

Keywords: neutrophil-to-lymphocyte ratio, intrapartum maternal fever, epidural analgesia, inflammation.

Table 1 Models of logistic regression of NLR and duration of EA.

Variables	NLR			Duration of EA		
	OR	95%CI	P-Value	OR	95%CI	P-Value
Model 1	1.242	1.087-1.419	0.001	1.002	1.001-1.002	< 0.001
Model 2	1.377	1.026-1.849	0.033	1.002	1.001-1.003	< 0.001
Model 3	1.401	1.036-1.895	0.029	1.001	1.000-1.002	0.031

Model 1: unadjusted.
Model 2: adjusted for demographic and biochemical data.
Model 3: adjusted for demographic, biochemical, and delivery variables.

Table 2 ROC analysis of NLR, duration of EA, and combined predictors for intrapartum fever.

Variables	AUC	Cutoff	95%CI	specificity	sensitivity	Youden's index	P-Value
NLR	0.583	3.296	0.532-0.635	0.369	0.801	0.432	0.002
Duration of EA	0.689	507.500	0.641-0.736	0.686	0.678	0.363	< 0.001
NLR+ Duration of EA	0.702	0.452	0.655-0.749	0.619	0.725	0.106	< 0.001

References: [1] Goetzl L. Maternal fever in labor: etiologies, consequences, and clinical management[J]. American Journal of Obstetrics and Gynecology, 2023, 228(5, Supplement): S1274–S1282.

Predictive value of neutrophil-to-lymphocyte ratio on admission for intrapartum maternal fever in parturients undergoing Epidural analgesia A propensity score-matched analysis.tif

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 07

Machine Learning Modeling to Predict Epidural-Related Maternal Fever

Presenting Author: Scott Segal, MD, MHCM
Presenting Author's Institution: Wake Forest University School of Medicine - Winston-Salem, North Carolina
Co-Authors: Amit Saha, PhD - Wake Forest University School of Medicine

Abstract:
Introduction: Epidural-related maternal fever (ERMF) complicates 15-25% of labors in women with epidural analgesia (EA), with an odds ratio compared to women without EA of 2.9-14.5.[1] Several studies have verified risk factors for development of ERMF and a handful have reported multivariable models testing independent association of risk factors with ERMF while controlling for others.[2] We hypothesized that modern machine learning modeling could produce a strong, multivariable classifier and predictor of ERMF.

Methods: With IRB approval we extracted temperature, demographic, and labor/delivery data from the records of 7190 women admitted for intended vaginal delivery who received EA and were afebrile at initiation. 47% initiated with CSE (Bupiv 1.75 mg+Fent 15 mcg); all patients received PIEB with Bupiv 0.1%+Fent 2mcg/ml. Fever was defined as T >99.5 °F. Models were constructed utilizing all 55 candidate variables, and separately for only variables that could be known or estimated at the time of EA initiation. For each classifier, the data was split the into training (70%) and validation (30%) sets. Each model was tuned within the training set using 5-fold cross validation, varying hyperparameters to maximize the area under the ROC curve (AUROC), and performance measured in the validation set. Models compared were Logistic regression (LR), Random Forest (RF), Naive Bayes (NB), Support Vector Machine (SVM), k-nearest neighbor (KNN), XGBoost (XGB), and Multi-layer Perceptron (MLP), a fully connected neural network. ROCs were plotted for each model, Youden's method used to choose the optimal cutoff value, and the confusion matrix, sensitivity, and PPV for the best model reported.

Results: Performance of the various models is shown in the Figure. SVM, KNN, and XGB performed much less well than did the other models, all of which demonstrated AUROCs of 0.787-0.876 in the test set with all variables (Fig, A) and 0.774-0.822 with variables available at EA initiation (Fig, B). Random Forest performed best overall, at the optimal cutoff point yielding recall (sensitivity) of 78.8% and precision (PPV) of 23.2% in the validation set using variables known at the time of EA initiation.

Discussion: A random forest model of variables can predict ERMF with high sensitivity and reasonable positive predictive value. If tuned further to align with desired clinical utility (e.g., if higher sensitivity but lower PPV is preferred) and validated in other populations, such a model could be used to selectively intervene in women at highest risk.

References:

1. Sultan P, David AL, Fernando R, Ackland GL. Inflammation and Epidural-Related Maternal Fever: Proposed Mechanisms. *Anesth Analg.* 2016;122(5):1546-1553.
2. Chang XY, Wang LZ, Xia F, Zhang YF. Factors associated with epidural-related maternal fever in low-risk term women: a systematic review. *Int J Obstet Anesth.* 2023;56:103915.

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Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 08

Impact of a Change in Default PIEB + PCEA Settings on Epidural Failure Rate for Labor Analgesia: A Single-Center Retrospective Analysis

Presenting Author: Sophia Bechek, MD
Presenting Author's Institution: Massachusetts General Hospital
Co-Authors: Hao Deng, MPH, DrPH(c) - Massachusetts General Hospital
Ariel Mueller, MA - Massachusetts General Hospital
Emily Naoum, MD - Massachusetts General Hospital
Chloe O'Connell, MD - Kaiser Permanente
Matthew Smith, BA - Massachusetts General Hospital

Abstract:
Background: The combination of programmed intermittent epidural bolus (PIEB) and patient controlled epidural analgesia (PCEA) is frequently utilized for labor analgesia. Despite much research demonstrating its advantages over continuous epidural infusions (CEI), the optimal dosing strategy for PIEB + PCEA remains largely unexplored. As a result, there is a great deal of heterogeneity in the PIEB + PCEA settings used between institutions. We assessed the impact of a change in default epidural pump settings to a higher hourly maximum on epidural failure rates at our institution. We hypothesized that the change in default PIEB + PCEA settings would be associated with no significant change in epidural failure rates.

Methods: In August of 2021, our institution changed the default PIEB + PCEA settings for labor epidurals. Prior to 8/2021, patients received 8 mL PIEB boluses q45 min with a PCEA dose of 6 mL q10 min (*setting 1*) of bupivacaine 0.0625% with fentanyl 2 mcg/mL. After 8/2021, they received 9 mL PIEB boluses q45 min with a PCEA dose of 10 mL q10 min (*setting 2*) of the same mix. In this retrospective analysis, we examined 14,512 labor epidurals performed at a single academic medical center from June 2016 to November 2023. To mitigate observation correlation from multiple admissions for the same patient, only the first labor admission for each patient was included. Epidural failure was defined as the presence of a subsequent neuraxial or airway procedure for the index patient prior to delivery. Epidural failure rates were assessed with logistic regression, and the primary intervention was a change in the default pump settings from *setting 1* to *setting 2*. We examined epidural failure rates using both an unadjusted model and an adjusted model that accounted for variables such as age, BMI, ASA class, time of day, duration of labor analgesia, catheter depth, month and year, and performing provider role.

Results: At our institution, the rate of epidural failure was observed to be 11% (95% CI 10-12%), with a breakdown of 10% (95% CI 9-11%) before the adjustment of pump settings and 13% (95% CI 12-14%) following the change. In the unadjusted model, the change in default PIEB settings was associated with increased risk of epidural failure (OR 1.32, 95% CI 1.18 to 1.48, $p < 0.001$). However, after adjusting for appropriate confounders, the change in PIEB

settings was associated with a decreased risk of epidural failure (OR 0.63, 95% CI 0.52 to 0.77, $P < 0.001$).

Conclusion: These findings suggest that at our institution, the change in default PIEB settings to a higher maximum hourly dose was associated with decreased epidural failure rates when controlling for patient and provider factors. In the near future, we plan to look at patient satisfaction and subjective pain scores before and after this change went into effect, as well as time to epidural failure and failure rates for the subset of patients that underwent unplanned cesarean delivery.

Labor Epidural Failure Table 2.pdf

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 09

A Comparison of Cold and Sharp Modalities for Testing Sensory Blockade in Neuraxial Labor Analgesia: A Prospective Observational Trial

Presenting Author: Laura Somppi-Montgomery, MD
Presenting Author's Institution: University of Iowa, Department of Anesthesia - Iowa City, Iowa
Co-Authors: Nathanial Lindsey, BA - University of Iowa Department of Anesthesia

Abstract:
Introduction: Neuraxial labor analgesia blocks transmission of afferent nerves; breakthrough pain may occur if the appropriate nerves are not blocked. Study of neuraxial anesthesia demonstrates differential neuroblockade–the extent of sensory block to cold differs from that to sharp.[1] Although anatomical study shows that sensory nerves from the uterus enter the spinal cord at T10 to L1,[2] it is not clear how the clinician should test block of sensory impulses that transmit labor pain. We hypothesized that after initiation and during maintenance of labor analgesia, the extent of the cephalad sensory block assessed using cold will differ from that of sharp and that parturients with breakthrough pain will not have a bilateral sensory block to a cold stimulus between S2 and T10.

Methods: Parturients in labor who requested neuraxial labor analgesia were consented to participate in this study. Analgesia was initiated with combined spinal-epidural analgesia (intrathecal bupivacaine 1.25 mg/fentanyl 20 μg, epidural test dose [3-mL 1.5% lidocaine with epinephrine 1:200,000]). Analgesia was maintained with programmed intermittent epidural bolus/patient-controlled epidural analgesia (PCEA) (bupivacaine 0.08%/fentanyl 2 μg/mL, 7 mL every 45 min, PCEA 6 mL every 10 min). Twenty minutes and 2 hours after the spinal dose, and before treatment for breakthrough pain, sensory blockade was tested bilaterally in the cephalad and caudad directions using a cold stimulus (ice-filled copper tube) and a sharp stimulus (10-g von Frey hair). Parturients were asked when they first felt cold and sharp. The primary outcome was the cephalad sensory level to cold and sharp. Pairwise differences between cold and sharp were analyzed using the exact Wilcoxon signed-ranks test. The two-sided *P*-values are reported after Bonferroni adjustment for the four comparisons (left, right, 20 min and 2 h after spinal dose), with adjusted $P < 0.05$ treated as statistically significant.

Results: Forty-eight parturients participated. Sensory block to cold was a median of 1 dermatome level higher (cephalad) than sharp bilaterally at both 20 min and 2 h (Table). Eight patients with breakthrough pain were assessed (median [IQR] left and right to cold, L1 [L1, L2] and L2 [T11.5, L3], respectively; zero demonstrated a cold sensory block to T10, and 2 demonstrated a bilateral cold sensory block to S2.

Discussion: During neuraxial labor analgesia, most patients have dermatome block to cold higher (cephalad) than block to sharp. For many patients, the difference between cold and sharp is 2 dermatomes or greater. Therefore, the sensory modality used to determine the

extent of sensory blockade (and whether the appropriate dermatomes are blocked) is likely to have clinical significance. Further study is required to determined which modality should be used in routine clinical practice.

References: 1) Russell IF. Int J Obstet Anesth. 2004;13:146-52. 2) Cleland JGP. Can Med Assoc J. 1948;59:225-30.

Table_Dermatomes v4.pdf

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 10

Patient Trust in Anesthesiologists during Labor and Delivery

Presenting Author: Talia Scott, MD
Presenting Author's Institution: Icahn School of Medicine at Mount Sinai
Co-Authors: Annalise Eger, MPH - Icahn School of Medicine at Mount Sinai
Cynthia Mercedes, MS, BA - Icahn School of Medicine at Mount Sinai
Yuxia Ouyang, PhD - Icahn School of Medicine at Mount Sinai

Abstract:
Background: Though scales to measure trust in physicians exist, they have been validated in primary care settings where the physician and patient have an ongoing relationship. The role of the anesthesiologist is unique as the physician meets the patient the same day they will be providing care and does not have an ongoing relationship. The purpose of this study is to validate a trust scale in labor anesthesia and analyze the factors that may affect patient's trust in their anesthesiologists during labor and delivery.

Methods: A pilot survey of 30 participants was used to determine internal reliability of the trust survey and the final questions used. The trust survey was administered to participants after they had received anesthesia care during their labor. Participants also completed a short survey supplying demographic data.

Results: 301 surveys were collected. The trust survey had high internal reliability with Cronbach's alpha of 0.914 and item total correlations ranging from .613 to .811. The survey questions were scored on a 5-point Likert scale. The overall median score was 4. With additive scoring, the median score was 29 with a ceiling effect of 22% of participants giving a perfect score of 35. There was no association between demographics and overall survey score. Having just delivered their first child or having a Bachelor's degree or higher were associated with higher scores for the question "my anesthesiologist is usually considerate of my needs and puts them first" ($p = .006$, $p < .001$) and "I trust my anesthesiologist's judgments about my medical care" ($p = .028$, $p = .011$). Having a Bachelor's degree or higher was also associated with higher scores for the question "I completely trust my anesthesiologist's decision about which medical treatments are best for me" ($p = .005$). In contrast, those who selected Other race were associated with lower scores on the question of judgment ($p = .008$). Those who selected White were associated with higher scores for the questions "I trust my anesthesiologist to put my medical needs over all other considerations when treating my medical problems" and "I completely trust my anesthesiologist's decision about which medical treatments are best for me" ($p = .015$, $p = .044$). We are working on developing a model to predict trust.

Conclusion: Overall trust in anesthesiologists during labor and delivery was high, but there is still room for improvement. This survey can be used in future studies to test the efficacy of

different interventions in increasing trust between the laboring patient and their anesthesiologist.

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 11

Pocket Warming of Bupivacaine with Fentanyl to Shorten Onset of Labor Epidural Analgesia: A Double-Blind Randomized Controlled Clinical Trial

Presenting Author: Tyler M. Balon
Presenting Author's Institution: The Ohio State University College of Medicine - Columbus, Ohio
Co-Authors: Johnny McKeown - The University of Toledo, College of Medicine and Life Sciences
Harriet Washington, MD - The Ohio State University College of Medicine
Yun Xia, M.D. - The Ohio State University

Abstract:
Introduction: Warming the initial dose of epidural medications to 37℃ prior to administration has been shown to shorten the onset of action of the medication by more than 5 minutes without lowering its analgesic properties[1]. Currently, it is unknown whether this effect could be replicated by warming epidural medications in physician's pockets prior to administration without the use of any special equipment. If the pocket warming method proves efficacious, the use of this method would be less expensive and readily available to daily practice.

Methods: This is a prospective, double-blind, randomized clinical trial. The primary outcome is time to reach a pain Verbal Rating Scale ≤ 3 after the initial labor analgesia dose. Inclusion criteria included women with a single vertex presentation fetus at term with intact fetal membranes or membrane rupture < 6 hours. Exclusion criteria included patients with a history of chronic pain, patients with any contraindication to anesthetic medications or labor epidural placement, minors, and non-English speaking patients.

Results: Of all eligible participants, 64 women were randomized to the pocket warming group (PWG), and 72 women were randomized to the room temperature group (RTG). The two groups were demographically similar with no observed differences. The temperatures of medications were 27.8 ± 1.7 ℃ in PWG.
On Fig. 1, there was no significant difference in analgesia onset time: 6.2 [4, 15] vs. 8.0 [4.1, 16] (minutes, Median [IQR]) nor VRS score ≤ 3 within 15 minutes (59% vs 50%) between parturients in RTG and those in PWG (both $P > 0.05$). Mode of delivery, incidences of rescue bolus, hypotension, N/V, shivering, fever, and patient satisfaction remained the same between the groups.

Discussion: While previous research demonstrated the benefits of warming epidural medications to 37℃ prior to administration[1], this was not seen using the pocket warming method in our study. This may be because the temperature of the medication was not high enough to elicit any significant difference in outcomes. Our negative results also could not rule out the possibility of a type II error.

References: Sviggum HP, Yacoubian S, Liu X, Tsen LC. The effect of bupivacaine with fentanyl temperature on initiation and maintenance of labor epidural analgesia: a randomized controlled study. International Journal of Obstetric Anesthesia. 2015 Feb 1;24(1):15-21.

SOAP Abstract-Pocket Warming Graph.pdf

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 12

Programmed Intermittent Epidural Bolus versus Continuous Epidural Infusion - Is One Better? A Retrospective Chart Review

Presenting Author: Katelyn Fields, BS
Presenting Author's Institution: University of Kentucky College of Medicine - Lexington, Kentucky
Co-Authors: Elizabeth A. Janszen, MD - University of Kentucky
Hana Kebede, MD, MS - University of Kentucky College of Medicine
Margaret L. Lund, MD - University of Kentucky College of Medicine
Hannah Madden, MD - University of Kentucky
Morgan Moorhead, MD - University of Kentucky College of Medicine

Abstract:
Labor epidural analgesia has been managed with CEI + PCEA. Studies have shown improved outcomes with the use of PIEB. Our institution began using PIEB in October 2020. To investigate the effects of this change, we conducted a retrospective chart review between February 2020 & May 2021. Patient data were collected and recorded in REDCap. The primary outcome was the need for and number of physician-administered rescue boluses. We chose this as our primary outcome because rescue boluses may serve as a proxy for patient satisfaction, efficacy of analgesia, and anesthesioogy team workload. CEI and PIEB patients received 0.1% bupivacaine + 2 mcg/ml fentanyl. CEI patients received this at 10 ml/hour while PIEB patients received an 8 ml bolus q 45 minutes. All patients had PCEA available at a bolus of 5 ml and a lockout of 15 min. Categorical variables were analyzed with Pearson's chi-square or Fisher's exact test. Continuous variables were analyzed using Mann-Whitney U test. The statistical analysis was completed using IBM SPSS Statistics version 28. Data from 354 patients was collected, with 186 patients receiving CEI &168 receiving PIEB. There was no difference in duration of epidural analgesia with median duration of 8.93 hr. for CEI and 8.05 hr. for PIEB (p=0.832). There was no difference in percent requiring a rescue bolus with 37.1% in the CEI group and 35.1% in the PIEB group, p=0.69. There was no difference in the mean number of rescue boluses administered (0.48 for CEI, 0.62 for PIEB, p=0.176). The PIEB group had significantly more patients who required 3 or more rescue boluses (7.1% PIEB vs 1.6% CEI, p=0.046).
These results showed that within the confines of our study, PIEB was no more efficacious at preventing breakthrough pain requiring physician-administered boluses than CEI, and did not decrease workload for the anesthesiology team. These results are in contrast to past studies. This could be due to the study design and our patient population. We weren't able to control for the parity of the women due to the retrospective design. This could contribute to differences in our results vs those of RCTs and could call into question the generalizability of the results found in RCTs to the typical L & D setting. The retrospective nature of our study limited the outcomes that could be studied when comparing the two regimens. Indicators of successful labor analgesia, such as pain scores, maternal satisfaction & motor block were not available in our record system. Also, the optimal PIEB settings & solutions have not yet been

determined, and our settings & solutions differed from those used in prospective studies. Perhaps there is an association between the type of PIEB regimen used and the amount of breakthrough pain experienced. The results we obtained highlight the need for further research, such as a prospective study, at our institution to truly discern the differences in outcomes when PIEB vs CEI is used for labor analgesia.

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 13

Making Labor Epidural Analgesia Better: A Quality Improvement Project

Presenting Author: Shreya Vinjamuri, BA
Presenting Author's Institution: Boston University School of Medicine
Co-Authors: Rachel Achu-Lopes, Anesthesiologist - Boston Medical Center

Abstract:
Background: Programmed intermittent epidural bolus provides more effective analgesia and reduces the need for provider-administered boluses compared to patient controlled epidural analgesia.[1,2] Systematic evaluations suggest that the optimal PIEB regimen is 10 mL boluses given every 40 minutes.[3-5] We recently modified our original PIEB settings to see if increasing the bolus volume to 10 mL would decrease the need for provider interventions.

Methods: This project was done at an urban safety net hospital from June-September 2023. We provided epidural, dural puncture epidural (DPE), or combined spinal epidural (CSE) labor analgesia per individual anesthesiologist preference. Analgesia was induced with varying doses of intrathecal or epidural bupivacaine, epidural fentanyl, and epidural lidocaine. Then, epidural infusion pumps delivered 0.0625% bupivacaine with 2 μg/mL fentanyl at two different settings. In June (group A), patients received 8 mL boluses every 30 minutes. Patients could self-administer an 8 mL bolus every 15 minutes with an hourly limit of 32 mL. In September (group B), patients received 10 mL boluses every 40 minutes. They could self-administer a 10 mL bolus every 20 minutes with an hourly limit of 30 mL**.** We reviewed electronic medical records to extract demographics, neuraxial anesthetic type, all neuraxial medications, all provider-administered interventions (rescue boluses, increased infusion concentration, epidural replacement), time from analgesia induction to first provider intervention, and time to delivery. For patients requiring intrapartum cesarean delivery, we recorded time to induction of surgical anesthesia. We assessed differences in the need for and timing of provider interventions using survival analysis/log-rank test.

Results: We studied 260 patients, 118 in Group A and 142 in Group B. The cohorts had similar demographics. Gestational age slightly differed (38.7 ± 1.8 weeks in A vs. 39.1 ± 1.6 weeks in B, p=0.048). There were no differences in frequency of labor induction, neuraxial technique, or route of delivery. 73 (61.9%) patients in group A and 82 (57.8%) in group B did not require any provider intervention. The log-rank test revealed no difference in need for provider intervention between the groups (p=0.84). We replaced the epidural catheter in 5 patients in group A and 8 in group B (p=0.61). We switched to 0.125% bupivacaine with 2 μg/mL fentanyl in 8 patients in group A and 1 in group B (p=0.005).

Conclusion: At our institution, increasing bolus volume and prolonging dosing interval did not decrease the need for provider intervention but may have improved the quality of analgesia, as measured by the need to increase local anesthetic concentration.

References:

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2. Anesth Analg 2013; 116: 133.
3. Anesth Analg 2011; 112: 904.
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5. Anaesthesia 2018; 73: 459.

Vinjamuri Image.pdf

Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 14

A Randomized Controlled Trial of Combined Spinal Epidural versus Dural Puncture Epidural Technique for Labor Analgesia

Presenting Author: Hannah Zang
Presenting Author's Institution: Duke University School of Medicine - Durham, North Carolina
Co-Authors: Amanda Craig, MD - Duke University
Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Andrew Padilla - Duke University School of Medicine
Trung Q. Pham, MD - Duke University
Samantha Rubright, MD - Duke University

Abstract:
Background: The dural puncture epidural technique (DPE) is a modification of the combined spinal epidural technique (CSE). Data comparing the two techniques are limited. We performed this randomized study to compare the quality of labor analgesia following DPE vs. CSE. We hypothesized that the quality of analgesia will be improved following initiation with DPE compared with CSE.

Methods: Term parturients requesting labor epidural analgesia were enrolled in this prospective double-blinded, randomized trial. The neuraxial technique was placed in the sitting position at L3/4 or L4/5 interspace using loss of resistance to saline. A 25-g Whitacre needle was used to puncture the dura. In the CSE group, analgesia was initiated with 2 mg intrathecal bupivacaine and 10 mcg fentanyl. In the DPE group, analgesia was initiated with 20 mL ropivacaine 0.1% with fentanyl 2 mcg/mL in 5 mL increments. The end of intrathecal injection or administration of the last 5 mL of epidural solution was considered time zero. Maintenance of analgesia was standardized and identical in both groups using programmed intermittent epidural bolus with patient controlled epidural analgesia (PCEA). Data were collected by a blinded investigator at 15 and 30 minutes then every 2 hours until delivery. Breakthrough pain was managed by a standardized protocol. The primary outcome was block quality defined by a composite of 5 components: (1) asymmetric block after 30 minutes of initiation, (2) top-up interventions, (3) catheter adjustments, (4) failed catheter requiring replacement, and (5) need for general anesthesia or replacement of the neuraxial anesthesia in case of cesarean delivery. Secondary outcomes included pain scores, Bromage scores, sensory levels at 15 and 30 minutes, adverse events (hypotension, nausea, pruritus, PDPH, FHR changes), duration of second stage of labor, mode of delivery, total anesthetic dose, PCEA use, and overall satisfaction with analgesia. Continuous outcomes were compared with log-linear models with results reported as geometric mean ratios, and categorical outcomes were compared using chi-squared tests with results reported as risk ratios. P-values for secondary outcomes were adjusted using the Bonferroni-Holm method to control family-wise error rate, adjusted p-values < 0.05 were considered statistically significant.

Results: One hundred patients were included in the analysis. Pain scores and cervical dilatation at initiation of analgesia, and duration of analgesia were comparable between the two groups. There were no significant differences between the two groups in the primary composite outcome of quality of analgesia or any of the secondary outcomes except that pain scores at 15 minutes were significantly lower in the CSE compared to the DPE group (Table).

Conclusions: There were no significant differences in the quality of labor analgesia following initiation with a CSE compared to a DPE technique, but onset of analgesia was quicker in the CSE group.

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Abstract #: FRI – RA – BS 2 – BR 5 – Neuraxial Labor Analgesia – 15

Impact of Epidural Analgesia on Labour Progression in a Third-Level Hospital: A Retrospective Study

Presenting Author: Mariangela Di Muro, MD
Presenting Author's Institution: Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome - Rome, Lazio
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Luciano Frassanito - Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome
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Abstract:
Background: Understanding to what extent epidural analgesia (EA) affects labour is essential to timely treat complications leading to unfavourable outcomes, while reducing inappropriate interventions. However, despite EA for labour is increasingly widespread, there is hitherto no standard curve to evaluate the progress of cervical dilation under EA.
Aim of this retrospective study is to analyse cervical dilation and fetal descent patterns during spontaneous labour of low-risk women who vaginally delivered and received or not low-dose EA.

Materials and methods: We retrospectively reviewed data from the electronic labour suite database of a large maternity unit. We included all patients aged between 18 and 40 years and categorized as Group 1 according to Robson Classification, who vaginally delivered between October 1st 2008 and October 31st 2018. Other inclusion criteria were neonatal weight between 2500 and 4000 grams, labour duration >3 hours and cervical dilation < 7 cm at admission. We selected a total of 5169 patients, subdivided into patients who had EA (EA group, n=3761) and patients who had not EA (n-EA group, n=1408). Our primary endpoint was to model the curves of the cervical dilation and fetal station in the two groups with mixed model polynomial regression.

Results: Baseline characteristics, including age (EA 32 ± 4 vs n-EA 29 ± 5 years), neonatal weight (EA 3236 ± 344 vs n-EA 3257 ± 321 g), gestational age (EA 40 ± 1 vs n-EA 40 ± 1 weeks), cervical dilation at admission (EA 3 ± 1 vs n-EA 3 ± 1 cm), were all similar. EA was performed at a cervical dilation of 4 ± 2 cm. The cervical dilation and fetal station curves showed a similar progression over time between the two groups, often overlapping or running parallel, indicating that only minor differences existed. In the active phase, the EA group showed an overall slower progression rate. Also, despite fetal head station was lower at the beginning of labour in the EA group, in the active phase the head descent occurred more rapidly in the n-EA group. Contractions frequency increased linearly in the EA group, and exponentially in the n-EA group. Accordingly, the active phase and the second stage of labor were significantly

prolonged in patients receiving EA (active phase, 157±139 min vs 210±143, second stage 59±55 vs 77±55 minutes, P< 0.001 for no EA vs EA).
Other maternal (including haemorrhages, perineal lacerations, episiotomy rate) and neonatal (1-5 Apgar, admission in NICU, death) outcomes were similar, except for operative vaginal delivery, almost twice as frequent in the EA group (15% vs 8%, P< 0.001).

Conclusions: Low-dose EA seems to prolong the active phase and the second stage of labour, still not changing obstetric outcomes in low-risk women who vaginally delivered.

Fig_SOAP.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 01

Virtual Reality Compared to Nitrous Oxide for Labor Analgesia: A Prospective, Randomized, Cross-Over Non-Inferiority Study

Presenting Author: Z Bekemeyer, BA
Presenting Author's Institution: Stanford Medicine
Co-Authors: Thomas Caruso, MD, PhD - Stanford University School of Medicine
Brendan Carvalho, MD - Stanford University
Dan Hoang, DO - Kaiser Permanente Santa Clara
Guillermina Michel - Stanford University
Guo Nan, MD, PhD - Stanford University

Abstract:
Introduction: Systemic opioids and nitrous oxide (NO) are common labor analgesics for parturients wanting to avoid or delay epidural analgesia; however, these modalities have deleterious maternal and fetal side effects, including increased risk of nausea and respiratory depression. Virtual reality (VR) platforms have emerged as a non-invasive and non-pharmacologic analgesic (1), although few studies have explored its use for labor analgesia (2). This study hypothesized that VR would be non-inferior to NO for labor analgesia.

Methods: Following IRB approval, we conducted a prospective, randomized, crossover, non-inferiority study comparing VR to NO. Patients were included if >18 years, singleton term pregnancy, in labor experiencing regular uterine contractions and pain scores ≥3/10. The primary outcome was satisfaction (scored 0-10) with pain relief post-intervention. Secondary outcomes were change in pain (0-10), anxiety (0-10), ability to cope with pain (0-10), and incidence of side effects (nausea and dizziness). Parturients received 30 min VR and then 30 min of NO, with a 5 min washout between interventions to reduce carryover effects. The order of VR and NO was randomized. VR consisted of active programs such as swimming in the ocean, walking through forests, engaging in 3D puzzles, and interacting with musical objects with an Oculus Go headset. Outcomes were measures at 15- and 30-min time intervals from start of the interventions. Paired t-test compared mean treatment differences and 95% CI between the VR and NO. A 95% CI < 3/10 was selected as significantly different but still a non-inferiority margin.

Results: Eighteen of 20 patients completed the study with 9 in each group. The VR intervention was non-inferior to NO for pain, anxiety, and coping. At 15- and 30-min time intervals, respectively, satisfaction with pain relief difference between VR and NO was non-inferior [-0.66, 95% CI (2.26, 0.94) and -0.79, 95% CI (-2.38, 0.80)]. All secondary outcomes and side effects were also non-inferior (Table).

Discussion: These preliminary results suggest that VR is a promising non-pharmacological analgesic option that is non-inferior to NO for labor pain management. Future studies with larger sample sizes are needed to confirm the results of this pilot feasibility study, and to

further investigate the efficacy of VR for the provision of labor analgesia.

References:

1. Chuan, Alwin, et al. "Virtual reality for acute and chronic pain management in adult patients: a narrative review." *Anaesthesia* 76.5 (2021): 695-704.

< !2. Baradwan, Saeed, et al. "The impact of virtual reality on pain management during normal labor: A systematic review and meta-analysis of randomized controlled trials." *Sexual & Reproductive Healthcare* 32 (2022): 100720.

Table_VR_Nitrous_SOAP Abstract.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 02

Do Essential Oil Diffusers During Labor Pose a Contamination Risk to Sterile Neuraxial Placement?

Presenting Author: Neva P. Lemoine, MD
Presenting Author's Institution: Vanderbilt University Medical Center - Nashville, Tennessee
Co-Authors: Willie Agee, MD - Vanderbilt University Medical Center
Jeanette Bauchat, MD - Vanderbilt University Medical Center
Holly Ende, MD, MS - Vanderbilt University Medical Center
Bryan Wakefield, MD - Vanderbilt University Medical Center

Abstract:
Background: Essential oils are popular during labor to decrease anxiety, pain perception, and encourage contractions.[1,2] While some essential oils exhibit antimicrobial properties,[3-5] a recent Melioidosis outbreak was linked to an essential oil aromatherapy spray.[6] Essential oil diffusers may pose infection risk during neuraxial placement via contamination of the sterile field. We sought to examine this potential by measuring microbial growth on agar plates during diffusion of two popular essential oils in childbirth. We hypothesized that microbial growth would be increased in the setting of essential oil diffusion compared to baseline circulating room air in a simulated open epidural tray environment.

Methods: Baseline microbial data was obtained by culturing samples from experimental equipment and hospital tap water. Tryptic soy agar (TSA) with 5% sheep blood and potato dextrose agar (PDA) plates were opened to room air to collect reference samples of any circulating airborne organisms in the experiment room. Following baseline collection, a new, unused oil diffuser was positioned on a simulated patient's bedside table. Fifteen drops of clary sage oil were added to the diffuser and aerosolized for two hours. TSA and PDA plates were set at 1, 3, 6, and 9 feet from the diffuser to simulate varying distances between the epidural tray and aerosolized plume. Plates were left open for 20 minutes to simulate the timeframe of an open epidural tray during a neuraxial procedure. The media were collected, incubated at 37°C for 48h, and microbial growth documented. After a 24h wash out period, the experiment was replicated utilizing eucalyptus oil. Following an additional 24h washout period, the study procedures were repeated with a used oil diffuser and both clary sage and eucalyptus oils. All experiments were conducted in a single, unoccupied room near the labor and delivery unit, with foot traffic limited to study personnel wearing personal protective equipment.

Results: Control cultures of hospital water and oil bottles demonstrated no growth at 48 hours. Swab cultures of the new and used diffusers grew 2 and 11 colonies on TSA after 48 hours, respectively. The used diffuser swab culture grew 3 colonies on PDA; however, they did not appear morphologically distinct from the TSA colonies. Control environmental cultures did reveal microbial growth with similar morphology to experimental group colonies (Figure 1). There was no significant difference in colony number at any measured distance.

Conclusions: Essential oil aerosolization did not yield significant bacterial or fungal growth at any distance in our simulated epidural tray environment. Furthermore, use of a new vs. used diffuser did not increase the risk of microbial growth. Although these findings are reassuring, this was a simulated environment and not all possible contamination scenarios were tested.

References:

1. PMID 32874088
2. PMID 29216912
3. PMID 24627729
4. PMID 35326856
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6. PMID 35235727

E.oils - Figure 1.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 03

Bicarbonation of Local Anesthetics and Effect On Storage of pH

Presenting Author: Samantha L. Armstrong, BS
Presenting Author's Institution: Beth Israel Deaconess Medical Center
Co-Authors: Philip E. Hess, MD - Beth Israel Deaconess Medical Center / Harvard Medical School
Yunping Li, MD - Beth Israel Deaconess Medical Center / Harvard Medical School

Abstract:
Introduction: Local anesthetics (LA) are used for a variety of surgical procedures to block transmission of neuronal impulses to reduce or eliminate sensation. To decrease the time to onset of local anesthetics, pH buffers such as sodium bicarbonate can be added. [2] Sodium bicarbonate brings the solution's pH closer to the pKa of the local anesthetic, favoring accumulation of the unionized form of the drug which can penetrate neuronal membranes, thus decreasing the time to onset. [1]
In clinical practice, bicarbonated LA solutions are prepared immediately before use to maximize pH buffering. We hypothesize that the storage of bicarbonated lidocaine or chloroprocaine (CPC), especially in an unsealed syringe, would lead to a change in the pH due to possible hydrolysis of carbon dioxide (CO_2).

Methods: To test the hypothesis, we performed four independent experiments: CPC with a blunt needle cap versus rubber seal cap, and lidocaine with a blunt needle cap versus rubber seal cap. 3% CPC or 2% lidocaine was drawn up into a large syringe with a 1:10 dilution of 8.4mM bicarbonate, replicating standard clinical practice. Each solution was aliquoted into 5 ml syringes capped with a blunt needle or sealed with a rubber cap. The pH was measured at 0, 1, 2, 4, 6, 12, and 24 hours, with n=5 per time point per condition. The results were analyzed by 2-way ANOVA.

Results: For both lidocaine and CPC, statistically significant effects of both time and presence of cap were observed. However, the changes in pH were so small as to be clinically significant. Based on these data, we expect the time to onset for these medications to be preserved when stored in syringes for 24 hours after bicarbonate is added.

References:
[1] Kin Wong. Anesthesia Analgesia, 1993
[2] Cosmo A. DiFazio. Anesthesia Analgesia, 1986

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Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 04

Anesthetic Factors Improve the Prediction of Intra-Partum Cesarean Delivery When Added to Known Obstetric Factors

Presenting Author: Amnon A. Berger, MD, PhD
Presenting Author's Institution: Beth Israel Deaconess Medical Center / Harvard Medical School - Boston, Massachusetts
Co-Authors: Samantha L. Armstrong, BS - Beth Israel Deaconess Medical Center
Bridget Donovan, MD - Beth Israel Deaconess Medical Center / Harvard Medical School
JoAnn Jordan, MS - Beth Israel Deaconess Medical Center

Abstract:
Background: A significant number of patients who labor with an intent to deliver vaginally will ultimately require cesarean delivery (CD). Multiple attempts have been previously made to identify which is the population at risk for requiring intra-partum CD (IPCD), with limited predictive values; these have been mostly focused on patients undergoing induction of labor (IOL),[1] or those attempting a trial of labor after cesarean (TOLAC).[2] Severe labor pain, likely identifying labor dystocia, was also associated with CD based on anesthetic variables.[3] However, there is a paucity of information about the risk for IPCD in the general population, and whether combining known obstetric and anesthetic factors will improve prediction.

Objective: To assess whether anesthetic factors are significantly associated with IPCD after accounting for known obstetric risk factors, and to evaluate which anesthetic factors can improve the prediction of the requirement for IPCD.

Methods: A single-center cohort study at a tertiary academic medical center, comparing the incidence of IPCD based on known obstetric and anesthetic factors. Study population included all patients who labored and then delivered a live newborn infant, either by vaginal delivery (VD) or CD. The main outcome was delivery by CD. We calculated odds ratio (OR), and binomial generalized models (GLM) to account for covariates. $P< 0.05$ was considered significant.

Results: We examined 26,058 records over 5 years (07/2016-07/2021) and analyzed 20,124 laboring parturients after accounting for exclusion criteria and incomplete data. We examined known obstetric risk factors from the IOL and TOLAC literature, including maternal self-reported race, age, body mass index (BMI), nulliparity, multiple gestation, gestational age, delivery weight, and whether this is a TOLAC; as well as medical conditions, including any hypertensive or diabetic diagnoses, and history of smoking. We found that having a labor epidural was associated with lower odds of CD (OR 0.49, 95%CI 0.44-0.55, $P< 0.001$), while requiring epidural bolus (OR 1.15, 95%CI 1.05-1.26, $P=0.005$) or epidural replacement (OR 1.76, 95% CI 1.46-2.11, $P< 0.001$) were associated with higher odds in both univariate (Table 1) and multivariate (Table 1, listed above) analyses. Epidural dwell time and epidural

replacement were interchangeably significant in our analyses, and are likely collinear, owing to the known risk of epidural replacement with longer dwell times.[4]

Discussion: Anesthetic factors improve prediction CD including known risk factors. Anesthesia providers would be aided by having advanced warning and could better prepare for an impending CD by assessing the patient and ensuring any epidural is functional.

References:
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3. PMID: 10735793
4. PMID: 36030558

2024-01-21 - CD Prediction Abstract Table.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 05

Maternal, Neonatal and Delivery Outcomes Following a SARS-CoV-2 Moratorium on Elective Deliveries

Presenting Author: Jayne Caron, MD
Presenting Author's Institution: Cedars Sinai Medical Center
Co-Authors: Gabriela Dellapiana, MD - Cedars Sinai Medical Center
Naomi Greene, MPH, PhD - Cedars Sinai Medical Center

Abstract:
Objective: During the SARS-CoV-2 Omicron variant surge, hospitals experienced severe staffing shortages as essential workers contracted the coronavirus. To compensate for the diminished workforce, our institution cancelled *elective* inductions of labor (IOL) and *elective* cesarean deliveries (CD) in January 2022. The purpose of this study was to determine the impact of this elective delivery moratorium on labor and delivery outcomes.

Study Design: Retrospective cohort study of patients with singleton full-term deliveries at our quaternary care center: (1) three months prior to the moratorium (October – December 2021), (2) the month of the moratorium (January 2022), and (3) three months following the moratorium (February-April 2022). Data were abstracted from the electronic medical record utilizing auto-generated reports and manual chart review. The primary outcome was the rate of nulliparous term singleton vertex (NTSV) CD. Secondary outcomes included select maternal and neonatal outcomes. Outcomes were compared between the three time periods using Chi-square, Kruskal-Wallis, and one-way ANOVA tests.

Results: During the study period, 3248 patients meeting inclusion criteria delivered, 419 during the time period of the moratorium. There were no differences in maternal age, body mass index, race, insurance status, nulliparity, or overall induction of labor across all three time periods.
NTSV CD rates did not differ across the three time periods. There were also no differences in rates of operative vaginal deliveries, trial of labor after CD, vaginal birth after CD, or overall CD rates. Maternal outcomes were similar with no differences in chorioamnionitis, hypertensive disorders of pregnancy, or higher order perineal lacerations. Lastly, there were no differences in neonatal outcomes including 5-minute Apgar < 7, neonatal intensive care unit admission, shoulder dystocia, or Unexpected Term Newborn Complications.

Conclusion: As elective IOL has become common, the pandemic-motivated elective delivery moratorium at our institution provided a unique environment to re-examine the impact of elective IOL on birth outcomes. We found no significant differences in perinatal maternal or fetal outcomes despite the cancellation of elective IOL.
Previous studies have evaluated the impact of modifications to labor and delivery practices in response to SARS-CoV-2 and the impact of lockdown measures on preterm birth and CD rates; however, this is the first study to our knowledge to specifically look at the impact of

cancellations of elective IOL or CD. It is reassuring that this preliminary analysis found no significant impacts on maternal, neonatal or delivery outcomes during the moratorium.

References:

Einarsdottir K, Swift EM, Zoega H. Changes in obstetric interventions and preterm birth during COVID-19: A nationwide study from Iceland. Acta Obstet Gynecol Scand. 2021;100(10)1924-1930.

Table 1 Moratorium 1-28.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 06

Patients' Perspectives on Non-Utilization of Neuraxial Epidural Analgesia: A Qualitative Study

Presenting Author: Eliana R. Weinstein, BS
Presenting Author's Institution: Albert Einstein College of Medicine
Co-Authors: Jaime A. Aaronson, MD - Weill Cornell Medicine Department of Anesthesiology
Sharon A. Abramovitz, MD - Weill Cornell Medicine Department of Anesthesiology
Ruth Gotian, EdD, MS - Weill Cornell Medicine Department of Anesthesiology
Danielle McCullough, MD - Weill Cornell Medicine Department of Anesthesiology

Abstract:
Background: Over 25% of women who undergo vaginal birth do not receive neuraxial labor analgesia, and few studies have examined patient-level factors.[1-2] Our study aimed to investigate the factors important in pregnant people's decision to opt-out of neuraxial analgesia for labor. We explored patients' perspectives and beliefs about pain relief, experiences leading up to the most recent labor and delivery, and how these factors affected the birth experience.

Methods: We conducted semi-structured interviews with 32 women who delivered vaginally at a New York City hospital between October 1, 2022-May 30, 2023 who opted out of epidural analgesia usage. We used grounded theory to analyze data and group responses into themes.

Results: We identified five themes encompassing the main factors participants considered when deciding to not use neuraxial analgesia for birth: preferences for a natural birth experience, an empowering or supportive environment, preparation or preparedness for a birth without medication, positive outlook on labor pain, and information, misinformation, knowledge gaps and fears about the epidural. Participants mentioned feeling a sense of trust and support and communication/rapport with the physician/staff. They mentioned autonomy and an appreciation of open-minded physicians. Most used non-pharmaceutical strategies to manage labor pain, including breathing/relaxation techniques, touch/pressure, and exercise/movement. Participants mentioned perceived ability and strength associated with labor pain. Many shared the perspective that pain is a natural part of the birthing process. Participants used a variety of information sources for labor pain management including friends, partner, family members, obstetrician, social media, and doula/midwife. Participants conveyed fears about the epidural, including needles, staying still, and faulty insertion, as well as a fear of side effects (e.g., back pain, paralysis, headache). The majority stated either they did not have much of an understanding of the epidural or had unanswered questions prior to labor.

Conclusions: Participants described a variety of factors important in their decision to birth without an epidural, which we mapped onto five primary themes. Participants expressed the value of personal preferences coupled with a desire for more information on both the

epidural and non-pharmaceutical pain management options. The information gathered may provide insight into how providers can incorporate shared decision making into their practice.

References:

1. Butwick AJ, Bentley J, Wong CA, Snowden JM, Sun E, Guo N. United States State-Level Variation in the Use of Neuraxial Analgesia During Labor for Pregnant Women. *JAMA Netw Open*. 2018;1(8):e186567.
2. Orejuela FJ, Garcia T, Green C, Kilpatrick C, Guzman S, Blackwell S. Exploring factors influencing patient request for epidural analgesia on admission to labor and delivery in a predominantly Latino population. *J Immigr Minor Health*. 2012;14(2):287-91.

1SOAP Interview Study Table.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 07

Influence of Nitrous Oxide Use on Surgical Anesthesia Method for Cesarean Delivery

Presenting Author: Grace DeSena
Presenting Author's Institution: University of Florida College of Medicine
Co-Authors: Meghan Brennan, MD - University of Florida Department of Anesthesiology
Omowonuola Ogundele - University of Florida College of Medicine

Abstract:
Introduction: The use of self-administered nitrous oxide during labor is associated with a high degree of maternal satisfaction but is frequently not the sole method of pharmacologic analgesia used.[1] The purpose of our study is to determine the method of surgical anesthesia used in patients who used nitrous oxide then underwent cesarean delivery and whether nitrous oxide use and increased rates of general anesthesia during cesarean delivery are associated.

Methods: In interim analysis of data from a single-center, retrospective study, we analyzed 125 patients above the age of 18 who utilized nitrous oxide as labor anesthesia between August 30, 2018 and December 31, 2022. Two trained reviewers abstracted data from the electronic medical record, including type of labor, times of analgesia and estimated blood loss during cesarean delivery. A senior reviewer adjudicated conflicts and verified results. Complete chart review of 1130 charts and addition of a comparison group who did not use nitrous oxide is pending.

Results: Of 125 patients, 97 converted from nitrous oxide to an alternate form of analgesia. Of the 97, 11 patients also underwent cesarean delivery. 10 of these patients converted to epidural analgesia prior to cesarean delivery. 1 patient declined neuraxial anesthesia and received general anesthesia for her cesarean delivery. Patients who received neuraxial anesthesia had a mean estimated blood loss of 1359mL (range 798-2231mL) while the patient who received general anesthesia had estimated blood loss of 1425mL. The patient who had general anesthesia did not have a difficult or failed intubation. There was no incidence of postpartum wound infection in any patient.

Discussion: The use of nitrous oxide likely delays the use of neuraxial analgesia, which may increase rates of general anesthesia use in patients who use nitrous oxide and subsequently need cesarean section. The use of general anesthesia during cesarean deliveries has been associated with increased risk of complications including postpartum hemorrhage (blood loss > 1,000 mL).[2] Postpartum hemorrhage was seen in the patient who underwent cesarean delivery with general anesthesia, but also in 8 out of 10 of those who underwent cesarean delivery with neuraxial anesthesia. Thus far, our study has found no association between the use of nitrous oxide during labor and general anesthesia during cesarean delivery. Next steps in our project include the addition of a comparison group who initiated analgesia with labor epidural and had an intrapartum cesarean delivery without utilizing N2O labor analgesia.

References:

1. Nodine PM, Collins MR, Wood CL, et al. Nitrous Oxide Use During Labor: Satisfaction, Adverse Effects, and Predictors of Conversion to Neuraxial Analgesia. *J Midwifery Womens Health*. 2020;65(3):335-341. doi:10.1111/jmwh.13124

2. Committee on Practice Bulletins-Obstetrics. Practice Bulletin No. 183: Postpartum Hemorrhage. *Obstet Gynecol*. 2017;130(4):e168-e186. doi:10.1097/AOG.0000000000002351

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 08

Analgesic Use After Vaginal Delivery in Women with Postpartum Perineal Pain

Presenting Author: Catherine Gao, MD
Presenting Author's Institution: Mayo Clinic
Co-Authors: Megan E. Branda, MS - Mayo Clinic
Alyssa Larish, MD - Mayo Clinic
Mark Rollins, MD, PhD - Mayo Clinic Rochester
Hans Sviggum, MD - MAYO CLINIC

Abstract:
Introduction: Perineal injury is common, with over 70% of women sustaining some degree of laceration with vaginal delivery. Importantly, perineal injuries can cause significant postpartum pain, postpartum depression, persistent dyspareunia, and incontinence.[1-3] The objective of our study was to determine if mediolateral episiotomies were associated with increased postpartum opioid requirements compared to spontaneous perineal injuries.

Methods: A single-center retrospective electronic medical record review was performed in patients over age 18 who had vaginal deliveries between May 2018 and February 2023. Patients with a history of chronic pain, chronic opioid use, or substance use disorder were excluded. Patients who received epidural morphine following the perineal repair were also excluded. Patients were divided into four groups: (1) no lacerations or episiotomies, (2) $1^{st}/2^{nd}$ degree lacerations only, (3) $3^{rd}/4^{th}$ degree lacerations only, and (4) episiotomy. Data collected included maternal demographics, neonatal characteristics, and total opioid consumption at 24 hours after delivery (the primary outcome). Secondary outcomes included pain scores, opioid-associated side effects, and home-going opioid prescription (collected but not reported). A priori sample size calculation estimated 1,900 patients would be required, assuming a 5% episiotomy rate, 80% power, and 10% absolute difference in patients requiring postpartum opioids as clinically meaningful difference between groups.

Results: There were 6,698 women included in the analysis; 3,538 (53%) had no lacerations, 2,293 (34%) had $1^{st}/2^{nd}$ degree lacerations, 117 (2%) had $3^{rd}/4^{th}$ degree lacerations, and 750 (11%) had an episiotomy. Demographic data noted a greater number of operative deliveries in the episiotomy and $3^{rd}/4^{th}$ degree laceration groups (not displayed). Study outcomes are displayed in the Table. In patients who requested opioids, opioid requirements were not significantly different between the groups. However, the rates of opioid use in the first 24 hours after delivery were significantly different (5% no laceration and 6% $1^{st}/2^{nd}$ degree lacerations vs. 29% $3^{rd}/4^{th}$ degree lacerations vs. 15% episiotomy, $p< 0.1$).

Discussion: Although our hypothesis was that mediolateral episiotomies would be associated with increased opioid requirements, our results found no difference in total opioid use among post-vaginal delivery patients who requested opioids. However, we did find that a greater proportion of those with an episiotomy or $3^{rd}/4^{th}$ degree laceration required opioids.

Interestingly, the proportion of patients requiring opioids was greatest in the 3rd/4th degree laceration group. Optimal pain management prediction and efficacious strategies for postpartum patients with episiotomy or perineal birth injury remains to be determined.

References:

1. Smith. BMC Pregnancy Childbirth, 2013. **13**: p. 59.
2. Hartmann.JAMA, 2005. **293**(17): p. 2141-8.
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MME Table.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 09

Error-Focused Versus Conventional Checklist Assessment of Lumbar Epidural Placement

Presenting Author: Hans Sviggum, MD
Presenting Author's Institution: MAYO CLINIC
Co-Authors: David Cook, MD, MHPE - Mayo Clinic
Paula Craigo, MD - MAYO CLINIC
Rochelle Pompeian, MD - Mayo Clinic
Emily E. Sharpe, MD - Mayo Clinic

Abstract:
Introduction: Competence-based assessments are integral to medical education. Checklists and global rating scales assess the procedural skills of trainees. Both have good inter-rater reliability and assess observable behaviors. While checklists capture stepwise actions, global rating scales capture a holistic assessment which may better reflect expertise and can have better reliability and validity (Regehr 1998). Moreover, conventional checklists may fail to detect procedural incompetence even when high cut-off scores are used. Error-focused checklists focusing on procedural errors rather than the completion of steps have been shown to be more sensitive to incompetence than conventional checklists in a study of lumbar puncture (Ma 2015). The aim of this study was to compare the reliability and accuracy of an error-focused checklist with that of a conventional checklist in assessing procedural incompetence during lumbar epidural placement.

Methods: This was a three staged study: (1) creation of a conventional checklist and a novel error-focused checklist and adapting a global rating scale to supervision anchors; (2) video recording anesthesia providers placing an epidural in a simulator model; and (3) rating the videos using both checklists and a global rating scale (1-5 scale). The conventional checklist was refined by 14 experts and during pilot testing. An error-focused checklist was created by three study team members while reviewing videos of trainees and recording errors until saturation was reached. Each video was rated independently by three board certified anesthesiologists with subspecialty expertise in obstetric anesthesia using one checklist, then rated again using the other checklist. The global rating was completed after each checklist. When disagreement between raters occurred, independent reassessment and discussion allowed for consensus.

Results: There were 58 participants (52 residents, 3 fellows, 3 faculty) who created 83 video recordings. The internal consistency (Cronbach's alpha) of the error-focused checklist was 0.31, while that of the conventional checklist was 0.60. By global rating scale, 30 (36%) videos were considered "competent". Global rating scale scores did not differ whether preceded by the conventional or error-focused checklist (3.87 ± 1.15 vs. 3.93 ± 1.10). The accuracy of the conventional checklist in identifying competence was acceptable (AUC 0.76). Accuracy of the error-focused checklist in identifying incompetence was excellent (AUC 0.82).

Discussion: The error-focused checklist outperformed the conventional checklist in diagnosing incompetence in epidural placement. The global rating assessment was not affected by the type of checklist immediately preceding it. Educators wanting to identify procedural incompetence in epidural placement should consider using an error-focused checklist.

References:

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Regehr G, et al. (1998) Academic Medicine 73(9): 993-7.

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Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 10

An Analysis of Non-Cesarean Anesthesia Utilization from 2016-2022

Presenting Author: Nafisa Mostofa, BS
Presenting Author's Institution: Carle Illinois College of Medicine at the University of Illinois at Urbana-Champaign
Co-Authors: Minnatallah Eltinay, BS - Carle Illinois College of Medicine at The University of Illinois at Urbana-Champaign
Aksal P. Vashi, BS - Carle Illinois College of Medicine at the University of Illinois at Urbana-Champaign

Abstract:
Labor analgesia is vital in reducing stress and exhaustion during labor, potentially reducing the need for medical interventions such as cesarean sections[1]. Communities with equitable access to obstetric anesthesia services may have improved maternal and neonatal outcomes[2]. This study aims to evaluate how access to non-cesarean obstetric anesthesia has evolved around the country.
Four unique open access databases were utilized to collect data: Medicare demographics, CDC WONDER,US Census ACS, and the USDA Atlas of Rural and Small-Town America for the years 2016 to 2022. Python was utilized for database building and data cleaning. GeoDa5 was used to plot and assess demographic, geographic, and socioeconomic trends. Multivariate logistic regressions were performed to assess and control for confounding variables. Moran's I was used to measure the similarity of a FIPS area code to its neighbors and to provide statistical significance of these spatial patterns. Spatial clusters that were identified were broken down into four groups of spatial outliers (High-High, High-Low, Low-High, and Low-Low) referencing the area's relationship with its neighbors. Factorial ANOVA was performed to identify significant demographic variables within the cluster analysis groupings and a t-test was performed specifically between High-High and Low-Low clusters.
Geospatial analysis revealed increases in anesthesia use primarily concentrated along the West Coast in regions of California, the southern regions of Texas, southern Florida, and the Northeast extending from Maryland to Massachusetts. Conversely, coldspots, indicating slower growth of obstetric anesthesia utilization, were observed throughout the Midwest and Central United States.
ANOVA testing of demographic variables between regions with the highest and lowest non-cesarean anesthesia growth demonstrated lower rates of poverty in regions with the most growth compared to lower utilization regions (10.67% vs 11.71%, $p = 0.042$). Similarly, regions with high anesthesia use exhibited higher median household incomes ($75,736.78 vs $65,230.27, $p < 0.001$) and larger populations (584,767.82 vs 379,545.41, $p < 0.001$).
These findings suggest socioeconomic factors play a significant role in determining access to anesthesia, with wealthier and more densely populated regions experiencing greater growth in utilization. Moreover, the geographic distribution of anesthesia use highlights potential inequities in access. Regional and disparity-focused initiatives could improve access to anesthesia and peripartum outcomes in underserved areas.

References:

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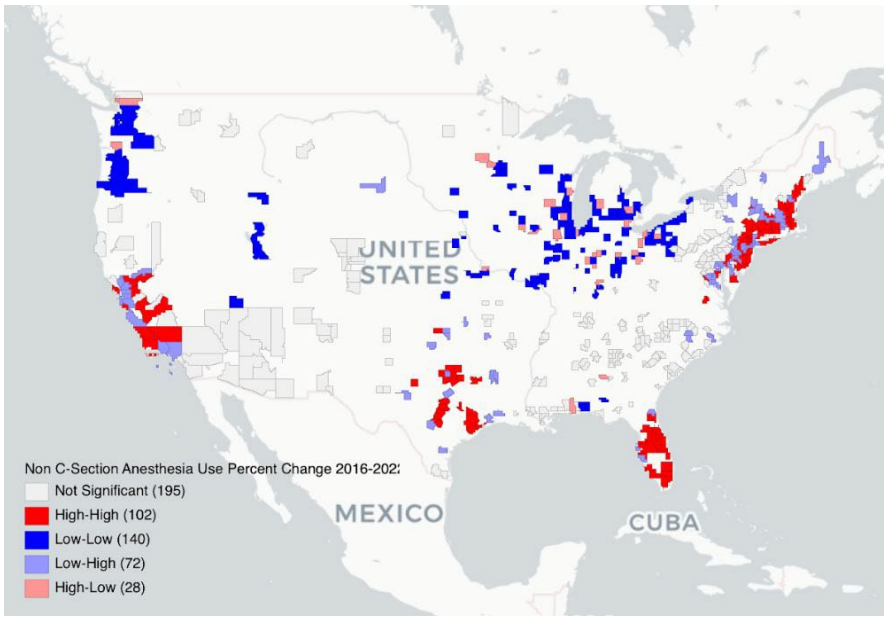

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 11

Outcomes With Intrathecal 3% 2-Chloroprocaine for Cervical Cerclage - A Quality Assurance Study

Presenting Author: Ebubechukwu Obiora, Medical Student
Presenting Author's Institution: City University of New York, New York
Co-Authors: Richard Smiley, MD, PhD - Columbia University

Abstract:
Background: Cervical cerclage is a short ambulatory procedure (15- 30 mins) that is preferentially performed with spinal anesthesia. Bupivacaine is the most common intrathecal agent used, however intrathecal chloroprocaine has been shown to provide similar anesthetic conditions, while reducing the time to discharge.[1] The ED90 of chloroprocaine, co-administered with fentanyl 10 mcg, for the procedure has been reported to be 49.5 mg (45.0 – 50.1 mg).[2] In a prior study using the 50 mg dose, intraoperative discomfort was reported for 9% of patients, prompting a practice change in the same institution, to increase the intrathecal dose to 60mg.[3] There have been few studies of intrathecal chloroprocaine doses higher than 50mg. We report outcomes with 2 years of experience using the 60 mg dose.

Methods: This was a retrospective cohort study. Chart review was conducted for patients who underwent cervical cerclage with spinal anesthesia with intrathecal 60 mg 3% 2-chloroprocaine and 15 mcg fentanyl between July 2021 - July 2023. Outcomes recorded were time of spinal injection, surgery duration, failed blockade/need for supplementation of the anesthetic, time to meet discharge criteria, and any documented postoperative concerns from postoperative day 1 phone calls (July 2022 – December 2023).

Results: N = 219 cases were identified, with 205 having available documentation of discharge times. Mean (SD) surgery duration was 20.3 (13.1) minutes. N = 4 (2%) patients received IV propofol boluses 40 – 100 mg for intraoperative discomfort. One of them also received IV fentanyl. No patients required general anesthesia.
Median time from spinal anesthetic drug injection to discharge = 186 [163- 218] minutes. The comparable median time in the prior study mentioned =158 [137 – 188] minutes).[3] The mean difference between the 2 groups was 32.6 minutes (95% CI 12, 49), p = 0.001. No patients reported transient neurologic symptoms, difficulty ambulating or voiding. One patient complained of back pain and 3 complained of abdominal cramping/discomfort.

Conclusion: Compared to the 50mg dose, 60mg of intrathecal 3% 2-chloroprocine, co-administered with fentanyl 15 mcg, produced fewer anesthetic failures and blocks needing hypnotic or analgesia supplementation, with a comparable time to discharge. There were no significant adverse events documented among patients on postoperative day 1 with the higher dose.

References:

1. Int J Obstet Anesth. 2022 May;50:103276.
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Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 12

Impact of a Standardized Oxytocin Administration Protocol for Cesarean Delivery

Presenting Author: Beth A. Clayton, DNP, CRNA
Presenting Author's Institution: University of Cincinnati - Mason, Ohio
Co-Authors: Andrea Girnius, MD - University of Cincinnati Department of Anesthesiology
William Moravec, MD - University of Cincinnati, Department of Obstetrics & Gynecology
Emily Schaefer, DNP, CRNA - University of Cincinnati
Lee Ann Yates, DNP, RN - University of Cincinnati

Abstract:
Background: Racial and ethnic disparities in hemorrhage rate and severity have been demonstrated. Elimination of variation in processes is a cornerstone of improved performance and outcomes and has been shown to reduce racial healthcare disparity. 1

Purpose: At our institution, 27% of cesarean deliveries (CD) from 2018-2021 were complicated by hemorrhage. Previous data analysis demonstrated racial and ethnic disparities in maternal outcomes, including postpartum hemorrhage (PPH).[1] We sought to improve maternal outcomes and deliver equitable care through the implementation of a standardized oxytocin administration protocol during CD.

Setting: An 800-bed academic Level 4 Maternal Care Center housing a 13 bed Labor and Delivery unit with approximately 2500 deliveries per year and a CD rate of 33% and a 215-bed community hospital with approximately 450 deliveries per year and a CD rate of 27%.

Methods: An interdisciplinary team developed and implemented an oxytocin administration protocol during CD. To evaluate the protocol's impact, a retrospective chart review spanning October 2020 – October 2022 was performed. The inclusion criteria comprised CD with a quantitative blood loss (QBL) greater than 1500 mL. Cases that did not exceed QBL of 1500 mL nor adhered to the oxytocin protocol were excluded. Outcome measures comprised QBL, number and type of blood products administered in cases of PPH, use of additional uterotonics and tranexamic acid (TXA) and return to OR and intensive care unit (ICU) admission for PPH cases. Patient demographics, including race and ethnicity, were also collected to compare the outcome measures among different racial groups.

Results: A total of 1,593 CD were evaluated. The pre-protocol group included 850 CD, 52 of which met the inclusion criteria for evaluation. The post-protocol group comprised 743 CD, of which 45 met inclusion criteria. In the pre-protocol period, the average QBL was 2003 mLs and in the post-protocol group, the average QBL of 1969 mLs. The number of additional uterotonics, TXA and blood products per individual patient were less post-protocol than before initiation of the protocol. The most notable finding was a substantial reduction in the health disparity gap for outcomes in non-white patients. PPH was cut in half for black patients from a 10% increased risk to 4.3% increased risk. Hispanic patients went from a 2.9%

increased risk of PPH to a 3.5 % decreased risk when compared to white, non-Hispanic patients.

Conclusion: A standardized oxytocin protocol for cesarean delivery improved health equity related to PPH for non-white women undergoing CD and decreased utilization of hemorrhage response medications and blood products.

References:

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Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 13

Use of 1% Ropivacaine in Spinal Anesthesia for Cesarean Section During Medication Shortage

Presenting Author: Angel Pagan, MD
Presenting Author's Institution: University of Cincinnati Department of Anesthesiology
Co-Authors: Cameron Harmon, MD - University of Cincinnati Department of Anesthesiology

Abstract:
Introduction: Spinal anesthesia is the gold standard anesthetic technique for cesarean delivery (CD). Hyperbaric 0.75% bupivacaine (spinal Marcaine) is currently used for most spinal anesthetics. Since drug shortages are common, it is important to be able use alternative medications without compromising patient care. From 1/21-3/9 2023, we were unable to obtain Spinal Marcaine or the recommended alternative. (1) Based on a few studies in the obstetric population (2,3) we elected to use 1% ropivacaine for spinal anesthesia. Based on the limited evidence for the use of 1% ropivacaine for CD, we believe that reporting our experience using this medication will be valuable.

Methods: We performed an electronic medical record search to identify patients who received spinal anesthesia using 1% ropivacaine, patients who received spinal Marcaine prior to the shortage for comparison and performed a retrospective chart review. Variables collected for each group included patient demographics, anesthetic technique, local anesthetic dose, block success, block onset and duration times, rate of epidural dosing when combined spinal-epidural (CSE) technique was used, and whether IV analgesia or sedation was used. Data was analyzed using Chi-squared test for categorical data and t-test for continuous data.

Results: Data from 49 patients who received 1% ropivacaine and 69 patients who received spinal Marcaine was analyzed. The mean dose of 1% ropivacaine was 1.6 ml. In the ropivacaine groups, spinals were performed in 17 patients (35%), while CSE was performed in 32 patients (65%). In the bupivacaine group, spinals were performed in 36 patients (52%), and CSE was performed in 33 patients (48%) (p=0.06). Both groups had a high spinal success rate (94% ropivacaine, 99% bupivacaine, p=0.17). Block onset was similar, measured by spinal injection to “Ready to Prep” event (Mean times: ropivacaine 12 minutes, bupivacaine 13 minutes, p=0.33) and spinal injection to incision times (Mean times: ropivacaine 22 minutes, bupivacaine 23 minutes, p=0.46). Supplemental epidural dosing and IV sedation/analgesia rates were also similar (Ropivacaine group: 16% epidurals dosed, 22% sedation use; Bupivacaine group: 30% epidurals dosed, 32% sedation rate, p=1). No adverse events were reported from ropivacaine spinals.

Conclusion: 1% Ropivacaine is a viable alternative in spinal anesthesia for CD. It produced a reliable block with block onset, block duration time, and failure rate comparable to spinal

Marcaine. There was no difference in need for supplemental epidural dosing or IV analgesia compared to spinal Marcaine. No adverse events were observed.

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1. (SOAP) Advisory in Response to Shortages of Local Anesthetics in North America; https://soap.mclms.net/en/profile/my-courses/12381/lesson/48454/view, accessed 7/3/2023.
2. Chung CJ et al., Anesth. Analg., 2001; 93: 157–161.
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Ropi Spinal SOAP Abstract Figure.pdf

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 14

Assessing the Efficacy of an Innovative Airway Device Delivering Supplemental Oxygen During Intubation with GAX-specimen.

Presenting Author: Noah Swigart
Presenting Author's Institution: Western University of Health Sciences - Lebanon, Oregon
Co-Authors: Maui Lee, BS Cell Biology - Western University of Health Sciences
Dennis Nguyen, BS Biology - Western University of Health Sciences

Abstract:
Introduction: High risk intubation obstetrical patients can lead to significant poor outcomes due to altered anatomy and physiology airways. About 1 to 6% of obstetric intubations fail due to multifactorial conditions. One death occurs for every 90 failed intubations. Ideally supplemental oxygen could be delivered through the cords while attempting to pass an ET tube. A simplistic, yet ingenious engineering design of the Turbo 0_2 Cap facilitates delivering oxygen through the cords and into the primary bronchi thus diminishing airway dead space. This studies objective assesses the Turbo 0_2 Cap with a GAX-specimen measuring 3 separate oxygen flow rates from 2 distances to assess when 90% oxygen saturation is achieved at the bifurcation of the primary bronchi.

Methods: Surgical clam shell technique was performed on a GAX-specimen to access the interface between upper abdomen and thorax. Horizontal incision was made one tracheal ring above the bronchial bifurcation allowing a secure fit of a GOX 100 oxygen sensor (Greisinger Electronics) between tracheal rings. The cervical spine was extended facilitating placement of an Eagle Vision video laryngoscope (VL), and a conventional endotracheal (ET) tube. VL allowed visualization of vocal cords to accurately position ET tube during trials. Turbo O_2 Cap has a universal attachment for ET tubes and port access for an oxygen line. Oxygen flow rate and placement of ET tube was evaluated with the oxygen sensor. With a baseline of 21.2±1% oxygen saturation, varying flow rates of oxygen were administered (4, 10, & 15 L/min) and time was measured to reach 90% oxygen saturation. Maxillary incisor landmark ensured accurate proximal (18cm mark on ET tube) and distal (21cm mark on ET tube) placement of ET tube to vocal cords.

Results: Literature search revealed no known studies assessing oxygen delivery with GAX-specimens. Comparison of flow rate demonstrated 10L/min improved the time to reach oxygen saturation of 90% by 7.8 seconds proximal to the vocal cords, and 3.6 seconds distal to the vocal cords when compared to 4L/min. Administration of 15L/min of oxygen had no significant difference on the time to reach 90% saturation when compared to 10L/min. Each trial finished following 90 seconds of delivered oxygen recorded by the oxygen sensor reaching maximum oxygen saturation at approximately 94% regardless of ET tube placement and/or flow rate. The Turbo O_2 Cap efficiently delivered oxygen during intubations practiced on a GAX-specimen suggesting an optimal flow rate of 10 liters to reach 90% oxygen saturation.

Conclusion: This pilot study suggests supplemental oxygen during normal or difficult intubations occurring in obstetrics can be delivered at varied flow rates using an innovative Turbo 0_2 Cap. A rate of 10 L/min was ideal compared to 4 L/min (saturation was prolonged) and 15 L/min (saturation not signicantly different then 10 L/min, thus wasting oxygen supply) regarding time to achieve 90% oxygen saturation.

Abstract #: FRI – RA – BS 2 – BR 6 – Morbidity, Drugs, and non-CS Anesthesia – 15

The anesthetic quality and safety of dural puncture epidural (DPE) in cesarean section

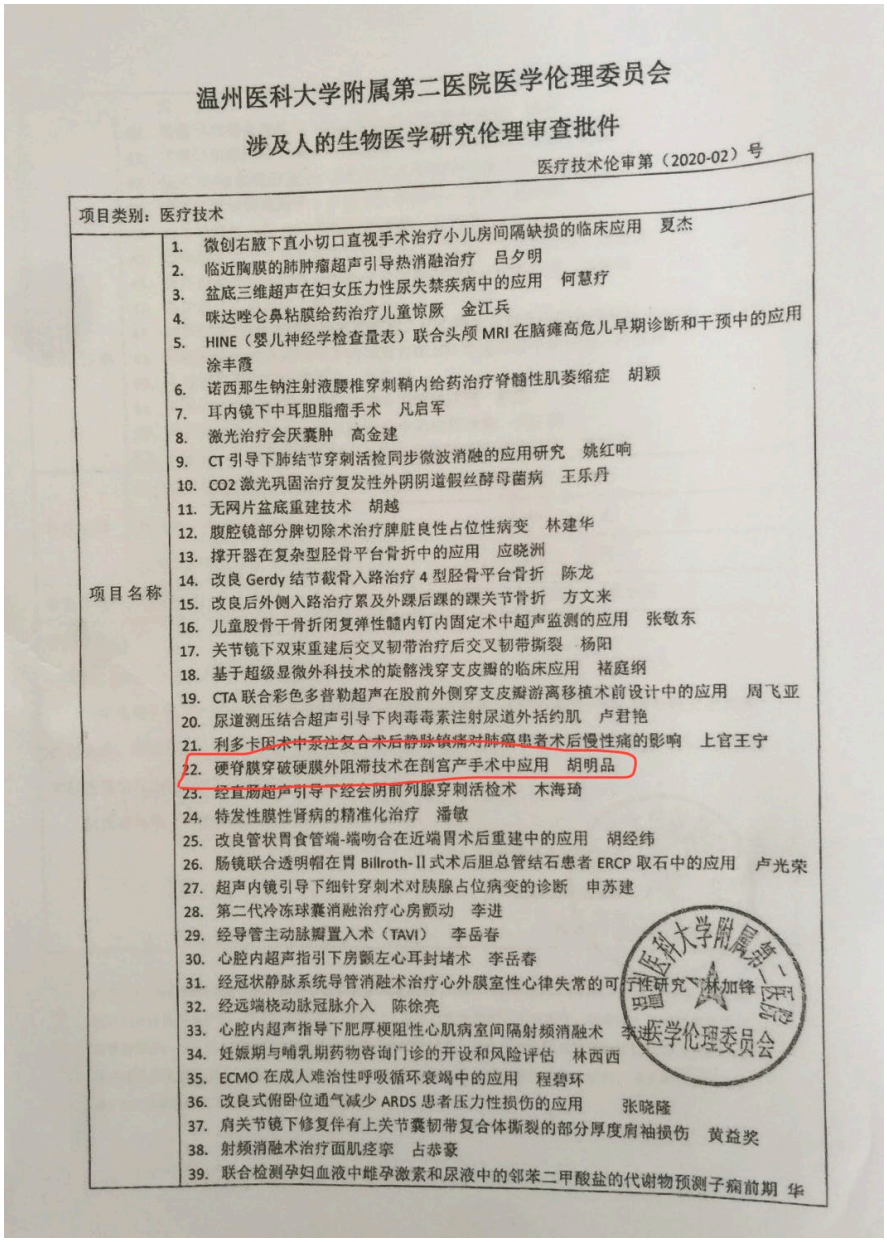
Presenting Author: Mingpin Hu, Project leader
Presenting Author's Institution: +8613705880737, Zhejiang

Abstract : Objective: To investigate the anesthetic quality and safety of dural puncture epidural (DPE) in cesarean section.
Methods: 135 parturients who underwent elective cesarean section at the Second Affiliated Hospital of Wenzhou Medical University from June 2021 to September 2022 were enrolled in this study.They were randomly assigned to Epidural (EP) group, DPE group, and CSE group（ 45 cases per group).All neuraxial blocks were performed in the L_2-L_3 intervertebral space using a 18 G needle. DPE subjects received a dural puncture using a 25 G needle through the Tuohy needle and free flow of CSF was observed but no medication was administered into the subarachnoid space,All epidural catheters were inserted 4 to 5 cm into the epidural space in both EP group and DPE group. After negative aspiration for blood and CSF, a 5-mL test dose was administered (2% lidocaine) to check for intravascular or subarachnoid catheter placement. Epidural catheters were then administered with a full amount of local anesthetic drugs (0.75% of ropivacaine 8~12 ml) according to the situation;In CSE group, 0.5% ropivacaine 12.5~15 mg was given to the subarachnoid space, then the epidural catheter was inserted 4 to 5 cm into the epidural space as well.
The use of oxytocin, fluid infusion volume, blood loss volume, Apgar scores of newborns among 1 min and 5 min, and the anesthesia effects were compared among the three groups; The anesthesia effect,hemodynamic changs during operation; adverse reactions during operation were compared among the three groups.

Results: There was no statistically significant difference in age,BMI , intraoperative oxytocin dosage, infusion volume, bleeding volume among the three groups(P >0.05),and the Apgar scores of the newborn at 1min and 5min among the three groups(P >0.05). The time from administration to reaching the T6 plane and from administration to skin incision in the EP group was higher than that in the DPE group and CSE group (P< 0.01). The highest level of sensory nerve block in the CSE group and DPE group was higher than that in the EP group (P< 0.01), and the number of grade I traction reactions during surgery in the CSE group and DPE group was significantly higher than that in the EP group (P< 0.01) .The relaxation scores during surgery in the CSE and DPE groups were significantly higher than those in the EP group (P< 0.01); SBP in CSE group was lower than that of the EP group and DPE group (P< 0.01), HR was higher than that of the EP group and DPE group (P< 0.01) . The dose of norepinephrine in EP and DPE groups was lower than that in the CSE group (P< 0.01), and the use of propofol in EP group was significantly higher than that in the CSE and DPE groups (P< 0.05).

Conclusion: DPE was associated with shorter median times to achieving adequate analgesia compared with EP group; Compared with CSE group, DPE was associated with less adverse reactions and better haemodynamic stability, which is worthy of clinical promotion.

References:



温州医科大学附属第二医院医学伦理委员会

涉及人的生物医学研究伦理审查批件

医疗技术伦审第（2020-02）号

项目类别：医疗技术

项目名称

1. 微创右腋下直小切口直视手术治疗小儿房间隔缺损的临床应用　夏杰
2. 临近胸膜的肺肿瘤超声引导热消融治疗　吕夕明
3. 盆底三维超声在妇女压力性尿失禁疾病中的应用　何慧疗
4. 咪达唑仑鼻粘膜给药治疗儿童惊厥　金江兵
5. HINE（婴儿神经学检查量表）联合头颅 MRI 在脑瘫高危儿早期诊断和干预中的应用　涂丰霞
6. 诺西那生钠注射液腰椎穿刺鞘内给药治疗脊髓性肌萎缩症　胡颖
7. 耳内镜下中耳胆脂瘤手术　凡启军
8. 激光治疗会厌囊肿　高金建
9. CT 引导下肺结节穿刺活检同步微波消融的应用研究　姚红响
10. CO2 激光巩固治疗复发性外阴阴道假丝酵母菌病　王乐丹
11. 无网片盆底重建技术　胡越
12. 腹腔镜部分脾切除术治疗脾脏良性占位性病变　林建华
13. 撑开器在复杂型胫骨平台骨折中的应用　应晓洲
14. 改良 Gerdy 结节截骨入路治疗 4 型胫骨平台骨折　陈龙
15. 改良后外侧入路治疗累及外踝后踝的踝关节骨折　方文来
16. 儿童股骨干骨折闭复弹性髓内钉内固定术中超声监测的应用　张敬东
17. 关节镜下双束重建后交叉韧带治疗后交叉韧带撕裂　杨阳
18. 基于超级显微外科技术的旋髂浅穿支皮瓣的临床应用　褚庭纲
19. CTA 联合彩色多普勒超声在股前外侧穿支皮瓣游离移植术前设计中的应用　周飞亚
20. 尿道测压结合超声引导下肉毒毒素注射尿道外括约肌　卢君艳
21. 利多卡因术中泵注复合术后静脉镇痛对肺癌患者术后慢性痛的影响　上官王宁
22. 硬脊膜穿破硬膜外阻滞技术在剖宫产手术中应用　胡明品
23. 经直肠超声引导下经会阴前列腺穿刺活检术　木海琦
24. 特发性膜性肾病的精准化治疗　潘敏
25. 改良管状胃食管端-端吻合在近端胃术后重建中的应用　胡经纬
26. 肠镜联合透明帽在胃 Billroth-II 式术后胆总管结石患者 ERCP 取石中的应用　卢光荣
27. 超声内镜引导下细针穿刺术对胰腺占位病变的诊断　申苏建
28. 第二代冷冻球囊消融治疗心房颤动　李进
29. 经导管主动脉瓣置入术（TAVI）　李岳春
30. 心腔内超声指引下房颤左心耳封堵术　李岳春
31. 经冠状静脉系统导管消融术治疗心外膜室性心律失常的可行性研究　林加锋
32. 经远端桡动脉冠脉介入　陈徐亮
33. 心腔内超声指导下肥厚梗阻性心肌病室间隔射频消融术　李进
34. 妊娠期与哺乳期药物咨询门诊的开设和风险评估　林西西
35. ECMO 在成人难治性呼吸循环衰竭中的应用　程碧环
36. 改良式俯卧位通气减少 ARDS 患者压力性损伤的应用　张晓隆
37. 肩关节镜下修复伴有上关节囊韧带复合体撕裂的部分厚度肩袖损伤　黄益奖
38. 射频消融术治疗面肌痉挛　占恭豪
39. 联合检测孕妇血液中雌孕激素和尿液中的邻苯二甲酸盐的代谢物预测子痫前期　华

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Etiologies and Management of Maternal Cardiac Arrest During Peripartum Anesthetic Care

A Study from the Multicenter Perioperative Outcomes Group Consortium

Michael J. Furdyna, MD
Combined Critical Care | Obstetric Anesthesiology Fellow
Brigham and Women's Hospital | Harvard Medical School

*No disclosures

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Background

- Prior studies utilizing national hospitalization-level data to study maternal cardiac arrest are limited in granular assessments
- More detailed, contemporary studies are registry-based and rely on manual reporting (NAP7, CAPS)
- U.S. lacks studies assessing maternal cardiac arrest with this level of detail

Aims: Describe the frequency, risk factors, etiology, and management of maternal cardiac arrest during peripartum anesthetic care

Mhyre *Anesthesiology* 2014 | Ford *Ann Intern Med* 2023 | Lucas *Anaesthesia* 2024 | Beckett *BJOG* 2017

2

Methods

Inclusion criteria:
- All anesthetic records for delivery + any associated anesthetic records within 7 days
- 2015-2022
- Ages 15-44

Screening criteria:
- ICD/CPT codes
- ACLS medications
- MPOG electronic record concepts/events
- Free-text notations

Manual review:
- Two anesthesiologists independently evaluated each case
- Granular data manually abstracted from anesthetic records

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

3

Results

778,000 delivery hospitalizations

87 cardiac arrests during anesthetic care

11.2 per 100,000 deliveries (95% CI 9.1, 13.8)

Overall risk 1:8,944

Patient Factors	Odds Ratio (95% CI)	Risk
Age 40+	2.13 (1.02, 4.5)	1:4,527
BMI 40+	2.90 (1.61, 5.2)	1:4,477
Black Race	1.82 (1.08, 3.08)	1:5,843

Comorbidities	Odds Ratio (95% CI)	Risk
Pulmonary Hypertension	60.4 (22.1, 165.0)	1:155
Placenta Accreta Spectrum	35.9 (19.1, 67.7)	1:284
Chronic Ischemic Heart Disease	27.0 (9.9, 73.6)	1:347

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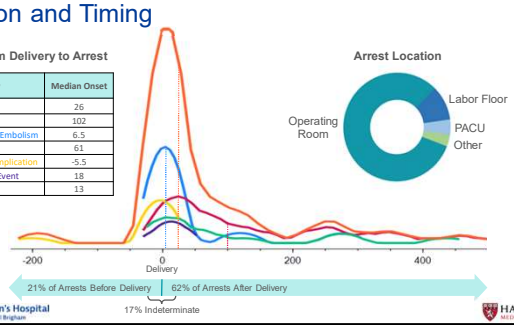
Location and Timing

Minutes from Delivery to Arrest

Etiology	Median Onset
All Causes	26
Hemorrhage	102
Amniotic Fluid Embolism	6.5
Respiratory	61
Anesthesia Complication	-5.5
Acute Cardiac Event	18
Unknown	13



Arrest Location

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Etiologies and Outcomes

Etiology	N (%)	ROSC N (%)	30 Day Survival N (%)	Median LOS Among Survivors (Days)	Trach/G-tube Among Survivors N(%)
All Causes*	87	67 (77.0)	60 (69.0)	6	3 (5.0)
Hemorrhage	35 (40.2)	23 (65.7)	22 (62.9)	8	1 (4.55)
Amniotic Fluid Embolism	27 (31.0)	23 (85.2)	20 (74.1)	8	3 (15.0)
Respiratory	12 (13.8)	9 (75.0)	6 (50.0)	4	1 (16.7)
Anesthesia Complication	10 (11.5)	10 (100.0)	9 (90.0)	4	-
Acute Cardiac Event	8 (9.2)	7 (87.5)	6 (75.0)	13.5	-
Trauma	3 (3.5)	0 (0.0)	0 (0.0)	-	-
Venous Thromboembolism	3 (3.5)	2 (66.7)	1 (33.3)	5	-
Air Embolism	1 (1.2)	0 (0.0)	0 (0.0)	-	-
Unknown	9 (10.3)	7 (77.8)	7 (77.8)	2	-

* Some cases had multiple etiologies

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Management

14 cases
11 survived case
8 survived to 30 days

Delayed resuscitative hysterotomy
Epinephrine
Amiodarone

Interventions	N (%)	Adjuvant Medications	N (%)
Advanced Airway		Epinephrine (1 milligram)	76 (87.4)
Pre-existing	45 (51.7)	Amiodarone	10 (11.5)
New	35 (40.2)	Atropine	22 (25.3)
Arterial Access		Sodium Bicarbonate	46 (52.9)
Pre-existing	22 (25.3)	Calcium Chloride	40 (46.0)
New	40 (46.0)	Vasopressor Infusions+	53 (60.9)
Central Venous Access		Ino-chronotrope Infusions++	31 (35.6)
Pre-existing	5 (5.8)	Pulmonary Vasodilators	6 (6.9)
New	26 (29.9)	Blood Products	44 (50.6)
Transesophageal Echo	17 (19.5)	Factor Concentrates	8 (9.2)
Transthoracic Echo	9 (10.3)	Lipid Emulsion	1 (1.1)
ECMO (VA or VV)	14 (16.1)		
Deviation from ACLS Guidelines	16 (18.4)		

+ Phenylephrine, norepinephrine, vasopressin
++ Epinephrine, milrinone, dopamine

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Conclusions

Risk of peripartum MCA during anesthetic care:
1:8,944

Highest risk comorbidities:
Pulmonary hypertension, placenta accreta spectrum, chronic ischemic heart disease

Most common etiologies:
Hemorrhage and AFE

Outcomes after MCA:
77% ROSC, 69% 30-Day Survival

Opportunities for improvement?
- Hemorrhage Outcomes
- ACLS

Co-Investigators:
Allison Mootz, MD | Shakthi Venkatachalam, MBBS
Michael Mathis, MD | Thomas Klumpner, MD
Kara Fields, PhD | Jill Mhyre, MD
Brian Bateman, MD, MSc | Sharon Reale, MD

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SOAP 2024 ANNUAL MEETING
MAY 1-5, 2024
SHERATON DENVER DOWNTOWN HOTEL
DENVER, COLORADO
SOAP

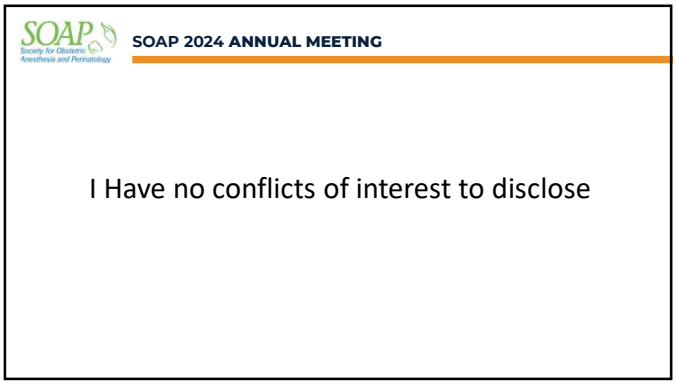
1

SOAP 2024
ANNUAL MEETING
Ehab Natsheh M.D
Hadassah Medical
Center, Jerusalem.

2

SOAP 2024
ANNUAL MEETING
Washout time for the return to "safe-for-spinal" levels of anti-Xa levels following Prophylactic and secondary prevention doses of enoxaparin in pregnancy: a pharmacodynamic study

3


SOAP
Society for Obstetric Anesthesia and Perinatology
SOAP 2024 ANNUAL MEETING
I Have no conflicts of interest to disclose

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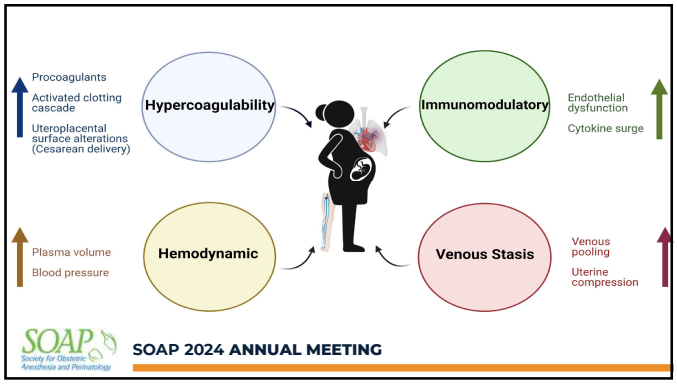
Procoagulants
Activated clotting cascade
Uteroplacental surface alterations (Cesarean delivery)
Hypercoagulability
Immunomodulatory
Endothelial dysfunction
Cytokine surge
Plasma volume
Blood pressure
Hemodynamic
Venous Stasis
Venous pooling
Uterine compression
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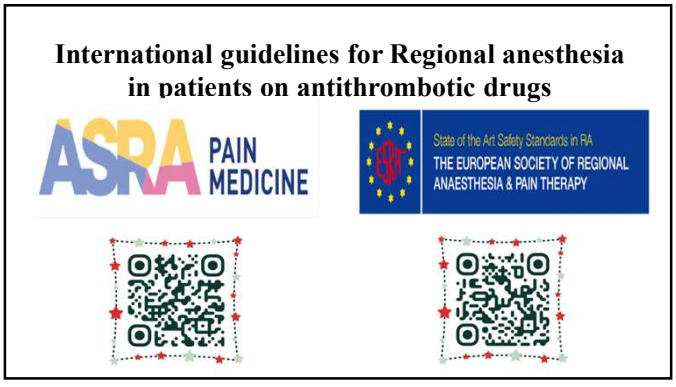
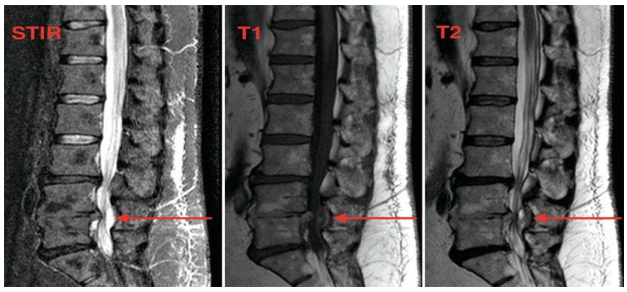

International guidelines for Regional anesthesia in patients on antithrombotic drugs
ASRA PAIN MEDICINE
State of the Art Safety Standards in RA
THE EUROPEAN SOCIETY OF REGIONAL ANAESTHESIA & PAIN THERAPY

6

SOAP 2024 ANNUAL MEETING



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Spinal Epidural Hematoma (SEH) in literature

PAIN AND REGIONAL ANESTHESIA
Anesthesiology 2004; 101:950–9
© 2004 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

Severe Neurological Complications after Central Neuraxial Blockades in Sweden 1990–1999

Vibeke Moen, M.D., Nils Dahlgren, M.D., Ph.D.,† Lars Irestedt, M.D., Ph.D.‡*

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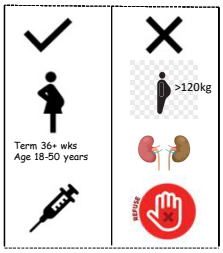
The study…



Prophylactic group

40mg x1 once daily for <90kg, or 60mg x1 once daily for weight [90-120kg]

Secondary Prevention group

0.7-1mg/kg once daily

Blood sampling at baseline (T0) and at fixed time intervals as follows:
Group A: T0, T+3.5h, T+6h, T+8h, T+10h, T+12h
Group B: T0, T+3.5h, T+12h, T+14h, T+16h, T+18h, T+ 20h, T+22h, T+24h

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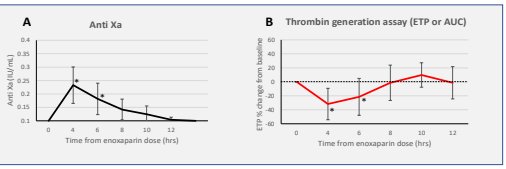
Prophylactic enoxaparin (clexane)
<90kg patient: 40mg x1/d.
90-120kg patient: 60mg x1/d.

Current guidelines prevent neuraxial anesthesia before 12 hrs from last dose.

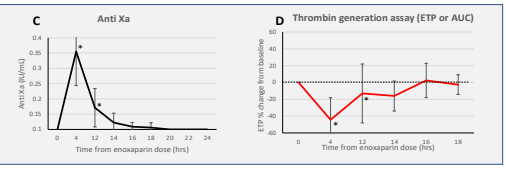
Anti Xa and TGA returned to baseline by 8-10 hrs.



Secondary prevention enoxaparin (clexane)
0.7-1.0 mg/kg x1/d.

Current guidelines prevent neuraxial anesthesia before 24 hrs from last dose.

Anti Xa and TGA returned to baseline by 16 hrs.



* Significant difference (p<0.05) from baseline (RM-ANOVA)

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Local Anesthesia Injection (ILA) Pain Severity as a Predictor of Obstetric Quality-of-Recovery Scores (ObsQoR-11) and Post-Cesarean Pain: A Prospective Observational Study

Erin Dengler MD, Benjamin Cobb MD, Courtney Hood MD, Michael Hart MD, Justin Swengel MD, Jeremy Gue MD, Lacey Straube MD, Marwa Sidani MD, Christine McKenzie MD

UNC SCHOOL OF MEDICINE

1

Background

Prior Research	ObsQoR-11	Question
Severe pain with ILA is associated with increased pain during the first 24 hours after cesarean delivery[1]	A validated assessment of functional recovery after cesarean delivery[2]	Does ILA pain severity predict post-cesarean pain at 24h and/or ObsQoR-11 functional recovery?

1. Orbach-Zinger et al. European Journal of Pain 2015;19(9):1382-8.
2. Ciechanowicz et al. British Journal of Anaesthesia 2019;122(1):69-78.

2

Methods

Inclusion

- Scheduled cesarean
- Neuraxial

Exclusion

- < 18 years old
- Failed Spinal
- Non-English speaking
- Postpartum hemorrhage
- Bilateral tubal ligation

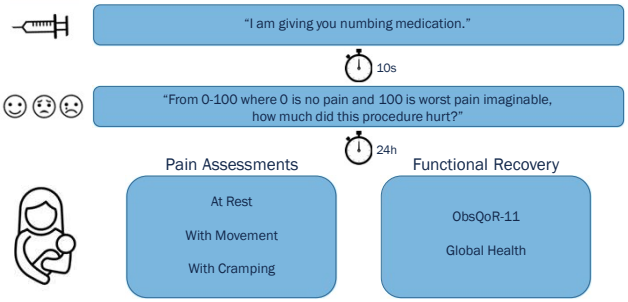
Primary Outcome

- 24h pain scores
- 24h ObsQoR-11

All patients received standardized enhanced recovery after cesarean analgesia

3

Methods



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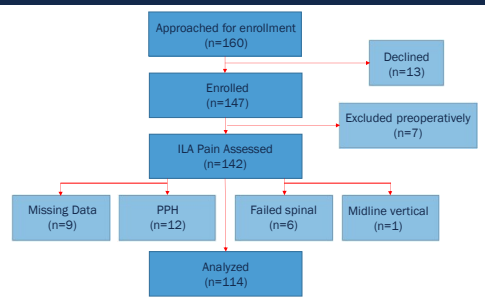
Results



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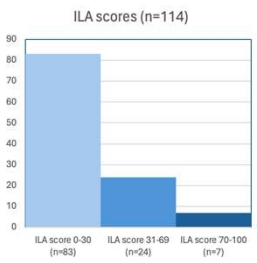
Results



	ILA ≤ 30 (n=83)	ILA > 30 (n=31)	p-value
Average pain at rest (0-100)	20.3 (17.0)	36.0 (19.6)	<0.001
Worst pain at rest (0-100)	34.6 (25.2)	55.5 (24.3)	<0.001
Average pain with movement (0-100)	39.3 (25.6)	58.2 (19.1)	<0.001
Worst pain with movement (0-100)	51.2 (28.6)	76.0 (16.5)	<0.001
ObsQoR-11 (0-110)	83.4 (16.8)	74.9 (16.1)	0.018
Global Health Rating (0-100)	70.6 (17.8)	58.9 (16.3)	0.002

All values reported as mean (SD). ANOVA test performed for comparison between groups.

6

Results

Outcome	ILA ≤ 30 (n=83)	ILA > 30 (n=31)	Odds Ratio	P-value
Severe Pain at Rest	15.3% (13)	38.7% (12)	3.4 [1.3-8.7]	0.010
Severe Pain with Movement	36.1% (30)	74.2% (23)	5.1 [2.0-12.8]	<0.001
Opioid use 0-24 hours	43.3% (36)	64.5% (20)	2.4 [1.0-5.5]	0.047
Opioid use 0-48 hours	53.0% (44)	77.4% (24)	3.0 [1.2-7.8]	0.021
Poor recovery (Global Health Rating < 70)	36.1% (30)	61.3% (19)	2.8 [1.2-6.5]	0.018

Data presented in %(n); OR [95% CI]

	ILA ≤ 30 (n=83)	ILA > 30 (n=31)	p-value
Opioid consumption on POD0 (MME)	6.78 (10.1)	10.2 (10.7)	0.118
Opioid consumption on POD1 (MME)	9.31 (12.9)	13.3 (14.3)	0.156

All values reported as mean (SD). ANOVA test performed for comparison between groups.

7

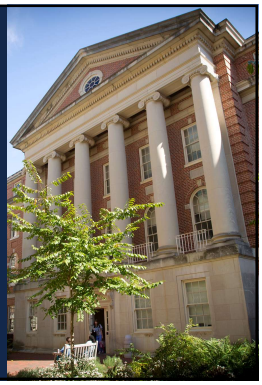
Discussion

- ✓ Our study confirms higher pain scores with ILA is associated with increased pain scores in the first 24 hours following cesarean delivery
- ✓ The addition of the ObsQoR-11 illustrates this increase in pain may have a negative impact on functional recovery
- ? Is there a role for additional pain interventions for patients who report high pain scores on ILA?

8

Questions

Thank you



9

SOAP 2024
ANNUAL MEETING
Racial & Ethnic Disparities in Labor Neuraxial Use in the United States, 2016-2022
Eva Martinez, MD
Disclosures: None
Co-Authors:
Sara Siadat, MSc
Emily Stockert, MD, MBA
Brian Bateman, MD, MSc, MBA
Alexander Butwick, MBBS, FRCA, MS
Stephanie Leonard, PhD, MS
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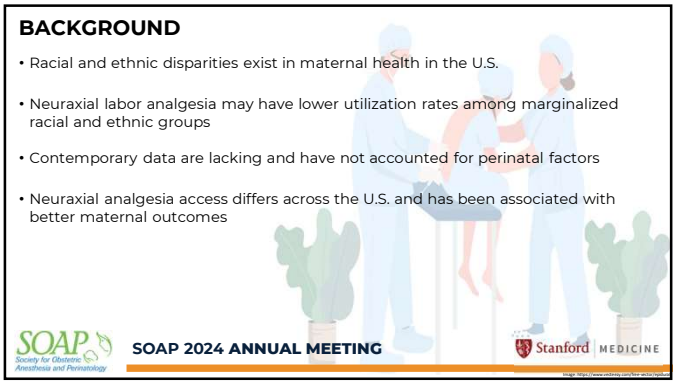
BACKGROUND
• Racial and ethnic disparities exist in maternal health in the U.S.
• Neuraxial labor analgesia may have lower utilization rates among marginalized racial and ethnic groups
• Contemporary data are lacking and have not accounted for perinatal factors
• Neuraxial analgesia access differs across the U.S. and has been associated with better maternal outcomes
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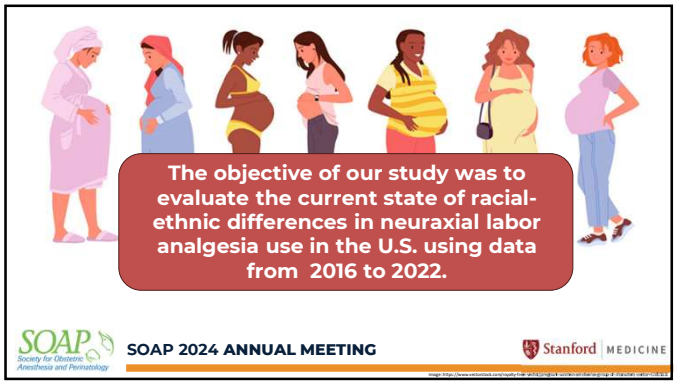
The objective of our study was to evaluate the current state of racial-ethnic differences in neuraxial labor analgesia use in the U.S. using data from 2016 to 2022.
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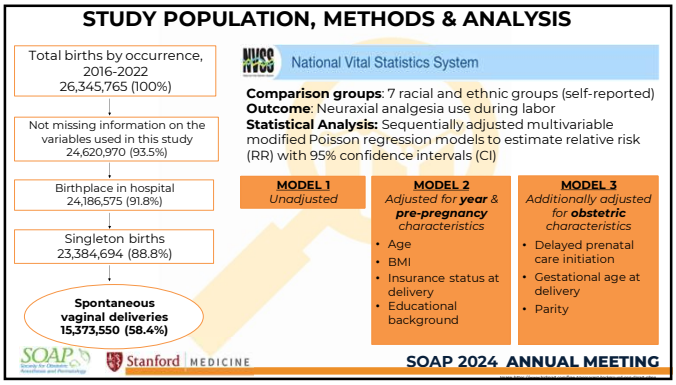
STUDY POPULATION, METHODS & ANALYSIS
Total births by occurrence, 2016-2022
26,345,765 (100%)
Not missing information on the variables used in this study
24,620,970 (93.5%)
Birthplace in hospital
24,186,575 (91.8%)
Singleton births
23,384,694 (88.8%)
Spontaneous vaginal deliveries
15,373,550 (58.4%)
National Vital Statistics System
Comparison groups: 7 racial and ethnic groups (self-reported)
Outcome: Neuraxial analgesia use during labor
Statistical Analysis: Sequentially adjusted multivariable modified Poisson regression models to estimate relative risk (RR) with 95% confidence intervals (CI)
MODEL 1
Unadjusted
MODEL 2
Adjusted for year & pre-pregnancy characteristics
• Age
• BMI
• Insurance status at delivery
• Educational background
MODEL 3
Additionally adjusted for obstetric characteristics
• Delayed prenatal care initiation
• Gestational age at delivery
• Parity
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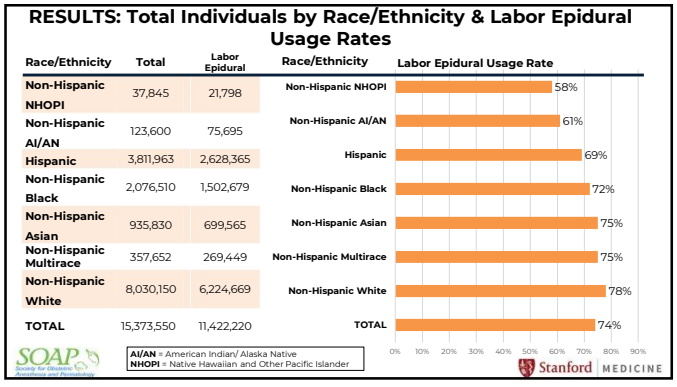
RESULTS: Total Individuals by Race/Ethnicity & Labor Epidural Usage Rates
Race/Ethnicity | Total | Labor Epidural
Non-Hispanic NHOPI | 37,845 | 21,798
Non-Hispanic AI/AN | 123,600 | 75,695
Hispanic | 3,811,963 | 2,628,365
Non-Hispanic Black | 2,076,510 | 1,502,679
Non-Hispanic Asian | 935,830 | 699,565
Non-Hispanic Multirace | 357,652 | 269,449
Non-Hispanic White | 8,030,150 | 6,224,669
TOTAL | 15,373,550 | 11,422,220
Race/Ethnicity
Labor Epidural Usage Rate
Non-Hispanic NHOPI 58%
Non-Hispanic AI/AN 61%
Hispanic 69%
Non-Hispanic Black 72%
Non-Hispanic Asian 75%
Non-Hispanic Multirace 75%
Non-Hispanic White 78%
TOTAL 74%
0% 10% 20% 30% 40% 50% 60% 70% 80% 90%
AI/AN = American Indian/ Alaska Native
NHOPI = Native Hawaiian and Other Pacific Islander
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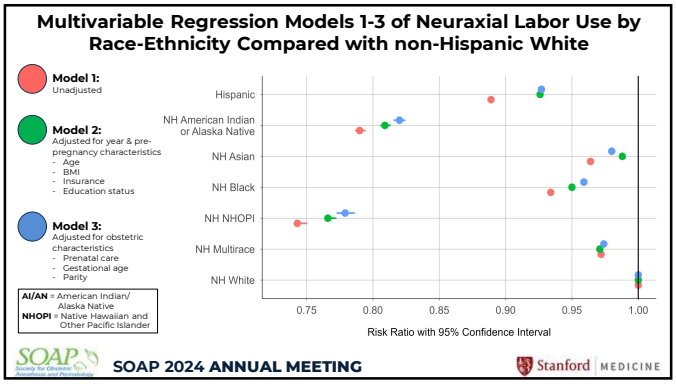
Multivariable Regression Models 1-3 of Neuraxial Labor Use by Race-Ethnicity Compared with non-Hispanic White
Model 1:
Unadjusted
Model 2:
Adjusted for year & pre-pregnancy characteristics
- Age
- BMI
- Insurance
- Education status
Model 3:
Adjusted for obstetric characteristics
- Prenatal care
- Gestational age
- Parity
AI/AN = American Indian/ Alaska Native
NHOPI = Native Hawaiian and Other Pacific Islander
Hispanic
NH American Indian or Alaska Native
NH Asian
NH Black
NH NHOPI
NH Multirace
NH White
0.75 0.80 0.85 0.90 0.95 1.00
Risk Ratio with 95% Confidence Interval
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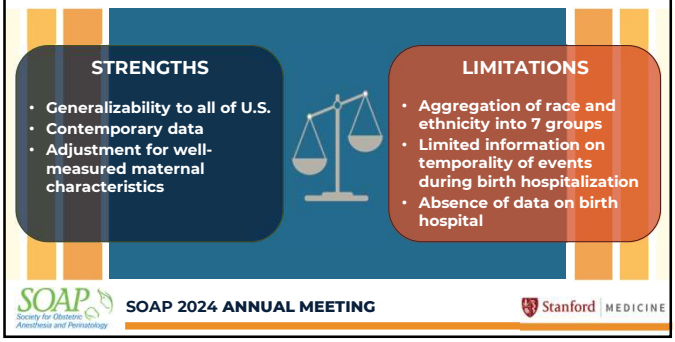
6

STRENGTHS & LIMITATIONS



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CONCLUSIONS

- **Racial and ethnic differences in labor neuraxial analgesia use remained persistent despite adjusting for pre-pregnancy and obstetric characteristics**
- Use of labor neuraxial analgesia was **highest** among non-Hispanic **white** individuals and **lowest** among **AI/AN** and **NHOPI** individuals
- Ongoing efforts are needed to understand and address disparities in contemporary practice, with a particular focus on NHOPI and AI/AN patients

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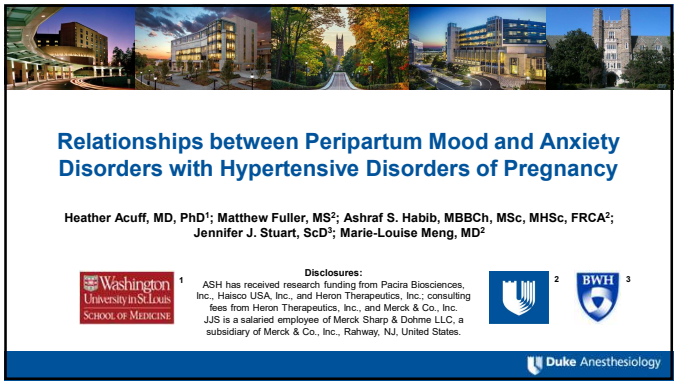

Relationships between Peripartum Mood and Anxiety Disorders with Hypertensive Disorders of Pregnancy

Heather Acuff, MD, PhD[1]; Matthew Fuller, MS[2]; Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA[2]; Jennifer J. Stuart, ScD[3]; Marie-Louise Meng, MD[2]

Disclosures:
ASH has received research funding from Pacira Biosciences, Inc., Haisco USA, Inc., and Heron Therapeutics, Inc.; consulting fees from Heron Therapeutics, Inc., and Merck & Co., Inc.
JJS is a salaried employee of Merck Sharp & Dohme LLC, a subsidiary of Merck & Co., Inc., Rahway, NJ, United States.

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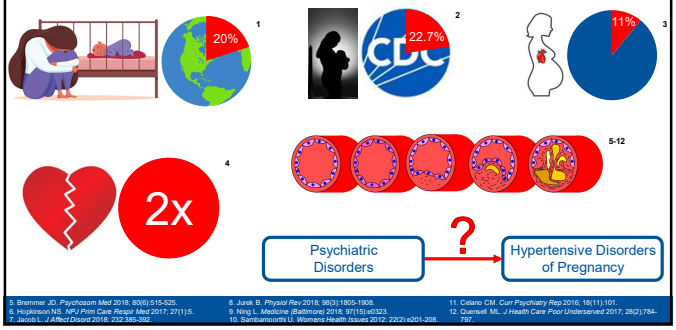
1

Background



5. Bremmer JD. *Psychosom Med* 2018; 80(6):515-525.
6. Hopkinson NS. *NPJ Prim Care Respir Med* 2017; 27(1):5.
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8. Jurek B. *Physiol Rev* 2018; 98(3):1805-1908.
9. Ning L. *Medicine (Baltimore)* 2018; 97(15):e0323.
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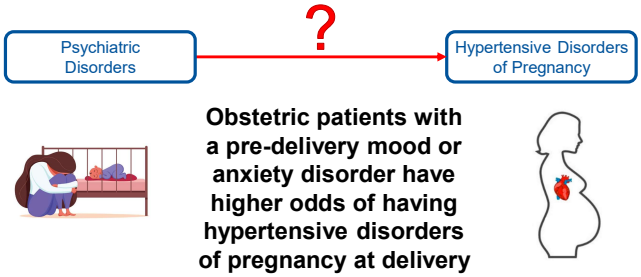
2

Hypothesis



Obstetric patients with a pre-delivery mood or anxiety disorder have higher odds of having hypertensive disorders of pregnancy at delivery

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3

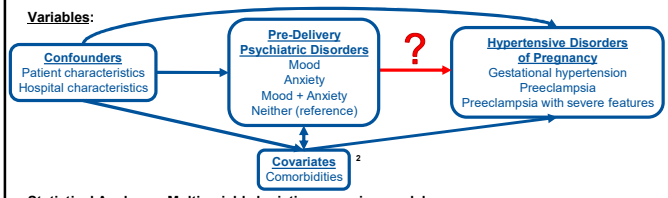
Methods

Study Design: Retrospective cohort study using the Premier Healthcare Database [1]

Inclusion Criteria: Obstetric patients, ≥18y, 2016-2020, ≥3 encounters

Pre-Delivery Period + Delivery Hospitalization + Post-Delivery Period

Variables:



Statistical Analyses: Multivariable logistic regression model

2. Leonard SA. *Obstet Gynecol* 2020; 136(3):440-449.

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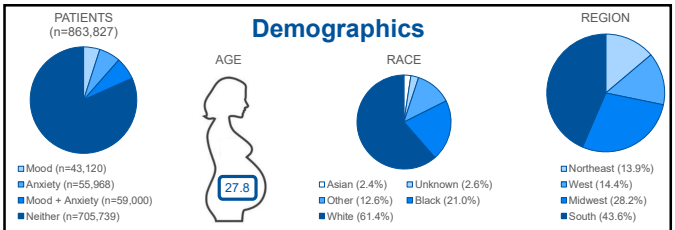
Demographics



Comorbidity	Prior Cesarean	Substance Use Disorder	Preexisting Anemia	Preterm Delivery	Asthma	GI Disease	BMI ≥40 kg/m²
Mood	20.0%	21.6%	18.2%	15.9%	13.3%	9.7%	5.7%
Anxiety	20.0%	14.3%	15.7%	14.9%	11.3%	11.0%	4.4%
Mood + Anxiety	20.2%	25.7%	17.6%	17.88%	16.6%	14.2%	5.1%
Neither	18.6%	7.7%	13.4%	11.7%	5.9%	5.6%	3.8%

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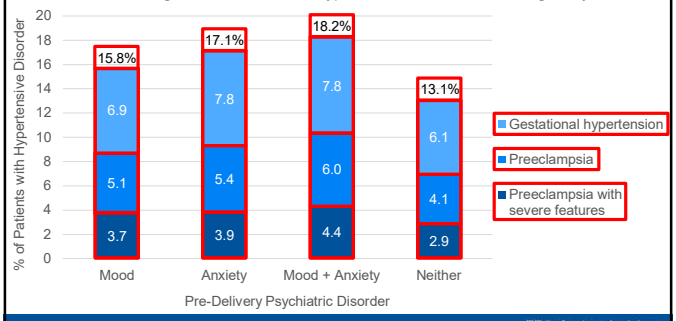
5

Percentages of Patients with Hypertensive Disorders of Pregnancy



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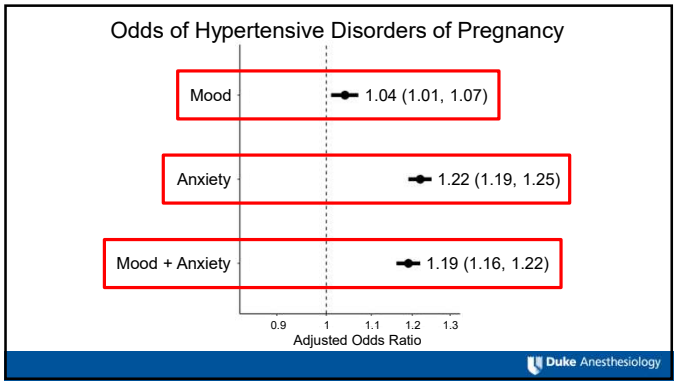
Odds of Hypertensive Disorders of Pregnancy
Mood
1.04 (1.01, 1.07)
Anxiety
1.22 (1.19, 1.25)
Mood + Anxiety
1.19 (1.16, 1.22)
0.9
1
1.1
1.2
1.3
Adjusted Odds Ratio
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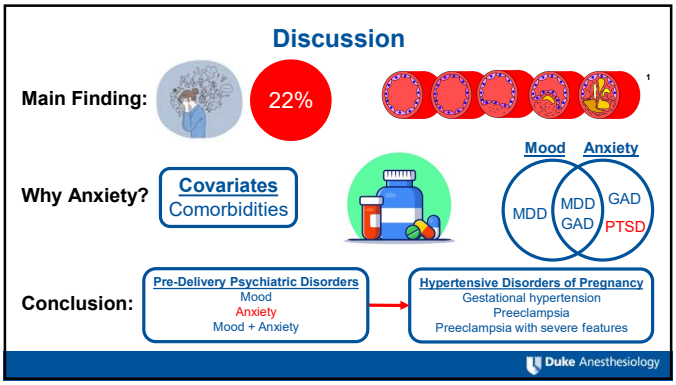
Discussion
Main Finding:
22%
Why Anxiety?
Covariates
Comorbidities
Mood
Anxiety
MDD
MDD
GAD
GAD
PTSD
Conclusion:
Pre-Delivery Psychiatric Disorders
Mood
Anxiety
Mood + Anxiety
Hypertensive Disorders of Pregnancy
Gestational hypertension
Preeclampsia
Preeclampsia with severe features
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8

Abstract #: FRI – GMRC – 01

Etiologies and Management of Maternal Cardiac Arrest During Peripartum Anesthetic Care: A Study from the Multicenter Perioperative Outcomes Group Consortium

Presenting Author: Michael J. Furdyna, MD
Presenting Author's Institution: Brigham and Women's Hospital - Boston, Massachusetts
Senior Author: Sharon Reale, MD - Brigham and Women's Hospital and Harvard Medical School
Co-Authors: Brian Bateman, MD, MSc - Stanford University
Michael Mathis, MD - University of Michigan
Jill M. Mhyre, MD - University of Arkansas for Medical Sciences
Allison A. Mootz, MD - Brigham & Women's Hospital
Shakthi Venkatachalam, MBBS - Brigham and Women's Hospital

Abstract:
Background: Prior studies utilizing hospitalization-level data estimate the occurrence of maternal cardiac arrest at 1 in 9-12,000 delivery hospitalizations,[1,2] though with limited ability to ascertain granular details of the arrest. Our study aims to describe the frequency, risk factors, etiology, and management of maternal peripartum cardiac arrest in a large, contemporary sample of US deliveries drawn from the 70+ hospitals in the Multicenter Perioperative Outcomes Group (MPOG).

Methods: In this multicenter, retrospective, observational study, we identified obstetric anesthetic records for delivery, as well as associated records within 7 days, for patients aged 15-44 who delivered between 1/1/2015 and 12/31/2022. We queried the database for cases meeting criteria for potential cardiac arrest using ICD/CPT codes, ACLS medications (e.g., epinephrine), MPOG electronic record concepts, and free-text notations (e.g., “ROSC”). Two independent reviewers conducted manual chart reviews to determine if cardiac arrest occurred, as well as to assess etiology, timing, management, and outcomes. We calculated frequencies, 95% confidence intervals (CI), and univariable associations between patient characteristics and cardiac arrest.

Results: We identified 778,102 deliveries across 60 institutions. There were 87 cardiac arrests during peripartum anesthetic care, at a median gestational age of 37 weeks; the frequency was 11.2 per 100,000 deliveries [95% CI 9.1,13.8]. The most common presumed etiologies were hemorrhage (40.2%) and amniotic fluid embolism (AFE) (31.0%); anesthetic complications (e.g., high spinal) accounted for 11.5%. The most common setting was a cesarean delivery (66.7%). Cardiac arrest occurred a median of 26 minutes after delivery and varied by etiology; the medians for hemorrhage and AFE were 102 minutes and 6.5 minutes, respectively. Of 18 arrests before delivery, 13 resuscitative hysterotomies were performed, with 5 occurring in 5 minutes or less. 77.0% of patients survived the acute event; 69.0% survived to 30 days with a median length of stay of 6 days. Patient factors associated with cardiac arrest included age > 40 (OR 2.13, 95% CI [1.02,4.46] compared to age < 35), BMI ≥ 40 (OR 2.90 [1.61,5.21] compared to BMI < 30), and Black race (OR 1.82 [1.08,3.08] compared to White race). Pulmonary hypertension (OR 60.43 [22.09,165.31]), placenta accreta spectrum

(PAS) (35.91 [19.06,67.65]), chronic ischemic heart disease (26.95 [9.87,73.59]) and stillbirth (10.74 [4.96,23.26]) were the comorbidities most strongly associated with cardiac arrest.

Conclusions: In this large, multicenter study examining the frequency, risk factors, etiology, and management of maternal peripartum cardiac arrest based on electronic health records of anesthetic care, the highest proportion of arrests were due to hemorrhage and AFE; comorbidities most strongly associated with arrest were pulmonary hypertension and PAS.

References:

1. Mhyre *Anesthesiology* 2014
2. Ford *Ann Intern Med* 2023

Furdyna Etiologies and Management of Maternal Cardiac Arrest Table.pdf

Abstract #: FRI – GMRC – 02

Washout Time for the Return to "Safe-For-Spinal" Levels of Anti-Xa Levels Following Prophylactic and Secondary Prevention Doses of Enoxaparin in Pregnancy: A Pharmacodynamic Study

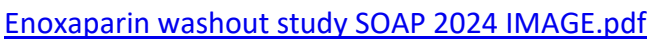
Presenting Author: Ehab Natsheh
Presenting Author's Institution: Department of Anesthesiology, Critical Care and Pain Medicine Hadassah Hebrew University Medical Center, Jerusalem, Israel
Senior Author: Yehuda Ginosar - Hadassah Hebrew University Medical Center, Jerusalem, Israel
Co-Authors: Suzan Burrows, Resident Anaesthesiologist - Department of Anesthesiology, Critical Care and Pain Medicine, Hadassah Hebrew University Medical Center, Jerusalem Israel
Yosef Kalish, Director, Coagulation Unit - Department of Haematology, Hadassah Hebrew University Medical Center, Jerusalem Israel
Amichai Rottenstreich, Resident Obstetrician - Department of Obstetrics and Gynaecology Hadassah Hebrew University Medical Center, Jerusalem Israel
Ela Shai, Laboratory Scientist - Department of Haematology, Hadassah Hebrew University Medical Center, Jerusalem Israel

Abstract:
Introduction: For women receiving enoxaparin (clexane, lovenox), international guidelines recommend against neuraxial anesthesia for 12 hours after prophylactic doses, and for 24 hours after secondary prevention or therapeutic doses. The physiological changes of pregnancy may affect the validity of these recommendations in pregnancy. This is of major significance as women presenting in labor or for urgent cesarean shortly after receiving enoxaparin may be denied neuraxial analgesia for labor and may have to undergo more dangerous general anesthesia for cesarean delivery. In this study, we aimed to determine washout times for enoxaparin for the safe conduct of neuraxial anesthesia.

Methods: This prospective observational pharmacodynamic study enrolled third trimester pregnant patients receiving either prophylactic (if < 90kg: 40mg x1/d; if 90-120kg: 60mg x1/d) or secondary prevention doses (0.7-1mg/kg x1/d) of enoxaparin. Blood samples were collected at baseline, at peak (3.5 hours) and fixed time intervals following drug administration (prophylactic 0,3.5,6,8,10,12hrs; secondary prevention 0,3.5,12,14,16,18,20,22hrs). Anti-Xa levels (primary outcome) and thrombin generation ETP assays were measured using commercially available kits. Data were assessed using repeated measures ANOVA.

Results: We enrolled 25 participants receiving enoxaparin (14 received prophylactic doses, 11 received secondary prevention doses). Mean ***Emax*** anti-Xa levels were 0.21 IU/mL (95% CI: 0.19-0.24) and 0.36 IU/mL (95% CI: 0.28-0.44) respectively. ***Emax*** thrombin generation assays reduced by 32% and 42% from baseline respectively. Washout time was defined as the time at which the anti-Xa level thrombin generation ETP returned to baseline, and anti-Xa < 0.15 IU/mL. The "safe-for-spinal" time for prophylactic enoxaparin was 8-10 hours (versus 12 hours by protocol) and was 16 hours for secondary prevention (versus 24 hours by protocol).

Discussion: We measured washout times for enoxaparin following prophylactic and secondary prevention doses in pregnancy. Our pharmacodynamic data suggest that current guidelines may be excessively restrictive in pregnant patients, particularly for secondary prevention doses. These data justify personalized measurement of anti-Xa in individual patients who require labor analgesia and anesthesia before current time restrictions allow. If these findings are repeated in larger samples, then international protocols for “safe-for-spinal” washout times may need to be adjusted, enabling pregnant patients to receive neuraxial anesthesia earlier in labor.



Abstract #: FRI – GMRC – 04

Local Anesthesia Injection (ILA) Pain Severity as a Predictor of Post-Cesarean Pain and Obstetric Quality-of-Recovery Scores (ObsQoR-11): A Prospective Observational Study

Presenting Author: Erin Dengler, MD, MBA
Presenting Author's Institution: University of North Carolina at Chapel Hill
Senior Author: Christine McKenzie, MD - The University of North Carolina at Chapel Hill, Department of Anesthesiology
Co-Authors: Benjamin Cobb, MD - University of North Carolina
Michael Hart, MD - University of North Carolina
Courtney R. Hood, MD, MEd - Brooke Army Medical Center
Lacey Straube, MD - University of North Carolina

Abstract:
Introduction: Limited tools are available to identify parturients who are at high risk for severe pain after cesarean delivery (CD). Prior research suggests severe pain upon infiltration of local anesthesia (ILA) prior to spinal anesthesia was associated with increased pain at 24 hours following CD.[1] Our study evaluates the association of ILA with postpartum pain and functional recovery using the ObsQoR-11 and global health rating.

Methods: This is a prospective observational study done at a tertiary care medical center between September 2019 and September 2023. Inclusion criteria were women presenting for scheduled CD with neuraxial anesthesia. Exclusion criteria included women < 18 years of age, non-English speaking, BMI > 50, failed spinal, postpartum hemorrhage, and bilateral tubal ligation. Participants were administered 3mL of 1% lidocaine upon positioning in the operating room in preparation for the neuraxial procedure. Immediately following ILA, pain severity of the injection was assessed using a numerical rating scale (NRS) of 0-100. At 24 hours postpartum, NRS pain scores (average and peak pain at rest, with movement, and with uterine cramping), ObsQor-11 survey and global health rating were assessed. Opioid consumption (morphine milligram equivalents (MME)) data was collected. All participants received intrathecal morphine (0.1 mcg) and scheduled acetaminophen and ibuprofen. Outcome data was assessed comparing two groups (mild ILA (NRS < /= 30) and moderate or severe ILA score (NRS > 30)).

Results: There were 114 participants included in the study. Eighty-three patients (72.8%) reported mild pain with ILA injection (NRS < /= 30) and 31 patients (27.2%) had NRS > 30 with ILA. Table 1 shows pain scores, ObsQoR-11 and global rating of two groups. Demographic and obstetrical data did not differ between the two groups. There was no statistically significant difference in MMEs between the groups.

Discussion: Our study confirmed higher reported pain with ILA is associated with increased pain at 24 hours after CD.[1] Higher ILA pain scores were also associated with lower ObsQoR-11 and global health ratings at 24 hours postpartum. Further investigation into the association of ILA score, postpartum pain, and functional recovery as well as the role of tailored analgesia are warranted.

Abstract #: FRI – GMRC – 03

EVERY 72 Hours, really? Investigating the Necessity of Repeat Type and Screen-Testing Pre-Delivery

Presenting Author: Brian Waldman, MD
Presenting Author's Institution: Columbia University
Senior Author: Richard Smiley, MD, PhD - Columbia University
Co-Authors: Lisa Eisler, MD - Columbia University
Eldad Hod, MD - Columbia University

Abstract:
Introduction: Pregnancy and red blood cell (RBC) transfusions are the main causes of developing new RBC alloantibodies. Nonetheless, prior studies suggest that a small proportion of transfused patients (i.e., 2-10%) seroconvert and < 1% of the general population have a positive antibody screen.[1,2] It has been suggested that pregnant women are at high risk of seroconversion due to exposure to fetal antigens, and guidelines suggest requiring an antibody screen within 72 hours of any transfusion.[1] When a pregnant woman presents for an emergency procedure, obstetricians and anesthesiologists must decide whether to wait for the results of the antibody screen or rush the patient into surgery. The aim of this study was to determine what percentage of pregnant women, who have had only negative prior antibody screens, seroconvert during pregnancy and present at delivery with a new positive antibody screen.

Methods: Demographics, delivery dates, blood type test results/dates, and antibody screen test results/dates were obtained from electronic records for all deliveries at our large academic medical center between Jan 1, 2006 and Apr 23, 2023. Rh-negative mothers were removed from the database to eliminate positive antibody screens due to Rh-immune globulin administration. Database queries were performed to identify mothers with prior negative antibody screen results, who then had positive screens within 72-hours of delivery.

Results: There were 69,949 eligible subjects in this study, 64,101 of whom were Rh-positive and included for analysis. Of these, 49,531 had both ≥1 antibody screen >72 hours before delivery and ≥1 antibody screen < 72 hours before delivery. Only 358 patients had a positive antibody screen within 72 hours of delivery, with negative antibody screens prior. Thus, 0.72% (i.e., 358/49,531) of Rh-positive mothers who presented for delivery had a new positive antibody screen upon blood bank testing peri-delivery.

Discussion: Our results suggest a 1 in 139 chance (i.e., 0.72%) that an Rh-positive mother with prior negative antibody screening results is sensitized during pregnancy prior to delivery. Further work is ongoing to determine what percentage of these positive antibody screen results are associated with clinically-significant antibodies that would warrant delaying an urgent procedure. Furthermore, risk factors for seroconversion (e.g., history of transfusion, number of prior pregnancies) need to be explored. Finally, the seroconversion rate during

pregnancy for Rh-negative patients should be determined, although this is complicated by Rh-immune globulin administration.

References:

1. *CMAJ*. 2006; 174(1): 29-32.
2. *Transfusion*. 2019; 59(1): 217-225.

References:

1. Orbach-Zinger S, et al. Eur J Pain. 2015 Oct; 19(9):1382-8.
2. Ciechamowicz S, et al. Br J Anaesth. 2019 Jan; 122(1):69-78.

Table.pdf

Abstract #: FRI – GMRC – 05

Racial and Ethnic Disparities in Neuraxial Analgesia Use in the United States, 2016-2022

Presenting Author: Eva Martinez, MD
Presenting Author's Institution: Stanford University
Senior Author: Stephanie Leonard, PhD, MS - Stanford University
Co-Authors: Brian Bateman, MD, MSc - Stanford University
Alexander J. Butwick, MD - Stanford University
Sara Siadat, MS - Stanford University
Emily Stockert, MD, MBA - Stanford University

Abstract:
Background: Neuraxial analgesia is the most effective form of pain relief during labor, and determining racial/ethnic disparities in utilization is important to improve care[1]. Neuraxial labor analgesia may have lower utilization rates among marginalized racial and ethnic groups, however contemporary data are lacking and have not accounted for perinatal factors[2]. The objective of our study was to evaluate racial/ethnic disparities in neuraxial labor analgesia use in the U.S. between 2016 and 2022.

Methods: We used live birth certificate data from in-hospital spontaneous vaginal births of singletons during 2016 to 2022 in the U.S. (N=26,345,765). Race and Hispanic ethnicity were considered as social constructs, measured by self-report, and combined into seven racial/ethnic groups for analysis. The outcome of interest was neuraxial analgesia use during labor. We conducted sequentially adjusted multivariable modified Poisson regression models to estimate relative risks (RR) with 95% confidence intervals (CI) for associations between racial/ethnic groups and neuraxial labor analgesia. We first adjusted for delivery year and maternal characteristics: age, body mass index, insurance status, and educational background. We additionally adjusted for obstetric characteristics: timing of prenatal care initiation, gestational age at delivery, and parity. In a secondary analysis, we assessed neuraxial analgesia use among intrapartum cesarean births.

Results: The rate of neuraxial analgesia use was 74% overall among 15,373,550 spontaneous vaginal births in the U.S. Compared with non-Hispanic White individuals, the largest disparities in neuraxial analgesia use were observed in American Indian Alaska Native (AIAN) (fully adjusted RR 0.82; 95% CI: 0.82-0.82) and Native Hawaiian or Other Pacific Islander (NHOPI) individuals (fully adjusted RR 0.78; 95% CI: 0.77-0.79) (Table 1). While usage rates were also reduced for black, Hispanic, Asian and multiracial individuals, the observed disparities were comparatively smaller. Our secondary analysis of intrapartum cesarean births found that racial/ethnic differences were smaller than for spontaneous vaginal births, but persistent, including 91% in Non-Hispanic White, 84% in AIAN (fully adjusted RR 0.94; 95% CI: 0.93-0.95) and 87% in NHOPI (fully adjusted RR 0.97; 95% CI: 0.96-0.98) individuals.

Discussion: Neuraxial labor analgesia use in the U.S. during 2016-2022 was lowest among NHOPI and AIAN individuals, independent of measured maternal and obstetric characteristics.

Although disparities were reduced, they remained persistent for individuals in all minority ethnic and racial groups. Ongoing efforts are needed to understand and address disparities in contemporary practice, with a particular focus on NHOPI and AIAN individuals.

References: PMID: 17194841
PMID: 37565312

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Abstract #: FRI – GMRC – 06

Peripartum Mood and Anxiety Disorders and the Development of Preeclampsia

Presenting Author: Heather E. Acuff, MD, PhD
Presenting Author's Institution: Washington University in Saint Louis - St. Louis, Missouri
Senior Author: Marie-Louise Meng, MD - Duke University Medical Center
Co-Authors: Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA - Duke University Department of Anesthesiology
Jennifer Stuart, ScD - Harvard Medical School

Abstract:
Background: Peripartum psychiatric disorders are common and debilitating, with the global prevalence of peripartum mental illness estimated at >20%.[1] Mental health conditions are the leading underlying cause of pregnancy-related deaths (22.7%).[2] Psychiatric disorders are among the most common comorbidities in patients with preeclampsia (PEC) with a prevalence of ~11%.[3] PEC is associated with subsequent cardiovascular disease (CVD).[4] There are limited studies that address the exact nature and temporality of the relationships between psychiatric disorders and PEC. The aim of our study was to examine predelivery psychiatric disorders as potential risk factors for PEC. We hypothesized that obstetric patients with predelivery mood and anxiety disorders would be at increased risk of developing PEC at delivery.

Methods: After IRB approval, we performed a retrospective cohort study using the Premier Healthcare Database.[3] Inclusion criteria were obstetric patients >18 years who delivered from 1/1/16-9/30/20 with >1 predelivery visit and 1 delivery visit. Exposures were predelivery psychiatric disorders (mood, anxiety, and comorbid mood and anxiety) ascertained by ICD-10 diagnosis codes.[5] Primary outcomes were the development of PEC during delivery hospitalization as compared to normotensive pregnancy. Covariates (patient characteristics, hospital characteristics, and comorbidities) were selected a priori and based on known CVD and maternal morbidity risk factors. Multivariable regression models, logistic regression, and generalized estimating equation models examined associations of predelivery psychiatric disorders and PEC. Results are reported as odds ratios (ORs) with 95% confidence intervals (CI).

Results: 863,827 patients met inclusion criteria. Compared to patients with normotensive pregnancies (n=705,739), patients with predelivery psychiatric disorders were found to be at increased risk for PEC at delivery: mood disorders (n=43,120, OR 1.04, CI [1.01, 1.07], p=0.003); anxiety disorders (n=55,968, OR 1.22, CI [1.19, 1.25], p< 0.001); comorbid mood and anxiety disorders (n=59,000, OR 1.19, CI [1.16, 1.22], p< 0.001).

Discussion: Both mood and anxiety disorders are associated with an increased risk of PEC during delivery hospitalizations with anxiety conferring more risk than mood disorders. There are known associations between anxiety and CVD with suggested underlying mechanisms including autonomic dysfunction, inflammation, and endothelial dysfunction.[6] A clearer

understanding of relationships between predelivery psychiatric disorders and PEC may lead to greater prevention and treatment strategies for women with comorbid psychiatric and hypertensive disease in the peripartum period.

References:

1. Urslak R, et al. Res Social Adm Pharm. 2023.
2. Trost SL, et al. CDC. 2022.
3. Meng ML, et al. Anesth Analg. 2023.
4. Wu P, et al. Circ Cardiovasc Qual Outcomes. 2017.
5. Leonard SA, et al. Obstet Gynecol. 2020.
6. Celano CM, et al. Curr Psychiatry Rep. 2016.

Acuff_Peripartum_Mood_and_Anxiety_Disorders_and_the_Development_of_Preeclampsia.pdf

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate Utilization for Postpartum Hemorrhage from 2015 to 2023

Lilian Liao, MD MS, Gavin Ovsak, MD, Noor Raheel MD, Michaela K. Farber, MD MS, John J. Kowalczyk, MD
Department of Anesthesiology, Pain, and Perioperative Medicine,
Brigham and Women's Hospital, Harvard Medical School

Postpartum hemorrhage (PPH)
4% deliveries
2% req. transfusion[1]

Fibrinogen < 200 mg/dL predicts severe PPH
Early replacement may decrease complications and death[2,3]

Most PPH protocols:

Cryoprecipitate (Cryo)
>30min to thaw prior to administration[4]

Not standardized:

Fibrinogen Concentrate (FC)
Rapidly reconstituted

Increasingly available on our L&D unit since 2015, now rapidly accessible

Aim: To describe institutional trends in Cryo and FC utilization since 2015 for PPH with low fibrinogen

1. Pettersen S et al. J Thromb Haemost. 2007
2. Charbit B et al. J Thromb Haemost. 2007
3. Deleu F et al. J Clin Anesth 2022
4. Escobar MF et al. Int J Gynaecol Obstet 2022

Methods

Inclusion Criteria:
Patients who delivered Jan 1, 2015 – Dec 31, 2023
+
Received Cryo or FC ≤ 4 weeks from admission

Primary Outcome:
Proportion of cases per year receiving FC, Cryo, or both

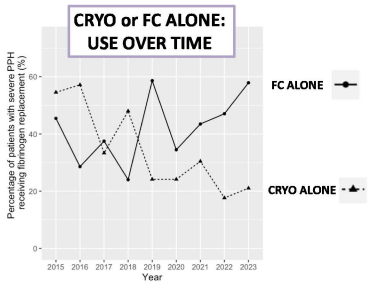
Secondary Outcomes:
- Estimated blood loss
- Fibrinogen nadir
- Hemoglobin nadir
- Products transfused
- Time to first fibrinogen administration
- Length of stay

Statistical Tests:
- Wilcoxon rank sum / T-test (continuous)
- Chi-square / Fisher's Exact (categorical)

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate for PPH. Liao, Ovsak, Raheel, Farber, Kowalczyk. SOAP 56th Annual Meeting. May 3, 2024.

Results: Use of Isolated Cryo vs. Isolated FC

CRYO or FC ALONE: USE OVER TIME



2015 vs. 2023

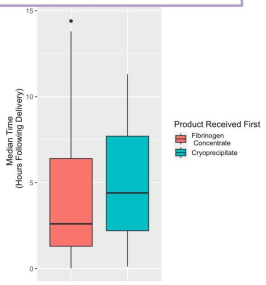
FC alone increased from **45.5% to 57.9%** (p=0.03)

Cryo alone decreased from **54.5% to 21.1%** (p=0.03)

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate for PPH. Liao, Ovsak, Raheel, Farber, Kowalczyk. SOAP 56th Annual Meeting. May 3, 2024.

Results: Timing of Administration

TIME TO FIRST FC TREATMENT



Patients who received **FC first:**

- **Had a shorter median time** from delivery to **first fibrinogen** administration
- **2.6 [1.3-6.4] hr** vs. **4.4 [2.2-7.7] hr** (p=0.0068)

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate for PPH. Liao, Ovsak, Raheel, Farber, Kowalczyk. SOAP 56th Annual Meeting. May 3, 2024.

Results: Outcomes

FC only vs. Cryo only was associated with:

Lower EBL
1872 [1038-3446] vs. 2702 [1500-4000]

Higher fibrinogen nadir*
230 [178-286] vs. 194 [160-230], p=0.001

Less pRBC units transfused*
2 [1-4] vs. 4 [2-7], p=0.0005

Less FFP units transfused*
0 [0-2] vs. 2 [1-5], p<0.0001

Less platelet units transfused*
0 [0-0] vs. 0 [0-1], p=0.0003

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate for PPH. Liao, Ovsak, Raheel, Farber, Kowalczyk. SOAP 56th Annual Meeting. May 3, 2024.

Discussion

Conclusion:
- With **increased access** over time, **use of FC for PPH increased** on our unit
- Patients who **received FC first received it faster**
- **FFP administration decreased** as FC replacement increased

Limitations:
- Single institution
- Retrospective
- Confounding: Cryo may be chosen in cases of severe PPH

Significance:
Availability of FC on L&D with inclusion into a PPH protocol increases FC use, decreases FFP, and decreases time to fibrinogen replacement

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate for PPH. Liao, Ovsak, Raheel, Farber, Kowalczyk. SOAP 56th Annual Meeting. May 3, 2024.

VOLUME VERSUS CONCENTRATION: A COMPARISON OF TWO DELIVERY STRATEGIES FOR MAINTENANCE OF NEURAXIAL LABOR ANALGESIA WITH PROGRAMMED INTERMITTENT EPIDURAL BOLUS

Elizabeth Lange, Robert McCarthy, Cynthia Wong, Feyce Peralta, Ian Gaston, Paloma Toledo

No disclosures. No conflicts of interest.

1

BACKGROUND

- PIEB-PCEA superior maintenance of labor analgesia compared to CEI-PCEA due to improved infusate spread
- Maintenance of labor analgesia with a low-concentration infusion ➡ fewer operative vaginal deliveries
- Many institutions use higher concentration infusion because of less breakthrough pain

OBJECTIVE

Compare quality of labor analgesia using an equivalent dose of a low-concentration versus high-concentration maintenance solution

HYPOTHESIS

The high-concentration group would have a lower incidence of breakthrough pain requiring provider-administered supplemental bolus of local anesthetic than the lower-concentration group

2

METHODS

	Maintenance epidural solution	Pump settings
High-concentration group	Bupivacaine 0.1% with fentanyl	PIEB: 6.25 mL Q45 min, 250 mL/hr PCEA: 5 mL Q10 min with 3/hr max
Low-concentration group	Bupivacaine 0.0625% with fentanyl	PIEB: 10 mL Q45 min, 250 mL/hr PCEA: 8 mL Q10 min with 3/hr max

- Double-blind randomized control trial
- Inclusion criterion: term, nulliparous patients, singleton pregnancy, early labor (≤5 cm)
- Exclusion criterion: replacement of epidural catheter, delivery <90 min after IT dose, refusal of vaginal exam prior to placement of CSE, chronic pain history
- CSE analgesia initiated with 25 mcg of intrathecal fentanyl

Primary outcome:
The proportion of subjects in each group requiring **provider-administered supplemental analgesia for breakthrough pain**

Secondary outcomes:
Time to request for supplemental analgesia, bupivacaine consumption, motor blockade, sensory levels, mode of delivery

Power calculation:
- Sample size 91/group, α 0.05, power 80%

3

RESULTS

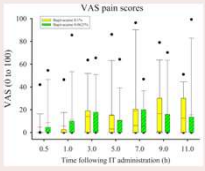
	Bupivacaine 0.1% (n=67)	Bupivacaine 0.0625% (n=62)	Difference (95% CI)	*P*
Provider administered bolus	23 (34)	11 (18)	17 (1 to 32)	0.033
Number provider-administered supplemental boluses				
1	9 (39)	7 (64)	-25 (-69 to 12)	
2	8 (35)	3 (27)	8 (-34 to 49)	0.53
3	5 (22)	1 (9)	13 (-18 to 44)	
4	1 (4)	0 (0)	4 (-11 to 19)	
Time to first provider bolus (min)	270 (193, 475)	489 (286, 627)	219 (-10 to 360)	0.06
VAS scores (0 to 100)				
At 10cm dilation	1 (0, 22)	9 (0, 36)	8 (-10 to 19)	0.36
After delivery	0 (0, 6)	0 (0, 20)	0 (0 to 4)	0.10
Intrascapular pain	0 (0)	3 (5)	5 (-2 to 12)	0.07
PCEA boluses				
Requests	7 (4, 13)	8 (5, 19)	1 (-3 to 6)	0.75
Administrations	5 (3, 9)	5 (2, 12)	0 (-2 to 3)	0.79
Ratio	1.5 (1.0, 1.7)	1.3 (1.1, 2.0)	-0.2 (-0.3 to 0.2)	0.63
VAS scores (0 to 100)				
Prior to provider 1st dose	72 (50, 82)	61 (42, 88)	-11 (-33 to 24)	0.84
30 min after provider 1st dose	25 (0, 50)	5 (0, 24)	-20 (-50 to 21)	0.55
Bupivacaine consumption per hr	13.1 ± 4.0	11.7 ± 3.5	-1.4 (0.2 to 2.6)	0.046
Max oxytocin dose (IU)	12 (10, 18)	16 (10, 24)	4 (-2 to 6)	0.14
Time IT administration to delivery (min)	468 (330, 736)	575 (275, 805)	107 (-22 to 221)	0.16
Mode of delivery				
Vaginal	45 (68)	42 (68)	0 (-18 to 18)	0.63
Instrumented	7 (11)	4 (6)	5 (-5 to 15)	
Cesarean	14 (21)	16 (26)	-5 (-20 to 10)	

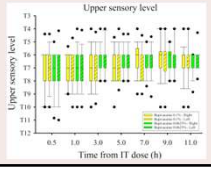
Adjusted Analyses:

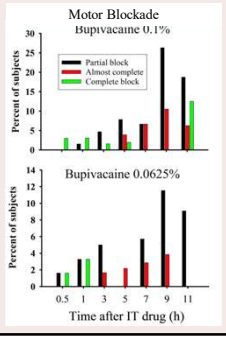
- GEE with negative binomial probability distribution and log link function
- Adjusted for demographic variables with an effect size of >0.2
  - EGA
  - BMI
  - Cervical dilation at labor analgesia request
- **Need for provider-administered supplemental bolus *P* = 0.022 (95% CI: 3% to 34%)**

4

RESULTS







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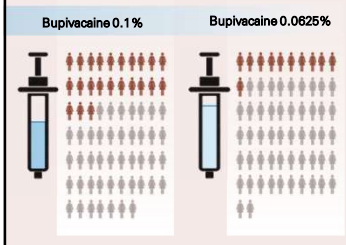
CONCLUSIONS



- Despite using equivalent doses of PIEB boluses, the low-concentration group required fewer provider-administered supplemental boluses than the high-concentration group
- There were no differences in the time to first request for supplemental analgesia, but the 95% confidence interval included a clinically significant difference
- These findings are likely explained by improved spread of a higher volume of maintenance solution
- A larger study would need to evaluate the secondary outcomes as the current study was underpowered to evaluate the analgesic secondary outcomes

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6

Maternal Intensive Care Unit Utilization by Mode of Delivery in the United States: a retrospective cohort study

Rebecca Himmelwright MD, Matthew Fuller MS, Vijay Krishnamoorthy MD PhD, Melissa Bauer DO, Ashraf S Habib MBBCh, Marie-Louise Meng MD

Background:

Increased understanding of obstetric ICU utilization can improve resource allocation

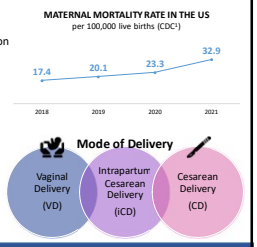
Range of incidence for maternal ICU admission (150-4,000 per 100,000 live births)

Study Aims:

1. Determine rates of ICU admission by mode of delivery
2. Describe severe maternal morbidity (SMM) events in patients who require ICU care

Hypothesis:

The highest need for ICU care during a delivery hospitalization is among patients who require intrapartum cesarean deliveries (iCD)



1. Hoyert DL. Maternal mortality rates in the United States, 2021. NCHS Health E-Stats. 2023. DOI: https://dx.doi.org/10.15620/cdc:124678

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1

Methods

Retrospective Cohort Study
- Premier Database: Delivery hospitalizations Oct. 1, 2015-Dec. 31, 2020

- Primary Outcome
  - Admission to ICU during delivery hospitalization
- Descriptive Analysis
  - Rate of SMM events by mode of delivery as a surrogate for ICU admission indication

Multivariable logistic regression analysis to examine the association of mode of delivery with ICU admission
- Covariates:
  - patient and hospital characteristics
  - payor status
  - location of care
  - comorbidities
  - transfusion of ≥4 pRBC

CDC Severe Maternal Morbidity Indicators

- Acute myocardial infarction
- Dissection
- Acute renal failure
- Acute respiratory distress syndrome
- Amniotic fluid embolism
- Cardiac arrest
- Ventricular fibrillation
- Conversion of cardiac rhythm
- Disseminated intravascular coagulation
- Heart failure or arrest during procedure or surgery
- Puerperal cerebrovascular disorders
- Pulmonary edema
- Acute heart failure
- Severe anesthesia complications
- Sepsis
- Shock
- Sickle cell disease with crisis
- Air and thrombotic embolism
- Hysterectomy
- Temporary tracheostomy
- Ventilation
- Blood Transfusion

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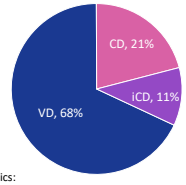
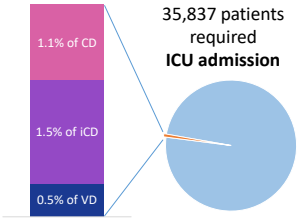
2

Results

Database of **4.8 Million** Delivery Hospitalizations



Demographics:
Majority urban hospitals in the South and Midwest caring for predominantly white, non-Hispanic patients.



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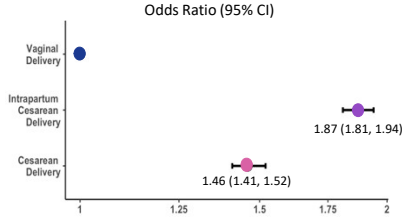
Results

Risk of ICU Admission by Mode of Delivery:
Odds Ratio (95% CI)



Comorbidities associated with increased odds of ICU admission

Transfusion pRBC ≥4 units	116.33 (110.30, 122.68)
Cardiomyopathy	18.46 (16.71, 20.40)
Preeclampsia w/ SF	6.72 (6.48, 6.97)
Pulmonary hypertension	6.53 (5.17, 8.25)
Arrythmia	3.99 (3.60, 4.43)
Placenta accreta spectrum	3.90 (3.46, 4.39)
Preterm birth	3.55 (3.45, 3.66)
Chronic renal disease	2.48 (2.24, 2.75)

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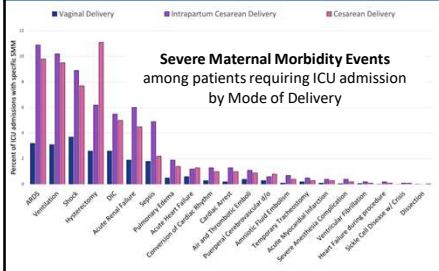
4

Results



Severe Maternal Morbidity Events among patients requiring ICU admission by Mode of Delivery

The top SMM events for all patients admitted to the ICU:

1. Acute respiratory distress syndrome (ARDS, 7%)
2. Ventilation (6.7%)
3. Shock (6.1%)
4. Hysterectomy (6%)
5. Disseminated intravascular coagulopathy (DIC, 4.0%)

SMM rates were highest in patients who delivered via an iCD, except for hysterectomy which was highest in the CD group

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5

Discussion

Intrapartum Cesarean Delivery increases a patient's risk of ICU admission by 187% compared to patients who deliver vaginally

Compared to VD or CD; pts delivered via iCD are more likely to be
- Admitted to the ICU
- Suffer severe maternal morbidity
- Die*

This mode of delivery differential is amplified on high-risk units caring for patients with comorbidities such as **cardiopulmonary disease, preeclampsia, PAS, and prematurity.**

Identifying which patients are at the greatest risk for morbidity and mortality helps facilitate equitable resource allocation & improve outcomes.

Dataset & Study Limitations:
- Cannot identify specific indications for ICU admission; rely on SMM events as proxies.
- Timing of ICU admission relative to delivery was not examined (antepartum vs postpartum.)
- Some patient populations are underrepresented in the data

*Dataset in-hospital mortality rate VD 3, iCD 15, CD 13 (per 100,000 live births)

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6

SOAP 2024 ANNUAL MEETING

Planning for postpartum tubal ligation: aspiration risk during immediate postpartum period

Chris Cariello, MS4, Speaker
Daniel Conti, MD
Nan Guo, PhD
Brendan Carvalho, MD
Clemens Ortner, MD

I have nothing to disclose

1

Introduction

- ACOG considers postpartum tubal ligation (PPTL) a non-elective procedure [1]
- 47% risk of unwanted pregnancies within 1 year postpartum when unfulfilled sterilization [2]
- Study question: Are we unnecessarily postponing PPTL after vaginal delivery?
- Study aim: Assessment of aspiration risk immediately postpartum using gastric ultrasound (GUS)

[1] ACOG Committee Opinion #827, Vol.137, No 6, June 2021
[2] Thurman AR, Obstet Gynecol 2010; 116: 1071-7

2

Methods

- Prospective cohort study, GUS in healthy (ASA ≤3) term (≥37 wks) parturients ≤1 hrs of VD.
- SOAP endorsed feeding guidelines (no solids after epidural, no liquids during 2nd stage labor)
- GUS performed in supine (SD) and right lateral decubitus (RLD) ≤1 hour of VD [3, 4]
- Primary aim: prevalence of high-risk gastric contents
- Secondary aims: (a) comparison aspiration status using GUS vs. ASA NPO guidelines,
  (b) identify potential predictors high risk gastric contents

[3] Perlas A., Can J of Anesthesia 2018; 65: 437–448
[4] Sherwin M., BJA Education 2021; 21(11), 404-407

3

Results (I)

- 50 parturients enrolled (16 excluded for feeding guidelines violation, N=34)
- Demographics: age 32.5 [30-35], BMI 27.0 [25.3-31.3], gest. wks 39.6 [39.3-40.1], epidural rate 97%
- Median labor duration: 6.5hrs [3.1-11.0]
- Median time neuraxial analgesia to GUS: 7.6 hrs [4.0-11.7]
- Mean time VD to GUS: 60min [48-72]
- Last intake before GUS: clear liquids 2 hrs [1.3-2.9], solid food 15.0hrs [13.5-18.0]

4

Results (II)

Table 1.: Gastric ultrasound findings and aspiration risk

Supine decubitus (SD, n=34)		Right laternal decubitus (RLD, n=34)	
Empty	50.0%	Empty	23.5%
Clear fluid	29.4%	Clear fluid	52.9%
Solid/thick liquid	5.9%	Solid/thick liquid	8.8%
Inconclusive	14.7%	Inconclusive	14.7%

Mean Gastric Volume (GV): 165 ml [106.7-220.8]

High vs. low Aspiration Risk

Low (GV <1.5ml/kg)	29.4%
High (GV ≥ 1.5ml/kg)	55.9%
Inconclusive	14.7%

NPO status according to ASA-guidelines		**NPO status according to GUS**	
Solids and clear fluids	16 (47.1%)	ASA guidelines = GUS findings	10 (29.4%)
Solids only	28 (82.4%)	ASA guidelines high risk and GUS low risk	6 (17.7%)
Clear fluids only	18 (52.9%)	**ASA guidelines low risk and GUS high risk**	**13 (38.2%)**

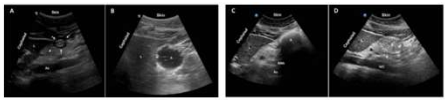
Table 2.: Time of last intake and aspiration risk

	High aspiration risk (N=19)	Low aspiration risk (N=10)	Inconclusive (N=5)
Time last meal to GUS (hrs)	15.0 [8.0-18.1]	15.2 [13.8-16.8]	13.9 [13.5-15.4]
Time last fluid to GUS (hrs)	2.0 [1.4-3.3]	1.4 [1.0-2.1]	1.9 [1.6-2.1]

5

Conclusion

- PPTL immediately postpartum associated high aspiration risk
- GUS confirms ASA fasting times are not valid for laboring patients
- ASA fasting time intervals may only start from after delivery
- If PPTL is being considered, aspiration risk should be confirmed with GUS



GUS image interpretation: empty vs clear liquid
GUS image interpretation: solid (early vs. late stage)

6

Abstract #: FRI – OP 1 – 01

Temporal Trends in Cryoprecipitate and Fibrinogen Concentrate Utilization for Postpartum Hemorrhage from 2015 to 2023

Presenting Author: Lillian Liao, MD, MS
Presenting Author's Institution: Brigham and Women's Hospital, Department of Anesthesiology, Perioperative, and Pain Medicine - Boston, Massachusetts
Senior Author: John Kowalczyk, MD - Brigham and Women's Hospital / Harvard Medical School
Co-Authors: Michaela K. Farber, MD, MS - Brigham & Women's Hospital
Gavin G. Ovsak, MD MBA - Brigham and Women's Hospital
Noor A. Raheel, MD, MPH - Brigham and Women's Hospital

Abstract:
Introduction: Postpartum hemorrhage (PPH; blood loss > 1 L) occurs in approximately 4% of deliveries and can develop into severe PPH requiring transfusion in 2% (1). Fibrinogen < 200 mg/dl is a leading predictor of severe PPH and early fibrinogen replacement may decrease complications and death (2,3). In most PPH protocols, fibrinogen is replaced using cryoprecipitate (Cryo), which requires ≥30 minutes to thaw prior to administration (4). While fibrinogen concentrate (FC) can be rapidly reconstituted for direct replacement, its use as a first-line fibrinogen source is not standardized. Since 2015, access to FC in our labor unit has increased, and it is now available for rapid access. Here we describe institutional trends in Cryo and FC utilization since 2015 for PPH with low fibrinogen.

Methods: Patients who received Cryo or FC within 4 weeks of admission for delivery between January 1, 2015, and December 31, 2023 were identified. Estimated blood loss (EBL), transfusion, and coagulation labs were extracted. The proportion of cases per year that received FC and Cryo alone or in combination were calculated.

Results: We identified 227 patients who received either FC or Cryo from 2015 to 2023. The median EBL was 2500 mL [1200-3626], and the median fibrinogen nadir was 198 mg/dL [159-249]. 30.4% of patients received Cryo alone, 26.0% received FC alone, and 26.0% received both. The median number of units of product transfused were 3 0 [2.0-4.4] pRBC, 0.0 [0.0-0.7] platelets, 2.0 [0.0-4.0] FFP, 2.0 [0.0-2.0] Cryo, and 1.0 [0.0-1.3] FC. The administration of FC alone significantly increased from 45.5% to 57.9% (p=0.03), while the administration of Cryo alone significantly decreased from 54.5% to 21.1% (p=0.03). The median time to first fibrinogen administration was shorter in those who received FC as their first dose, 2.6 [1.3-6.4] hours vs. Cryo, 4.4 [2.2-7.7] hours (p=0.0068). There was a decrease in the plasma administered from 3 [2-4] units in 2015 to 0 [0-2] units in 2023 (p=0.01). There was no difference in estimated blood loss, pRBC transfusion, Hgb nadir, fibrinogen nadir, or length of stay.

Conclusion: The use of FC for PPH on our L&D unit has significantly increased over time in conjunction with increased access. There was a substantial reduction in time to first fibrinogen administration in patients who received FC as their first replacement dose.

Consistent with other studies, there was a reduction in plasma administration as FC replacement increased (5). This study provides further insight into how the availability of FC on the labor and delivery unit and inclusion of FC into a PPH bundle can improve time to replacement. Studies powered to evaluate outcomes are warranted.

References:

1. J Thromb Haemost. 2007
2. Charbit B et al. J Thromb Haemost. 2007
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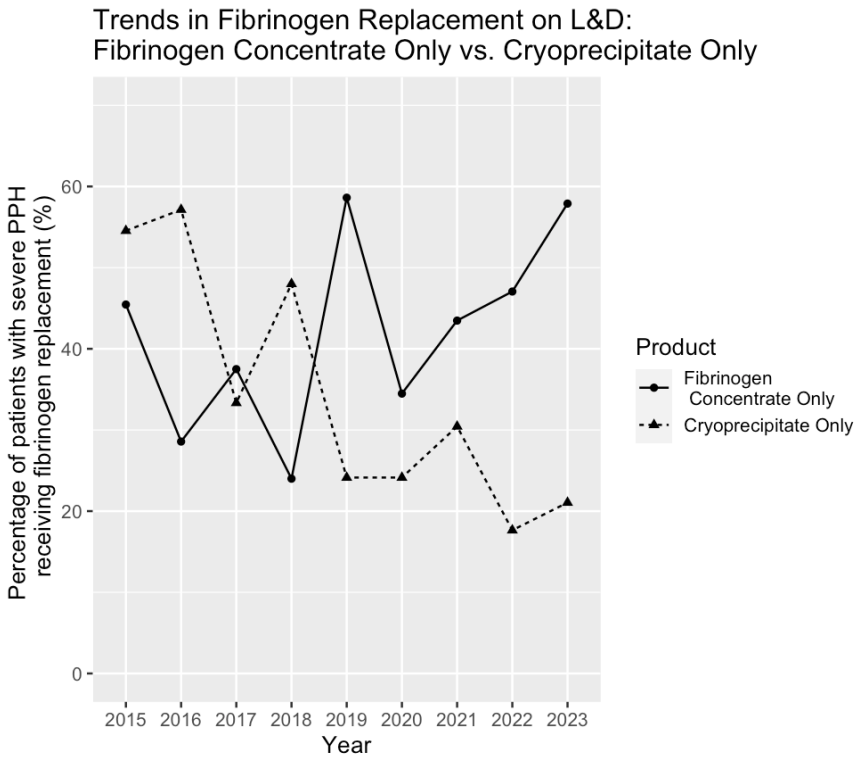


Abstract #: FRI – OP 1 – 02

Volume Versus Concentration: A Comparison of Two Delivery Strategies for Maintenance of Neuraxial Labor Analgesia with Programmed Intermittent Epidural Bolus

Presenting Author: Elizabeth Lange, MD
Presenting Author's Institution: Emory University
Senior Author: Paloma Toledo, MD, MPH, FASA - University of Miami
Co-Authors: Ian Gaston, MD - Northwestern University Feinberg School of Medicine
Robert J. McCarthy, PharmD - Rush University
Feyce M. Peralta, MD - Northwestern Memorial Hospital
Cynthia A. Wong, MD - University of Iowa

Abstract:
Introduction: Programmed intermittent epidural bolus (PIEB) in combination with patient controlled epidural analgesia (PCEA) provides superior maintenance of labor analgesia compared to continuous epidural infusion with PCEA due to improved spread of infusate. Maintenance of labor analgesia with a low-dose infusion results in fewer instrumental vaginal deliveries, however, many institutions maintain labor analgesia with a higher concentration infusion, as both are commercially available, and higher concentrations result in less breakthrough pain. The objective of this study was to compare the quality of labor analgesia using an equivalent dose of a low-concentration versus high-concentration maintenance solution. We hypothesized that the high-concentration group would have a lower incidence of breakthrough pain requiring provider-administered supplemental bolus (redose) of local anesthetic than the lower-concentration group.

Methods: Nulliparous women with a term singleton pregnancy, admitted for spontaneous or induced labor, and at a cervical dilation of ≤5 cm at request for neuraxial analgesia, were consented to participate in this double-blind, randomized study. Combined spinal-epidural analgesia was initiated with intrathecal fentanyl 25 μg. Equivalent doses of maintenance solution were calculated. The low-concentration PIEB group was randomized to receive 10 mL of bupivacaine 0.625 mg/mL with fentanyl 1.95 μg/mL administered every 45 min, 8-mL PCEA volume. The high concentration PIEB group received 6.25 mL of bupivacaine 1 mg/mL with fentanyl 1.95 μg/mL administered every 45 min, 5-mL PCEA volume. Timed boluses were administered at a rate of 250 mL/h. The primary outcome was the need for redose. Secondary outcomes included the time to first request for supplemental analgesia, maternal motor blockade, and mode of delivery.

Results: Baseline patient characteristics were similar between groups (Table 1). Significantly fewer patients in the low-concentration group required redose for breakthrough pain than in the high-concentration group (P=0.037). The time to first provider-administered bolus was 494 (239,701) min in the low-concentration group and 223 (174,465) min in the high-concentration group (P=01.73). Mode of delivery, motor block at delivery, and sensory level were similar between the two groups.

Discussion: Despite using equivalent doses of PIEB boluses, the low-concentration group required fewer redoses than the high-concentration group. There were no differences in the time to first request for supplemental analgesia, but the 95% confidence interval included a clinically significant difference. These findings are likely explained by improved spread of a higher volume of maintenance solution, yet a larger study would need to evaluate the secondary outcomes as the current study was underpowered to evaluate the analgesic secondary outcomes.

SOAPCADDTable.pdf

Abstract #: FRI – OP 1 – 03

Maternal Intensive Care Unit Utilization by Mode of Delivery in the United States: A Retrospective Cohort Study

Presenting Author: Rebecca S. Himmelwright, MD
Presenting Author's Institution: Division of Women's Anesthesia & Critical Care Medicine, Department of Anesthesiology, Duke University
Senior Author: Marie-Louise Meng, MD - Duke University Medical Center
Co-Authors: Melissa Bauer, DO - Duke University Medical Center
Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA - Duke University Department of Anesthesiology
Vijay Krishnamorthy, MD PhD - Duke University Medical Center

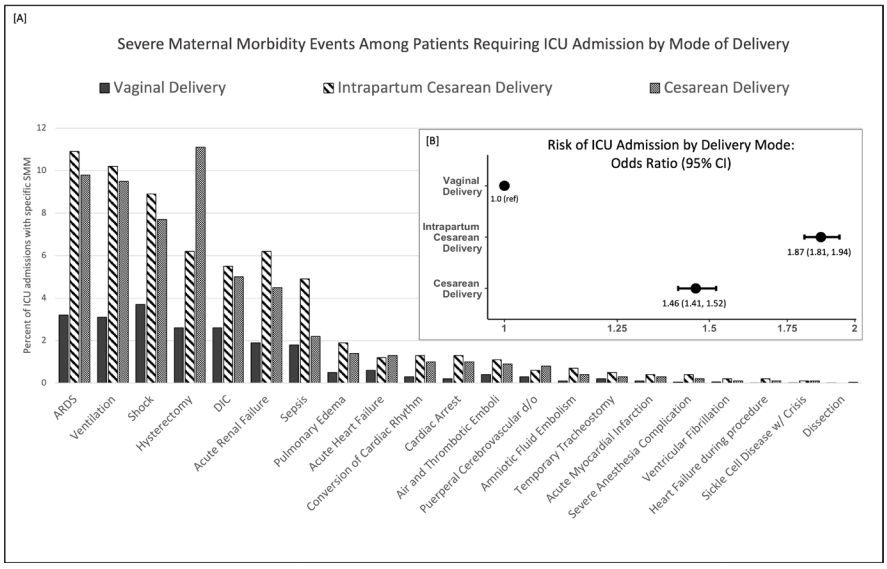
Abstract:
Background: Improved understanding of ICU utilization for obstetric patients is essential for resource allocation within healthcare systems. The aim of our study was to describe severe maternal morbidity (SMM) events in patients who require ICU care and to determine rates of ICU admission by delivery mode: vaginal delivery (VD); cesarean delivery (CD); and intrapartum cesarean delivery (iCD). We hypothesized that there is an increased need for ICU care conferred by iCD as compared to VD or CD.

Methods: After IRB approval, we conducted a retrospective cohort study using delivery hospitalizations in the Premier Database (October 1, 2015-December 31, 2020). The primary outcome was admission to the ICU during delivery hospitalization. We performed a descriptive analysis according to delivery mode of SMM events, by CDC definition, as a surrogate for ICU admission indication. A multivariable logistic regression analysis was done to examine the association of mode of delivery with ICU admission. Covariates examined were patient and hospital characteristics, payor status, location of care, comorbidities, and transfusion of ≥4 pRBC.

Results: We analyzed 4.8 million delivery hospitalizations (VD 68%, iCD 11%, CD 21%); among those 35,837 people required ICU admission (0.5% of VD, 1.5% of iCD, 1.1% of CD.) The top SMM events for patients admitted to the ICU were acute respiratory distress syndrome (ARDS, 7.0%), ventilation (6.7%), shock (6.1%), hysterectomy (6.0%), and disseminated intravascular coagulopathy (DIC, 4.0%). SMMs were highest in people who delivered by iCD, except for hysterectomy which was highest in the CD group (Fig. 1a).
Delivery by iCD or CD compared to VD was associated with higher adjusted odds of ICU admission, aOR (95% CI), 1.87 (1.81, 1.94) and 1.46 (1.41, 1.52), respectively (Fig. 1b). Comorbidities associated with increased odds of ICU admission include: transfusion pRBC ≥4 units, 116.33 (110.30, 122.68); cardiomyopathy, 18.46 (16.71, 20.40); preeclampsia with severe features, 6.72 (6.48, 6.97); pulmonary hypertension, 6.53 (5.17, 8.25); arrythmia, 3.99 (3.60, 4.43); placenta accreta spectrum, 3.90 (3.46, 4.39); preterm birth, 3.55 (3.45, 3.66); and chronic renal disease, 2.48 (2.24, 2.75).

Discussion: Delivery via iCD confers a higher risk of ICU admission. As expected, significant transfusion requirements conferred the greatest risk of ICU admission. Across all delivery modes, ICU resources are primarily used to manage conditions requiring advanced respiratory and hemodynamic support. ICU admissions for patients with cardiac conditions may be due to their need for monitoring rather than for advanced therapies. Due to the dataset limitations, we cannot identify specific indications for ICU admission and rely on SMM events as proxies. Mode of delivery alone does not determine a patient's risk for ICU admission; patient comorbidities, system capabilities and the unpredictable nature of labor contribute to the need for ICU admission.

References:



Abstract #: FRI – OP 1 – 04

Planning for Postpartum Tubal Ligation: Aspiration Risk During Immediate Postpartum Period

Presenting Author: Christopher Cariello
Presenting Author's Institution: College of Osteopathic Medicine of the Pacific Northwest - Oceanside, New York
Senior Author: Clemens Ortner, MD, MSc, DESA - Stanford University
Co-Authors: Brendan Carvalho, MD - Stanford University
Daniel Conti, MD - University of California, Davis
Guo Nan, MD, PhD - Stanford University

Abstract:
Introduction: The American College of Obstetricians and Gynecologists (ACOG) considers postpartum tubal ligation (PPTL) a non-elective procedure (1), and recommends evening or overnight procedures if possible. However, the risk of unwanted pregnancies, estimated 47% within 1 year postpartum when unfulfilled sterilization requests (2), need to be balanced with pulmonary aspiration risk if the American Society of Anesthesiologists (ASA) fasting periods are not followed. The aim of this study was to assess aspiration risk immediately postpartum using gastric ultrasound (GUS) in parturients desiring PPTL or contraception.

Methods: A prospective study (IRB #69989) at an academic hospital enrolled healthy (ASA status ≤3) term (≥37 weeks gestation) patients in the immediate postpartum period after vaginal delivery (VD). Women enrolled followed local labor feeding guidelines including ingestions of liquids only after placement of neuraxial analgesia and no ingestion during 2nd stage of labor. Ultrasound assessments of gastric contents were performed in supine (SD) and right lateral decubitus (RLD) within 1 hour after VD before transfer to the postpartum unit. The prevalence of high-risk gastric contents was calculated and compared to NPO status in concordance with ASA-guidelines (NPO= ≥2h no liquids, ≥8h no solids).

Results: We enrolled 50 parturient, 16 excluded for local feeding guidelines violation or being fed prior to GUS evaluation. Labor duration was 6.5hrs [3.1-11.0] with 97% of parturients receiving neuraxial analgesia. Time of last fluids and/or meal intake before GUS was 2.0hrs [1.3-2.9] and 15.0hrs [13.5-18.0], respectively. Only 18 parturient (52.9%) were considered low risk of aspiration on GUS despite being NPO by ASA criteria. GUS revealed an empty antrum in SD and RLD in 8 (23.5%), RLD only in 8 (23.5%) and inconclusive in 5 (14.7%) women. Defining a calculated gastric volume of ≤1.5ml/kg as cut-off, 19 (55.9%) of patients were at high risk of aspiration on GUS. In 10 (29%) risk assessment was comparable using NPO ASA-guidelines and GUS, in 13 (38%) aspiration risk was low based on NPO ASA criteria, but high-risk status using GUS. Time of last solid or fluid intake was similar between those with high and low risk aspiration status on GUS (p=0.7). GUS results are shown in Table 1.
Conclusion:
Study results suggest that PPTL immediately after delivery may be unsafe due to an unacceptable high incidence of gastric content considered aspiration risk. Even with adequate

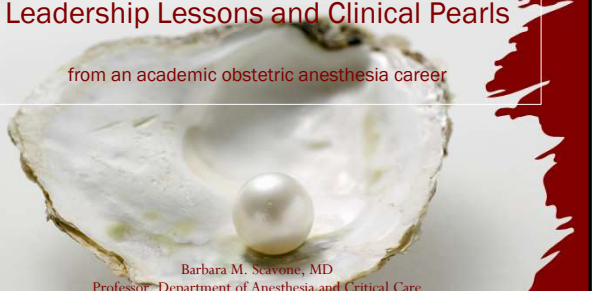
reported fasting times in concordance with ASA, the gastric content could not reliably be reduced to low aspiration risk in this cohort. Delayed gastric emptying was likely due to pain or stress of labor, and results suggest ASA fasting time intervals should only start from after delivery.

References: 1. ACOG Committee Opinion # 827
2. Obstet Gynecol 2010; 116:1071–7

Cariello, Table 1, GUS study.PDF

Leadership Lessons and Clinical Pearls

from an academic obstetric anesthesia career



Barbara M. Scavone, MD
Professor, Department of Anesthesia and Critical Care
Professor, Department of Obstetrics and Gynecology
The University of Chicago

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I have no financial interests or conflicts to disclose.

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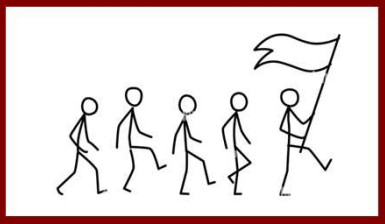
1) Vision

2) Followers



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5

What is your passion?

6

How do you get everyone on board?

7

Take Care of Your People, and They'll Take Care of Business

BY ROBERT GABSA AND SHRUTI RASTOGI

8

Advocate!

- What are their goals?
- What are the barriers?
- What do they need?

9

Give your team members all the glory.

10

Give people a voice.

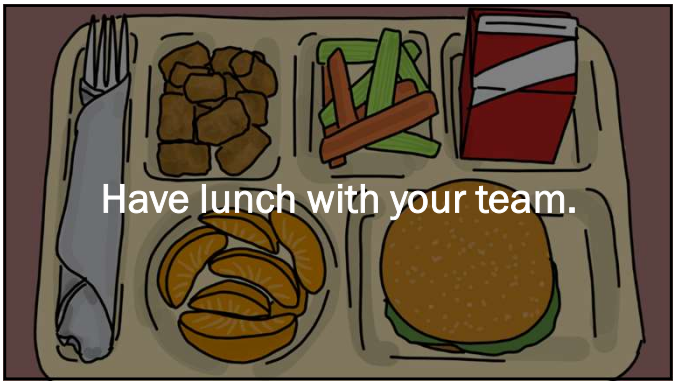
11

Keep your ear to the ground.

12

You must be present.

13



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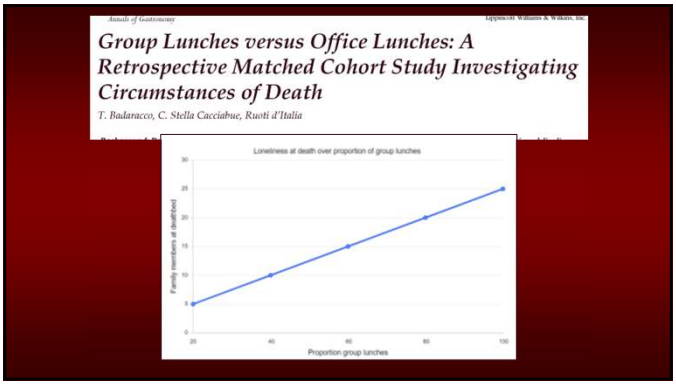

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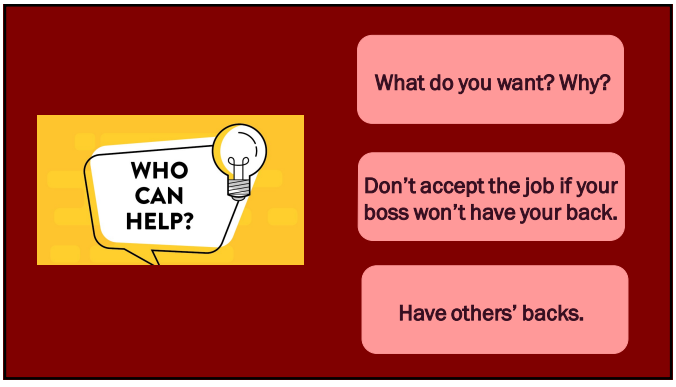

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Just apologize!

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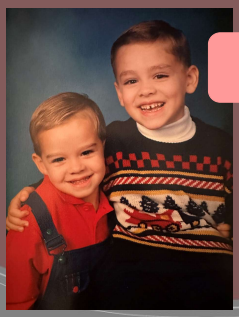

Don't tell on your colleagues.

Don't get drawn it to petty squabbles.

26

Don't let thoughts of a potential lawsuit dictate your clinical decisions.

27

28

Always strive to be worthy of your patients' trust.

29

30

SOAP 2024
ANNUAL MEETING

Wrangling the Experts

Katherine Arendt, MD
Joy Hawkins, MD
Lawrence Tsen, MD
Feyce Peralta, MD

1

SOAP 2024
ANNUAL MEETING

No Disclosures

2

The Learning Objective:

At the conclusion of this activity, participants should be able to identify various clinical options for common obstetric anesthesia clinical choices.

SOAP Society for Obstetric Anesthesia and Perinatology **SOAP 2024** ANNUAL MEETING

3

There are many ways to perform excellent OB Anesthesia

SOAP Society for Obstetric Anesthesia and Perinatology **SOAP 2024** ANNUAL MEETING

4

Structure

Clinical case presented

These experts offer opposing clinical options

Vote on which course of action you follow in your practice

5

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

Do you insist on seeing this patient upon arrival to L&D?

6

Case 1: Induction of Labor

Audience Vote:
Yes, a member of our anesthesia team sees every patient admitted to labor and delivery

No, I do not see the patient unless I am alerted from something I see on the EMR or from the nurse

7

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

Upon Admission, she would like to order Burger King. What do you inform her regarding eating and drinking restrictions?

8

Eating in Labor References

Practice Guidelines for Obstetric Anesthesia: An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology. Anesthesiology 2016; 124: 270-300.

Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures: An Updated Report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration. Anesthesiology 2017; 126: 376-93.

9

Case 1: Induction of Labor

Audience Vote:
Moderate amounts of clear fluids until delivery

Eat whatever you like until you feel like you need pain relief

Eat whatever you like until delivery

10

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

Her induction is initiating with vaginal Cytotec. She requests no intravenous line for her labor. How do you respond?

11

Case 1: Induction of Labor

Audience Vote:
I would ask that our OB Care Team not initiate the IOL without an IV

I would be sure a risk, benefit, alternative discussion was had with the patient and then leave the decision to the OB Care Team.

I would insist that we intervene with an IV placement only if needed

12

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

Her labor has begun, and she is in pain. She would like Nitrous Oxide. Do you support the use of nitrous oxide labor analgesia?

13

Nitrous Oxide References

Likis FE, et al. **Nitrous Oxide for the Management of Labor Pain: A Systematic Review.** Anes Analg 2014. 118: 153-167.

King TL, Wong CA. **Nitrous Oxide for Labor Pain: Is it a Laughing Matter?** Anes Analg 2014. 118: 12-14.

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Rollins MD, Arendt KW et al. **ASA Committee on Obstetric Anesthesia Working Group Statement on Nitrous Oxide**. https://www.asahq.org/about-asa/governance-and-committees/asa-committees/committee-on-obstetric-anesthesia/nitrous-oxide

14

Case 1: Induction of Labor

Audience Vote:
Yes

No

I leave that to the OB Care Team

15

Case 3: Labor Analgesia

Audience Vote:
Yes, I would support the use of nitrous oxide labor analgesia.

No, I would **not** support it.

16

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

The nitrous isn't cutting it and she would like IV analgesia. What do you recommend?

17

Case 1: Induction of Labor

Audience Vote:
Fentanyl pushes by the nurse

Fentanyl PCA

Remifentanil PCA

Dexmedetomidine infusion

18

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

She is now 4cm and would like an epidural. She is in 10/10 pain and is wondering why it is taking you so long! What do you recommend for her neuraxial technique?

19

CSE vs Epidural vs DPE References

Heesen M, Van de Velde M, Klohr S, Lehberger J, Rossaint R, Straube S. **Meta-analysis of the success of block following combined spinal-epidural vs epidural analgesia during labour**. Anaesthesia 2014; 69: 64-71.

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Tan HS, Reed SE et al. **Quality of Labor Analgesia with Dural Puncture Epidural versus Standard Epidural Technique in Obese Parturients: A Double-blind Randomized Controlled Study**, Anesthesiology 2022; 136: 678–687

Segal S., Pan P. Editorial: **Dural Puncture Epidural for Labor Analgesia: Is It Really an Improvement over Conventional Labor Epidural Analgesia?** Anesthesiology 2022; 136: 667–669

20

Case 1: Induction of Labor

Audience Vote:
a. Epidural
b. Dural Puncture Epidural
c. CSE with IT fentanyl and bup
d. CSE with just IT fentanyl
e. CSE with just IT bup

21

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

Do you test dose your epidural catheter, and if so, how?

22

Case 1: Induction of Labor

Audience Vote:
a. No, every dose is a test dose. I just initiate the bolus of my epidural infusion
b. Yes, 3cc 1.5%lido with 1:200,000 epi

23

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

What epidural infusion mix will you initiate?

24

Case 1: Induction of Labor

Audience Vote:
A. 0.0625% bupivacaine + 2 mcg/ml fentanyl
B. 0.08% bupivacaine + 2 mcg/ml fentanyl
C. 0.1% bupivacaine + 2mcg/mL fentanyl
D. 0.125% bupivacaine + 2mcg/mL fentanyl
E. We use more concentrated bupivacaine
F. We use ropivacaine

25

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

What pump settings do you use?

26

Case 1: Induction of Labor

Audience Vote:
A. Continuous infusion
B. Continuous infusion with PCEA
C. PIEP
D. PIEP with PCEA

27

Case 1: Induction of Labor

G1P0 at 41 weeks gestation arrives for elective induction of labor. She is 75kg, her airway is MPI and she is otherwise healthy.

Her cervix is unfavorable and she says she does not want to speak with anesthesia because she wants an unmedicated delivery.

The patient has excellent pain control for delivery but 18 hours after delivery, she is complaining of a severe positional headache. Her history and physical exam are consistent with a PDPH. How do you treat this?

28

Case 1: Induction of Labor

Audience Vote:
a. At least 24 hours of conservative treatment including caffeine, fluids, Tylenol, and NSAIDs.
b. I would offer her an epidural blood patch immediately
c. I would offer her a sphenopalentine block immediately

29

30

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

What anesthetic do you offer this patient?

31

Case 2: Repeat Cesarean Delivery

Audience Vote:
A. Single shot spinal
B. CSE

32

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

Upon completion of the block, you lay the patient down. What position do you place her in?

33

Positioning for Cesarean Delivery

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34

Case 2: Repeat Cesarean Delivery

Audience Vote:
A. If she has no history of supine hypotension syndrome, I allow her to lay flat on her back
B. 15 degrees left uterine displacement
C. 30 degrees left uterine displacement

35

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

How do you prevent spinal induced hypotension?

36

Case 2: Repeat Cesarean Delivery

I use the following technique(s) to prevent spinal induced hypotension:

Fluids

- ❑ I **preload** the patient with 1 liter of **crystalloid** prior to going to OR
- ❑ I **preload** the patient with 1 liter of **colloid** prior to going to OR
- ❑ I **co-load** crystalloid such that I open the fluids prior to placing the spinal

Vasopressors

- ❑ I use **ephedrine only** to **treat** hypotension in pregnancy
- ❑ I use phenylephrine only to **treat** hypotension in pregnancy
- ❑ I use **prophylactic phenylephrine on a pump**
- ❑ I **bolus prophylactic phenylephrine**
- ❑ I use **prophylactic norepinephrine on a pump**
- ❑ I **bolus prophylactic norepinephrine**

37

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

Do you place oxygen on this patient?

38

Case 2: Repeat Cesarean Delivery

Audience Vote:

A. No
B. Yes, via face mask
C. Yes, via nasal canula

39

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

What techniques do you use to prevent PONV?

40

PONV prophylaxis for Cesarean Delivery

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41

Case 2: Repeat Cesarean Delivery

I use the following drug(s) to prevent PONV:

- ❑ Scopolamine patch
- ❑ Metoclopromide IV
- ❑ Ondansetron IV
- ❑ Granisitron IV
- ❑ Dexamethasone IV
- ❑ Promethazine IV
- ❑ Diphenhydramine IV
- ❑ Haloperidol IV
- ❑ Dexmedetomidine IV

- ❑ Do you administer your PONV prophylaxis ***before or after*** cord clamping?

42

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

The patient is shivering uncontrollably, do you offer treatment?

43

Case 2: Repeat Cesarean Delivery

Audience Vote:
A. I offer meperidine 12.5mg IV
B. I offer dexmedetomidine 8-16mg IV
C. I do not treat shivering with medications

44

Case 2: Repeat Cesarean Delivery

G2P1 at 39 weeks gestation arrives for repeat Cesarean Delivery.

She is 95kg, her airway is MPIII and she is otherwise healthy.

After delivery of the newborn the patient begins complaining of diffuse abdominal pain and pressure. You did a single shot spinal. She is grimacing and clearly uncomfortable, what do you do?

45

Case 2: Repeat Cesarean Delivery

Audience Vote:
Utilizing a shared decision-making model, I encourage the patient to allow us to:
a. Convert to general anesthesia
b. Treat with Ketamine
c. Treat with dexmedetomidine
d. Initiate a propofol infusion

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Thank you!

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SOAP 2024 Annual Meeting, Denver, CO
Katherine Arendt, MD; Joy Hawkins, MD; Feyce Peralta, MD; Lawrence Tsen, MD

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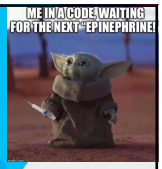
Intrathecal Epinephrine: Another Way to Administer an Amazing Drug



Epinephrine

Nature's reward for risky behavior.

Daniel Katz, MD

Icahn School of Medicine at Mount Sinai

1

I have no relevant financial disclosures…

2

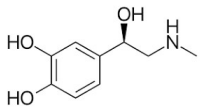
What we will cover

1. Brief review of epinephrine
2. Utility as an adjunct for local anesthetics
3. Evidence for use in cesarean delivery
4. Practical tips and tricks

3

Epinephrine in Brief!

- Endogenous Catecholamine
  - Hormone
  - Neurotransmitter
- Activates all adrenergic receptors
  - Alpha 1,2
  - Beta 1,2,3
- Crisis Cure All
  - 10 mcg for bronchospasm
  - 100 mcg for anaphylaxis
  - 1,000 mcg for ACLS



4

In Combination with Local Anesthetics

- Decreases systemic absorption
  - Local vasoconstriction
- Lowers toxicity

Agent	Techniques	Concentrations Available	Maximum Dose (mg/kg)	Typical Duration of Nerve Blocks[1]
Amides				
Bupivacaine	Epidural, spinal, infiltration, peripheral nerve block	0.25%, 0.5%, 0.75%	3	Long
Lidocaine (lignocaine)	Epidural, spinal, infiltration, peripheral nerve block, intravenous regional, topical	0.5%, 1%, 1.5%, 2%, 4%, 5%	4.5 7 [with epinephrine]	Medium
Mepivacaine	Epidural, infiltration, peripheral nerve block, spinal	1%, 1.5%, 2%, 3%	4.5 7 [with epinephrine]	Medium
Ropivacaine	Epidural, spinal, infiltration, peripheral nerve block	0.2%, 0.5%, 0.75%, 1%	3	Long

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In Combination with Local Anesthetics

- Enhances Block Quality
  - Vasoconstriction
  - Alpha-2 Agonism
    - Dorsal Horn Spinal Cord
    - Prejunctional
      - Reduced neurotransmitter release
    - Postjunctional
      - Hyperpolarization (decrease pulse transmission)

6

In Combination With Local Anesthetics

Benefit and Harm of Adding Epinephrine to a Local Anesthetic for Neuraxial and Locoregional Anesthesia: A Meta-analysis of Randomized Controlled Trials With Trial Sequential Analyses

Clément Tschopp, MD, MSc,* Martin R. Tramèr, MD, DPhil,*† Alexis Schneider, MD,* Maroun Zaarour, MD,* and Nadia Elia, MD, MSc*‡

- 70 Trials
- 3,644 Patients
- 17 Countries
- 1970-2017

- 70 Trials
  - 37 Epidural
  - 27 Intrathecal
  - 6 Locoregional
    - Femoral
    - Popliteal
    - Axillary

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In Combination With Local Anesthetics

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Clément Tschopp, MD, MSc,* Martin R. Tramèr, MD, DPhil,*† Alexis Schneider, MD,* Maroun Zaarour, MD,* and Nadia Elia, MD, MSc*‡

- Intrathecal Trials
  - Bupivacaine
  - Tetracaine
  - Lidocaine
  - Chloroprocaine
  - 15-500 mcg

Surgical Types
- CD: 6
- GU: 6
- Ortho: 5
- Gyn: 2
- Mix: 2

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In Combination With Local Anesthetics

Benefit and Harm of Adding Epinephrine to a Local Anesthetic for Neuraxial and Locoregional Anesthesia: A Meta-analysis of Randomized Controlled Trials With Trial Sequential Analyses

Clément Tschopp, MD, MSc,* Martin R. Tramèr, MD, DPhil,*† Alexis Schneider, MD,* Maroun Zaarour, MD,* and Nadia Elia, MD, MSc*‡

- Time to Max Height: 1.4 min [0.2-2.9]
- Analgesic Duration: 34 min [5.9-62]
- Motor Block: 64 min [37-91]
- 2 Segment Regression: 20 min [11-28]

No Impact
- Onset Time
- Bradycardia
- Ephedrine Requirement
- Pruritus
- PONV
- Pain Intensity at Rest

9

In Combination With Lidocaine?

- 80 Women

Effect of Epinephrine on Intrathecal Fentanyl Analgesia in Patients Undergoing Postpartum Tubal Ligation

A. M. Malinow, M.D.,* B. L. K. Mokriski, M.D.,† M. K. Nomura, M.D.,‡ M. A. Kaufman, M.D.,‡ J. A. Snell, M.D.,‡ G. D. Sharp, M.D.,‡ R. A. Howard, M.D.§

	L (n = 19)	LE (n = 21)	LF (n = 19)	LFE (n = 18)	Significance
Peak dermatome of sensory anesthesia	C7 ± 3	C8 ± 2	C8 ± 2	C8 ± 2	NS
Time to peak sensory anesthesia (min)	21 ±16	16 ±10	14 ±10	18 ±11	NS
Time to 2-segment regression (min)	67 ±23	77 ±29	71 ±23	83 ±33	NS
Time to sacral regression (min)	145 ±34	194 ±26*	156 ±42	214 ±56*	$P < 0.0005$
Time to complete motor block (min)	3.1 ± 3.1	3.4 ± 2.5	3.6 ± 2.6	5.1 ± 3.9	NS
Time to complete motor recovery (min)	108 ±37	146 ±41*	106 ±36	156 ±55*	$P < 0.0005$
Incidence of intraoperative discomfort (no. scores = 1, 2, or 3)	4	3	3	2	NS
Patients requiring ephedrine (%)	57	61	47	61	NS

* Different as compared to patient groups L, LF. NS = no significant difference between patient groups.

TABLE 4. Characteristics of Analgesia

	L (n = 19)	LE (n = 21)	LF (n = 19)	LFE (n = 18)	Significance
Duration of pain score = 0 (min)	65 ± 36	76 ± 32	85 ± 44	137 ± 47*	$P < 0.0005$
Time to first request for supplemental analgesia (min)	198 ± 342 (48–1440) (60, 74, 107)	227 ± 201 (44–825) (120, 150, 270)	203 ± 178 (23–840) (123, 150, 240)	502 ± 504* (105–1440) (195, 355, 1005)	$P < 0.005$
24-h opioid requirements (mg morphine equiv.)	10 ± 8	8 ± 4	10 ± 7	8 ± 13	NS

10

In Combination With Bupivacaine?

- "...bupivacaine spinal duration may be increased, but because of the already long duration, epinephrine is not generally added to bupivacaine..."

Brull, Macfarlane, Chan. Spinal, Epidural, and Caudal Anesthesia; Miller's Anesthesia, 9th Edition 1413-1449

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In Combination with Bupivacaine for Cesarean Delivery?

- 68 parturients
- Control, 100 mcg, 200 mcg

Study Group	Time to Reach T-4 (min)	*P* Value	Number Failed to Reach T-4	*P* Value
HD N = 21	8 [6, 8]		1	
LD N = 22	8 [6, 10]		1	
NE N = 22	8 [6, 8]		0	
		.94		.99

Numbers expressed as medians and [first, third quartile]. Statistical test for time to reach T-4 and number failed to reach T-4 were log-rank test and Fisher exact test, respectively.
Abbreviations: HD, high-dose group; LD, low-dose group; NE, no epinephrine.

	Group	Median Recovery Time (min) (95% CI)	Median Difference (min) to NE Group (95% CI)	Comparative *P* Value to the NE Group	Median Difference (min) to LD Group (95% CI)	Comparative *P* Value to LD Group
Time to T-10 regression (min)	HD N = 21	165 (150–180)	40 (15–60)	.007	30 (15–45)	.007
	LD N = 22	135 (120–150)	10 (15–30)	.76		
	NE N = 22	120 (45–150)				

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In Combination with Bupivacaine for Cesarean Delivery?

- Block Quality

Table 2 Rating of Analgesia and Supplementation

Study group	n = 32 (100%)
Excellent (no supplementation)	25 (78%)
Very good (>5 mg morphine)	6 (19%)
Good (>5–10 mg morphine)	0 (0%)
Poor (>10 mg morphine) (general anesthesia)	1 (3%) 0 1
Control group	n = 31 (100%)
Excellent (no supplementation)	14 (45%)
Very good (>5 mg morphine)	5 (16%)
Good (>5–10 mg morphine)	10 (33%)
Poor (15 mg morphine) (15 mg morphine and general anesthesia)	2 (6%) 1 1

Significant difference between the two groups: $P < 0.05$.

Table 4. Intraoperative and Postoperative Analgesia

Analgesia	IT[a] epinephrine (n = 21)	IT morphine (n = 20)	IT combination (n = 29)
Intraoperative			
Excellent or very good	17 (80.8%)	18 (90%)	29 (100%)[b]
Excellent	14 (66.6%)	14 (70%)	28 (96.5%)[b]
Very good	3 (14.2%)	4 (20%)	1 (3.5%)
Good	1 (4.8%)	2 (10%)	0 (0%)
Poor	3 (14.4%)	0 (0%)	0 (0%)
Postoperative, 24 h			
Patient requiring narcotics, n (%)	21 (100)[b]	12 (60)	14 (48%)
Effective analgesia time in those requiring narcotics (min)	184 ± 43[b]	634 ± 51	670 ± 65
Total dose of morphine for those requiring narcotics (mg)	22.2 ± 2.5[b]	9.8 ± 1.5	11.1 ± 1.3

[a] IT = intrathecal.
[b] Significantly different from other two groups: $P < 0.05$.

- Lower Pain Scores on Uterine Closure

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Why Epi?

14

Why Epi?

"Spinal/CSE anaesthesia was associated with a lower overall prevalence of inadequate neuraxial anaesthesia than epidural anaesthesia: 10.2% (9.0–11.4%) vs. 30.3% (26.5–34.5%)"

Patel R, Kua J, Sharawi N, Bauer ME, Blake L, Moonesinghe SR, Sultan P. Inadequate neuraxial anaesthesia in patients undergoing elective caesarean section: a systematic review. Anaesthesia. 2022 May;77(5):598-604. doi: 10.1111/anae.15657. Epub 2022 Jan 22. PMID: 35064923.

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Why Epi?

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Downsides

- Systemic absorption
  - Tachycardia and Hypertension
- Vasoconstriction of the cord
  - 200 mcg or lower
    - No human data
    - Animal data
- Drug error
  - 1972-2022
  - 10 Drugs
    - Digoxin
    - Ephedrine
    - Labetalol
  - 33 Patients
    - ½ Epidural
    - ½ Intrathecal

Table 3
Medication, Source, Mode of Administration, and Preventive Measures for Neuraxial Cardiovascular Drug Errc

Drug Involved (References)	No. of Patients	Primary Source of Error
Digoxin[4–9]	8	Ampoule error
	1	5 Syringe error
Dobutamine[10–11]	1	Ampoule error
	1	Vial error
Dopamine[12–14]	2	Ampoule error
	1	ED-IV line confusion
Ephedrine[15–19]	6	Syringe swap
Epinephrine[20–21]	1	Syringe swap
	1	Syringe swap
Labetalol[22–23]	2	Ampoule error
	1	IT (catheter)-IV line confusion
	1	Vial error
Metaraminol[24–27]	4	Syringe swap
Mexiletine[28]	1	ED-IV line confusion
Norepinephrine[29]	1	Ampoule error
Phenylephrine[30]	1	ED-IV line confusion

Kozody R., Palahniuk R.J., Wade J.G., et. al.: The effect of subarachnoid epinephrine and phenylephrine on spinal cord blood flow. Can Anaesth Soc J 1984; 31: pp. 503-508.

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Downsides

- Prolonged duration!
  - Pacu

	Group	Median Recovery Time (min) (95% CI)	Median Difference (min) to NE Group (95% CI)	Comparative *P* Value to the NE Group	Median Difference (min) to LD Group (95% CI)	Comparative *P* Value to LD Group
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	LD N = 22	135 (120–150)	10 (15–30)	.76		
	NE N = 22	120 (45–150)				
Time to Bromage 3 (min)	HD N = 21	172 (150–210)	60 (30–93)	.007	30 (0–60)	.034
	LD N = 22	150 (135–150)	37.5 (15–60)	.001		
	NE N = 22	120 (105–120)				

Abbreviations: CI, confidence interval; HD, high-dose group; LD, low-dose group; NE, no epinephrine group.

Katz D, Hamburger J, Gutman D, Wang R, Lin HM, Marotta M, Zahn J, Beilin Y. The Effect of Adding Subarachnoid Epinephrine to Hyperbaric Bupivacaine and Morphine for Repeat Cesarean Delivery: A Double-Blind Prospective Randomized Control Trial. Anesth Analg. 2018 Jul;127(1):171-178. doi: 10.1213/ANE.0000000000002542. PMID: 29077615.

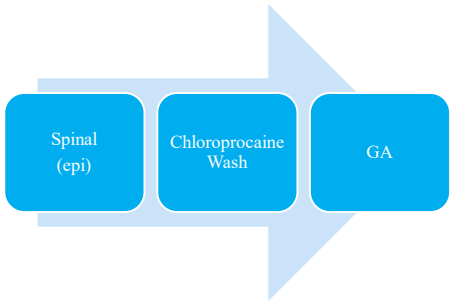
18

What do I do?

- My Mix
  - 1.5 mL hyperbaric bupi + 0.25 mL morphine + 0.25 mL fentanyl +0.2 mL epinephrine = 2.2 mL
- On whom?
  - Duration
    - Tertiary or greater
    - Adhesions
    - Obstetrician
  - Quality
    - Exteriorization
    - PAS
    - Extended incisions

19

What do I do?



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In Summary

- Great adjunct
- 200 mcg
  - Longer Duration
  - Enhanced Quality
- High order sections
- Uterine manipulations
- More time in the PACU

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Spinal adjuvants: clonidine & dexmedetomidine

Ruthi Landau, MD
Virginia Apgar Professor of Anesthesiology
Director of Obstetric Anesthesia
SOAP Past President

Columbia University Irving Medical Center | Department of Anesthesiology

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No disclosures

1

Twitter
@Twitter

Dr. Ruthi Landau
@ruthi_landau

#SOAPAM2024 coming soon!

Is anyone using spinal adjuvants for cesarean delivery?
#dexmedetomidine #clonidine

YES clonidine & YES dex	1.6%
Yes clonidine but NO dex	17.7%
NO clonidine but YES dex	11.3%
Hell NO - never will	**69.4%**

62 votes · Final results

2:30 AM · Apr 5, 2024 · **1,656** Views

2

Why consider a spinal adjuvant for cesarean delivery

During cesarean delivery
- Analgesia - denser block (tugging)
- Longer block (repeat CD, longer surgery)
- Sedation
- Anti-shivering

After cesarean delivery
- Prolonged analgesia
- Anti-hyperalgesia
- Opioid-sparing
- Anti-shivering

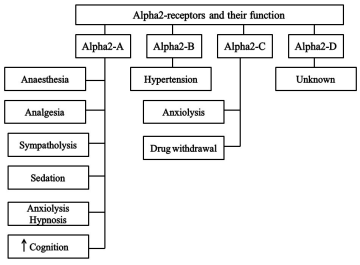
Hypotension – bradycardia
Neonatal effects?

In PACU (prolonged stay)
Prolonged hypotension
Excessive motor block

Black box warning

3

α_2-agonists



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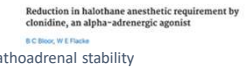
Clonidine

- 1962: synthesized as nasal decongestant
- 1972: marketed as antihypertensive
- 1982: anesthetic adjuvant
  - Perioperative cardiovascular and sympathoadrenal stability
  - To enhance general and regional anesthesia, sedation, and analgesia


> Anesth Analg. 1982 Sep;61(9):741-5.

Reduction in halothane anesthetic requirement by clonidine, an alpha-adrenergic agonist

B C Bloor, W E Flacke

α_2-agonist stimulates α_2-adrenoceptors in the brain & spinal cord
- ↓ sympathetic outflow from SNC
- Activation of pre-synaptic α_2-adrenoceptors ↓ norepinephrine release at the synapse
  - ↓ HR, CO, and BP
- Activation of post-synaptic α_2-adrenoceptors in the dorsal horn - analgesia

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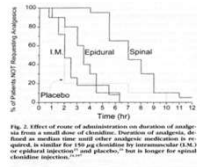
Clonidine – regional anesthesia

- Supraspinal site of action in the nucleus coerulus
- Spinal site of action in the dorsal horn & cholinergic activation
- Sensory-motor block
- Enhance analgesia from spinal opioids



α'-Adrenergic Agonists for Regional Anesthesia: A Clinical Review of Clonidine (1984 - 1995)

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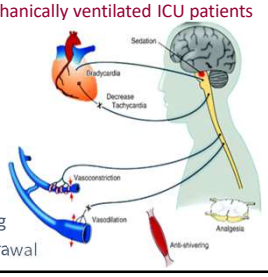
Dexmedetomidine – systemic effects

- 1999: sedation & analgesia for mechanically ventilated ICU patients
- Highly selective α_2 agonist
  - Sympatholytic
  - Sedative & anxiolytic
  - Analgesic & opioid-sparing
  - Reduces emergency delirium
  - Reduces post-anesthetic shivering
  - Mitigates alcohol & opioid withdrawal



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Clonidine & dexmedetomidine

	Clonidine	Dexmedetomidine
Primary effect	Anti-hypertension	Sedation
α_2 selectivity	$\alpha_{2/1}$= 220:1	$\alpha_{2/1}$= 1620:1
$T_{1/2}\beta$	8h	2h
Respiratory depression	none	none
Uterine contractility	+	++
Placental retention Fetal exposure	+ ++	++ +
Milk:plasma (& RID)		0.76 (0.034%)

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Clonidine – in obstetric anesthesia

- Epidural (bolus/infusion) for labor analgesia
  - Top-up for breakthrough pain
  - PCEA during labor
  - OUD
- Spinal for prolongation of labor analgesia
- Epidural for cesarean delivery
- Spinal for cesarean delivery
- Abdominal wall blocks (TAP)

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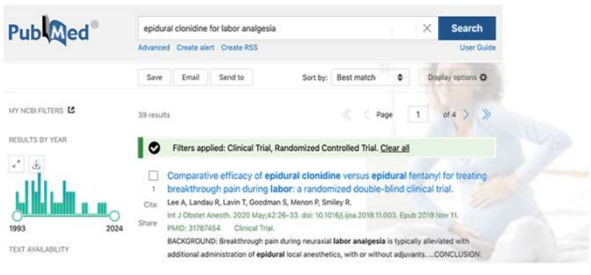
Epidural clonidine – labor analgesia



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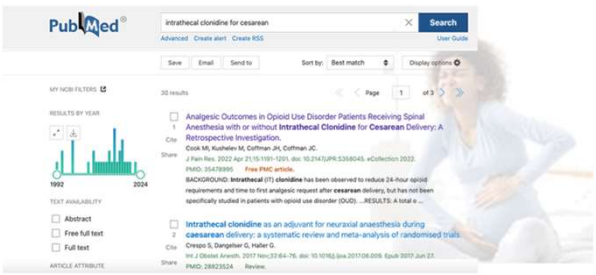
Intrathecal clonidine – cesarean anesthesia



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Intrathecal clonidine – cesarean anesthesia

Intrathecal clonidine 75mcg ± fentanyl 12.5mcg
Pain during cesarean delivery every 5 minutes
Decreased pain during CD, increased quality of analgesia, no side effects

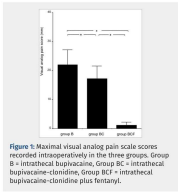

Figure 1: Maximal visual analog pain scale scores recorded intraoperatively in the three groups. Group B = intrathecal bupivacaine, Group BC = intrathecal bupivacaine-clonidine, Group BCF = intrathecal bupivacaine-clonidine plus fentanyl.

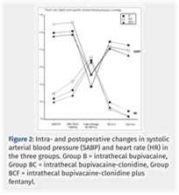

Figure 2: Intra- and postoperative changes in systolic arterial blood pressure (SABP) and heart rate (HR) in the three groups. Group B = intrathecal bupivacaine, Group BC = intrathecal bupivacaine-clonidine, Group BCF = intrathecal bupivacaine-clonidine plus fentanyl.

Intrathecal clonidine and fentanyl with hyperbaric bupivacaine improves analgesia during cesarean section

12

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Intrathecal clonidine – cesarean anesthesia

Dose-finding study (morphine 100mcg + clonidine 30-150mcg)
Time to iv PCA use + cumulative opioid use
Morphine 100 mcg + clonidine 60mcg or more increased duration of post-cesarean analgesia, reduced opioid requirement, and increased intraoperative sedation.

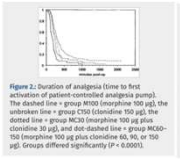

Figure 2.: Duration of analgesia (time to first activation of patient-controlled analgesia pump). The dashed line = group M100 (morphine 100 μg), the unbroken line = group C150 (clonidine 150 μg), the dotted line = group MC30 (morphine 100 μg plus clonidine 30 μg), and dot-dashed line = group MC60–150 (morphine 100 μg plus clonidine 60, 90, or 150 μg). Groups differed significantly ($P < 0.0001$).

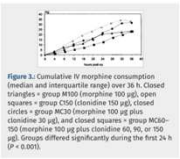

Figure 3.: Cumulative IV morphine consumption (median and interquartile range) over 36 h. Closed triangles = group M100 (morphine 100 μg), open squares = group C150 (clonidine 150 μg), closed circles = group MC30 (morphine 100 μg plus clonidine 30 μg), and closed squares = group MC60–150 (morphine 100 μg plus clonidine 60, 90, or 150 μg). Groups differed significantly during the first 24 h ($P < 0.001$).

Postcesarean Analgesia with Spinal Morphine, Clonidine, or Their Combination

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Intrathecal clonidine – cesarean anesthesia

12 studies – intrathecal clonidine (15-150mcg)
- Did not increase the level of block

Intrathecal clonidine as an adjuvant for neuraxial anaesthesia during caesarean delivery: a systematic review and meta-analysis of randomised trials

- Analgesia increased by 112 min (95%CI 55-169; p<0.01) when added to bupivacaine, and 181min (95%CI 84-279; p<0.01) when added to bupivacaine & morphine
- Dose-dependent effect
  Low dose (15-49mcg) – High dose (76-150mcg)
  - Duration of analgesia from 177min (95%CI 110-463) to 258min (95%CI 168-348) (p=0.03)
  - Duration of motor block from 14min (95%CI 9-20) to 120min (95%CI 67-173) (p<0.01)
- Increased sedation (central effect)
- No increase in hypotension, pruritus or PONV.
- Apgar scores at 1 or 5min not influenced by the addition of intrathecal clonidine.

Clonidine is an effective and safe adjuvant to local anesthetics for spinal anesthesia for cesarean delivery. This opens the debate as to whether intrathecal clonidine as an "off label" prescription should be reconsidered by medical regulatory authorities.

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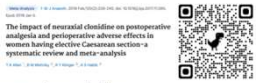
Intrathecal clonidine – cesarean anesthesia

18 studies – neuraxial clonidine
- reduced 24 h morphine consumption
- prolonged time to first analgesic request
- increased intraoperative hypotension
- reduced the need for intraoperative analgesic supplementation



The impact of neuraxial clonidine on postoperative analgesia and perioperative adverse effects in women having elective Caesarean section-a systematic review and meta-analysis

The effect of clonidine on intraoperative bradycardia, intraoperative and postoperative nausea and vomiting, postoperative sedation, and pruritus were inconclusive. Did not negatively impact neonatal umbilical artery pH or Apgar scores.

Neuraxial clonidine enhances postoperative analgesia in women with cesarean delivery with neuraxial anesthesia, but this has to be balanced against increased maternal adverse effects.

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Dexmedetomidine – in obstetric anesthesia

- IV (bolus/infusion) for labor analgesia
- Spinal (CSE) for labor analgesia
- Epidural for labor analgesia
- Nebulization for management of PDPH
- IV (bolus/infusion) for cesarean general anesthesia
- IV sedation for cesarean under neuraxial anesthesia
- IV prevention of shivering during/post cesarean under spinal
- IV prevention of postpartum depression post-birth (48h)
- IV PCA for post-cesarean analgesia
- Spinal for cesarean delivery

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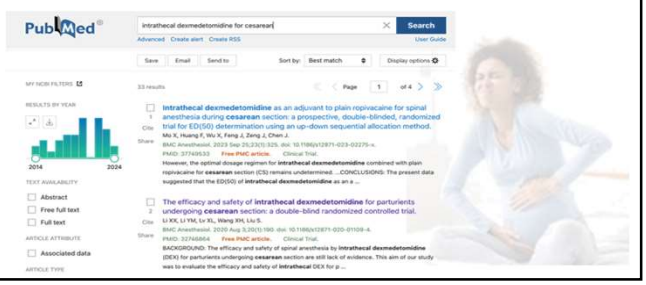
Intrathecal dexmedetomidine – cesarean anesthesia



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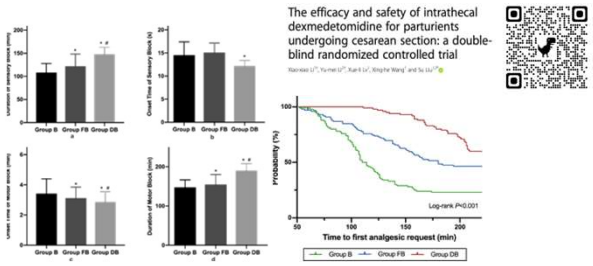
Spinal dexmedetomidine (5mcg)



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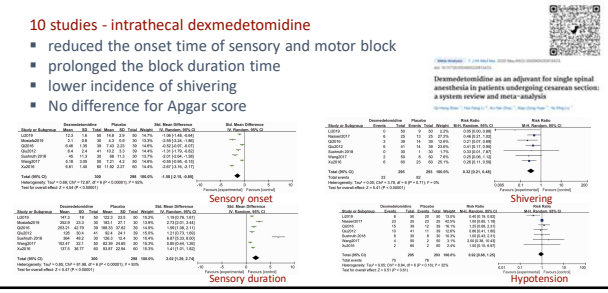
Spinal dexmedetomidine (2.5-7.5mcg)

10 studies - intrathecal dexmedetomidine
- reduced the onset time of sensory and motor block
- prolonged the block duration time
- lower incidence of shivering
- No difference for Apgar score



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Take home

Intrathecal clonidine (15-150mcg) > 25 years
- Reduces pain during cesarean delivery
- Dose-response effect on duration of analgesia & motor block
- Opioid-sparing (particularly in patients with OUD)
- Anxiolysis/sedation
- Anti-hyperalgesic? Anti-shivering?
- Hypotension ?

Intrathecal dexmedetomidine (2.5-7.5mcg) ~ 9 years
- Reduces onset time
- Prolongs duration of block
- Prevention of shivering
- No hypotension

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Why consider a spinal adjuvant for cesarean delivery

Black Box Warning

WARNING

See full prescribing information for complete Boxed Warning.

Obstetrical, postpartum, or perioperative pain management: **Clonidine hydrochloride injection (epidural clonidine) is not recommended for obstetrical, postpartum, or perioperative pain management. The risk of hemodynamic instability, especially hypotension and bradycardia, from epidural clonidine may be unacceptable in these patients. However, in a rare obstetrical, postpartum or perioperative patient, potential benefits may outweigh the possible risks.**

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MAY 1-5, 2024
SHERATON DENVER DOWNTOWN HOTEL
DENVER, COLORADO
SOAP

1

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ANNUAL MEETING
Laura Sorabella, MD
Neuraxial
Buprenorphine

2

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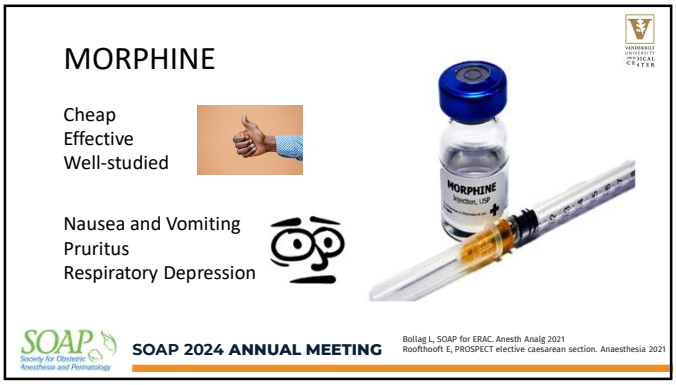
No disclosures.

3


MORPHINE
Cheap
Effective
Well-studied
Nausea and Vomiting
Pruritus
Respiratory Depression
MORPHINE
SOAP 2024 ANNUAL MEETING
Bollag L, SOAP for ERAC. Anesth Analg 2021
Rooftthooft E, PROSPECT elective caesarean section. Anaesthesia 2021

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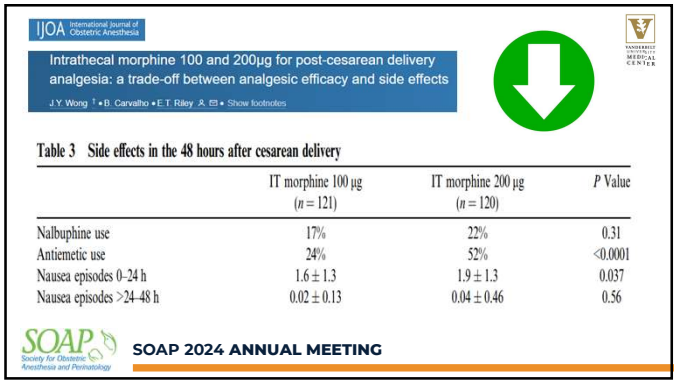
IJOA International Journal of Obstetric Anesthesia
Intrathecal morphine 100 and 200µg for post-cesarean delivery analgesia: a trade-off between analgesic efficacy and side effects
J.Y. Wong • B. Carvalho • E.T. Riley • Show footnotes
Table 3 Side effects in the 48 hours after cesarean delivery
IT morphine 100 µg (n = 121) | IT morphine 200 µg (n = 120) | P Value
Nalbuphine use | 17% | 22% | 0.31
Antiemetic use | 24% | 52% | <0.0001
Nausea episodes 0–24 h | 1.6 ± 1.3 | 1.9 ± 1.3 | 0.037
Nausea episodes >24–48 h | 0.02 ± 0.13 | 0.04 ± 0.46 | 0.56
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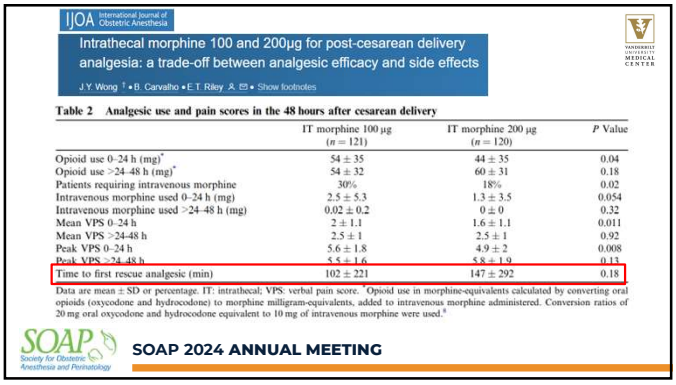
IJOA International Journal of Obstetric Anesthesia
Intrathecal morphine 100 and 200µg for post-cesarean delivery analgesia: a trade-off between analgesic efficacy and side effects
J.Y. Wong • B. Carvalho • E.T. Riley • Show footnotes
Table 2 Analgesic use and pain scores in the 48 hours after cesarean delivery
IT morphine 100 µg (n = 121) | IT morphine 200 µg (n = 120) | P Value
Opioid use 0–24 h (mg)* | 54 ± 35 | 44 ± 35 | 0.04
Opioid use >24–48 h (mg)* | 54 ± 32 | 60 ± 31 | 0.18
Patients requiring intravenous morphine | 30% | 18% | 0.02
Intravenous morphine used 0–24 h (mg) | 2.5 ± 5.3 | 1.3 ± 3.5 | 0.054
Intravenous morphine used >24–48 h (mg) | 0.02 ± 0.2 | 0 ± 0 | 0.32
Mean VPS 0–24 h | 2 ± 1.1 | 1.6 ± 1.1 | 0.011
Mean VPS >24–48 h | 2.5 ± 1 | 2.5 ± 1 | 0.92
Peak VPS 0–24 h | 5.6 ± 1.8 | 4.9 ± 2 | 0.008
Peak VPS >24–48 h | 5.5 ± 1.6 | 5.8 ± 1.9 | 0.13
Time to first rescue analgesic (min) | 102 ± 221 | 147 ± 292 | 0.18
Data are mean ± SD or percentage. IT: intrathecal; VPS: verbal pain score. *Opioid use in morphine-equivalents calculated by converting oral opioids (oxycodone and hydrocodone) to morphine milligram-equivalents, added to intravenous morphine administered. Conversion ratios of 20 mg oral oxycodone and hydrocodone equivalent to 10 mg of intravenous morphine were used.
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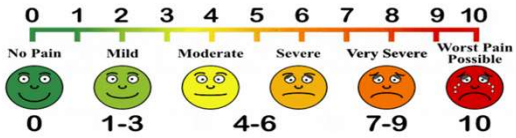
80% women report ***inadequate*** pain relief



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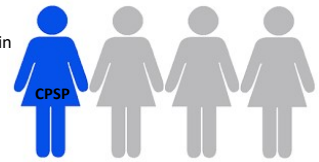
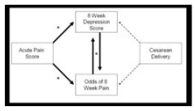
20% women experience ***severe*** acute pain

→ postpartum depression (3x risk)
→ chronic pain (2.5x risk)



Pain → acute opioid use → chronic dependence

- 1:300 after Cesarean delivery
- inpatient opioid use ≈ outpatient use



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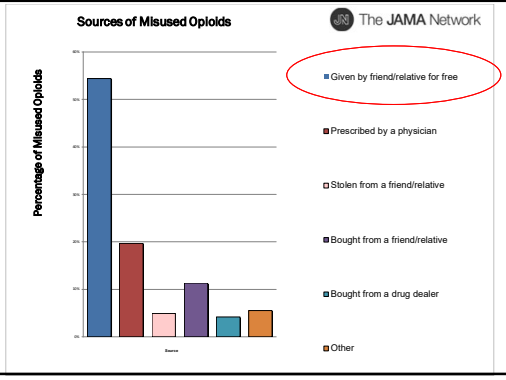

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- long-acting analgesia
- functional maternal status
- ↓ nausea, vomiting, pruritus
- ↓ respiratory depression

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Buprenorphine (BPN)

-**mixed** opioid receptor activity
-**agonism** at mu and NOP
-**antagonism** at kappa and delta
-**lipophilic**

-25X as potent as morphine

↓ euphoria
↓ respiratory depression

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Is it safe in pregnancy?

- Worldwide obstetric use since 1979
  - PO, SQ, epidural, intrathecal, and perineural
- ACOG gold standard oral opioid for Opioid Use Disorder (OUD)
- Best neonatal outcomes (MOTHER study)

IT route is considered off-label by FDA

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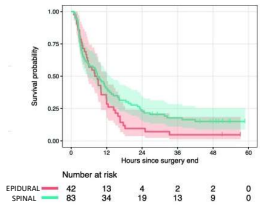
Neuraxial buprenorphine for post-cesarean delivery analgesia: a case series

L.L. Sorabella • H.B. Ende • S.R. Bellenger • M.F. Stewart • B. French • D.R. McIlroy • B.L. Raymond •



TTFO following CD: 8.9 hours

EPI and SPI similar

0-24 hour MME: 10

24-48 hour MME: 15

48-72 hour MME: 0

12% patients received no opioids post-op

PONV 12%
Pruritis 9% (all EPI BPN)

No respiratory depression or neurotoxicity

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IJOA International Journal of Obstetric Anesthesia

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Author (Year)	BPN dose	Duration of Analgesia (hours)	Surgery
Rabiee (2014)	60 mcg IT	18.73	Cesarean delivery
Shaikh (2010)	60 mcg IT	7.91	Lower limb orthopedic
Gupta (2014)	60 mcg IT	4.83	Abdominal
Capogna (1988)	300 mcg IT 450 mcg IT	3.1 7.2	Prostatectomy
Ipe (2010)	150 mcg IT 300 mcg EPI	6.0 17.0	Cesarean delivery
Cahill (1983)	60 mcg EPI	12.5	Abdominal
Lanz (1984)	300 mcg EPI	12.0	Lower limb orthopedic
Ackerman (1989)	300 mcg EPI	6.4	Cesarean delivery
Rondomanska (1982)	300 mcg EPI	24	Abdominal
Wolff (1986)	300 mcg EPI	10.3	Lower limb orthopedic

Duration of Analgesia in the Literature

60 mcg IT: 10.49 hr

300 mcg EPI: 13.94 hr

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Side Effects in the Literature

Pruritus

Author (Year)	Dose	Pruritus	Surgery
Wolff (1986)	300 mcg EPI	0%	Lower limb orthopedic
Ackerman (1989)	300 mcg EPI	0%	Cesarean delivery
Ipe (2010)	150 mcg IT 300 mcg EPI	20% 16%	Cesarean delivery

Nausea/Vomiting (N/V)

Author (Year)	Dose	N/V	Surgery
Wolff (1986)	300 mcg EPI	25%	Lower limb orthopedic
Capogna (1988)	300 mcg EPI 450 mcg EPI	26.6% 29.9%	Prostatectomy
Sen (1992)	300 mcg IT	30%	Lower limb orthopedic
Ipe (2010)	150 mcg IT 300 mcg EPI	20% 16%	Cesarean delivery

15

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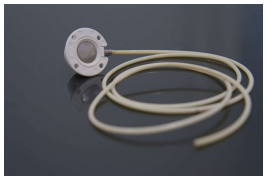
Chronic Pain Case Reports

IT BPN 114-150 mcg/day

-Excellent analgesia
-No N/V
-No Pruritus
-No Respiratory Depression



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Vanderbilt IT BPN QI TTFO data

17

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FDA

- Best dose of IT & EPI BPN?
- Ask patients analgesia vs. side effects?
- Role for other adjuvants?
- Who will require more opioids? COPE study

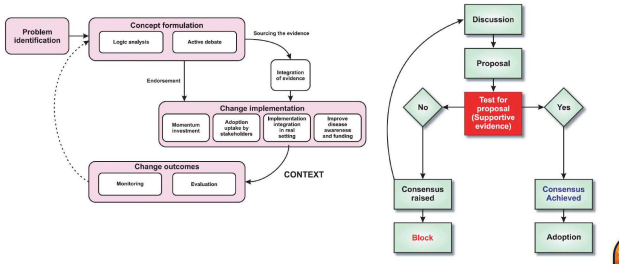
18

Research Panel

The Delphi Method

Ronald B. George, MD FRCPC
Professor & Director of Obstetric Anesthesiology
Mount Sinai Hospital
University of Toronto

Model for evidence-informed settling the debate



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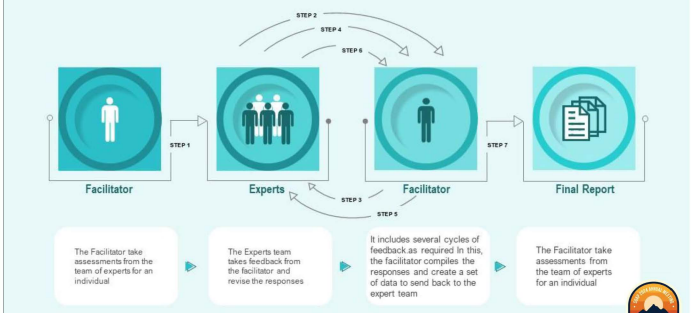

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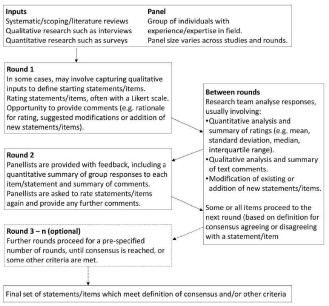

#SOAPAM2024 *Research in Social and Administrative Pharmacy 18 (2022) 2230–2236*

Table 4. Characteristics of the Delphi procedure.

Characteristics	Reported[a] n (%)	Present[b] n (%)
Type of Delphi procedure	**78 (98)**	
Modified		49 (63)
Basic		29 (37)
Not specified	2	
Timing of the meeting in modified Delphi procedures (n = 49)	**34 (69)**	
Between rounds		19 (56)
After the last round		15 (44)
Number of rounds		
Delphi	**23 (79)**	
Median (Q1;Q3)		3 (2;3)
Min;Max		2;4
Modified Delphi	**43 (88)**	
Median (Q1;Q3)		2 (2;3)
Min;Max		1;6
Delphi procedure duration (weeks)	**23 (29)**	
Median (Q1;Q3)		20 (8;28)
Main methods used to send the questionnaires[c]	**45 (56)**	
Mail		35 (78)
Internet		10 (22)
Telephone/Fax		3 (7)
Geographical scope	**71 (89)**	
National		60 (85)
International		11 (15)
Question formulation	**73 (91)**	
Rating scale + Open question		47 (64)
Rating scale		22 (30)
Open question (comments)		1 (2)
Other		3 (4)
Prioritize quality indicators		2
Remove and add quality indicators		1
Minimum value of rating scale (n = 69)		
Median(Q1;Q3)		1 (1;1)
Maximum value of rating scale (n = 69)		
Median(Q1;Q3)		9 (5;9)
Consensus methods	**62 (77)**	
Median score+Percentage of agreement		22 (35)
Median score		10 (16)
Percentage of agreement		9 (15)
Rand method		8 (13)

PLoS ONE 6(6): e20476. doi:10.1371/journal.pone.0020476

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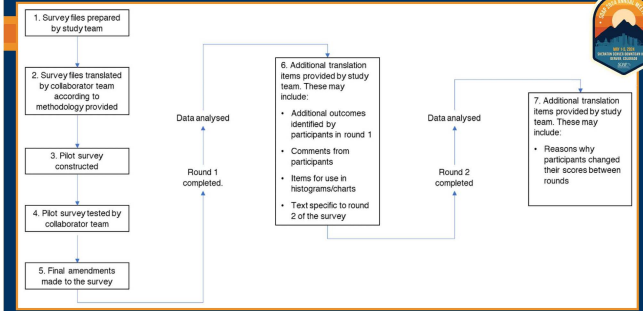

Akhtefal et al. Trials (2021) 22:410 https://doi.org/10.1186/s13063-021-05336-x

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- A **real-time Delphi** in which expert judgments are reflected back online and in real time; i.e., respondents can make their judgments several times, and there are no separate individual Delphi rounds [10].
- A **policy Delphi** is concerned with explicitly capturing a wide range of judgments or approaches toward innovations or solutions [11].
- An **argumentative Delphi** in which the focus is on the qualitative reasoning of the standardized judgments [12]. These are now mostly performed as a dynamic argumentative Delphi (DAD) in real-time.
- A **group Delphi** to which the experts are invited to openly discuss arguments for divergent judgments. This removes the anonymity of the experts [4].
- A **fuzzy Delphi** utilizes triangulation statistics to determine the distance between judgments within the expert panel [13].

J. Spranger et al. / Z. Evid. Fortbild. Qual. Gesundh. wesen (ZEFQ) 172 (2022) 1–1

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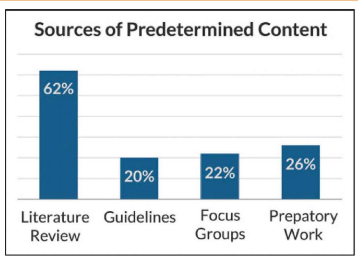

Figure 1. Predetermined content sources used in Delphi methods. Data *Source*. Boulkedid et al. (2011).

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Health Environments Research & Design Journal , 2020: 13(1)

	Preparing *(Phase One)*	Conducting *(Phase Two)*	Analyzing *(Phase Three)*
Goals	• Definition of research goals • Definition of Delphi format • Definition of Delphi statements • Definition of additional questions	• Selection of (software) tool • Setting up / programming (software) tool • Identification of expert panel • Collection of experts' opinions and data	• Identification of consensus • Analysis of dissent and sentiment • Analysis and interpretation of scenarios • Derivation of managerial implications
Time estimate for respective steps	• **4 – 6 weeks Delphi preparation,** depending on level of knowledge about the respective subject and methodology • **2 – 6 weeks Delphi statements,** depending on amount of initial iterations with experts	• **2 – 4 weeks Delphi programming,** acquisition of software license included • **2 – 4 weeks expert identification,** depending on access to the panel • **4 – 12 weeks Delphi survey conduction,** depending on the Delphi format and termination criteria (sequential tends to require a longer period than real-time)	• **1 – 3 weeks data cleaning and descriptive statistics,** depending on software skills • **2 – 6 weeks data analyses,** depending on extent of conducted analyses • **1 – 2 weeks data interpretation**
Minimum total time for Delphi study research	**4 weeks**	**8 weeks**	**4 weeks**
	16 weeks – always depending on the availability and response time of required experts *Additional 6 – 10 weeks for writing scientific manuscript (can be partially parallelized)*		

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D. Beiderbeck, N. Frevel and H.A. von der Gracht et al. / MethodsX 8 (2021) 101401

Research Question

Should we use an intrathecal catheter in the management of accidental dural puncture during labor analgesia?

Define the problem

- Are intrathecal catheters safe?
- Is the alternative to intrathecal catheters safe?
- Has the evidence been systematically reviewed?
- Who are the experts?
- Is there a role for patients? Non-expert anesthesiologist?

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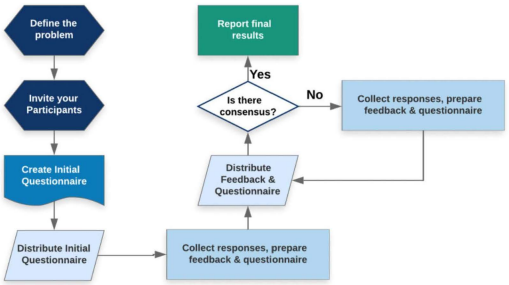

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Develop the survey

Extremely important Critical minimal standard Very important Minimal standard	• Extremely Important OR Very Important suggest the item is a HIGHLY RECOMMENDED minimal standard. If these HIGHLY RECOMMENDED standards are not met, the provision of anesthesia should be restricted to procedures that are absolutely essential for the immediate saving of mother or fetus
Moderately important	• Moderately Important suggest the item is possibly important but may require some revision
Slightly important Not at all important	• Slightly Important OR Not Important at all suggest the item is not that important or invalid

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Can you develop a consensus

- Is the topic polarizing?
- Would the results be generalizable?
- Could your investigators support the results

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Research Panel

The Delphi Method

Ronald B. George, MD FRCPC
Professor & Director of Obstetric Anesthesiology
Mount Sinai Hospital
University of Toronto

Program Material
Saturday, May 4, 2024

Research Network Symposium

Opening Remarks
Caitlin Sutton, MD & Brandon Togioka, MD
SOAP Speaks! Speaker Database for Curricular Development

Sol Shnider Track #2
1. What to Say When There are No Words: Disclosure and Debriefing Strategies for our Darkest Days After a Traumatic Event
   Caitlin Sutton, MD
2. Of Mice and Women: Cutting Edge Research in Uterine Atony
   Moderator: Shubhangi Singh, MD
   Panelists: Jessica Ansari, MD; Naida Cole, MD; David Combs, MD
3. Updates on Labor Analgesia: How to Deliver the Best Option for Your Patient
   Sharon Reale, MD

Best Case Reports
Moderator: John Kowalczyk, MD
Panelists: Cally Hoyt, MD; Allison Lee, MD; Alicia Dennis, MD

ASA Update
Speaker: Ron Harter, MD; ASA President

SOAP Endowment Fund 2025 Campaign Launch
Klaus Kjaer, MD, MBA & May Pian-Smith, MD, MS

Gerard W. Ostheimer Lecture
Introduction: Pervez Sultan, MD
Speaker: Melissa Bauer, DO

Distinguished Service Award
Introduction: Gillian Abir, MD
Recipient: Brendan Carvalho, MD

SOAP Annual Awards
- Best Research Paper
- Gertie Marx
- Teacher of the Year
- Best Case Report
- Diversity & Inclusivity Award
- Patient Safety Award
- Research in Education Award
- Frederick P. Zuspan Award
- Center of Excellence
- SOAP/Kybele International Outreach Grant
- SOAP Diversity & Inclusivity Mentored Grant

Case Reports & Research Abstracts #3 (Breakout Rooms)

Room 1 – Broken uterus and other unusual bleeders
Room 2 – It's not all in the head - sometimes the spine is broken
Room 3 – We did not forget preeclampsia/HELLP and a few other placental zebras
Room 4 - Oh no - pulmonary hypertension, dissecting aortas & pheochromocytoma
Room 5 - Neuraxial challenges, complications and adverse drug reactions
Room 6 - Liver, lungs, and lumps

What to Say When There Are No Words

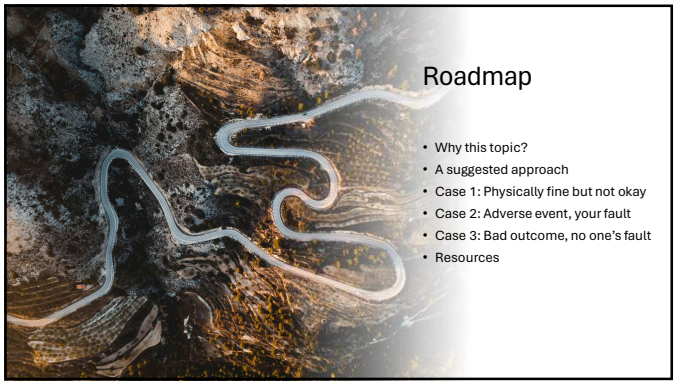
Communicating with Patients after an Adverse Event

1

No financial disclosures

Bad news

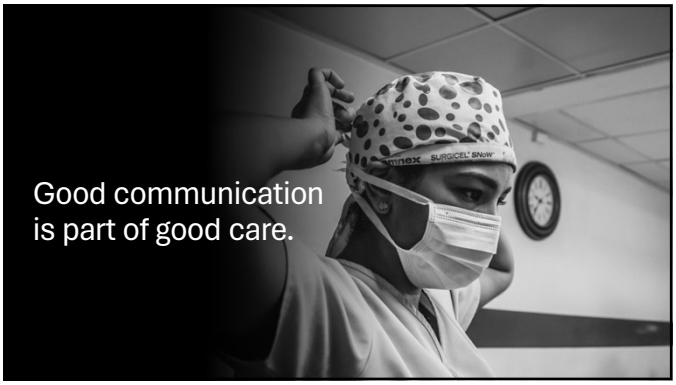
2



Roadmap

- Why this topic?
- A suggested approach
- Case 1: Physically fine but not okay
- Case 2: Adverse event, your fault
- Case 3: Bad outcome, no one's fault
- Resources

3



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A suggested approach:

5

Prepare

- Pick the right setting
- Get the right people (on both sides)
- Have the right headline
- Prepare for emotions

6

Begin

- Set the right tone
- Assess understanding
- Set agenda
- Discuss time limits

7

Inform/Invite

- Identify who needs to talk
- Address both channels
- Make it bite-size
- Check in continuously

8

Expand

- Metacommunicate
- Elicit goals
- Bridge the gap

9

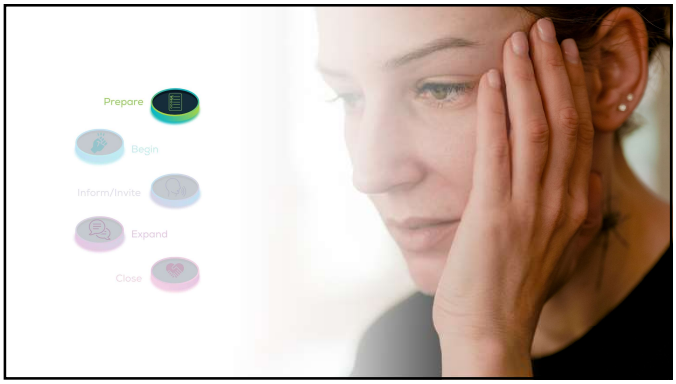
Close

- Reassess understanding
- Document as support

10

Case 1: Pain during cesarean delivery

11



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Getting it right

- Right setting
- Right people
- Right headline

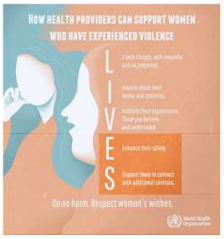
13

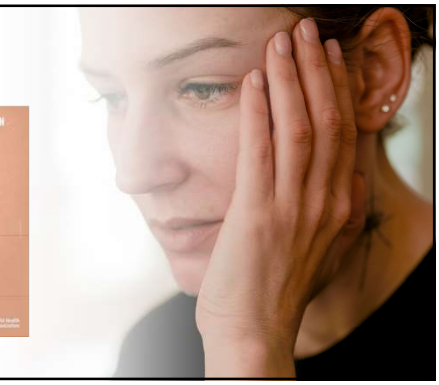
This *matters*.

14

15

LIVES tool

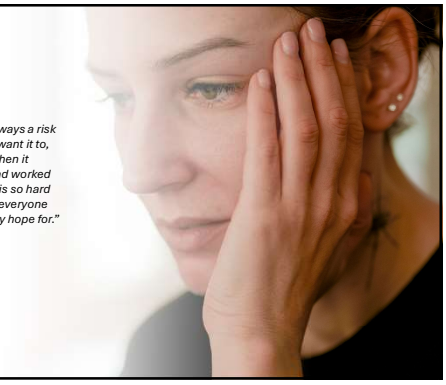




16

Set the Tone

"Even though we know there's always a risk that a spinal won't work how we want it to, that doesn't make it any easier when it happens to you. I really wish it had worked better for you. Becoming a mom is so hard and it's such a vulnerable time – everyone deserves to have the delivery they hope for."



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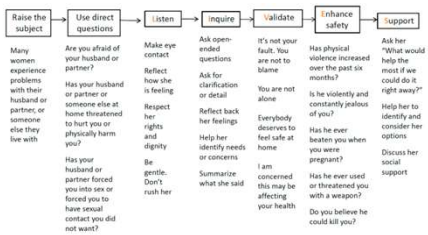
LIVES



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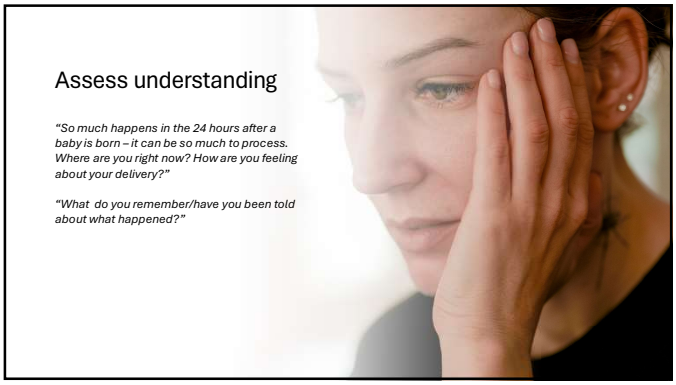

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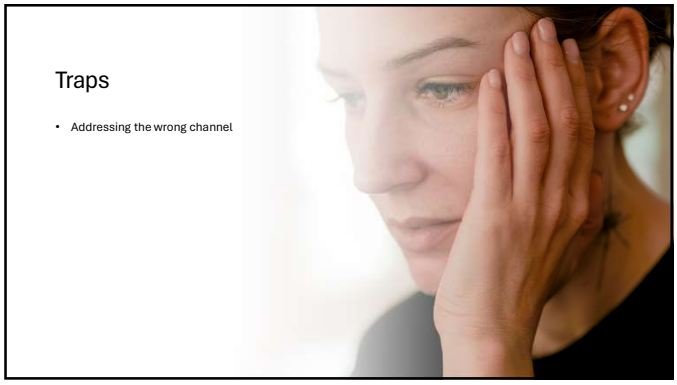

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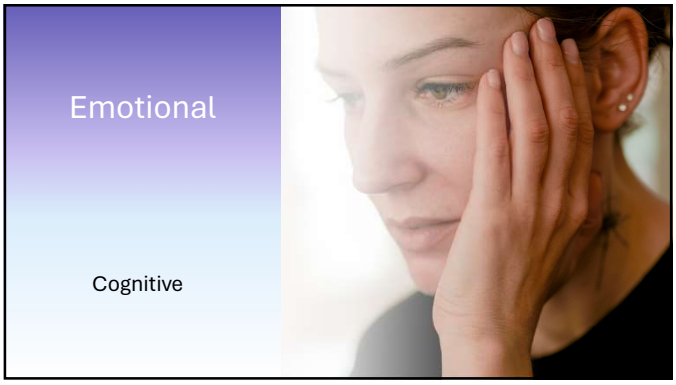

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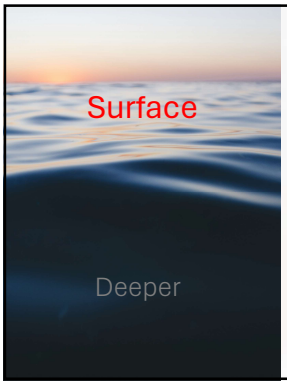
Traps

- Addressing the wrong channel
- Trying to prevent an emotional response
- Responding to surface emotions

25



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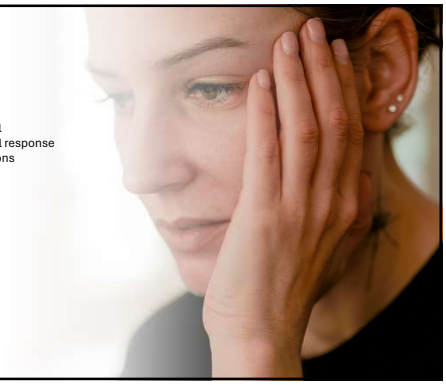
Traps

- Addressing the wrong channel
- Trying to prevent an emotional response
- Responding to surface emotions
- Talking too much



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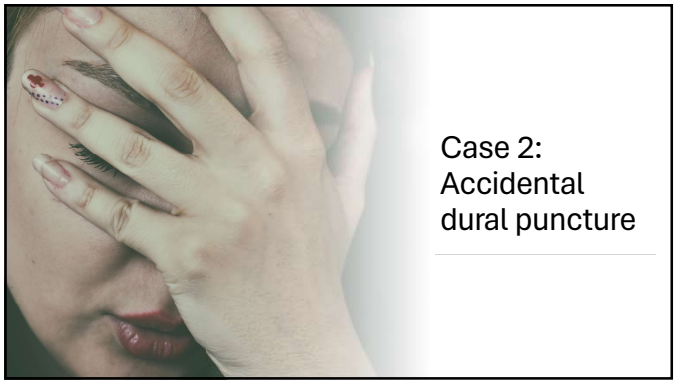
Make space for the pause.

"It sounds like you're frustrated."

"Can you tell me more about that?"

"I'm glad you shared that, it helps me understand what you're saying."

28



Case 2: Accidental dural puncture

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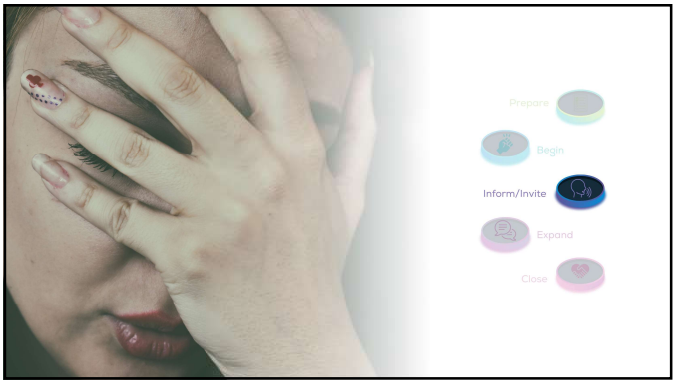

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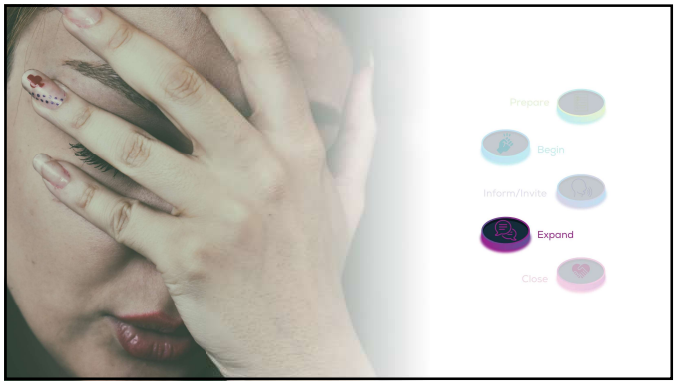

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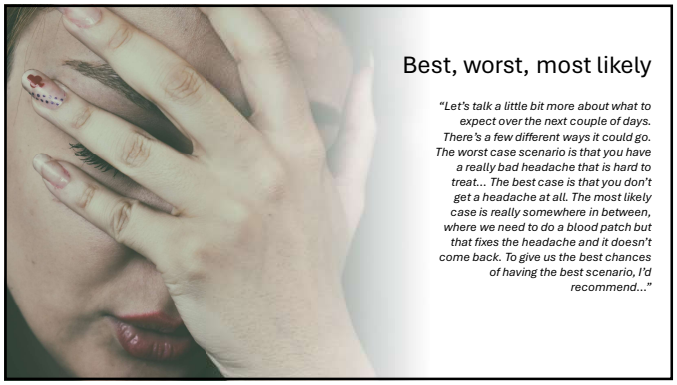

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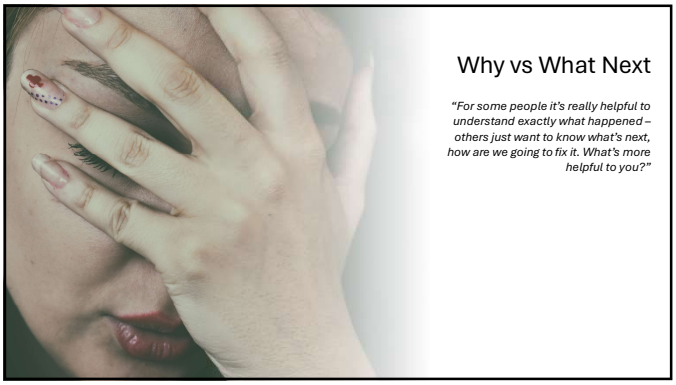

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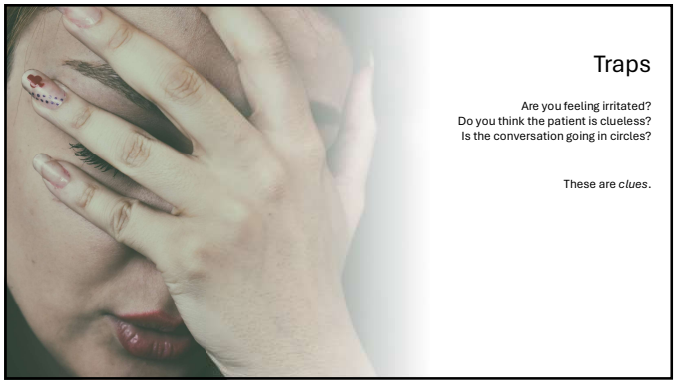

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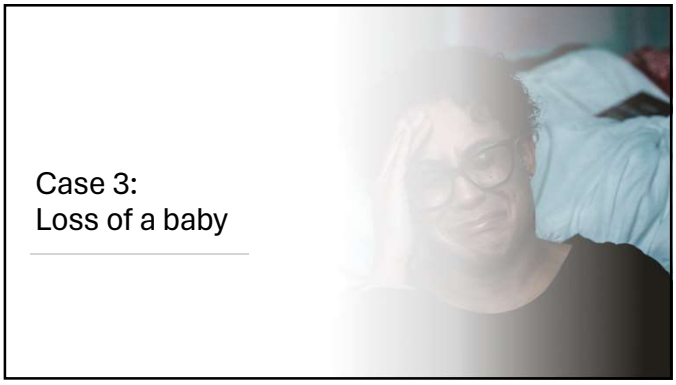

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37

Reassess understanding

"Some people find it helpful to understand more about what happened. Would it be helpful for you if we talked through how we got here?"

"Sometimes I'm not as clear as I'd like to be, and then you might not realize you still have questions until you are talking with your family. Would you like to tell me what you think you'll say to them, and we can work through any questions that come up together?"

38

Traps

"This happened to me too."

"At least…"

"I'm sorry"

Undesired anxiolysis

39

Closing scripts

"Even though we knew your baby's condition was serious, it doesn't make it easier to say goodbye. I know there isn't anything I can say to make this better, but my heart is grieving with yours."

"I know it's impossible to process all I've said. I'll be back at 2:00, because I expect that you will have questions for me, and I want to be sure to do all I can to answer them."

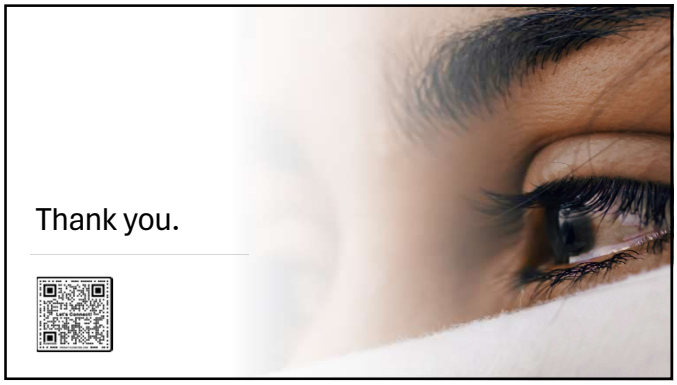
40

Documentation as support

- Impact of traumatic event on memory
- Perception of opacity can impact trust and hinder emotional processing
- Documentation in EMR can offer clarification and reassure patients that conversation occurred

41

42



43

Stanford MEDICINE

Could calcium be the next uterotonic?

SOAP 2024 ANNUAL MEETING

SPEAKER: Jessica Ansari, MD, MS

1

SOAP 2024
ANNUAL MEETING

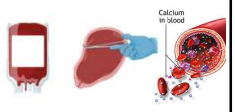
No disclosures

*** Will be discussing off-label use of a medication ***

2

Learning Objectives

- Review what is known about PPH, uterine atony, and calcium
- Discuss our recent RCT investigating calcium chloride as a uterotonic
- What's next?



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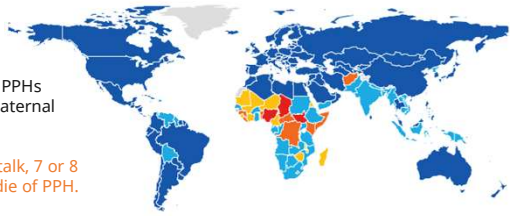
PPH is the leading global cause of maternal mortality

Each year:
- 14 million PPHs
- >80,000 maternal deaths

During this talk, 7 or 8 people will die of PPH.

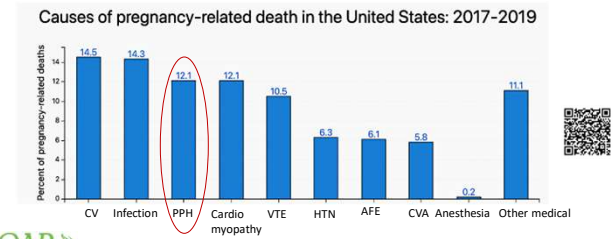


UNICEF data, maternal mortality ratio per 100,000 births, 2020

Very Low (<100) Low (100-299) High (300-499) Very High (500-999) Extremely High (>1000)

4

PPH is the 3rd leading cause of maternal mortality in the US



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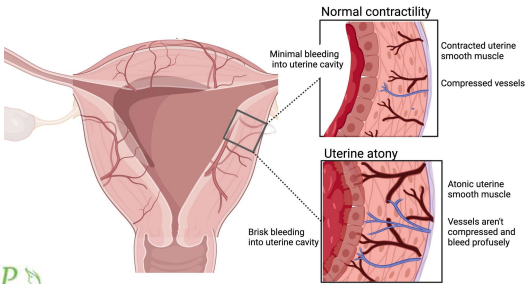
Uterine atony causes most cases of PPH



6

It's time for new and improved treatments

Oxytocin
- denatured by heat, often not enough

Carbetocin
- $$$$, not approved in US

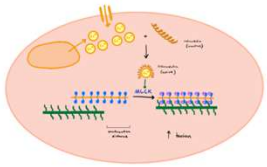
Methylergonovine
- $$$, denatured by heat
- Contraindicated in HTN, preeclampsia, cardiac dz

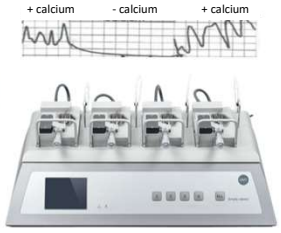
Carboprost
- $$$$, requires refrigeration
- Contraindicated in asthma, pulmonary disease

Misoprostol
- Doesn't really work

7

Uterine smooth muscle cells rely on influx of extracellular calcium to contract





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Uterine smooth muscle cells rely on influx of extracellular calcium to contract

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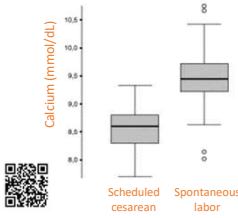
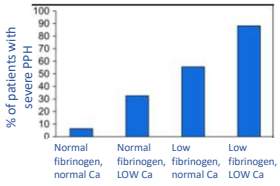
Observational studies suggest more serum calcium might be better for uterine contractility

Patients with spontaneous labor have higher serum calcium



Lower serum ionized calcium is associated with severe atonic PPH



10

OBSTETRICS & GYNECOLOGY

Original Research

Intravenous Calcium to Decrease Blood Loss During Intrapartum Cesarean Delivery

A Randomized Controlled Trial

Jessica R. Ansari, MD, MS, Alla Yarmosh, MD, MS, Guillermina Michel, BS, Deirdre Lyell, MD, Haley Hedlin, PhD, David N. Cornfield, MD, Brendan Carvalho, MBBCh, FRCA, and Brian T. Bateman, MD, MS

SOAP Society for Obstetric Anesthesia and Perinatology

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Objective

To evaluate whether:
- **one gram** of intravenous calcium chloride
- reduces quantitative blood loss
- during intrapartum cesarean delivery

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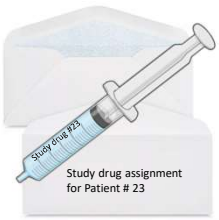
Methods

Laboring patients screened and consented



Randomization to **1 g calcium chloride** or **saline placebo** occurs upon decision for intrapartum CS

10-minute infusion after cord clamping

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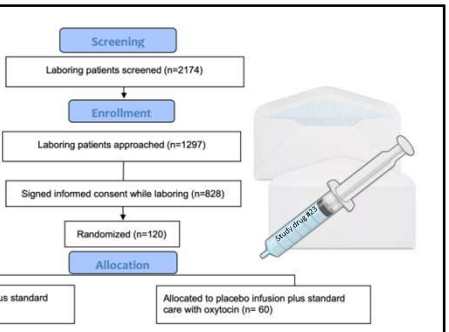

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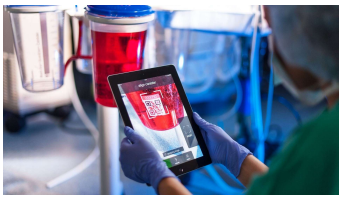
Primary outcome: Quantitative blood loss



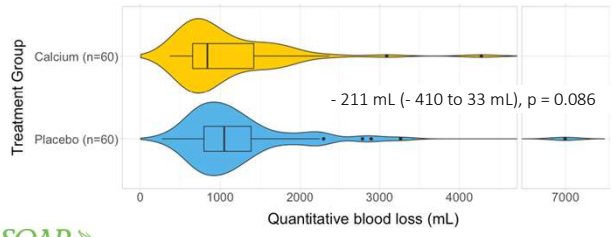
All patients (n=120)

Subgroup: exclude patients who bled for reasons no uterotonic could fix

Eg hysterotomy extension, accreta, cervical laceration (n=21 in $CaCl_2$ and n=20 in placebo)

15

Primary outcome: Blood loss (all participants)



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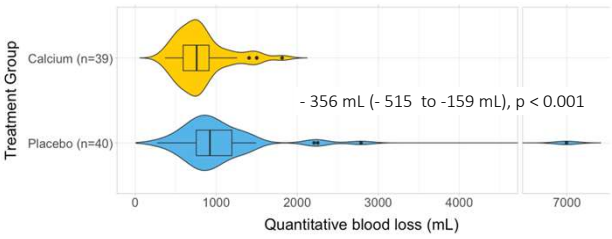
Pre-specified subgroup analysis: Blood loss



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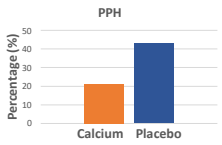
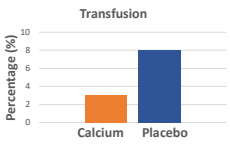
Secondary hemorrhage outcomes





	Calcium (n=60)	Placebo (n=60)	Relative Risk
PPH	24 (40%)	34 (57%)	0.71
2nd line uterotonic	18 (30%)	24 (40%)	0.75
Transfusion	5 (8%)	9 (15%)	0.56
Change in hematocrit	8 [7-9]	10 [8-12]	-2.0

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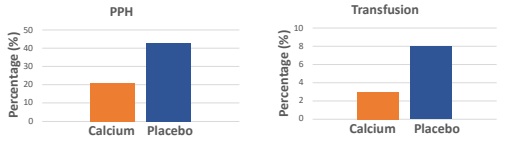
Secondary hemorrhage outcomes: subgroup



	Calcium (n=39)	Placebo (n=40)	Relative Risk
PPH	8 (21%)	17 (43%)	0.48*
2nd line uterotonic	10 (26%)	17 (43%)	0.60
Transfusion	1 (3%)	3 (8%)	0.56
Change in hematocrit	6 [5-8]	10 [8-12]	-3.2*

* Significant at p<0.05

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Side effects

	Calcium (n=60)	Placebo (n=60)	Risk difference	95% Confidence Interval
Any side effect	23 (39%)	25 (42%)	-3 %	-21% to +14%
Nausea	18 (30%)	18 (30%)	0 %	-16% to +16%
Vomiting	12 (20%)	11 (18%)	+2 %	-12% to +16%
IV site discomfort	1 (2%)	3 (5%)	-3 %	-10% to +3%
Flushing	0 (0%)	6 (10%)	-10 %	-18% to -2%
Change in heart rate	1 (2%)	6 (10%)	-8 %	-17% to 0%
HTN requiring treatment	0 (0%)	1 (2%)	-2 %	-5% to +2%
Abnormal tastes or sensations	0 (0%)	2 (3%)	-3 %	-8% to +1%

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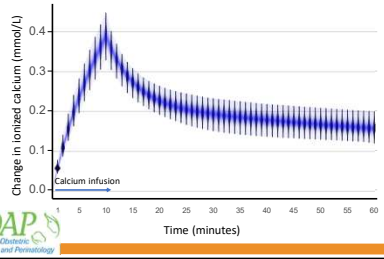
Pharmacokinetics

Change in ionized calcium after a 1 gram dose of $CaCl_2$



Practical kinetics of a one-gram dose of $CaCl_2$

	Value	*95% CI*
Equivalent calcium gluconate dose (g)	3	2.8 – 3.5
Peak increase in ionized calcium (mmol/L)	0.4	0.38 – 0.42
Time to half of peak (minutes)	30	23 – 40

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Discussion

Strengths
- Double blind RCT
- Significantly decreased QBL in pre-planned subgroup analysis (350mL)
- Quite well tolerated

Limitations
- Primary analysis **not statistically significant** (lack of power)
- Not powered to assess severe clinical endpoints
- 10-minute infusion after cord clamping

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Conclusion

Calcium is well tolerated and warrants additional investigation as a novel uterotonic agent

Low risk

High reward

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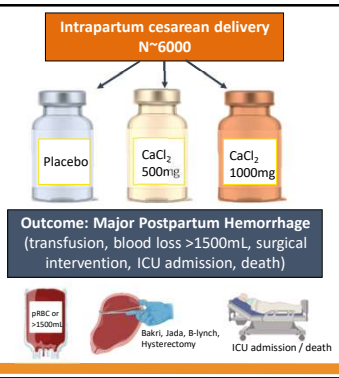
What's next? Multicenter RCT

MFMU Maternal-Fetal Medicine Units Network



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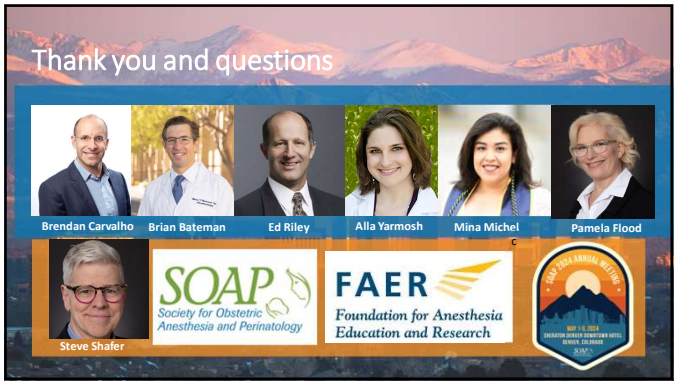
Thank you and questions
Brendan Carvalho
Brian Bateman
Ed Riley
Alla Yarmosh
Mina Michel
Pamela Flood
Steve Shafer
SOAP
Society for Obstetric Anesthesia and Perinatology
FAER
Foundation for Anesthesia Education and Research

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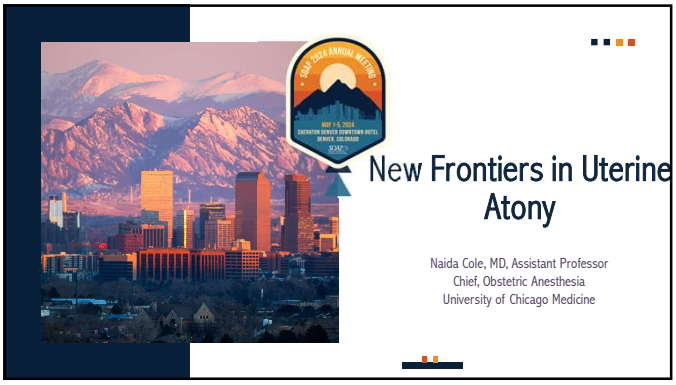
1



2

Telling the truth is a revolutionary act:

Disclosures

- No financial disclosures

3

Never try to solve all problems at once- make them line up, one by one:

Learning Objectives

- Describe the epidemiology of uterine atony
- Recognize why uterine atony is still a problem today, and…
  - Appraise new options to measure and predict uterine atony
  - Evaluate opportunities for rational oxytocin dosing in uterine atony prevention
  - Compare second-line uterotonics for management of refractory uterine atony

4

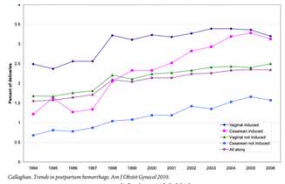
"Impossible" just means you haven't found the solution yet:

Trends in Uterine Atony

- 2-6% of all deliveries are complicated by uterine atony; 80% of postpartum hemorrhage (PPH) may result from uterine atony
- 19.6% with atony suffer substantial morbidity
  - Increased odds for related morbidity in Black and Hispanic women
- 62% increase in uterine atony-related PPH from 1994-2014

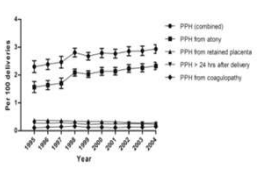
Butwick BJA 2014; Bryant A&A 2012; Reale A&A 2020

ATONY-RELATED PPH: 1994-2006 USA



Callaghan AJOG 2010

PPH By DIAGNOSIS: 1995-2004 USA



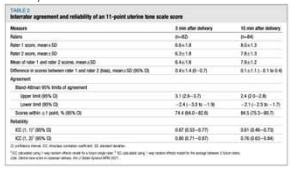
Bateman A&A 2010

5

If you can measure it, you can treat it:

0-10 Tone Score to Measure Uterine Atony

1. Qualitative: Palpation of uterus
   - "Satisfactory/Unsatisfactory", "Firm, Boggy", "0-100", "0-10"
   - 0-10 uterine tone score
     - Blinded measurement by 2 raters at 3, 10 minutes post-cesarean delivery; 84 enrolled
     - 0 represents "no tone", 10 represents "excellent tone"
     - Good inter-rater reliability (i.e. differentiation among parturients) with 1 rater, excellent inter-rater reliability with 2 raters
     - Good inter-rater agreement (i.e. agreement between providers)



Cole AJOG MFM 2021

6

If you can measure it, you can treat it:

Elastography to Measure Uterine Atony

2. Retrospective: Chart review
   - ICD codes
   - Diagnosis of uterine atony by obstetrician
   - Administration of 2nd-line uterotonic (methylergonovine or a prostaglandin) +/- diagnosis of uterine atony
3. Prospective & Quantitative: Ultrasound elastography

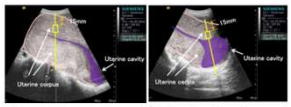
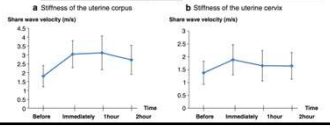


Fig. 2 The shear wave velocity of the uterine corpus (**a**) and uterine cervix (**b**). The stiffness of the uterine corpus significantly changed over time ($P = 0.44 \times 10^{-13}$), whereas the stiffness of the uterine cervix was not significantly altered ($P = 0.06$)



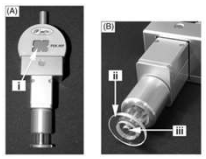
Tanaka J Med Ultrasonics 2011

7

If you can measure it, you can treat it:

"Hardness Meter" to Measure Uterine Atony

4. Prospective, Immediate & Quantitative: "Hardness Meter"



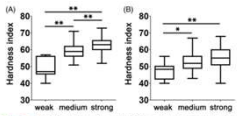


Figure 2. Association between the results of tissue hardness assessed subjectively by obstetricians and measured with the hardness metre. (A) Fundus uteri. (B) Corpus uteri. The hardness metre accurately quantifies the uterine hardness judgements of the operating obstetricians, more so in measuring at the fundus uteri (A). Data are analysed by a one-way ANOVA with Tukey's HSD test. *$p < .05$, **$p < .001$.

Imai J Obstet Gynaecol 2019

8

If you can predict it, you can prevent it:

Can uterine atony be predicted?

- In 23,390 1° cesarean deliveries from MFMU data,
  - 44% of uterine atony patients had no risk factors
  - 86% or more pts with 1 risk factor had no uterine atony
- In deliveries from Nationwide Inpatient Sample 1995-2004,
  - 1+ risk factors present in only 39% of uterine atony with transfusion

Rouse AJOG 2005; Bateman A&A 2010

9

If you can predict it, you can prevent it:

Defining the Risk Factors

- Meta-analysis including 13 studies
- Of 47 potential factors after vaginal or cesarean delivery, 6 definite risk factors (RFs) and 9 likely RFs:

1. Asian race
2. h/o PPH of any etiology
3. Pre-existing or gestational DM
4. Placental disorders (retained, previa, vasa previa, abruption)
5. Prolonged labor
6. Genital tract trauma during delivery

1. Hispanic ethnicity
2. Nulliparity
3. HTN disease of pregnancy
4. Multiple gestation
5. Chorioamnionitis
6. Uterine rupture
7. Pre-delivery oxytocin
8. Labor induction
9. Instrumented vaginal delivery

Ende Obstet Gynecol 2021

- Observational multicenter study in 23,390 pregnancies
- 8 risk factors (RFs) in multivariate model:

Table III Multivariable analysis of risk factors for uterine atony

Variable	Number	OR (95% CI)
Maternal race		
African American	7306	1.0 (Ref)
White	9836	1.28 (1.10-1.49)
Hispanic	4987	2.21 (1.90-2.57)
Other	1261	1.49 (1.14-1.92)
Nulliparous	15,912	1.29 (1.12-1.48)
Multiple gestation	1626	2.40 (1.95-2.93)
Hypertensive disorder	4429	0.84 (0.62-1.11)
Magnesium sulfate	3442	1.78 (1.31-2.45)
Gestational diabetes	1509	1.27 (1.03-1.55)
Chorioamnionitis	2371	1.80 (1.55-2.09)
Induced/augmented labor*		
<6 h	872	1.40 (0.99-1.91)
6-12 h	2360	1.35 (1.08-1.67)
>12-18 h	3371	1.60 (1.34-1.91)
>18 h	5176	2.23 (1.92-2.60)
Birth weight		
<4000 g	20,636	1.0 (Ref)
4000-4500 g	2144	1.73 (1.46-2.03)
>4500 g	590	2.05 (1.53-2.69)

* Reference group = no or spontaneous labor.

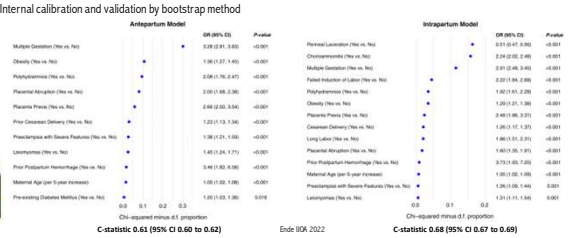
Rouse Obstet Gynecol 2005

10

If you can predict it, you can prevent it:

Predictive Models

- Single-center retrospective sample of 28,000 vaginal + cesarean deliveries; 16.6% atony rate
- Using 37 candidate RFs identified in systematic review, 2 prediction models for atony developed with logistic regression:
  - Antepartum model 20 RFs (demographics, comorbidities, pregnancy RFs)
  - Intrapartum model 20 + 7 RFs (antepartum RFs and intrapartum RFs)
- Internal calibration and validation by bootstrap method



C-statistic 0.61 (95% CI 0.60 to 0.62)

Ende IJOA 2022

C-statistic 0.68 (95% CI 0.67 to 0.69)

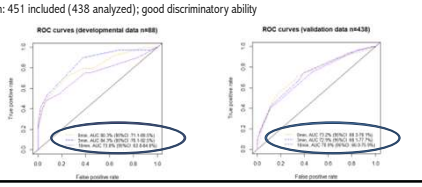
11

If you can predict it, you can prevent it:

Uterine Tone Score Validation

- Development Data: 100 enrolled, 88 analyzed (exclusion for protocol deviation) UTS and QBL entered in model odds ratio
  - Uterine tone scores associated with uterine atony*; odds ratio for atony for every 1-point increase (C.I.): 0.49 (0.34, 0.67), 0.35 (0.2, 054) and 0.54 (0.36, 0.76) at 0, 3 and 10 minutes respectively
  - No difference in predictive ability across the 3 timepoints
  - Cut-point scores (specificity & sensitivity):
    - 6 (0.88/0.44) at 0 minutes
    - 7 (0.90/0.34) at 3 minutes
    - 5 (0.95/0.03) at 10 minutes
- Validation: 451 included (438 analyzed); good discriminatory ability

* Uterine atony = increase in oxytocin or administration of 2nd-line uterotonic drug



AUC 0.9-1--> excellent;
AUC 0.8-0.9→ very good;
AUC 0.7-0.8→ good;
AUC 0.6-0.7→ sufficient
Šimundić 2009.

12

A Problem Well-Defined is a Problem Half-Solved:

Why Doesn't Oxytocin Prevent Atony?

- No single recommended dosing regimen for 3rd stage of labor or in cesarean delivery
  - Elective CD ED90→ 0.35IU bolus or 0.29IU/min (15-16.2IU/hr) infusion
  - Intrapartum CD ED90→ 2.99IU bolus or 44.2IU/hr infusion
  - Bolus + infusion appears to be most effective:1IU bolus + 2.5IU/hr in elective CD
- Despite dosing>ED90, atony occurs in up to 12% of elective cesarean deliveries
- Mechanisms of oxytocin failure and refractory uterine atony are poorly understood

Oxytocin failure is related to its pharmacokinetics (concentration over time) and/or pharmacodynamics (concentration-effect relationship)

Carvalho Obstet Gynecol 2004; George Can J Anesth 2010; Lavoie A&A 2015; Balki Obstet Gynecol 2006; Duffield A&A 2017; Sheehan BMJ 2011

13

Fix the problem, not the blame:

Measuring Oxytocin Concentrations

- Numerous oxytocin PK studies in pregnant patients from 1970's-1990's, but heterogeneity in:
  - study population- gestational age, stage of labor, timing in relation to contractions, elective vs intrapartum CS, 'hypocontractile labor'
  - measurement assays- bioassay vs radioimmunoassay vs ELISA vs mass spectrometry
  - presence and dosing of exogenous oxytocin

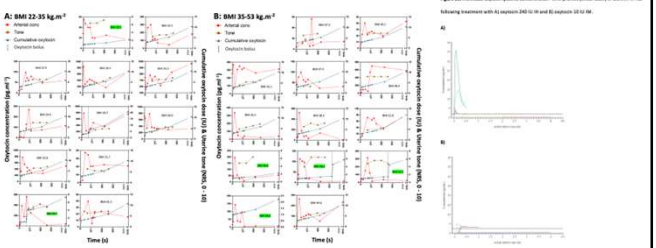
Plasma concentrations: ~2 pg/mL to 300 pg/mL

Uvnas-Moberg BMC Pregnancy Childbirth 2019.

14

Fix the problem, not the blame:

Oxytocin Pharmacokinetics



Monks Anaesthesia 2023

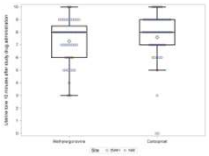
Gamewska-Knapik Br J Clin Pharmacol 2023

15

Never confuse a single defeat with a final defeat:

Second-line uterotonics

- Methergine & hemabate: two of the most commonly used second-line uterotonics in the U.S.
- Prospective observational studies suggest carboprost associated with lower blood loss after vaginal delivery
- Large secondary analysis of MFMU data: lower hemorrhage-related morbidity after therapeutic methergine in PPH
- Double-blinded RCT comparing methergine & hemabate for refractory uterine atony in 100 pts at cesarean delivery:
  - No significant difference in uterine tone at 10 minutes; similar blood loss & side effects



Gupta Obstet Gynecol Sci 2013; Verma Int J Adv Biol Biomed Res 2016; Butwick AJOG 2015; Cole et al (in submission).

16

A river cuts through a rock not because of its power, but its persistence.

Summary

- Uterine atony is increasing, with differential incidence + outcomes across racial groups
- Uterine atony continues to be a problem because:
  - Inconsistent diagnostic criteria + poor predictive power make uterine atony challenging to prevent and treat
    → *promising methods for measurement and prediction are emerging*
  - ED90 of oxytocin is known, yet atony still occurs
    → *better pharmacokinetic and pharmacodynamic data will inform dosing for high-risk pts*
  - 'Best' second-line uterotonic has been unknown until now
    → *new data suggests methylergonovine and carboprost have similar efficacy*

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18

Uterine Contractility - Basic and Translational Research

David J. Combs MD PhD
Brigham and Women's Hospital

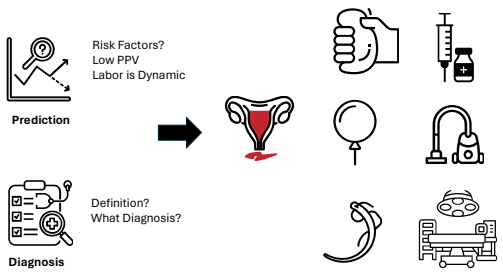
1

Learning Objectives

- Review the limitations of current care for uterine atony
- Understand the challenges in studying uterine atony using basic and translational scientific approaches.
- Explain recent advances in the genetics of postpartum hemorrhage
- Discuss novel uterine imaging approaches in humans and experimental animals
- Briefly discuss new insights in uterine myocyte physiology

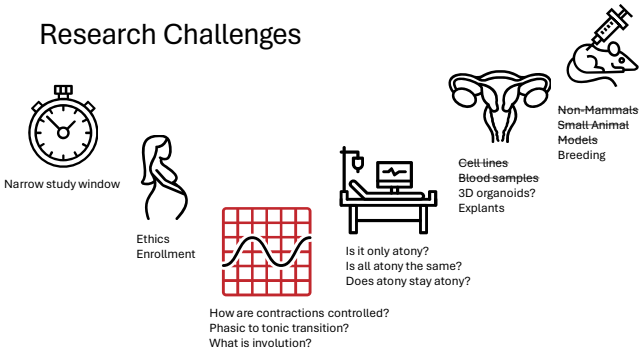
2

Limitations of Current Hemorrhage Care



3

Research Challenges



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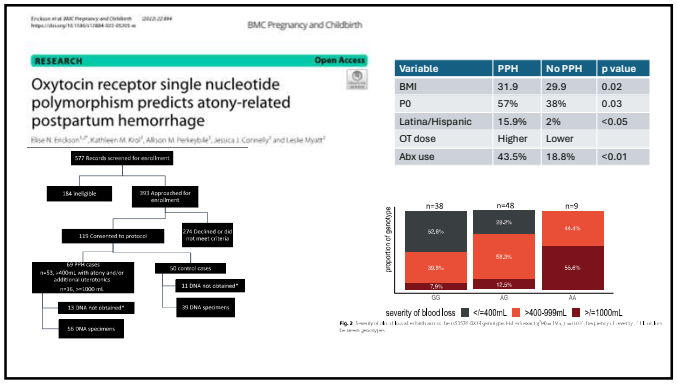

BMC Pregnancy and Childbirth

RESEARCH Open Access

Oxytocin receptor single nucleotide polymorphism predicts atony-related postpartum hemorrhage

Variable	PPH	No PPH	p value
BMI	31.9	29.9	0.02
P0	57%	38%	0.03
Latina/Hispanic	15.9%	2%	<0.05
OT dose	Higher	Lower	
Abx use	43.5%	18.8%	<0.01

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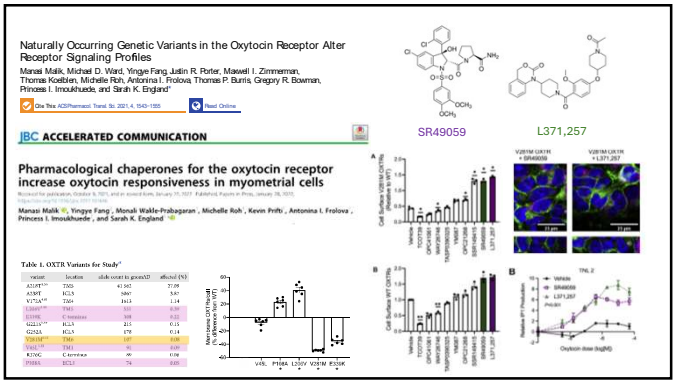


Naturally Occurring Genetic Variants in the Oxytocin Receptor Alter Receptor Signaling Profiles

JBC ACCELERATED COMMUNICATION

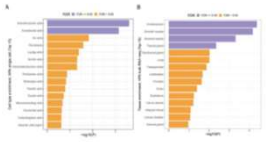
Pharmacological chaperones for the oxytocin receptor increase oxytocin responsiveness in myometrial cells

SR49059 L371,257

6

> medRxiv [Preprint]. 2023 Aug 15:2023.08.10.23293932. doi: 10.1101/2023.08.10.23293932.

Pregnancy-Associated Bleeding and Genetics: Five Sequence Variants in the Myometrium and Progesterone Signaling Pathway are associated with postpartum hemorrhage

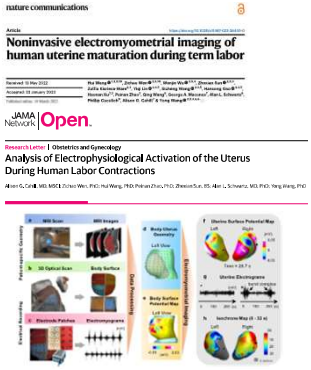


CHR	Allele Freq	PPH OR (95% CI, P value)	Subtype	Known Roles	Gene Targets
4	0.30	1.10 (1.08-1.13, 1E-17)	Atony		HAND2
6	0.32	1.10 (1.08-1.13, 9E-17)	Atony		
10	0.22	1.08 (1.05-1.11, 1E-9)	Atony	Fibroids, endometroisis	
12	0.42	1.07 (1.05-1.10, 4E-11)		Bone density, PSA	TBX3
X	0.32	0.91 (0.89-0.94, 9E-15)	rPOC	Fibroids, endometroisis	FRMD7, RAP2C

7

nature communications

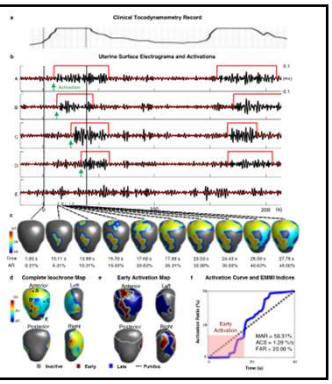
Noninvasive electromyometrial imaging of human uterine maturation during term labor



JAMA Network Open.

Research Letter | Obstetrics and Gynecology

Analysis of Electrophysiological Activation of the Uterus During Human Labor Contractions

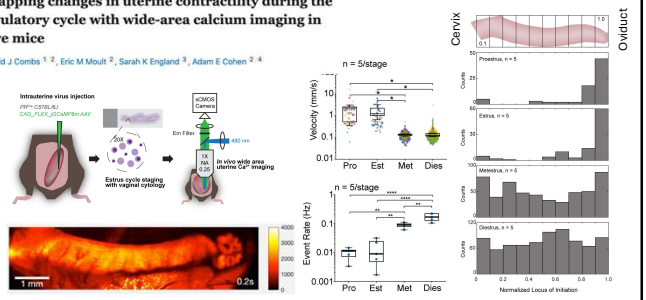


8

> bioRxiv [Preprint]. 2024 Feb 5:2024.02.02.578395. doi: 10.1101/2024.02.02.578395.

Mapping changes in uterine contractility during the ovulatory cycle with wide-area calcium imaging in live mice

David J Combs [1 2], Eric M Moult [2], Sarah K England [3], Adam E Cohen [2 4]



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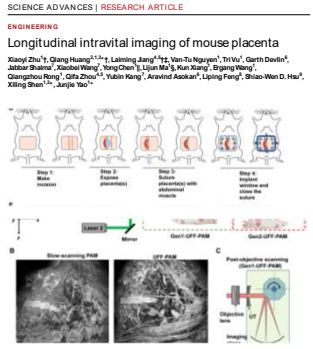
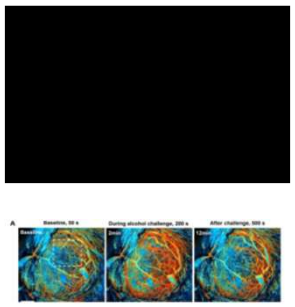
SCIENCE ADVANCES | RESEARCH ARTICLE

ENGINEERING

Longitudinal intravital imaging of mouse placenta





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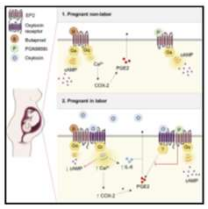
Cell Reports

CellPress OPEN ACCESS

Article

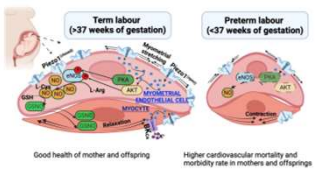
Functional rewiring of G protein–coupled receptor signaling in human labor



Novel identification and modulation of the mechanosensitive Piezo1 channel in human myometrium

Scott D. Barnett, Hazik Asif and Iain L. O. Buxton

Department of Pharmacology, Center for Molecular Medicine, Reno School of Medicine, University of Nevada, Reno, NV, USA



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Future Directions

- Genetically informed risk prediction
- AI/Machine Learning-based risk prediction of PPH
- Advancing diagnosis with imaging and electrophysiology
- New animal models for obstetric pathophysiology
- Delivering new therapeutics via novel drugs/pathways

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Brigham and Women's Hospital
Founding Member, Mass General Brigham

HARVARD MEDICAL SCHOOL
TEACHING AFFILIATE

Updates on Labor Analgesia: How to Deliver the Best Option for Your Patient

Sharon C. Reale, MD
Fellowship Program Director | Division of Obstetric Anesthesia
Attending Anesthesiologist | Brigham and Women's Hospital
Assistant Professor in Anaesthesia | Harvard Medical School

1

Dural Puncture Epidural
Program Intermittent Epidural Boluses
Neuraxial Dexmedetomidine
Sphenopalatine Ganglion Block
Ultrasound for Neuraxial Procedures
Racial Disparities in Labor Analgesia Usage

2

Dural Puncture Epidural

Anesthesia & Analgesia

Benefits include faster analgesic onset, faster sacral spread, fewer asymmetric blocks

3

Anesthesiology

4

Case scenario

- 28-year-old G1P0 at 39 weeks 4 days presents in labor, requesting epidural analgesia.
- History of gestational hypertension, BMI 54

5

ANESTHESIOLOGY

Quality of Labor Analgesia with Dural Puncture Epidural *versus* Standard Epidural Technique in Obese Parturients: A Double-blind Randomized Controlled Study

Hon Sen Tan, M.D., M.Med., M.H.Sc.,
Sydney E. Reed, M.D., Jennifer E. Mehdiratta, M.D., M.P.H.,
Olga I. Diomede, M.D., M.S., Riley Landreth, M.D.,
Luke A. Gatta, M.D., Daniel Weikel, M.Sc.,
Ashraf S. Habib, M.B.B.Ch., M.Sc., M.H.Sc., F.R.C.A.

Anesthesiology 2022; 136:678–87

6

DPE in Obese Parturients

- Women with BMI >35 randomized to DPE vs standard epidural

NO difference in:
- Asymmetrical block
- Top-ups
- Catheter adjustments
- Replacement
- Failed conversion

7

JAMA Network | Open

Original Investigation | Anesthesiology

Effect of Dural-Puncture Epidural vs Standard Epidural for Epidural Extension on Onset Time of Surgical Anesthesia in Elective Cesarean Delivery
A Randomized Clinical Trial

Nadir Sharawi, MBBS, MSc; Matthew Williams, MD; Waseem Athar, MD; Caroline Martinello, MD; Kyle Stoner, MD; Cameron Taylor, MD; Nan Guo, PhD; Pervez Sultan, MBChB, MD (Res); Jill M. Mhyre, MD

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DPE in for Surgical Extension

- Randomized women scheduled for elective CD to DPE vs. standard epidural in labor room
- T10 level achieved
- Surgical extension obtained in OR with 3% chloroprocaine

DPE group with onset of 422 seconds (vs. 655)

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PIEB Benefits

- Decreased LA use
- Less breakthrough pain
- Better patient satisfaction
- Less motor block
- Less operative vaginal delivery

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Optimal PIEB Interval

- Song et al- optimal PIEB interval for 8mL boluses ropivacaine 0.1% with sufentanil 0.3 mcg/mL with DPE

Table 2
Observed and PAVA-adjusted response rate.

Interval time (min)	Success (n/N)	Observed response rate (%)	PAVA-adjusted response rate (%)
60	0/1	0	0
50	7/11	63.6	63.6
40	21/23	91.3	91.3
30	5/5	100	100

PAVA-adjusted response rates were estimated by the use of a weighted isotonic regression method.
Abbreviations: PAVA, Pool-adjacent-violators algorithm.

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PIEB Intervals and Sensory Levels

- Does the sensory level recede between PIEB boluses?
- Casellato et al (2022)- assessed frequent sensory levels during establishment of analgesia with PIEB

No variation in sensory level between boluses

13

PIEB Speed

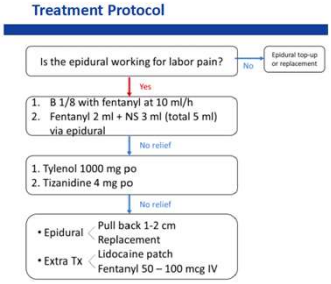
- Mazda et al 2021- compared PIEB speeds 125mL/hr vs. 250 mL/hr

NO difference in sensory block

- Relation to scapular pain?

14

Scapular Pain with PIEB



Achu et al, SOAP 2022

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Neuraxial Dexmedetomidine

- Studies have shown improved analgesia when used as an adjuvant
- Can come with prolonged motor block

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Epidural Dexmedetomidine

- Liu et al- randomized, double blind up down sequential allocation study
- 150 women randomized to ropivacaine 0.1% AND
  - Dexmedetomidine 0 µg/mL
  - Dexmedetomidine 0.3 µg/mL
  - **Dexmedetomidine 0.4 µg/mL**
  - Dexmedetomidine 0.5 µg/mL
  - Dexmedetomidine 0.6 µg/mL

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Epidural Dexmedetomidine

- 2024 metanalysis of 8 RCTs

Lower VAS scores in dexmedetomidine group
- Also, less pruritis but more bradycardia

- Most used doses of 0.4 or 0.5 µg/mL

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Epidural Dexmedetomidine for CD

- Liu et al- RCT of epidural ropivacaine alone vs ropivacaine + dexmedetomidine 0.5 µg/kg, 0.75 µg/kg, and 1 µg/kg

Visceral traction reaction reduced in all dexmedetomidine groups
- More thirst in higher dose groups

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Intrathecal Dexmedetomidine for CD

- Mo et al dose finding study for intrathecal dexmedetomidine dose for CD in combination with ropivacaine
- NO intrathecal opioids

ED50 of intrathecal dexmedetomidine with 8 mg and 10 mg plain ropivacaine = 6 µg and 3 µg

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Case scenario

- 33-year-old G1P0 with a history of significant scoliosis and L3-S1 fusion is s/p unintentional dural puncture at L2-3
- 10/10 positional headache
- Declining blood patch

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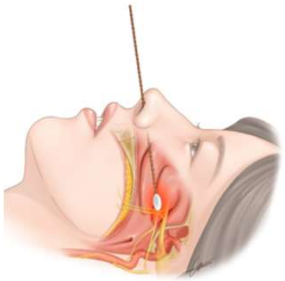
Sphenopalatine Ganglion Block



J. Pers. Med. 2022

24

Sphenopalatine Ganglion Block

- RCT by Jespersen et al
- 1mL local anesthetic vs. placebo

NO difference in upright pain intensity after 30 minutes

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Ultrasound for Neuraxial Procedures
Racial Disparities in Labor Analgesia Usage

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Ultrasound for Neuraxial Procedures

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Neuraxial Ultrasound

- Seligman et al (2018)- Accuro accurately determined **depth to epidural space**
- Ni et al (2020)- higher first pass success in **obese patients** receiving CSE for CD

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Racial Disparities in Labor Analgesia Usage

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Disparities in Labor Analgesia Usage

- Black women more likely than white women to receive general anesthesia for cesarean delivery and **no analgesia for vaginal delivery**
- **Non-English** preferred spoken language associated with less labor analgesia usage

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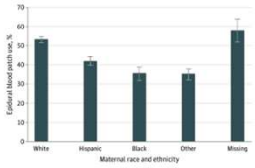
Disparities in Epidural Blood Patch

Figure. Use of Epidural Blood Patch for Postdural Puncture Headache After Neuraxial Analgesia or Anesthesia for Childbirth According to Maternal Race and Ethnicity (New York State Hospitals, 1998-2016)



Other includes Asian and Pacific Islander, Native American, and other race and ethnicity. Error bars indicate 95% CIs.

Lee et al 2022

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- Dural Puncture Epidural
- Program Intermittent Epidural Boluses
- Neuraxial Dexmedetomidine
- Sphenopalatine Ganglion Block
- Ultrasound for Neuraxial Procedures
- Racial Disparities in Labor Analgesia Usage

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Thank you!

screale@bwh.harvard.edu

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Abstract #: SAT – BCR – 01

Best Case Report - Acute Intracranial Hemorrhage Requiring Emergent Cesarean Section

Presenting Author: Shonna Gaskin, MD
Presenting Author's Institution: University of Texas Health Science Center at Houston - Richmond, Texas
Senior Author: Kelly West, MD - University of Texas Health Science Center at Houston

Introduction: Intracranial hemorrhage is a rare, yet potentially devastating event in pregnancy that poses significant risk to both the mother and the fetus.1 Studies show that if there is a hemorrhage from an arteriovenous malformation (AVM) during pregnancy, the risk of further hemorrhage is 27%, which is higher than the rebleeding rate in non-pregnant patients.3 Hemodynamic stability during labor and delivery is vital to prevent rebleeding in this patient population.

Case One: Our patient was a 22 year old G1PO at 37w4d who presented for emergent cesarean section due to intracranial hemorrhage. The patient initially presented with a headache and blurry vision of the right eye that progressed to eventual vision loss of the right hemifield. CT scan revealed a 2.5x1.5x3cm left parieto-occipital acute intraparenchymal hematoma and MRA brain was concerning for possible AVM. It was determined that the ICH was most likely due to an AVM in the setting of preeclampsia, requiring emergency cesarean section in order to prevent rebleeding and to allow for further diagnosis and treatment for the mother.1 An arterial line was placed prior to neuraxial placement for tight blood pressure control. We performed a low-dose combined-spinal epidural to avoid drastic hemodynamic shifts using 1 mL of 0.75% bupivacaine with dextrose 8.25%. We slowly titrated an additional 5 mL of 2% lidocaine via epidural catheter in order to achieve an adequate T4 level and epidural morphine for post-op pain control.

Discussion: Cesarean delivery was uneventful and on postoperative day 3, the patient underwent AVM resection. Anesthetic management was guided by the decision tree algorithm (fig.1). The patient was considered mild-to-moderate risk of herniation from dural puncture prompting neurosurgical consultation prior to neuraxial placement. According to multidisciplinary discussions, the neurological risk to the mother with neuraxial was determined to be low, and the decision was made for neuraxial anesthesia for better hemodynamic control, as well as the known benefits for both mother and fetus.2 This case demonstrates the importance of a multidisciplinary and individualized approach to manage high risk obstetrical patients with intracranial pathology. A tailored anesthetic plan must be made in order to avoid hypotension, which can reduce uteroplacental as well as maternal brain perfusion, but also to avoid hypertension, which can increase the risk of fatal maternal hemorrhage.

References: 1. Fairhall JM & Stoodley MA. Intracranial haemorrhage in pregnancy. Obstetric medicine. 2009; 2(4), 142–148. https://doi.org/10.1258/om.2009.090030 2. Leffert LR & Schwamm LH. Neuraxial Anesthesia in Parturients with Intracranial Pathology: A

Comprehensive Review and Reassessment of Risk. Anesthesiology. 2013; 119:703–718. doi: https://doi.org/10.1097/ALN.0b013e31829374c2 3. Sadasivan B, Malik GM, Lee C, Ausma JI. Vascular malformations and pregnancy. Surgical neurology. 1990; 33(5), 305–313. https://doi.org/10.1016/0090-3019(90)90197-w

Gaskin- Acute intracranial hemorrhage requiring emergent cesarean section .pdf

Abstract #: SAT – BCR – 02

Best Case Report - Delayed Interval Hysterectomy for Placenta Percreta: A Case Report

Presenting Author: Paige Oates, MD
Presenting Author's Institution: SAUSHEC Anesthesiology
Senior Author: Courtney Hood, MD, MEd - Brooke Army Medical Center

Introduction: Patients with placenta accreta spectrum are at risk of massive hemorrhage and damage to nearby structures at the time of delivery. There are multiple strategies discussed in the literature to mitigate some of these risks, with delayed interval hysterectomy emerging as an experimental but viable option for severe placenta percreta cases. In one retrospective study, patients in the delayed interval hysterectomy group had 50% less blood loss compared to the immediate hysterectomy group.1

Case One: We describe a 39-year-old G1P0 with a history of abdominal myomectomy and right salpingo-oophorectomy due to leiomyomas and endometriosis who presented with placenta percreta to the posterior bladder, lateral margins of the cervix and pelvic sidewalls. A Cesarean delivery was performed at 34 weeks gestation followed by a delayed interval hysterectomy 29 days later. The Cesarean was performed under an L2-L3 combined spinal epidural with two large-bore PIVs, an arterial line, and a phenylephrine infusion. Cell Saver and blood products were available. Prior to incision, bilateral ureteral stents were placed by Urology and a right femoral sheath was placed by Interventional Radiology for possible REBOA placement. A midline abdominal incision was made followed by a vertical fundal hysterotomy without disruption of the placenta. No uterotonics were administered. She remained hemodynamically stable on the phenylephrine infusion and her estimated blood loss was 800 mL. She was discharged on POD eight with the placenta in-situ and with plans to return in six weeks for a total abdominal hysterectomy. Instead, she returned to the emergency department 29 days later with complaints of abdominal pain, nausea and vomiting, but without signs of infection or sepsis. Imaging revealed a large, intrauterine hematoma and she underwent an urgent exploratory laparotomy with total hysterectomy and bilateral salpingectomy under general endotracheal anesthesia. Her estimated blood loss was 600 mL. She did not require a blood product transfusion and she was discharged on POD three.

Discussion: A delayed hysterectomy allows for regression of the morbidly adhered placenta and results in less blood loss at the time of delivery. However, the incidence of infection and/or delayed hemorrhage due to the retained placenta has not fully been described. Although she developed an intrauterine hematoma, her total estimated blood loss was only 1400 mL compared to the 3000 mL described by the immediate hysterectomy group by Zuckerwise, et al. This case highlights the benefits and risks of delayed interval hysterectomy and offers techniques for these high-risk cases, including possible REBOA placement.

References: 1. Zuckerwise LC, Craig AM, Newton JM, Zhao S, Bennett KA, Crispens MA. Outcomes following a clinical algorithm allowing for delayed hysterectomy in the management of severe placenta accreta spectrum. Am J Obstet Gynecol. 2020

Feb;222(2):179.e1-179.e9. doi: 10.1016/j.ajog.2019.08.035. Epub 2019 Aug 27. PMID: 31469990.

Abstract #: SAT – BCR – 03

Best Case Report - A Case of Serotonin Syndrome During Intrapartum Cesarean Delivery

Presenting Author: Michael Wen, MD
Presenting Author's Institution: Brigham & Women's Hospital, Harvard Medical School
Senior Author: Jimin Kim, MD, MSc - Brigham & Women's Hospital
Co-Authors: Marika O. Badhey, MD - Brigham & Women's Hospital, Harvard Medical School
Michaela K. Farber, MD, MS - Brigham & Women's Hospital
Katelin McDilda, MD MPH - Brigham & Women's Hospital, Harvard Medical School
Sharon C. Reale, MD - Brigham and Women's Hospital and Harvard Medical School
Julianna Schantz-Dunn, MD MPH - Brigham & Women's Hospital, Harvard Medical School

Introduction: Serotonin syndrome (SS) is a rare but potentially life-threatening syndrome caused by overstimulation of serotonin receptors leading to autonomic hyperactivity, altered mental status, and neuromuscular aberrations (1). We present a case of SS during intrapartum cesarean delivery (CD) after administration of commonly used medications.

Case One: A healthy 31-year-old G1P0 presented for induction of labor for polyhydramnios. After a prolonged labor course with epidural analgesia, she underwent a CD for arrest of descent. Epidural lidocaine, fentanyl, and morphine were administered for surgical anesthesia. Ondansetron was administered. Shortly after delivery, epidural chloroprocaine was given for breakthrough pain. Refractory uterine atony despite prophylactic oxytocin was treated with methylergonovine. Midazolam and promethazine were administered for significant anxiety and persistent nausea, respectively. The patient developed acute alternating somnolence and combativeness. After initial hypotension, she experienced significant hypertension, tachycardia, and hyperthermia to 39.9°C. Upper extremity hypertonicity also developed. The patient stabilized after 1.5 hours of supportive care with an abrupt return to baseline mental status. Postoperatively, the patient's creatinine kinase peaked to 1972 U/L. Workup was negative for thyroid storm, sepsis, preeclampsia, and posterior reversible encephalopathy syndrome. The neurology service was consulted, and SS was felt to be the likely diagnosis. Potential serotonergic triggers identified were fentanyl, ondansetron, promethazine, and methylergonovine (Table 1). The patient was discharged uneventfully on postpartum day 4.

Discussion: This case of intraoperative SS was characterized by autonomic instability, altered mentation, and pyrexia in a healthy parturient after exposure to multiple medications with serotonergic properties. SS is a clinical diagnosis; the differential includes neuroleptic malignant syndrome (NMS), malignant hyperthermia, anticholinergic toxicity, thyroid storm, and sepsis. Many clinical features of SS and NMS overlap, but SS is distinguished by neuromuscular hyperreactivity (hyperreflexia, myoclonus) and shorter time course while NMS is characterized by sluggish neuromuscular response (rigidity) and slower resolution over days. Given the acute onset and resolution of symptoms, SS was deemed most likely. Management of SS includes discontinuation of serotonergic agents, sedation with benzodiazepines, supportive care with the goal to normalize vital signs, and treatment with a

serotonin antagonist. Fentanyl, ondansetron, and methylergonovine are all commonly used medications during CD that each have potential serotonergic effects (2). Despite their frequent use, there are no known reports of peripartum SS. Care should be taken, as SS can recur upon subsequent exposure to serotonergic medications.

References: 1. Mikkelsen Basic Clin Pharm Toxicol 2023 2. Werneke J Integr Neurosci 2020

Wen- A Case of Serotonin Syndrome During Intrapartum Cesarean Delivery Table.pdf

Abstract #: SAT – BCR – 04

Best Case Report - Peripartum Management of a Patient with Vascular Ehlers-Danlos Syndrome and Loeys-Dietz Syndrome Complicated by Aortic and Carotid Dissections

Presenting Author: Jacob M. Nieb, MD
Presenting Author's Institution: McGaw Medical Center of Northwestern University - Chicago, Illinois
Senior Author: Jennifer Banayan, MD - Northwestern University

Introduction: Aortic dissection in pregnancy is associated with severe morbidity and mortality for both the mother and fetus. At an incidence of 4-5 per 1,000,000 pregnancies, aortic dissection is the third most common maternal cardiovascular cause of death.1 The physiological changes that occur with pregnancy and labor put severe stress on maternal vasculature, increasing the risk for postpartum dissection.1 Thus complex planning is required to manage the parturient throughout delivery.

Case One: Our patient was a 32-year-old G3P1011 at 33w5d with vascular Ehlers-Danlos Syndrome (vEDS) and Loeys-Dietz Syndrome complicated by type B aortic and left carotid artery dissections. A multidisciplinary meeting between obstetrics, cardiology, vascular surgery, and obstetric anesthesiology determined the safest course of delivery was scheduled cesarean delivery in a cardiac operating room with vascular surgery on standby. This delivery occurred during the late preterm period to avoid the hemodynamic changes associated with spontaneous labor that could lead to worsening of her existing dissections. The anesthetic plan was general anesthesia, as opposed to neuraxial anesthesia, given the patient's underlying vEDS and known dural ectasias on her most recent MRI. A preinduction arterial line and large bore intravenous access were placed. Rapid sequence induction and endotracheal intubation via video laryngoscopy were uncomplicated. Esmolol was administered throughout delivery to minimize tachycardia. Cesarean delivery was complicated by postpartum hemorrhage due to uterine atony requiring oxytocin, carboprost tromethamine, and misoprostol. Tranexamic acid, desmopressin, packed red blood cells, and cryoprecipitate were also administered. The patient was extubated in the operating room and admitted to the surgical intensive care unit for monitoring and transferred to the floor on postpartum day two. Her dissections remained stable on all postpartum imaging.

Discussion: No randomized controlled trials exist to support the management of parturients with genetic aortopathy. As such, the timing, mode of delivery, and anesthetic technique are guided by case reports and expert opinion. Existing literature supports that patients with chronic dissections should be delivered in the late-preterm and early term period.1 Regarding mode of anesthesia, patients with vEDS are at high risk for hematoma formation during neuraxial placement, favoring general anesthesia.1,2 Finally, coordination of care between multiple medical and surgical subspecialties allows for the safest delivery of this patient population with the ability to rapidly respond to emergencies should they occur.

References: 1. Whelan AR, Ringel ME, Shalhub S, Russo ML. Obstetric considerations for

aortopathy in pregnancy. Ann Cardiothorac Surg. 2023; 12(6):526-35. 2. Blackburn J, Geoghegan J, Sharih G, Allan M. Anesthesia for caesarean birth in patients with vascular Ehlers-Danlos syndrome. Int J Obstet Anesth. 2023; 56:103921.

MRI Aortic Dissection.pdf

Abstract #: SAT – BCR – 05

Best Case Report - Too Much of a Good Thing: High Dose Aspirin and Neuraxial Anesthesia

Presenting Author: Sara Dryden, MD
Presenting Author's Institution: University of North Carolina - Chapel Hill, North Carolina
Senior Author: Kathleen Smith, MD - University of North Carolina
Co-Authors: Erin Dengler, MD, MBA - University of North Carolina at Chapel Hill

Introduction: Spinal epidural hematoma (SEH) is a potentially devastating complication of neuraxial anesthesia. Low-dose Aspirin (ASA) is commonly prescribed to parturients as prophylaxis for Pre-eclampsia. While low-dose ASA is nearly universally accepted as safe (1), there are limited recommendations on high dose ASA and the risks associated with neuraxial placement. This case brings the question of safety regarding neuraxial anesthesia in a patient taking 1690mg of ASA daily.

Case One: A 36yo G1P0 at 39 weeks gestation was admitted for induction of labor (IOL) for Multiple Sclerosis, well controlled off medication. Additional history included chronic hypertension on prophylactic low-dose ASA, iron deficiency anemia and obesity (BMI 41 kg/m2). During anesthesia evaluation, the patient reported taking a high dose ASA pain reliever twice daily for the past two weeks, totalling 1690 mg of ASA per day. Given the relative contraindication to neuraxial and concern for post-partum haemorrhage, IOL was postponed. The patient was scheduled to return in 5-7 days. However, 3 days later the patient presented with spontaneous rupture of membranes. Hematology was consulted, and platelet function assay and serum Salicylate level obtained to elucidate safety of neuraxial placement. Following a risk/benefit discussion and detailed informed consent, the patient requested a labor epidural which was completed without complication. Labor progressed with a persistent Category II tracing. Following a fetal bradycardia event, urgent Cesarean delivery was performed. The fetus was delivered without complication, under epidural anesthesia.

Discussion: There is limited published data on high-dose ASA and safety of neuraxial anesthesia. ASRA guidelines recommend no change in practice for patients on low-dose ASA (1). It is generally accepted that ASA alone, without additional antithrombotic medications or bleeding conditions, does not increase risk of spinal hematoma (2). ASA inhibits platelet function for the life of the platelet, but varying dosages may affect function differently. Low-dose ASA (< 325mg) inhibits the synthesis of thromboxane A2, decreasing platelet aggregation. High dose ASA (1.5-2g/day), also inhibits prostacyclins (inhibitors of platelet aggregation), causing a thrombogenic effect, theoretically decreasing bleeding risk (1). European guidelines address high dose ASA (>200mg), recommending waiting 3-7 days from last dose prior to neuraxial anesthesia (3). Ultimately, there is little evidence to inform safety of neuraxial anesthesia in patients on high-dose ASA. Patient education, risk/benefit discussion and shared decision making must guide care.

References: 1) Horlocker TT, Vandermeuelen E, Kopp SL, et al. Regional Anesthesia & Pain Medicine 2018;43:263-309. 2) Vela Vásquez RS, Peláez Romero R. Br J Anaesth. 2015

Nov;115(5):688-98. 3) Kietaibl S, Ferrandis R, Godier A et al. Eur J Anaesthesiol. 2022 Feb 1;39(2):100-132.

Abstract #: SAT – BCR – 06

Best Case Report - A Case of Cosmetic Experimental Biopolymers Leading to Non-Neuraxial Management of Labor Analgesia

Presenting Author: Ann Norris, MD
Presenting Author's Institution: Massachusetts General Hospital, Department of Anesthesia, Critical Care, and Pain Medicine
Senior Author: Rebecca Minehart, MD, MSHPEd - Massachusetts General Hospital
Co-Authors: Stephanie W. Lee, MD, PhD - Massachusetts General Hospital, Department of Anesthesia, Critical Care, and Pain Medicine
Jeremi Mountjoy, MD - Massachusetts General Hospital/Harvard Medical School

Introduction: Biopolymers such as silicone have been injected in body contouring procedures despite warnings against their use. These non-compacted biopolymers can migrate from the gluteal region to lumbosacral subcutaneous tissue of the spine, posing a risk to safe neuraxial anesthesia (1). We present a parturient with a history of gluteal augmentation using biopolymers and MRI evidence of migration to areas overlying the lumbar spine.

Case One: A 33-year-old G3P0 presented for an anesthesia consult for history of a cosmetic gluteal augmentation procedure with experimental biopolymers roughly 10 years prior in another country. The patient reported that she had been told by a surgeon from that country that these biopolymers could migrate and was encouraged to obtain imaging but had not done so. A lumbar spine MRI was subsequently ordered and showed subcutaneous nodularities at L5-S1 with soft tissue changes extending to L2-L3. After review of literature, she was counseled that she was not a candidate for neuraxial anesthesia during labor due to significant risk of introducing biopolymer material into her spinal or epidural space (1). She then presented at 41 weeks for induction of labor in the setting of late term gestation. Her pain was initially managed using nitrous oxide and subsequently a fentanyl patient-controlled analgesia pump (PCA). When she reached the second stage of labor, a pudendal nerve block was performed by the obstetrics team and provided relief. Approximately 22 hours after admission she had an uncomplicated spontaneous vaginal delivery. Fentanyl PCA was discontinued following repair of a second-degree vaginal laceration. She had an uncomplicated postpartum course and was discharged on postpartum day two.

Discussion: Literature describes unpredictable migration of biopolymers used in body contouring procedures. MRI is recommended as the best imaging modality to assess for migration as ultrasound typically only identifies larger particles and the particles are not palpable on physical exam (1). Unfortunately, these substances have also been associated with inflammation, edema, and necrosis at sites of injection and migration. Performing neuraxial anesthesia in a patient with known lumbar migration of biopolymers thus risks perforation and release of injected substances into the spinal or epidural space, exposing the nervous system to potential toxicity. Ultimately, more investigation is needed to understand the physiological consequences of biopolymers. Patients with a history of cosmetic surgery with non-compacted biopolymer injections should have MRI imaging prior to neuraxial

anesthesia and require careful coordination of care with education on both pharmacological and non-pharmacological methods of analgesia should they not be a candidate for neuraxial anesthesia.

References: (1) Amaya-Zúñiga et al.Col. J. of Anesth. 2021.

Lumbar Spine MRI T2.pdf

Abstract #: SAT – BCR – 07

Best Case Report - The Use of Transcutaneous CO2 Monitoring to Guide Ventilatory Management in Pregnant Patients Undergoing Laryngeal Surgery

Presenting Author: Sara Feldman, MD
Presenting Author's Institution: Department of Anesthesiology, Duke University, Durham, NC - Durham, North Carolina
Senior Author: Vijay Ramaiah, MBBS - Department of Anesthesiology, Duke University, Durham, NC
Co-Authors: Chakib Ayoub, MD, MBA - Department of Anesthesiology, Duke University, Durham, NC
John J. Ward, MD - Department of Anesthesiology, Duke University, Durham, NC

Introduction: It is not known what the upper limit of safe PaCO2 is during pregnancy, particularly for short periods of time, though we know maternal hypercarbia can lead to fetal acidosis (1). We describe two cases of pregnant patients undergoing laryngeal surgery in which transcutaneous CO2 (TcCO2) monitoring was employed to guide ventilatory management during two different airway management techniques.

Case One: A 27-year-old G2P0010 with GERD and migraines presents at 19 weeks gestation for urgent balloon dilation of severe subglottic stenosis. Airway notable for Mallampati grade III and audible inspiratory and expiratory stridor. Standard monitors were applied with the addition of TcCO2 sensor (SenTec AG). The patient was pre-oxygenated with high flow nasal device. Transnasal humidified rapid insufflation ventilatory exchange (THRIVE) (Optiflow Fisher & Paykel) was initiated at 70 L/minute for apneic oxygenation after induction of general anesthesia. THRIVE was used for 20 minutes and oxygen saturation did not drop below 98%. Balloon dilations were performed at minutes 13 and 17. TcCO2 peaked at 75 mmHg at 20 minutes, at which point the procedure was ended and automatic supraglottic jet ventilation was initiated to rapidly decrease the TcCO2 prior to LMA Supreme placement. After neuromuscular blockade reversal and awakening, the patient was taken to the recovery area where fetal heart tones were recorded and within normal limits.

Case Two: A 31-year-old G3P1011 with idiopathic subglottic stenosis requiring recurrent dilation procedures presents at 24 weeks gestation for scheduled laser excision and balloon dilation procedure. Airway exam notable for Mallampati grade II airway and mildly hoarse voice. Standard monitors were applied with the addition of TcCO2. The patient was placed in reverse Trendelenberg position and pre-oxygenated via face mask. After induction of anesthesia, the larynx was exposed with Ossoff laryngoscope and supraglottic manual high frequency jet ventilation (HFJV) was commenced for intermittent ventilation. Initial TcCO2 measurement prior to pre-oxygenation was 33 mmHg; TcCO2 peaked at 53 mmHg 16 minutes into the procedure, at which time the frequency of HFJV was increased to correct hypercarbia to minimize acidosis. The procedure ended after 26 minutes, and laryngoscope was removed and the patient was supported with mask ventilation until reversal of neuromuscular blockade and resumption of spontaneous ventilation. The patient was taken to the recovery area where

fetal heart tones were recorded and within normal limits.

Discussion: TcCO2 is a noninvasive continuous real-time measurement of tissue CO2. TcCO2 measurement aids in monitoring of ventilation and may be particularly important in guiding management in laryngeal surgeries for pregnant patients during which a tubeless technique with THRIVE or HFJV is employed.

References: 1. Heesen, Michael; Klimek, Markus. Nonobstetric anesthesia during pregnancy. Current Opinion in Anaesthesiology 29(3): 297-303, June 2016.

Figure 1.pdf

Abstract #: SAT – BCR – 08

Best Case Report - A Patient with Hypodysfibrinogenemia Undergoing Cesarean Delivery: Discordant Dose-Response and ROTEM Results.

Presenting Author: Allison A. Mootz, MD
Presenting Author's Institution: Brigham & Women's Hospital - Boston, Massachusetts
Senior Author: John Kowalczyk, MD - Brigham and Women's Hospital / Harvard Medical School
Co-Authors: David J. Combs, MD PhD - Brigham and Women's Hospital
Jimin J. Kim, MD, MSc - Brigham & Women's Hospital
Shakthi Venkatachalam, MBBS - Brigham and Women's Hospital

Introduction: Congenital fibrinogen disorders (CFD) are rare coagulopathies with an incidence of 1:1,000,000 and associated with increased risk of bleeding.(1) CFD can be divided into quantitative and qualitative disorders. Hypodysfibrinogenemia represents a small subset of CFD, characterized by low Clauss fibrinogen levels (low fibrinogen functional activity) and normal fibrinogen antigen (dysfunctional protein). The low fibrinogen level increases postpartum hemorrhage (PPH), spontaneous abortion, and placental abruption risk, while increased dysfunctional protein increases venous and arterial thrombosis risk.(2) Treatment with fibrinogen concentrate for delivery and prophylactic heparin postpartum are often utilized to prevent these complications.(3) Limited data exists in the literature to guide peripartum management of hypodysfibrinogenemia.

Case One: A 33yo multigravida at 38wk7d with hypodysfibrinogenemia presented for elective repeat CD. She was diagnosed prior to her first pregnancy due to a family history of dysfibrinogenemia. She had no history of abnormal bleeding. On presentation, her fibrinogen level was 135mg/dL and fibrinogen antigen was 423mg/dL. Based on prior data of fibrinogen levels and PPH risk, we selected a goal fibrinogen level of 200mg/mL prior to neuraxial placement and CD. Rotational thomboelastometry (ROTEM) measurements were performed to assess their correlation with her fibrinogen levels. Her FIBTEM A10 on presentation was 21mm (ref range: 14-30mm), which correlates to a Clauss fibrinogen of approximately 350mg/dL.(4) Despite repletion with 5.3g of fibrinogen concentrate based on manufacturer's dose equation, her fibrinogen level rose to 174mg/dL, less than half the predicted response of 255mg/dL. Further replacement with 3.3g of fibrinogen concentrate increased her fibrinogen level to 244mg/dL and FIBTEM A10 to 26mm, correlating to an approximate Clauss fibrinogen of approximately 420mg/dL. The patient subsequently underwent an uncomplicated CD under a spinal anesthetic. Quantitative blood loss was 464mL. The patient did not experience any significant bleeding or thrombosis postpartum.

Discussion: There is no defined fibrinogen threshold for safe neuraxial placement in pregnant patients. Our patient's dose response to fibrinogen concentrate did not follow the

manufacturer's expected dose response, suggesting higher doses of fibrinogen concentrate may be required in patients with hypodysfibrinogenemia. Further work should be done to refine treatment protocols for this population. Furthermore, our ROTEM results confirm Santos et al findings, which show an artifactual increase in FIBTEM A10 in hypodysfibrinogenemia. Interpretation of fibrinogen levels utilizing viscoelastic testing in the dysfibrinogenemia population should be performed with the awareness of its limitations.

References: 1. Mohsenian S Blood Adv 2024. 2. Franchini M Ann Hematol 2007. 3. Szanto T Int J Mol Sci 2021. 4. Toffaletti JG Anesth Analg 2019.

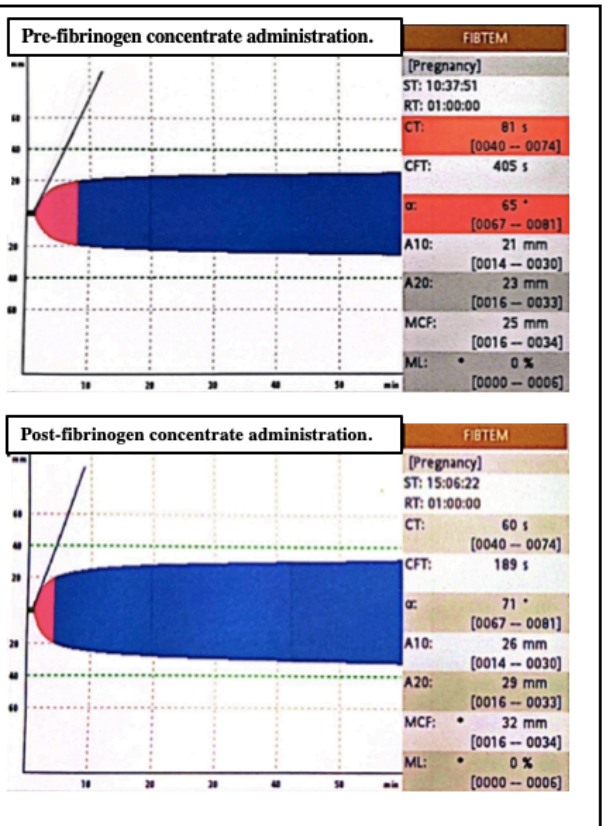


Figure 1. ROTEM FIBTEM results show a discordantly elevated A10 at 21 mm with a Clauss fibrinogen level of 135 mg/dL prior to any fibrinogen concentrate administration. The second panel shows a further increase post-fibrinogen concentrate administration of 8.6g, with a Clauss fibrinogen level of 244 mg/dL.

Abstract #: SAT – BCR – 09

Best Case Report - Uncommon Cause of Altered Mental Status in the Parturient with Polysubstance Use: Could it be the Thyroid?

Presenting Author: Saheb S. Dhillon, MD
Presenting Author's Institution: MetroHealth/Case Western Reserve University - Cleveland, Ohio
Senior Author: Jessica Merrill,MD - MetroHealth/Case Western Reserve University

Introduction: While rare in pregnancy, overt hypothyroidism can increase risk of hypertensive disorders of pregnancy, non-reassuring well-being, IUGR, PPH, need for c-section and adverse neonatal outcomes. Myxedema coma is a rare life-threatening consequence of untreated hypothyroidism. Progression to myxedema coma in pregnancy has rarely been reported and often difficult to diagnose. Early recognition and treatment is paramount given the relatively high mortality rate. Presentation is non-specific and may mimic pre-eclampsia with hypertension, proteinuria, encephalopathy and generalized edema. There is often a precipitating event, including labor or infection (1).

Case One: 35-year-old G5P1031 at 35w4d with active polysubstance use (methamphetamines, cocaine, opioids, benzodiazepines), known severe preE, IUGR, hypothyroid, hepatitis C and bipolar presented with IUFD. During induction, patient became increasingly somnolent precluding her ability to consent for neuraxial anesthesia. Initial concern for ongoing drug use however only moderate improvement following naloxone. Following uncomplicated delivery patient remained hypothermic and increasingly obtunded. Labs significant for profoundly elevated TSH (124), elevated troponins and Covid + at which point concern for myxedema coma raised. Transferred to MICU for initiation of IV thyroid replacement. Hospital course complicated by aspiration PNA for requiring intubation/ventilation and withdrawal.

Discussion: It is important to maintain a comprehensive differential when evaluating a laboring patient with altered mental status, particularly in patients with substance use disorder and severe pre-eclampsia (Mg overdose, intoxication, hypercarbia, hypoxia, stroke, seizure, sepsis, PRES). Even with recent active substance use, one must rule out underlying medical causes (hypoglycemia, hypoxia, anemia, myocardial ischemia). Overt hypothyroidism/ myxedema in pregnancy is rare and can be difficult to diagnose but must be considered in any patient with known hypothyroidism. Given its high mortality, it is important consult endocrinology to initiate treatment early with transfer to ICU for close hemodynamic monitoring. Treatment includes IV levothyroxine and IV hydrocortisone. Anesthetic considerations include airway edema, intravascular volume depletion, catecholamine resistant cardiac depression, arrhythmia, coagulopathy and increased aspiration risk. (1,2)

References: 1 Singh AK, Sarkar S, Khanna P. Parturient with Endocrine Disorders in the Intensive Care Unit. Indian J Crit Care Med. 2021 Dec;25(Suppl 3):S255-S260. doi: 10.5005/jp-journals-10071-24055. PMID: 35615618; PMCID: PMC9108778. 2 Peramunage D, Nikravan S. Anesthesia for Endocrine Emergencies. Anesthesiol Clin. 2020 Mar;38(1):149-163. doi: 10.1016/j.anclin.2019.10.006. Epub 2020 Jan 2. PMID: 32008649. PMID: 19857436

Abstract #: SAT – BCR – 10

Best Case Report - Management of a Pregnant Patient on Dual Antiplatelet Therapy After Percutaneous Intervention: Cangrelor Bridging as a Path to Neuraxial Anesthesia for Delivery

Presenting Author: Brian Waldman, MD
Presenting Author's Institution: Columbia University
Senior Author: Ruth Landau, MD - Columbia University
Co-Authors: Laurence E. Ring, MD - Columbia University
Richard Smiley, MD, PhD - Columbia University

Introduction: Acute myocardial infarction is a rare event in pregnancy (~1/10,000), but management with percutaneous intervention [PCI] and subsequent requirement of dual antiplatelet therapy [DAPT] for stent patency has implications for anesthesia type at delivery.1,2 In this case, we demonstrate a novel use for short-acting antiplatelet agents (cangrelor) to prevent stent thrombosis while still mitigating the risk of epidural hematoma associated with neuraxial anesthesia.

Case One: A 35-year-old G1P0 at 33w5d with a history of hypermobility Ehlers-Danlos syndrome presented to ED with chest pain. Initial findings included [1] elevated HS-troponin (138>443), [2] ST depressions in inferolateral leads on EKG, [3] hypokinesis of mid-distal inferior LV wall with LV EF 55-60% on TTE. Patient was given aspirin 324mg, and emergent left heart catheterization showed a coronary dissection (Ost to Prox LAD). A drug-eluting stent was successfully deployed, and DAPT was initiated with a traditional agent, clopidogrel. She was admitted to cardiac ICU for 5 days, and the Cardio-Obstetrics team set a tentative plan for C-section under general anesthesia at 37w in a cardiac OR with cardiothoracic surgery and ECMO on standby. Once she was transferred to OB High Risk unit, our team reviewed her case as well as the current literature and guidelines and proposed bridging with a short-acting antiplatelet agent, cangrelor, prior to delivery to minimize time off DAPT and allow for neuraxial anesthesia.3,4,5 Patient was transitioned to DAPT with cangrelor at 36w for planned C-section at 38w. Cangrelor was continued until 1am day of surgery, and and a single shot spinal anesthetic (at our standard dose: hyperbaric bupivacaine 12mg, fentanyl 15mcg, morphine 150mcg) was provided at 8am, with an arterial line and phenylephrine for blood pressure monitoring and support. Delivery was uncomplicated and concluded at 9:45am with EBL 1 L. She was admitted to cardiac ICU post-operatively for monitoring, and cangrelor was restarted at 9pm once deemed stable and appropriate by the ICU team. She was transitioned back to traditional DAPT the following day, and she was discharged home 3 days later.

Discussion: Cesarean delivery under general anesthesia is the presumed default for patients on DAPT, because holding traditional antiplatelet agents (e.g., clopidogrel) for the recommended week prior to neuraxial placement is not recommended given the risk of stent thrombosis. Cangrelor requires only a 3 hour hold prior to neuraxial anesthesia and can be restarted as early as 8 hours after catheter removal.6 By advocating for DAPT bridging with this short-acting antiplatelet agent, we provided the benefits of neuraxial anesthesia while

still minimizing associated hematologic risks.

References: 1. Clin Res Cardiol. 2022;111(7):723-731. 2. Obstet Med. 2018;11(3):144-7. 3. SOAP Annual Mtg. 2021;96. 4. Minerva Anestesiol. 2023;89(4):362-363. 5. Obstet Gynecol Cases Rev. 2020;7:164. 6. Reg Anesth Pain Med. 2018;43(3):263-309.

SOAP 2024
ANNUAL MEETING

Endowment Fund Campaign

Klaus Kjaer, MD, MBA
May Pian-Smith, MD, MS

Where Have We Been?

Focus:	Research	Education	Most Valued by Members: Consensus Statements and Practice Advisories
Year	1968	2004	2024
$:	Founded	Gertie Marx Foundation Trust Gertie Marx Fellowship Fund	Annual Meeting

Where Are We Now?

1,039 Active Members
2,023 Total Members

April 12, 2024

$2.6M Endowment Fund
+ $2.7M Operating Accounts

$5.3M Net Assets

December 31, 2023

What Are We Now?

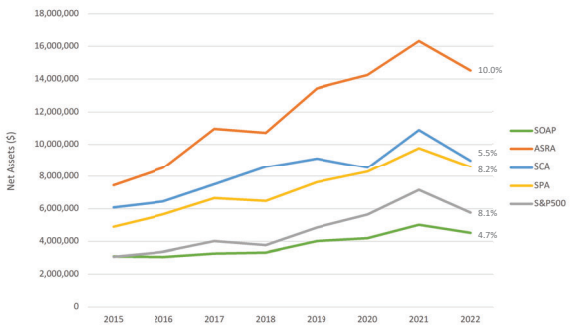
- SOAP Annual Meeting
- SOAP Consensus Statements and Practice Advisories
- SOAP Centers of Excellence
- SOAP-FAER Mentored Research Training Grant
- SOAP Research Network
- SOAP Special Interest Groups
- SOAP Fall Forum
- SOAP Fundamentals Course
- SOAP Mentoring Academy
- SOAP Research Highlights
- SOAP Journal Club
- SOAP State Representatives Program

Where Are We Going?

"We want to be the voice of obstetric anesthesia and reach more people with that voice."

"We want to recruit more trainees into our subspecialty."

How Do We Stack Up?



How Do We Stack Up?

Total Membership

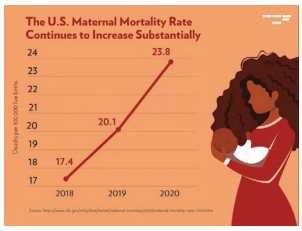
SOAP	SCA	SPA	ASRA
2,000	3,000	4,000	5,000

Do SOAP's Resources Match the Clinical Need?

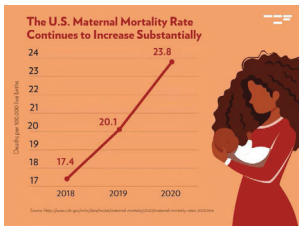
Cesarean Delivery (CD) is the most common surgery after cataract surgery.

3.7M births/annually in the US.
32.1% CD rate —> 1.2M CD + 2.5M NSVD.

Why the 2026 Endowment Fund Campaign?



Why the 2026 Endowment Fund Campaign?



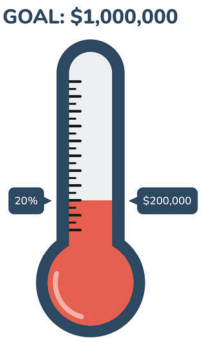
Why the 2026 Endowment Fund Campaign?

Why the 2026 Endowment Fund Campaign?

To be the voice of obstetric anesthesia, SOAP needs to:

1. **mentor** the next generation of researchers advancing our knowledge,
2. **lead** data capture on clinical performance in our subspecialty, and
3. **bring** educational material directly to patients.

2026 Endowment Fund Campaign Launch



2026 Endowment Fund Campaign Launch

Top Individuals	
May Pian-Smith	$50,000+
Klaus Kjaer	
Mark Norris	$25,000+
Richard Month	
David Wlody	
Ted Yaghmour	$10,000+
David Gambling	
Ashraf Habib	
Dan Katz	
Grace Lim	
Michaela Farber	
Jill Mhyre	
Heather Nixon	
Mahesh Vaidyanathan	$5,000+

Top Groups	
SOAP Board of Directors	$125,000

2026 Endowment Fund Campaign Launch

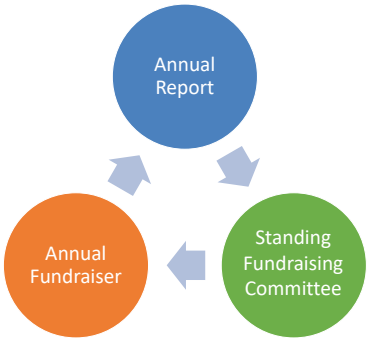
Every Donation Counts!

2026 Endowment Fund Campaign Launch

Note:

1. There may be opportunities to **recruit others** and combine forces and raise funds in honor of a mentor or a department.
2. Gifts may be **pre-tax**, so that the net cost to the donor will be roughly only 2/3 of the amount given.
3. Gifts, especially when very large, may also be part of **legacy planning**.

2026 Endowment Fund Campaign Next Steps as of July 1, 2024



Donate to the SOAP Endowment Fund

Your contribution will advance the safety and comfort of pregnant women and their babies throughout the world

- Research grants
- Education projects
- Charitable organizations

Ostheimer Lecture 2024

Melissa E. Bauer, D.O., FASA
Associate Professor of Anesthesiology
Associate Professor of Population Health Sciences
Duke University

1

Disclosure

- NIH/NICHD UG3/UH3 HD108053 (Contact PI)
  - Large-scale Implementation of Community Co-led Maternal Sepsis Care Practices to Reduce Morbidity and Mortality from Maternal Infection

2

- Ostheimer app thank you

3

Dr. Gerard W. Ostheimer

- Professor of Anesthesia at Harvard Medical School
- Director of Obstetric Anesthesia at Brigham and Women's Hospital
- Former SOAP President
  - 1980-1981

4

Process for selection

- Librarian created search (Thank you to Sarah Cantrell, MLIS)
- 5,263 abstracts reviewed
  - Potential to change practice
  - Novel concepts
  - Spur future research
  - Scientific integrity
  - Purpose
- XXX Final Papers selected
- 25 presented in the Ostheimer 2024 lecture

5

Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

6

Syllabus

#

Article

- Objective
- Population studied
- Methods
- Outcomes
- Years

7

Syllabus

#

Article

Action Item

8

Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

9

Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

10

Syllabus

#

Tranexamic Acid to Prevent Obstetrical Hemorrhage after Cesarean Delivery

L.D. Pacheco, R.G. Clifton, G.R. Saade, S.J. Weiner, S. Parry, J.M. Thorp, Jr., M. Longo, A. Salazar, W. Dalton, A.T.N. Tita, C. Gyamfi-Bannerman, S.P. Chauhan, T.D. Metz, K. Rood, D.J. Rouse, J.L. Bailit, W.A. Grobman, H.N. Simhan, and G.A. Macones, for the Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal–Fetal Medicine Units Network*

- To evaluate whether prophylactic TXA leads to a lower risk of maternal death or blood transfusion
- 31 U.S. Hospitals
- 50% scheduled and unscheduled cesarean delivery
- 11,000 patients (randomized to placebo or TXA)
  - 1 g of TXA given prophylactically after cord clamp
- maternal death
- blood transfusion
- 2018 to 2021

11

Syllabus

#

Tranexamic Acid to Prevent Obstetrical Hemorrhage after Cesarean Delivery

L.D. Pacheco, R.G. Clifton, G.R. Saade, S.J. Weiner, S. Parry, J.M. Thorp, Jr., M. Longo, A. Salazar, W. Dalton, A.T.N. Tita, C. Gyamfi-Bannerman, S.P. Chauhan, T.D. Metz, K. Rood, D.J. Rouse, J.L. Bailit, W.A. Grobman, H.N. Simhan, and G.A. Macones, for the Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal–Fetal Medicine Units Network*

Prophylactic Tranexamic acid during cesarean delivery did not lead to a lower risk of maternal death or blood transfusion compared with placebo (adjusted relative risk, 0.89; 95.26% confidence interval [CI], 0.74 to 1.07; P = 0.19)

12

Tranexamic acid at cesarean delivery: drug-error deaths

Neil F. Moran[1,2] | David G. Bishop[1,3] | Susan Fawcus[4] | Edward Morris[5] | Haleema Shakur-Still[6] | Adam J. Devall[7] | Ioannis D. Gallos[8] | Mariana Widmer[9] | Olufemi T. Oladapo[9] | Arri Coomarasamy[7] | G. Justus Hofmeyr[9,10,11]

World Health Organization

FDA U.S. FOOD & DRUG ADMINISTRATION

Best practices:

13

Azithromycin to Prevent Sepsis or Death in Women Planning a Vaginal Birth

A.T.N. Tita, W.A. Carlo, E.M. McClure, M. Mwenechanya, E. Chomba, J.J. Hemingway-Foday, A. Kavi, M.C. Metgud, S.S. Goudar, R. Derman, A. Lokangaka, A. Tshefu, M. Bauserman, C. Bose, P. Shivkumar, M. Waikar, A. Patel, P.L. Hibberd, P. Nyongesa, F. Esamai, O.A. Ekhaguere, S. Bucher, S. Jessani, S.S. Tikmani, S. Saleem, R.L. Goldenberg, S.M. Billah, R. Lennox, R. Haque, W. Petri, L. Figueroa, M. Mazariegos, N.F. Krebs, J.L. Moore, T.L. Nolen, and M. Koso-Thomas, for the A-PLUS Trial Group[a]

- To test whether azithromycin reduces maternal or neonatal death, stillbirth, or sepsis
- Low or middle income countries
- At least 28 weeks of gestation
- Excluded infection, arrythmia, or cardiomyopathy, > 6cm dilation
- 29,278 patients
- Randomized,double-blind,placebo controlled trial
- 2 g Azithromycin
- Maternal sepsis or death
- Stillbirth,neonatal sepsis, or death
- 2020 to 2022

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Syllabus

#

Azithromycin to Prevent Sepsis or Death in Women Planning a Vaginal Birth

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- Maternal sepsis or death
  - 1.6% (azithromycin) vs 2.4% (placebo)
  - Relative risk 0.67 (95% CI, 0.56 to 0.79)
- Stillbirth, neonatal death, or sepsis
  - 10.5% (azithromycin) vs 10.3% (placebo)
  - Relative risk 1.02 (95% CI, 0.95 to 1.09)

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Syllabus

#

Access to Prenatal Care Among Patients With Opioid Use Disorder in Florida

Findings From a Secret Shopper Study

Kimberly Fryer, MD, MSCR, Chinyere N. Reid, MBBS, MPH, Amanda L. Elmore, PhD, MPH, Saloni Mehra, MPH, CPH, Caitlynn Carr, MA, Jason L. Salemi, PhD, Christopher R. Cogle, MD, Claire Pelletier, BA, Maria Pacheco Garrillo, BSPH, William S. Sappenfield, MD, MPH, and Jennifer Marshall, PhD

- To assess access to care in pregnant patients taking medication for opioid use disorder with Medicaid coverage
- Medicaid provider enrollee
- FL
- Secret shopper study
- 14 weeks of gestation pregnant person taking methadone calling to establish care
- Success in obtaining an appointment
- 2021

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Syllabus

#

Access to Prenatal Care Among Patients With Opioid Use Disorder in Florida

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- 1,747 attempts to 1,023 offices registered for Medicaid
- 500 (48.9%) were able to be contacted
  - 197 (39.4%) offered an appointment
  - 303 (60.6%) not offered an appointment
    - Reasons:
    - Not accepting patients taking methadone 34.7%
    - Not accepting Medicaid 23.8%
    - Pregnancy too advanced 7.3%

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Syllabus

#

Nonfatal Overdoses Among Pregnant Individuals With Opioid Use Disorder

Jasmin E. Charles, PA-C, Jacob Baylis, MPH, Marcela C. Smid, MD, MS, and Gerald Cochran, PhD, MSW

- Characterize prior overdose events
- 7 to 32 weeks of gestation
- Opiod use disorder
- Part of larger prospective randomized trial
- Survey study
- Questions about prior overdose
- Descriptive statistics about prior overdose
- 2019 to 2022

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Nonfatal Overdoses Among Pregnant Individuals With Opioid Use Disorder

Jasmin E. Charles, PA-C, Jacob Baylis, MPH, Marcela C. Smid, MD, MS, and Gerald Cochran, PhD, MSW

- How many times have you overdosed? 66% (1 or more)
- When was the most recent time? 42% in the past year
- Only 21% went to the hospital
- Was it on purpose or accidental? Only 5% intentional
- How many times have you seen someone else overdose? 85% (once or more)

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Maternal deaths due to suicide and overdose in the state of Michigan from 2008 to 2018

Joanna A. Kountanis, MD; Mary Roberts, MD, DFAPA, CHCQM, FABQARP; Lindsay K. Admon, MD, MSc; Roger Smith, MD; Allison Cropsey, BS; Melissa E. Bauer, DO

- To characterize timing and clinical and social characteristics of suicide and overdose deaths
- Maternal deaths due to suicide or overdose in Michigan
- Pregnancy through 1 year postpartum
- Death certificates, prenatal and postpartum visits, delivery hospitalization, toxicology reports
- Descriptive statistics
- Temporal trends
- Causes of death
- Missed opportunuties
- 2008 to 2018

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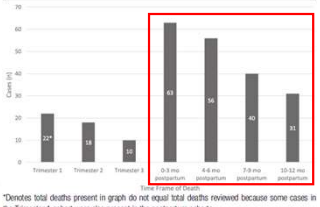
Maternal deaths due to suicide and overdose in the state of Michigan from 2008 to 2018

FIGURE 2
Maternal deaths in Michigan by time frame of death, 2008–2018 combined



*Denotes total deaths present in graph do not equal total deaths reviewed because some cases in the Trimester 1 cohort were also present in the postpartum cohorts.

Kountanis. Maternal suicide and overdose deaths. Am J Obstet Gynecol MFM 2023.

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Maternal deaths due to suicide and overdose in the state of Michigan from 2008 to 2018

Joanna A. Kountanis, MD; Mary Roberts, MD, DFAPA, CHCQM, FABQARP; Lindsay K. Admon, MD, MSc; Roger Smith, MD; Allison Cropsey, BS; Melissa E. Bauer, DO

- Only 43 (27.4%) on medication-assisted therapy
  - 18 (11.6%) stopped in the last trimester or postpartum

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Access to Prenatal Care Among Patients With Opioid Use Disorder in Florida

Nonfatal Overdoses Among Pregnant Ind

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- Major Challenges
  - Access to care
  - Overdose is common
  - Medication assisted therapy is underutilized
  - Stigma

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Syllabus

#

Buprenorphine (MOUD) Q&A

Therefore, any qualified practitioner can treat patients who screen positive for OUD with buprenorphine. This includes prescribing, administering, or dispensing buprenorphine with their DEA registration *as long as there are no state regulations that prohibit (or limit) them from participating in this activity.* DEA Registration numbers no longer indicate DATA-waivers, and prescriptions for buprenorphine no longer require the DATA-waivered or "x" waivered number on them, with the elimination of the DATA-waivered requirement in the CAA, 2023.

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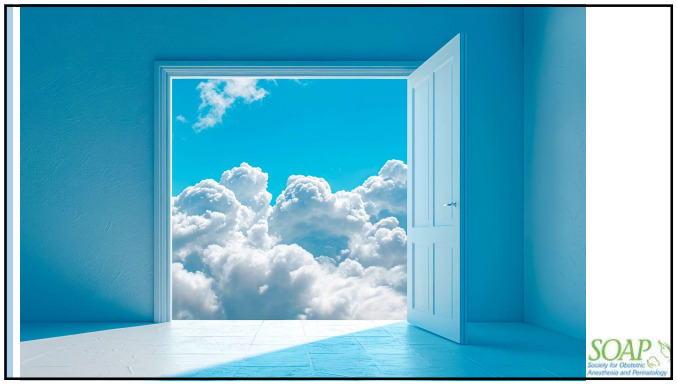

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Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

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Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

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Syllabus

#

Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group

Vishal Uppal,[1] Robin Russell,[2] Rakesh V Sondekoppam,[3] Jessica Ansari,[4] Zafeer Baber,[5] Yian Chen,[6] Kathryn DelPizzo,[7] Dan Sebastian Dirzu,[8] Hari Kalagara,[9] Narayan R Kissoon,[10] Peter G Kranz,[11] Lisa Leffert,[12] Grace Lim,[13,14] Clara Lobo,[15] Dominique Nuala Lucas,[16] Eleni Moka,[17] Stephen E Rodriguez,[18] Herman Sehmbi,[19] Manuel C Vallejo,[20] Thomas Volk,[21] Samer Narouze[22,23]

ASRA PAIN MEDICINE | SOAP Society for Obstetric Anesthesia and Perinatology | American Society of Spine Radiology | American Interventional Headache Society | Obstetric Anaesthetists' Association — Promoting the highest standards of anaesthetic practice in the care of mother and baby | State of the Art Safety Standards in RA — THE EUROPEAN SOCIETY OF REGIONAL ANAESTHESIA & PAIN THERAPY

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Syllabus

#

Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group

A — Routine use of non-cutting spinal needles for LP for all populations is recommended.

A — If using a cutting needle for LP, the use of a narrower gauge needle is recommended to reduce the risk of PDPH.

B — Regular multimodal analgesia including acetaminophen and NSAIDs should be offered to all patients with PDPH (if not contraindicated).

B — Focal neurological deficits, visual changes, alterations in consciousness, or seizures, especially in the postpartum period, should prompt neuroimaging to evaluate alternative diagnoses.

B — When PDPH is refractory to conservative therapy and impairs activities of daily living, an EBP should be considered to treat headache and other neurological sequelae of intracranial hypotension.

B — When the site of dural puncture is known, an EBP should be performed ideally at, or one space below, this level.

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Syllabus

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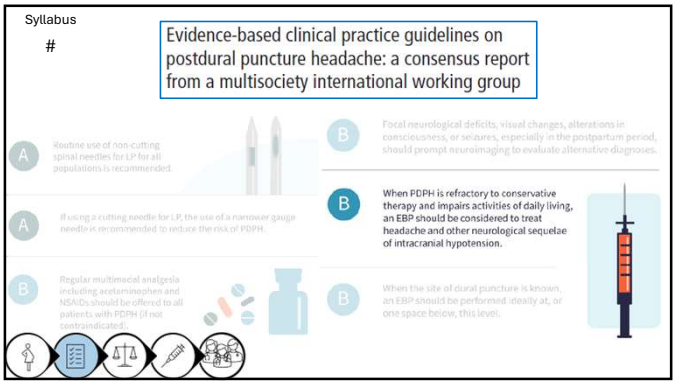

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Syllabus

#

Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group

B Strict aseptic technique should be observed in both collection and injection of autologous blood.

A Informed consent for an EBP should include the potential for repeat dural puncture, backache, and neurological complications.

B To minimize complications, blood should be injected slowly and incrementally. If the patient develops significant backache or headache (e.g., pressure paresthesia), injection of blood should be stopped and resumed based on the clinical judgement if symptoms resolve.

B Before discharge, information regarding PDPH sequelae should be conveyed to patients with arrangements for appropriate follow-up and contact information with their anesthesia provider and other health care providers.

B Follow-up with patients who experience PDPH should be continued until headache resolves.

B Urgent neuroimaging and referral to an appropriate specialist should be performed for any PDPH patient with worsening symptoms despite an EBP, new focal neurologic symptoms, or a change in the nature of headache.

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Syllabus

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Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group

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B Follow-up with patients who experience PDPH should be continued until headache resolves.

B Urgent neuroimaging and referral to an appropriate specialist should be performed for any PDPH patient with worsening symptoms despite an EBP, new focal neurologic symptoms, or a change in the nature of headache.

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Syllabus

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B Follow-up with patients who experience PDPH should be continued until headache resolves.

B Urgent neuroimaging and referral to an appropriate specialist should be performed for any PDPH patient with worsening symptoms despite an EBP, new focal neurologic symptoms, or a change in the nature of headache.

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Syllabus

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B Follow-up with patients who experience PDPH should be continued until headache resolves.

B Urgent neuroimaging and referral to an appropriate specialist should be performed for any PDPH patient with worsening symptoms despite an EBP, new focal neurologic symptoms, or a change in the nature of headache.

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Syllabus

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B Urgent neuroimaging and referral to an appropriate specialist should be performed for any PDPH patient with worsening symptoms despite an EBP, new focal neurologic symptoms, or a change in the nature of headache.

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Syllabus

#

Consensus Statement

Alliance for Innovation on Maternal Health

Consensus Bundle on Cardiac Conditions in Obstetric Care

Afshan B. Hameed, MD, Alison Haddock, MD, Diana S. Wolfe, MD, MPH, Karen Florio, DO, MPH, Nora Drummond, DNP, CNM, Christie Allen, MSN, BSN, Isabel Taylor, MS, Susan Kendig, JD, MSN, Garsaundra Pressney-Leblanc, MS, and Emily Greenwood, MPH

- Readiness- every unit
- Recognition and and Prevention- every patient
- Response- every event
- Reporting and Systems learning- every unit
- Respectful care- every unit, health care professional and team member

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#

	ROUTINE CARE Reassurance	CAUTION[#1] Nonemergent Evaluation	STOP[#2] Prompt Evaluation Pregnancy Heart Team
History of CVD	None	None	Yes
Self-reported symptoms	None or mild	Yes	Yes
Shortness of breath	No interference with activities of daily living; with heavy exertion only	With moderate exertion, new-onset asthma, persistent cough, or moderate or severe OSA[§]	At rest; paroxysmal nocturnal dyspnea or orthopnea; bilateral chest infiltrates on CXR or refractory pneumonia
Chest pain	Reflux related that resolves with treatment	Atypical	At rest or with minimal exertion
Palpitations	Few seconds, self-limited	Brief, self-limited episodes; no lightheadedness or syncope	Associated with near syncope
Syncope	Dizziness only with prolonged standing or dehydration	Vasovagal	Exertional or unprovoked
Fatigue	Mild	Mild or moderate	Extreme
Vital signs	Normal		
HR (beats per minute)	<90	90–119	≥120
Systolic BP (mm Hg)	120–139	140–159	≥160 (or symptomatic low BP)
RR (per minute)	12–15	16–25	≥25
Oxygen saturation	>97%	95–97%	<95% (unless chronic)
Physical examination	Normal		
JVP	Not visible	Not visible	Visible >2 cm above clavicle
Heart	S3, barely audible soft systolic murmur	S3, systolic murmur	Loud systolic murmur, diastolic murmur, S4
Lungs	Clear	Clear	Wheezing, crackles, effusion
Edema	Mild	Moderate	Marked

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Box 3. Warning Signs for an Imminent Cardiac Event

- Shortness of breath at rest
- Severe orthopnea using 1 or more pillows
- Resting heart rate 120 bpm or higher
- Resting systolic blood pressure 160 mm Hg or higher
- Resting respiratory rate 30 or higher
- Oxygen saturation rate 94% or lower with or without personal history of CVD

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Syllabus

#

Anesthetic Care of the Pregnant Patient With Cardiovascular Disease: A Scientific Statement From the American Heart Association

Marie-Louise Meng, MD, Chair; Katherine W. Arendt, MD; Jennifer M. Banayan, MD; Elisa A. Bradley, MD; Arthur J. Vaught, MD; Afshan B. Hameed, MD; Jade Harris, MSN, RN, C-OB, C-EFM; Benjamin Bryner, MD; Laxmi S. Mehta, MD, FAHA; Vice Chair, and on behalf of the American Heart Association Council on Cardiovascular Surgery and Anesthesia; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; and Council on Peripheral Vascular Disease

- Highlights specialized cardio-obstetric anesthesiology care
- Systematic approach to care

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Syllabus

#

Anesthetic Care of the Pregnant Patient With Cardiovascular Disease: A Scientific Statement From the American Heart Association

Figure. Planning for delivery framework. CARPREG indicates Cardiac Disease in Pregnancy; SOAP, Society for Obstetric Anesthesia and Perinatology; and WHO, World Health Organization.

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Syllabus

#

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Consensus Bundle on Sepsis in Obstetric Care

Melissa E. Bauer, DO, Catherine Albright, MD, MS, Malavika Prabhu, MD, R. Phillips Heine, MD, Chelsea Lennox, MPH, Christie Allen, MSN, RN, Carol Burke, MSN, APRN/CNS, April Chavez, MA, Brenna L. Hughes, MD, MS, Susan Kendig, MSN, JD, Maile Le Bouef, BA, Elliott Main, MD, Tiffany Mossrall, DNP, WHNP-BC, Luis D. Pacheco, MD, Laura Riley, MD, Rachel Sobieck, MD, MS, Andrew Youmans, MSN, CNM, and Ronald Gibbs, MD

- Remains a leading cause of maternal death
- At least 40% of deaths are preventable
- Deaths are due to delays in recognition, treatment, and escalation of care

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Syllabus

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READINESS

- Create a culture that utilizes non-hierarchical communication so that all team members, including the patient, feel empowered to speak up about a concern and know that their input is valued by the entire care team.*

RECOGNITION & PREVENTION

- Provide patient education focused on general life-threatening pregnancy and postpartum complications and early warning signs, including sepsis signs and symptoms other than fever, and instructions for who to notify with concerns.*

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Syllabus

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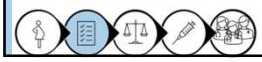

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RESPONSE

- Facilitate comprehensive post-sepsis care, including screening and proper referrals for post-sepsis syndrome.*

REPORTING & SYSTEMS LEARNING

- Conduct multidisciplinary reviews for systems improvement of each sepsis case to assess the screening program, the quality of care provided to patients with sepsis, and whether instances of bias may have impacted care.*

RESPECTFUL, EQUITABLE & SUPPORTIVE CARE

- Because maternal mortality and severe maternal morbidity related to sepsis disproportionately affect Black, Indigenous, and Hispanic people because of systemic racism, but not race itself, it is necessary to mitigate this bias by having a high index of suspicion for sepsis.*

SOAP Society for Obstetric Anesthesia and Perinatology

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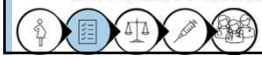

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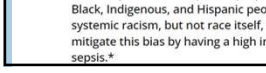
RESPECTFUL, EQUITABLE & SUPPORTIVE CARE

- Because maternal mortality and severe maternal morbidity related to sepsis disproportionately affect Black, Indigenous, and Hispanic people because of systemic racism, but not race itself, it is necessary to mitigate this bias by having a high index of suspicion for sepsis.*



SOAP Society for Obstetric Anesthesia and Perinatology

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Syllabus

#

Society for Maternal-Fetal Medicine Consult Series #67: Maternal sepsis

Society for Maternal-Fetal Medicine (SMFM); Andrea D. Shields, MD, MS; Lauren A. Plante, MD, MPH; Luis D. Pacheco, MD; and Judette M. Louis, MD, MPH; SMFM Publications Committee

- Systematically endorses or modifies each recommendation from the Surviving Sepsis Campaign for pregnancy
- Grades for level of evidence
- Antibiotic recommendations

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Society of Anesthesia and Sleep Medicine and the Society for Obstetric Anesthesia and Perinatology Consensus Guideline on the Screening, Diagnosis, and Treatment of Obstructive Sleep Apnea in Pregnancy

Jennifer E. Dominguez, MD, MHS,* Sarah Cantrell, MLIS, Ashraf S. Habib, MBBCh,MHSc, Bilgay Izyt-Balserak, MS, PhD, Ellen Lockhart, MD, Judette M. Louis, MD, MPH, Alice Mirkovic, MBBS, FRCA, Jamb W. Nadler, MD, PhD, Mahesh Nagappa, MD, MSc, Louise M. O'Brien, PhD, MS, Christine Won, MD, MSc, and Ghada Bourjeily, MD*

- Screening for OSA in BMI> 30 kg/m^2, hypertensive disorders of pregnancy, diabetes
- Use pregnancy specific screening criteria in 1st or 2nd trimester

- Avoid using:
  - STOP-BANG
  - Berlin questionnaire
  - Epworth Sleepiness Scale
  - ASA checklist

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Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

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Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

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Syllabus

#

Race and Ethnicity Reporting and Representation in Obstetrics and Gynecology Clinical Trials and Publications From 2007-2020

Jecca R. Steinberg, MD, MSc; Brandon E. Turner, MD, MSc; Julia D. DiTosto, MS; Brannon T. Weeks, MD; Anna Marie P. Young, MD, MPH; Connie F. Lu, MD; Tierney Wolgemuth, MD; Kai Holder, BA; Nora Laasiri, MPAS; Natalie Squires, MD; Naixin Zhang, MD; Michael Taylor Richardson, MD; Christopher J. Magnani, MD, MS, MPhil; Jill N. Anderson, MD; Dario R. Roque, MD; Lynn M. Yee, MD, MPH

- To characterize race and ethnicity reporting and representation in US OB-GYN clinical trials and their subsequent publications
- US OBGYN Interventional trials
- Clinicaltrials.gov, subsequent publications from Pubmed and Google Scholar
- Compared with US Census data
- Reporting of race and ethnicity data
- Race and ethnicity representation and odds above US Census estimates
- 2007 to 2020

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Syllabus

#

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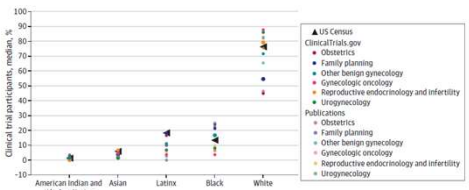
Figure 3. Race and Ethnicity Representation in Obstetrics and Gynecology Clinical Trials and Publications



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Syllabus

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Figure 3. Race and Ethnicity Representation in Obstetrics and Gynecology Clinical Trials and Publications

Replicate in OB anesthesia studies
Strive for inclusivity in recruitment
Opportunity to influence patient, support persons, families

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Syllabus

#

RESEARCH ARTICLE

Factors which influence ethnic minority women's participation in maternity research: A systematic review of quantitative and qualitative studies

Holly Lovell, Sergio A. Silverio, Lisa Story, Emily Skelton, Jacqueline Matthew

- To investigate factors which influence participation in maternal research
- Systematic review
- MEDLINE/CINHAL/PsycInfo/EMBASE databases
- Reported race and ethnicity and reasons for participation or decline
- Qualitative and quantitative collation of reasons
- 2021 to 2022

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Syllabus

#

RESEARCH ARTICLE

Factors which influence ethnic minority women's participation in maternity research: A systematic review of quantitative and qualitative studies

Holly Lovell[1], Sergio A. Silverio[2,3], Lisa Story[1,2], Emily Skelton[3], Jacqueline Matthew[1,4]*

Participated

- Cultural competency and diversity
- Trust and community support
- Research design and demands
- Personal and community benefit

Declined to participate

- Cultural and family influence
- Distrust
- Facilitative study design
- Perception of potential harm with no benefit

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Syllabus

#

Vital Signs: Maternity Care Experiences — United States, April 2023

Youssra A. Mohamoud, PhD[1]; Elizabeth Cassidy, MPH[1]; Erika Fuchs, PhD[1]; Lindsay S. Womack, PhD[1]; Lisa Romero, DrPH[1]; Lauren Kipling, PhD[1]; Reena Oza-Frank, PhD[1]; Katharyn Baca, PhD[1]; Romeo R. Galang, MD[1]; Andrea Stewart, PhD[1]; Sarah Carrigan, MPH[1]; Jennifer Mullen, MPH[1]; Ashley Busacker, PhD[1]; Brittany Behm, MPH[1]; Lisa M. Hollier, MD[1]; Charlan Kroelinger, PhD[1]; Trisha Mueller, MPH[1]; Wanda D. Barfield, MD[1]; Shanna Cox, MSPH[1]

Respectful Care

"The care organised for and provided to all women in a manner that maintains their dignity, privacy and confidentiality, ensures freedom from harm and mistreatment, and enables informed choice and continuous support during labour and childbirth"

-World Health Organization

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Syllabus

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Vital Signs: Maternity Care Experiences — United States, April 2023

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- To examine patient perspective of respectful care
- Porter Novelli View Moms survey
- Survey
- Most recent childbirth experience
- Stratified by insurance type and Race and Ethnicity

- *Satisfaction*
- *Mistreatment*
- *Discrimination*
- *Asking questions or discussing concerns*
- 2023

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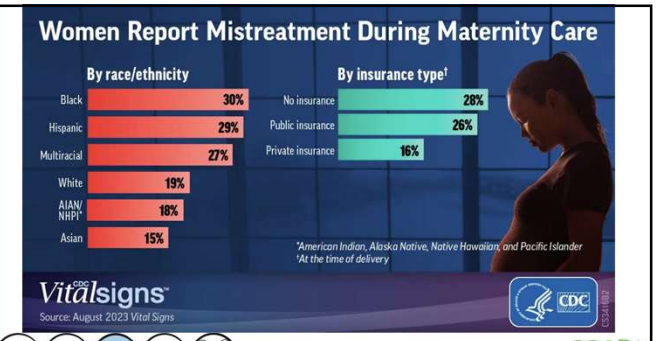

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- Mistreatment (20% overall)
  - Receiving no response to requests for help
  - Being shouted at or scolded
  - Not having their physical privacy protected
  - Being threatened with withholding treatment or made to accept unwanted treatment

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Syllabus

#

Vital Signs: Maternity Care Experiences — United States, April 2023

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- Holding back asking questions or discuss concerns (45%)
  - Thinking, or being told by friends or family, what they were feeling was normal
  - Not wanting to make a big deal about it or being embarrassed to talk about it
  - Thinking their healthcare provider would think they're being difficult
  - Thinking their healthcare provider seemed rushed
  - Not feeling confident that they knew what they were talking about

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Syllabus

#

Racial disparities in care escalation for postpartum hemorrhage requiring transfusion

Carolyn S. Guan, BA; Theresa M. Boyer, MS, MSPH; Kristin C. Darwin, MD; Chelsea Henshaw, MD; Erin D. Michos, MD, MHS; Shari Lawson, MD; Arthur J. Vaught, MD

- Identify maternal demographics and obstetric characteristics associated with intervention for postpartum hemorrhage
- Intervention level
- Adjusted for variables
- 2 Hospitals
- Postpartum hemorrhage and blood transfusion
- 2015 to 2020
- Retrospective chart review
- Assessment of 3 levels of escalation of intervention
- Ordinal logistic regression to estimate odds of higher intervention levels

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Syllabus

#

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Carolyn S. Guan, BA; Theresa M. Boyer, MS, MSPH; Kristin C. Darwin, MD; Chelsea Henshaw, MD; Erin D. Michos, MD, MHS; Shari Lawson, MD; Arthur J. Vaught, MD

FIGURE 3
Definitions of 3 levels of antihemorrhagic intervention

Level 1: Uterotonic Only (n=233)	Level 2: Procedure (n=98)	Level 3: Hysterectomy (n=34)
	- B-Lynch suture	
- Oxytocin (Pitocin)	- O'Leary stitch	- Hysterectomy
- Methylergonovine (Methergine)	- Bakri balloon	
	- Dilation and curettage (D&C)	
- Carboprost (Hemabate)	- Laceration repair (≥3rd degree)	
- Misoprostol (Cytotec)	- Exploratory laparotomy	
	- Interventional radiology uterine artery embolization	

Guan. Disparities in care escalation. Am J Obstet Gynecol MFM 2023.

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#

Racial disparities in care escalation for postpartum hemorrhage requiring transfusion

Carolyn S. Guan, BA; Theresa M. Boyer, MS, MSPH; Kristin C. Darwin, MD; Chelsea Henshaw, MD; Erin D. Michos, MD, MHS; Shari Lawson, MD; Arthur J. Vaught, MD

- Black and Hispanic patients were less likely to receive higher levels of intervention (P=0.034)
- After adjusting for EBL, AMA, PAS, and fibroids
  - aOR 0.55 (95%CI, 0.30 to 0.98), Black patients still less likely to have intervention
- Persisted at ≥ 3 L
  - Black patients: 0.31 (95% CI, 0.10 to 0.92)
  - Hispanic patients: 0.10 (95% CI, 0.01 to 0.53)

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#

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  - Hispanic patients: 0.10 (95% CI, 0.01 to 0.53)

Recognize bias affects interventions, and with recognition can change practice
"I know bias can lead to less interventions… should we go to the OR, IR, get labs"
Conduct studies to more granularly understand disparities
Protocolization saves lives

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Syllabus

#

Strategies to Promote Maternal Health Equity

The Role of Perinatal Quality Collaboratives

Audra R. Meadows, MD, MPH, Renée Byfield, MS, FNP, Debra Bingham, DrPH, RN, and Hafsatou Diop, MD, MPH

- Perinatal Quality Collaboratives
  - Standardize care through bundle implementation
  - Improve severe maternal morbidity overall
  - Reduce or eliminate disparities in outcomes

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Syllabus

#

Strategies to Promote Maternal Health Equity

The Role of Perinatal Quality Collaboratives

Audra R. Meadows, MD, MPH, Renée Byfield, MS, FNP, Debra Bingham, DrPH, RN, and Hafsatou Diop, MD, MPH

- Strategies:
  - Communicate maternal equity as a priority through leadership
  - Leverage data and enhance surveillance
  - Engage and collaborate with strategic partners
  - Collaborate and listen to patients and members of the community
  - Educate clinicians
  - Collaborate to implement best practices

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Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

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Ostheimer 2023 Themes

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Ethical Principles Do Not Support Mandatory Preanesthesia Pregnancy Screening Tests: A Narrative Review

Stephen Jackson, MD,* James Hunter, MD,† and Gail A. Van Norman, MD‡

- Given current climate, reexamine policies
  - Informed consent
  - Ethics
- Reasoning
  - Preventing fetal harm
  - Medicolegal concerns

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Ethical Principles Do Not Support Mandatory Preanesthesia Pregnancy Screening Tests: A Narrative Review

Stephen Jackson, MD,* James Hunter, MD,† and Gail A. Van Norman, MD‡

- Risk of fetal harm
  - Anesthetic drugs are not known teratogens or cause known harm
  - Relative risk slightly elevated for miscarriage
    - Appears related to surgery
  - "There is no evidence that in utero human exposure to anesthetic or sedative drugs has any effect on the developing fetal brain: and there are no animal data to support an effect with limited exposures less than 3 hours in duration." –ASA and ACOG *Committee on obstetric practice opinion: nonobstetric surgery during pregnancy*

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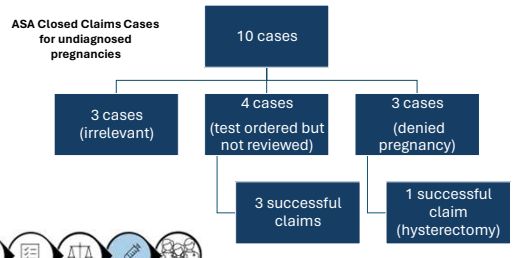

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Ethical Principles Do Not Support Mandatory Preanesthesia Pregnancy Screening Tests: A Narrative Review

Stephen Jackson, MD,* James Hunter, MD,† and Gail A. Van Norman, MD‡

"Other than for surgical indications, routine pregnancy testing may pose greater medicolegal risk to anesthesiologists due to failure to check the result or failure to document informed consent of [perhaps minimal] risk of miscarriage prior to elective surgery"
- ASA Committee on Quality Management and Departmental Administration

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Ethical Principles Do Not Support Mandatory Preanesthesia Pregnancy Screening Tests: A Narrative Review

Stephen Jackson, MD,* James Hunter, MD,† and Gail A. Van Norman, MD‡

- Surgical reasons for pregnancy test (to be ordered by surgeon)
  - Pregnancy would obviate need for surgery
  - Radiation to pelvis or gravid uterus (not applicable to other sites)
  - Administration of chemotherapy
  - Manipulation of pelvic organs

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Syllabus

#

Ethical Principles Do Not Support Mandatory Preanesthesia Pregnancy Screening Tests: A Narrative Review

Stephen Jackson, MD,* James Hunter, MD,† and Gail A. Van Norman, MD‡

- Recommendations
  - Remove any routine, mandatory, screening policies
  - Provide patient education
  - Offer pregnancy testing, including transgender men
  - Document discussion and consent or decline to test

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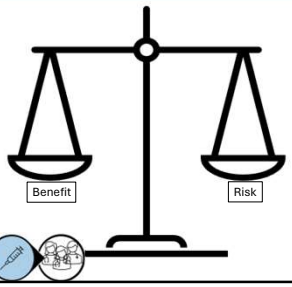
Syllabus

#

OPEN MIND: THE OPEN MIND

Sugammadex Use for Reversal in Nonobstetric Surgery During Pregnancy: A Reexamination of the Evidence

Gaston, Ian N. MD*; Lange, Elizabeth M. S. MD†; Farrer, Jason R. MD*; Toledo, Paloma MD, MPH*‡



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Syllabus

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OPEN MIND: THE OPEN MIND

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Gaston, Ian N. MD*; Lange, Elizabeth M. S. MD†; Farrer, Jason R. MD*; Toledo, Paloma MD, MPH*‡

- Higher risk of difficult airway management
- Less pulmonary complications
- No demonstrated evidence of maternal or fetal harm
- Progesterone vs Progestin

- SOAP ad hoc taskforce statement (2019)
- Merck warning
- No FDA approval in pregnancy

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Syllabus

#

Original Investigation | Anesthesiology

Effect of Dural-Puncture Epidural vs Standard Epidural for Epidural Extension on Onset Time of Surgical Anesthesia in Elective Cesarean Delivery

A Randomized Clinical Trial

Nadir Sharawi, MBBS, MSc; Matthew Williams, MD; Waseem Athar, MD; Caroline Martinello, MD; Kyle Stoner, MD; Cameron Taylor, MD; Nan Guo, PhD; Pervez Sultan, MBChB, MD (Res); Jill M. Mhyre, MD

To compare dural puncture epidural and standard epidural techniques in outcomes of speed of onset and quality of block

Patients presenting for scheduled cesarean delivery

- Double blind randomized controlled trial
- 140 randomized

- Seconds to reach T6
- Composite Quality
  - Failure to achieve T10 analgesia
  - Failure to achieve T6 anesthesia
  - Intraoperative analgesia
  - Repeat procedure
  - General anesthesia

2019 to 2022

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- Onset time faster in DPE group (422 seconds) vs standard epidural group (655 seconds)
  - Lower quality of anesthesia
    - 15.7% (DPE group)
  - 36.3% (Standard epidural group)

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Syllabus
#

Medicaid and Fulfillment of Postpartum Permanent Contraception Requests

Arora, Kavita Shah MD, MBE; Chua, Arzice BS; Miller, Emily MD; Boozer, Margaret MD; Serna, Tania MD, MPH; Bullington, Brooke W. BA; White, Kari PhD, MPH; Gunzler, Douglas D. PhD; Bailit, Jennifer L. MD, MPH; Berg, Kristen PhD, CRC

- Evaluate association between Medicaid insurance and fulfillment of postpartum tubal ligation (PPTL)
- PPTL before discharge
- 4 study sites
- States: IL,OH,CA, AL
- 2018 to 2019
- Retrospective cohort
- Documented plan for PPTL

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Syllabus
#

Medicaid and Fulfillment of Postpartum Permanent Contraception Requests

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- 3013 (7.1%) desired PPTL
- 1096/2076 (52.8%) • Medicaid insurance
- vs
- 663/397 (70.8%) private insurance

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Syllabus
#

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- 3013 (7.1%) desired PPTL
- 1096/2076 (52.8%) • Medicaid insurance
- vs
- 663/397 (70.8%) private insurance

ACOG

"Institutions should consider designating postpartum sterilizations as nonelective procedures, which indicates its high priority to staff and schedulers"
- Advocate for policy changes for consent

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Ostheimer 2023 Themes

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Ostheimer 2023 Themes

Maternal Morbidity and Mortality | Guidelines and Consensus Statements | Health Justice | Anesthesia and Analgesia | Workforce

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Syllabus

#

A survey of United States obstetric anesthesiologists' perceived value of obstetric anesthesiology fellowship

C. Thomas [a,*], K.E. Neumann [b], C. Smith [c], J.E. Dominguez [d], A. Traynor [e], M.K. Farber [f], M. Zakowski [g], R.J. McCarthy [h], F.M. Peralta [i]

- To evaluate the perceived value of obstetric anesthesiology subspecialty training
- Alumni of Obstetric anesthesiology fellowships
- Survey study on career trajectory, job satisfaction, quality of life, and job autonomy
- Sent to 50 fellowship program directors
- Proportions of all outcomes stratified by men and women
- 2022

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A survey of United States obstetric anesthesiologists' perceived value of obstetric anesthesiology fellowship

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- 21 of 50 program directors confirmed
- Sent to 217 (43%) alumni
- Response rate 158 (73%)

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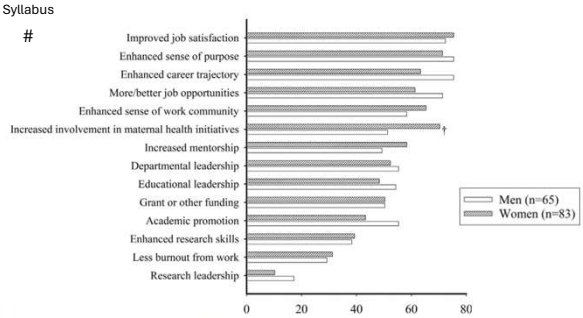
Syllabus

#



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Syllabus

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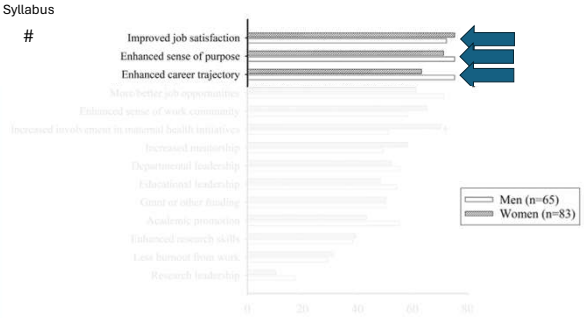

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Original Investigation | Occupational Health

Well-Being Parameters and Intention to Leave Current Institution Among Academic Physicians

Jennifer A. Ligibel, MD; Nicolette Goularte, PhD; Jennifer I. Berliner, MD; Steven B. Bird, MD; Chantal M. L. R. Brazeau, MD; Susannah G. Rowe, MD, MPH; Miriam T. Stewart, MD; Mickey T. Trockel, MD, PhD

- To assess burnout, intention to leave, and associated factors
- 15 academic institutions
- Survey
- Sent to 18,719 participants
- Intention to leave
  - Burnout
  - Professional fulfillment
- 2022 to 2023

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- 50% response rate, 18,719 respondants
- 37.9% met criteria for burnout
- 39.3% professional fulfillment
- 32.6% moderate intention to leave

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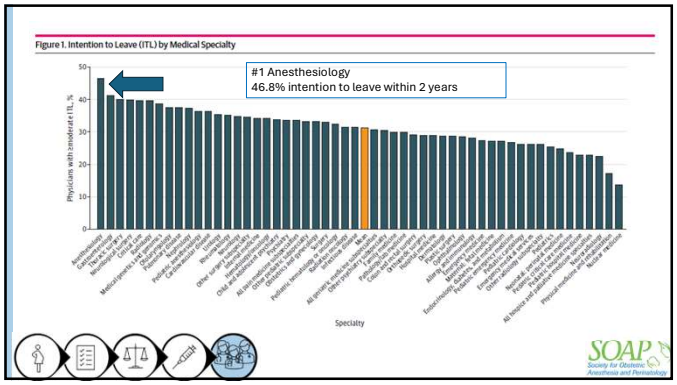

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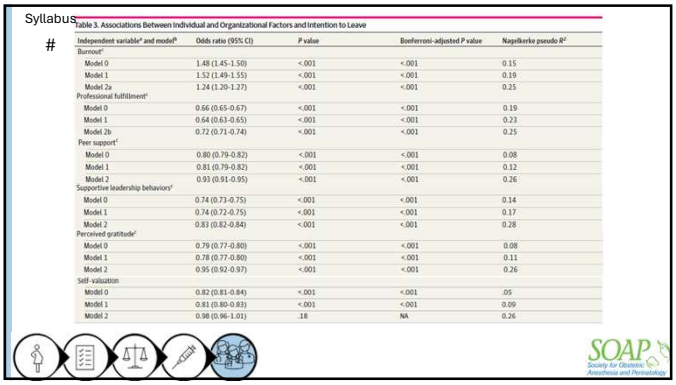

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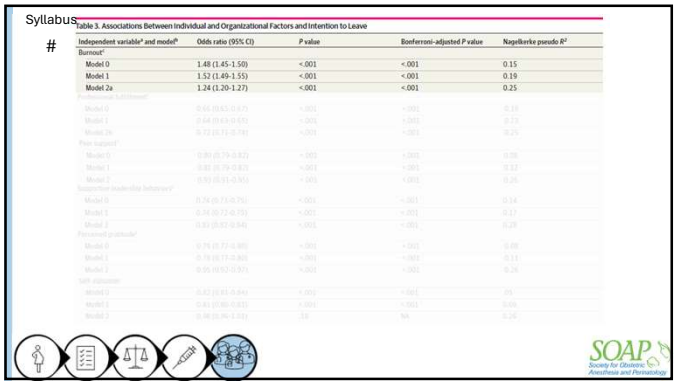

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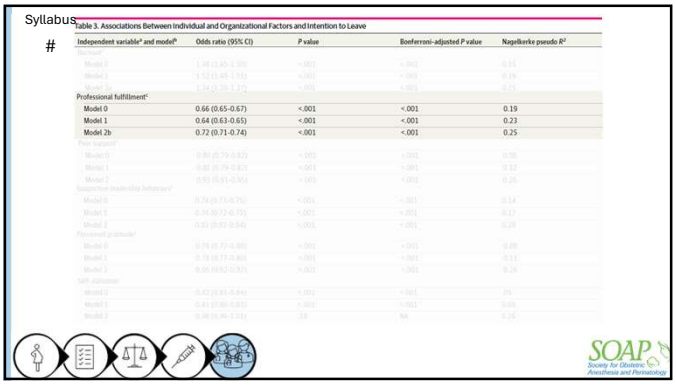

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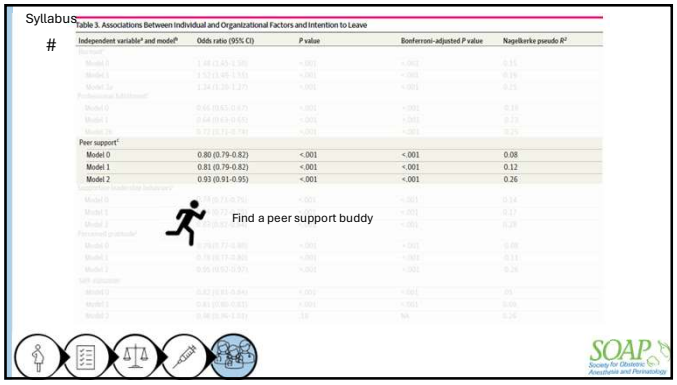

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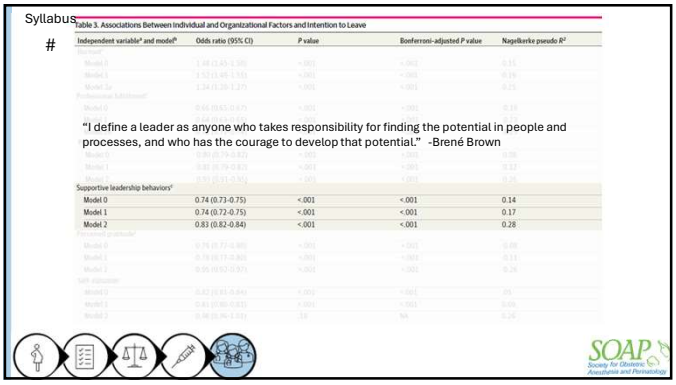

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Syllabus

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Table 3. Associations Between Individual and Organizational Factors and Intention to Leave

Independent variable[a] and model[b]	Odds ratio (95% CI)	*P* value	Bonferroni-adjusted *P* value	Nagelkerke pseudo R^2
Perceived gratitude[c]				
Model 0	0.79 (0.77-0.80)	<.001	<.001	0.08
Model 1	0.78 (0.77-0.80)	<.001	<.001	0.11
Model 2	0.95 (0.92-0.97)	<.001	<.001	0.26

Journal or think about 3 things you are grateful for each day

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Syllabus

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Table 3. Associations Between Individual and Organizational Factors and Intention to Leave

Independent variable[a] and model[b]	Odds ratio (95% CI)	*P* value	Bonferroni-adjusted *P* value	Nagelkerke pseudo R^2
Self-valuation				
Model 0	0.82 (0.81-0.84)	<.001	<.001	.05
Model 1	0.81 (0.80-0.83)	<.001	<.001	0.09
Model 2	0.98 (0.96-1.01)	.18	NA	0.26

Explore these resources: https://self-compassion.org
Center for Mindful Self-compassion https://centerformsc.org

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Syllabus

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Let's be open to talking, listening,and supporting someone who may be planning to leave

105

Summary Action Items

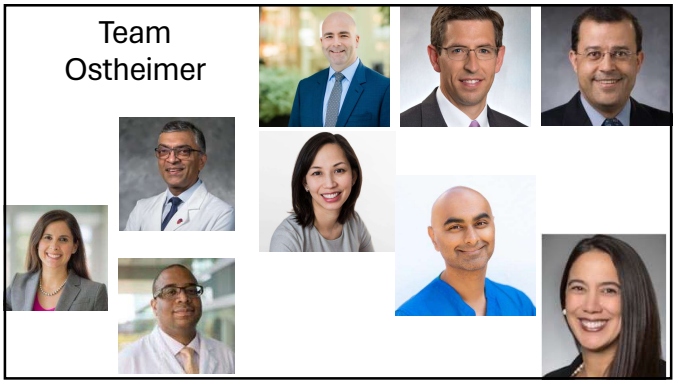
- Follow best practices for TXA
- Improve our recruitment of xxx
- Consider starting medication-assisted therapy program
- Standardize care
- Stop the stigma
- Gratitude

106

Family

107

Team Ostheimer



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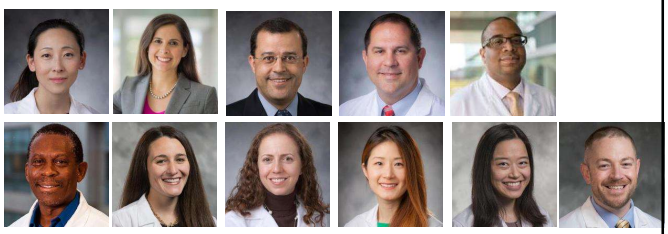
Duke Womens' Anesthesiology Division



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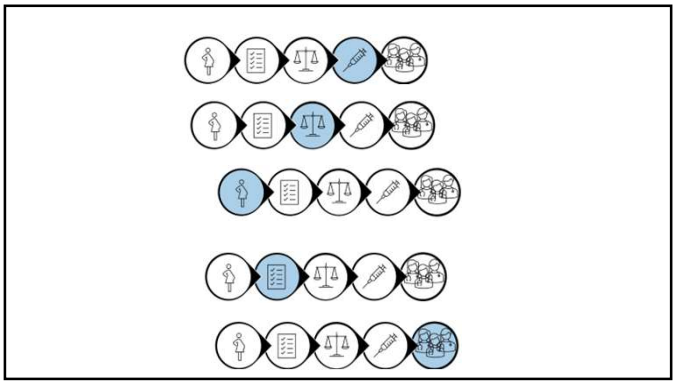

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 01

Anesthetic Management of Cesarian Deliveries Following Uterine Transplant

Presenting Author: Annalese G. Neuenschwander, MD
Presenting Author's Institution: University of Alabama at Birmingham - Birmingham, Alabama

Introduction: Uterine transplantation (UTx) for treatment of uterine factor infertility has been occurring at three academic centers in the United States since 2016, with the first live birth (LB) occurring in 2017 [1]. In 2022 our institution became the fourth center in the United States to successfully perform a UTx, with the first LB occurring in 2023. Although all births following UTx occur via cesarian section (CS), there is only one publication [2] discussing anesthetic management for these deliveries. This case report reviews the anesthetic approach to our institution's first LBs following UTx.

Case One: 33-year-old with history of uterine agenesis due to Mayer-Rokitansky-Küster-Hauser syndrome, chronic hypertension (cHTN), and obesity presented for scheduled CS at 36.4 weeks gestational age (wga). Her UTx course included immunosuppression, successful embryo transfer 11 months post UTx, and gestational diabetes. Patient desired to keep the transplanted uterus in-situ for future pregnancies. On day of surgery patient underwent combined spinal epidural (CSE) for her CS with good intraoperative and postoperative pain control. Post-op course was complicated by Severe Pre-Eclampsia and patient was discharged on post-op day (POD) four.

Case Two: 33-year-old G1P1001 with history of cHTN and peripartum hysterectomy due to post-partum hemorrhage following her prior delivery. Her UTx course included immunosuppression and successful embryo transfer six months post UTx. She presented at 33.5wga with preterm premature rupture of membranes and underwent CS after steroid course at 33.6wga. After discussion with a multi-disciplinary team the patient did not desire future fertility so a cesarian hysterectomy was performed. A CSE was placed to allow the patient to witness the birth of her child, and the case was converted to general anesthesia for the hysterectomy portion of the procedure. She had an uncomplicated post-op course and was discharged on POD four with immunosuppression taper.

Discussion: CS following UTx requires several anesthetic considerations when planning. Physiologic factors to include surgical approach and technique, adhesive disease, uterine atony, history of immunosuppression, and underlying maternal comorbidities, as well as psychosocial factors appreciating that these patients are experiencing childbirth, something previously thought impossible for them, both weigh into patient consent and counseling, anesthetic choice, medication administration, and transfusion needs. Obstetric anesthesiology holds an important place in this multidisciplinary team to ensure safe and favorable outcomes for both mother and baby.

References: 1. Johannesson L, et al. The First 5 Years of Uterus Transplant in the US: A Report

From the United States Uterus Transplant Consortium. JAMA Surg. 2022;157(9):790–797. doi:10.1001/jamasurg.2022.2612 2. Shehata IM, et al. Anesthetic Considerations for Cesarean Delivery After Uterine Transplant. Cureus. 2021 Mar 16;13(3):e13920. doi: 10.7759/cureus.13920. PMID: 33880271.

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 02

Di-Cavity Twin Pregnancy in the Setting of Uterine Didelphys

Presenting Author: Annalese G. Neuenschwander, MD
Presenting Author's Institution: University of Alabama at Birmingham - Birmingham, Alabama
Co-Authors: Zasmine Hymes-Green, MD - University of Alabama at Birmingham

Introduction: Uterine didelphys is a congenital uterine anomaly that arises from the incomplete fusion of Mullerian ducts during embryogenesis [1]. The overall prevalence of uterine anomalies is estimated at 5.5% with didelphys uterus to be estimated at 0.3% [2]. Patients with mullerian agenesis present with an array of symptoms, including amenorrhea, dysmenorrhea, pelvic pain, endometriosis, and sexual difficulties [3]. There is little literature on the management of pregnancy and delivery in patients with uterine didelphys. Thus, this case reports aims to add to the medical knowledge of this rare patient population and further their care as an example of a successful di-cavity twin delivery.

Case One: Patient is a healthy 32-year-old G5P3 with known uterine didelphys status-post vaginal septum resection at 17yo now with di-cavity twin pregnancy who presents for scheduled induction of labor at 39 weeks gestation. Both babies' had vertex presentation, with baby A (maternal right uterus) presenting lower than baby B (maternal left uterus). A labor combined spinal epidural (CSE) was placed and oxytocin started. Labor progressed, with maternal right uterus progressing at a faster rate. Artificial rupture of membranes (AROM) of baby A was performed, followed by successful vaginal delivery, complicated by uterine inversion corrected with manual replacement. Patient then continued labor with oxytocin to deliver baby B. Due to ongoing bleeding from maternal right uterus from retained products of conception and atony, postpartum hemorrhage (PPH) protocol was activated. Vaginal bleeding improved; however, due to non-reassuring fetal heart tones (NRFHT) of baby B, patient underwent an expedited cesarian delivery via activation of her labor epidural. Patient discharged on post-op day 2 without complications.

Discussion: Patients with di-cavity twin pregnancy are at an increased risk of peri-partum compilation, often requiring planning and cooperation of multidisciplinary teams. Management considerations include the preterm delivery, operative delivery, management of PPH, uterine atony, and various fetal complications. This case adds to the literature of successful di-cavity twin delivery without major complications to the patient.

References: 1. Crowley CM, Botros K, Hegazy IF, O'Donnell E. Uterine didelphys: diagnosis, management and pregnancy outcome. BMJ Case Rep. 2021 Mar 29;14(3):e242233. doi: 10.1136/bcr-2021-242233. PMID: 33782076; PMCID: PMC8009243. 2. Chan YY, Jayaprakasan K, Zamora J, Thornton JG, Raine-Fenning N, Coomarasamy A. The prevalence of congenital uterine anomalies in unselected and high-risk populations: a systematic review. Hum Reprod Update. 2011 Nov-Dec;17(6):761-71. doi: 10.1093/humupd/dmr028. Epub 2011 Jun 24. PMID: 21705770; PMCID: PMC3191936. 3. Passos IMPE, Britto RL. Diagnosis and treatment of

müllerian malformations. Taiwan J Obstet Gynecol. 2020 Mar;59(2):183-188. doi: 10.1016/j.tjog.2020.01.003. PMID: 32127135.

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 03

Disseminated Intravascular Coagulopathy Following Primary Cesarean Section Complicated by Broad Ligament Hematoma

Presenting Author: Bryan Wakefield, MD
Presenting Author's Institution: Vanderbilt University Medical Center
Co-Authors: Pauline Ripchik, MD - Vanderbilt University Medical Center

Introduction: Broad ligament hematomas are a rare obstetric emergency. The incidence of broad ligament hematomas is between 1:500 to 1:20,000 and occur secondary to trauma to the cervix or uterus that extends into the vessels of the broad ligament. Most hematomas are diagnosed immediately following delivery secondary to hemodynamic compromise. The remaining hematomas are often discovered within 24 hours – with these slowly expanding hematomas typically being of venous origin.

Case One: A 40-year-old G6P6006 with her current pregnancy complicated by polyhydramnios presented for induction of labor at 39 weeks and 5 days for reduced fetal movement. Her labor course was complicated by non-reassuring fetal status ultimately requiring a primary low transverse cesarean section for delivery. Surgical anesthesia was achieved with 630mg of 3% Chloroprocaine via a lumbar epidural catheter. Her intraoperative course was complicated by incision extension and a post-partum hemorrhage of 1.5L. Intraoperatively the patient received 1U of packed red blood cells and 2L of crystalloid. Roughly 2 hours post operatively, the patient was noted to be hypotensive and tachycardic. Labs at that time were notable for a hemoglobin drop from 11.2gm/dl preoperatively to 4.7gm/dl. Bedside ultrasonography was significant for a positive FAST exam and the patient was emergently taken back to the operating room for exploratory laparotomy. General anesthesia was induced with etomidate and succinylcholine followed by uneventful endotracheal intubation. Intraoperative course was notable for removal of 1L hemoperitoneum and a 4cm fundus laceration extending into a 7cm right broad ligament hematoma. Total estimated blood loss was 3.5L. Intraoperative labs were significant for an INR of 2.2 and platelet count of 98 concerning for DIC. The patient received a balanced resuscitation of 5U pRBC, 2U FFP, 2U cryoprecipitate and 2g of Fibryga. The patient was taken to the surgical ICU postoperatively intubated and sedated. The patient was extubated on post operative day 1 and discharged on post operative day 5 after an uneventful postoperative course.

Discussion: Broad ligament hematomas are a rare complication of labor with their incidence increasing following rapid labor, cesarean section, and instrumental deliveries. They are often characterized by profound hemodynamic instability, however insidious venous bleeding may occur and delay diagnosis. Broad ligament hematomas require prompt recognition and expedited operative exploration as maternal mortality rates approach 40%. Furthermore, these patients are at are at a significantly increased risk of DIC. Thus, despite its rarity, labor associated broad ligament hematomas present a profound mortality risk and warrant thorough understanding of symptomology and risk factors.

References: Korde-Nayak, V., Biniwale, P. (2020). Broad Ligament Haematoma. In: Sharma, A. (eds) Labour Room Emergencies. Springer, Singapore. https://doi.org/10.1007/978-981-10-4953-8_41

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 04

The Repeat Offender: A Rare Case of Recurrent Incarcerated Uterus in Pregnancy

Presenting Author: Yeong Ha Oh, BA
Presenting Author's Institution: Vanderbilt University School of Medicine - Nashville, Tennessee
Co-Authors: Kaitlyn Brennan, DO - Vanderbilt University Medical Center
Alexandra Brown, MD - Vanderbilt University Medical Center
Niharika Ravichandran, MD - Vanderbilt University Medical Center

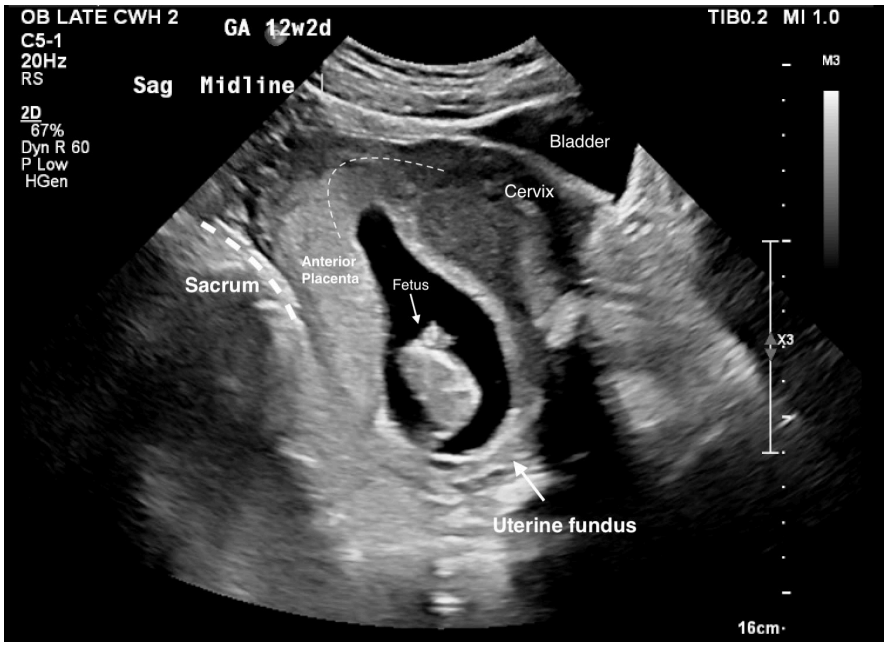
Introduction: Incarcerated gravid uterus (IGU) is a rare obstetric complication in which the gravid uterus is trapped between the sacral promontory and pubic symphysis.1 When the uterus becomes incarcerated, the cervix can become displaced against the pubic symphysis depending on the original orientation, leading to bladder outlet obstruction symptoms.

Case One: A 33-year-old G3P1011 female with PMH of endometriosis presented at 12w3d with pelvic pressure and difficulty urinating. Her prior pregnancy was notable for similar symptoms at 14w5d, at which time she was found to have a retroverted uterus and IGU. Manual reduction attempts of the prior IGU were first performed with 1mg IV midazolam and 100mcg IV fentanyl, with successful reduction ultimately completed in the OR under propofol monitored anesthesia care (MAC). The prior delivery was also complicated by 10% placental abruption at term necessitating an emergent cesarean delivery. A transabdominal ultrasound (US) revealed recurrent IGU in this pregnancy. The decision was made to perform manual reduction with a combined spinal epidural (CSE). 2cc of 5mcg/mL fentanyl with 0.125% bupivacaine was injected in the intrathecal space followed by a test dose of 2cc of 1% lidocaine with 1:200,000 epinephrine. After a negative test dose, 8cc of 5mcg/mL fentanyl with 0.125% bupivacaine was given via the epidural catheter. 100mcg of fentanyl was given IV for anxiolysis. The uterus was successfully reduced, and the patient tolerated the procedure well. A pessary was placed in the posterior fornix. Two weeks later, transvaginal US revealed no retroflexion with most of the uterus above the sacrum.

Discussion: IGU is reported to occur in 1 in 3,000 pregnancies, but most resolve spontaneously by 14 weeks gestation.1 IGU is attributed to uterine anomalies like a retroverted uterus. If retroversion persists, early recognition and treatment are crucial. Treatment options include passive, manual, colonoscopic/sigmoidoscopic, balloon, and laparoscopic reduction. For anesthetic management, literature shows successful utilization of general and spinal anesthesia.2,3 Some recommend using a CSE in the absence of significant contraindications due to its quick onset of analgesia, option for lower initial dose that reduces the impact on patient motor function, and the ability to increase or extend neuraxial blockade for surgical intervention.2,3 Also, CSE minimizes the need for airway management and fetal exposure to systemic medications. Once reduced, the uterus typically remains in the correct abdominal location without further support. A Hodge pessary placement in the vagina for five to seven days may help the uterus maintain an upright anterior position.4 The rate of

recurrence in the same pregnancy is 5.6% and 6.8% in subsequent pregnancies.5,6 Thus, patients with known uterine anomalies or history of IGU must be monitored to prevent complications.

References: 1. PMID: 18677703 2. PMID: 15321160 3. PMID: 31577539 4. PMID: 7991232 5. PMID: 36495234 6. PMID: 30428743



Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 05

A Case of Uterine Rupture in a Nulliparous Patient

Presenting Author: Pasha Rahbari, MD
Presenting Author's Institution: Weill Cornell Medicine: Department of Anesthesiology - New York, New York
Co-Authors: Dorian Batt, MD - Weill Cornell Medicine: Department of Anesthesiology
Kyle Sullivan, MD - New York Presbyterian- Weill Cornell

Introduction: Uterine rupture is a very rare but serious obstetric complication where all three layers of the uterine tissue have been damaged–it is associated with high peripartum and perinatal morbidity and mortality1. Most commonly, this occurs in women with prior cesarean delivery (CD), with risk ranging from 0.47% - 0.87% for trial of labor after cesarean1,2,3, however it is possible to occur in primigravid patients as well without the traditional risk factors.

Case One: A 35 year old G1P0 at 34w3d presented for evaluation in the setting of known preeclampsia without severe features for several weeks. Her only other relevant medical problem was a history of childhood asthma. At the time of admission, her vital signs (VS) were stable, and she had a dull frontal headache without any other symptoms. Her blood pressures (BP) on hospital days 2-3 were showing severe ranges, so she was treated with betamethasone and labor was induced. Labor analgesia was provided by a combined spinal epidural. Two hours after placement of the CSE, labor was augmented by oxytocin. Approximately four hours after the start of oxytocin, the patient began requiring frequent intermittent doses of pressors over a 20 minute period along with an increasingly diminished BP response. With this new onset refractory hypotension and a non-reassuring fetal heart trace, the decision was made to perform a stat CD. Her epidural was dosed with 2% lidocaine with epinephrine. She was found to have 2L of frank blood in her peritoneum with a 12cm rupture of her uterus tracking horizontally and inferiorly at the level of the internal cervical os to the left uterosacral ligament. An arterial line and 14g IV was placed emergently and massive transfusion protocol was initiated. Patient was intubated, and her BP eventually stabilized with blood products and pressors. Given the extent of uterine damage, the obstetric team performed a hysterectomy and hemostasis was then quickly achieved. Her overall transfusion requirement was 2g of fibrinogen concentrate, 6 units of packed red blood cells, and 2 units of fresh frozen plasma. Patient was extubated at the end of the case uneventfully. The remaining postpartum care was unremarkable.

Discussion: This case highlights that even without a prior CD or uterine scar, the risk uterine rupture is possible1,2,3. For this patient, the only risk factor she had is labor induction with oxytocin2,3. Ultimately, uterine rupture should be on the differential diagnosis in a nulliparous patient with unexplained hypotension, since providers must diagnose and treat rapidly to prevent severe maternal or fetal morbidity/mortality.

References: 1. Flis, Wojciech et al. Journal of clinical medicine vol. 12,10 3532. 18 May. 2023 2. Dimitrova, D et al. Archives of gynecology and obstetrics vol. 306,6 (2022): 1967-1977 3. Abdulmane, Mrooj M et al. Cureus vol. 15,6 e39861. 2 Jun. 2023

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 06

Bandl's Ring

Presenting Author: Natalya Malenko, DNP, CRNA
Presenting Author's Institution: Weill-Cornell NYP Hospital - New York, New York
Co-Authors: Samantha Smith, DNP, CRNA - Weill- Cornell NYP Hospital
Kyle Sullivan, MD - New York Presbyterian- Weill Cornell

Introduction: A Bandl's ring (BR) is a pathological constriction dividing the uterus into a thinned-out lower segment and a thickened, contractile upper segment (1), obstructing labor to cause fetal entrapment. Although a cesarean section (CS) is indicated, operative fetal extraction in the setting of BR has an increased risk for maternal and infant morbidity (2). While the literature suggests that 1 out of every 5,000 live births occurs in the presence of BR, scholars suggest this incidence rate is underreported (1). Therefore, spreading awareness for BR is essential for maternal and infant safety.

Case One: Our hospital reported 4 cases of BR over the past year. For the purpose of this case report, we will focus on 2 of the cases. The common factors are healthy women, no history of obstetric complications, epidural analgesia and either prolonged labor or arrest of fetal descent. Case 1 was a 36 year-old G2P0 who underwent urgent CS for non-reassuring fetal status after 36 hours of labor. A BR was visualized and operative course was complicated by a 9-minute fetal extraction, bilateral uterine extensions and uterine atony requiring methergine, carboprost and misoprostol. While the neonate went to neonatal intensive care unit for respiratory support, the mother had a prolonged surgical recovery phase with pharmacologic anxiolytics and patient controlled epidural analgesia (PCEA) for post-operative pain management.

Case Two: Case 2 was a 38 year-old G3P1 who presented with arrest of labor at 8 cm. In the operating room, a BR was noted and a vertical incision performed for infant delivery. Following, uterine atony led to 2.8 L blood loss, requiring 2 doses of tranexamic acid, methergine, misoprostol and transfusion of 2 units of packed red blood cells. This patient also required PCEA.

Discussion: A leading theory for the cause of BR is prolonged labor (1). The rise in incidence of BR mirrored the rise in prolonged labor (3). BR is associated with higher infant mortality rates and adverse effects for the mother. The leading cause of maternal morbidity from BR relates to increased risk for hemorrhage requiring blood transfusion. Lastly, since CS in the setting of BR is often more surgically intensive, these patients may require more pain control, such as PCEA.

References: 1. Gupta, R. Cureus, 10(12), e3800. 2. Lauria MR. Obstet Gynecol. 2007. 3. Tinelli A. Int J Gynaecol Obstet. 2015.

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 07

Cesarean Hysterectomy in a Nulliparous Parturient Complicated by Acute Kidney Injury

Presenting Author: Kyle Sullivan, MD
Presenting Author's Institution: New York Presbyterian- Weill Cornell - New York, New York
Co-Authors: John Rubin, MD - New York Presbyterian- Weill Cornell

Introduction: Acute kidney injury (AKI) is a serious complication in the peripartum period and the rate has doubled between 1998 and 2009 (1). With the rise in maternal comorbidities, providers need to be vigilant to recognize and treat AKI early to prevent maternal morbidity.

Case One: A 20-year-old G1P0 patient at 39 weeks GA with PMH of gestational diabetes, asthma, penicillin allergy, and obesity (BMI 40) presented for induction of labor. After 7 hours of labor, an uncomplicated combined spinal-epidural was placed. The patient had a cesarean delivery for arrest of descent after laboring for 27 hours, during which time she developed chorioamnionitis. Prior to entering the OR, the patient received gentamycin (5 mg/kg), clindamycin (900 mg once), and vancomycin (1000 mg Q 12 hours x 2) for antibiotic treatment. Prior to the OR, it was discovered that the patient had low urine output in the 12 hours preceding cesarean delivery. In the OR, the epidural had to be replaced to obtain a sufficient surgical block. After an uncomplicated delivery, there was concern for ureteral injury. Urology performed a cystoscopy, and no injury was noted. During closure of the fascia, post-partum hemorrhage was noted. Despite administration of methergine, misoprostol, oxytocin, and placement of a Bakri balloon, massive bleeding occurred and DIC ensued. General anesthesia was induced via rapid sequence induction. The incision was re-opened, and a hysterectomy was performed. Massive hemorrhage protocol was initiated; norepinephrine and vasopressin infusions were started for hemodynamic instability. Arterial blood gas showed profound metabolic acidosis (pH 7.0) and a creatinine of 5mg/dL. Hyperventilation was started to temporize the acidosis. Increasing peak airway pressures from pulmonary edema limited the achievable tidal volumes. Hemodialysis was considered but could not be started intraoperatively. In the absence of dialysis, the patient received a sodium bicarbonate bolus and started on a bicarbonate infusion. The patient required 2 doses of furosemide 80mg to begin making urine; diuresis improved ventilation. The patient received 10 units of packed red blood cells, 6 units of thawed plasma, 12 units of fibrinogen concentrate, 1 unit of platelets, 5L of crystalloid, and 1L of 5% albumin; QBL was 2.9L. After the hysterectomy, the patient was transferred to the MICU where she was extubated on POD 1 and never required hemodialysis. She later had a full recovery of renal function after her AKI.

Discussion: By KDIGO guidelines, this patient suffered stage 3 AKI, which was likely multifactorial from hypovolemia, acute blood loss, chorioamnionitis, diabetes, and nephrotoxic medications (2). This case highlights the need for clinical awareness of AKI during the perioperative period, including close monitoring of urine output and careful dosing of nephrotoxic agents in parturients with at-risk renal function.

References: 1. Callaghan WM et al. Obstet Gynecol 2012 2. Kellum JA et al. Crit Care 2013

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 08

Delayed Diagnosis of Uterine Rupture After Successful Vacuum-Assisted Vaginal Birth After Cesarean Delivery

Presenting Author: Catharine Keim, MD
Presenting Author's Institution: NewYork-Presbyterian/Weill Cornell Medical Center - New York, New York
Co-Authors: Danielle McCullough, MD - Weill Cornell Medicine Department of Anesthesiology
Aysha Sultana, M.D. - NewYork-Presbyterian/Weill Cornell Medical Center

Introduction: Uterine rupture is a rare complication in pregnancy associated with significant maternal and fetal morbidity. It most commonly occurs in the setting of trial of labor after cesarean delivery (TOLAC). Diagnosis is typically made during labor but can be delayed in a proportion of patients1. Management of delayed uterine rupture presents unique challenges for anesthesia providers.

Case One: A 32-year-old G4P3003 was admitted at 38w4d for TOLAC in the setting of spontaneous rupture of membranes. Obstetric history was significant for two vaginal deliveries following a primary cesarean section. Intrapartum course was notable for a terminal fetal deceleration necessitating vacuum-assisted delivery which was successful after one pull. The following morning, the patient was transferred back to the labor unit from postpartum for closer monitoring in the setting of increasing abdominal pain and frank blood in the foley. On exam, vitals were stable and labs within normal limits. Point of care ultrasound (POCUS) revealed clot within the bladder but no intraabdominal blood. Additional IV access was placed. The patient was transferred to the OR for exploratory laparotomy under general anesthesia. An arterial line was placed after induction. Surgical visualization revealed an adherent bladder and large cystostomy tamponading a 15cm uterine rupture, which was repaired. Labs were sent for guided resuscitation. The patient was extubated in the OR and brought to PACU off pressors. Over the next several hours, the patient became progressively tachycardic and hypotensive in PACU. Repeat POCUS was concerning for ongoing bleeding, and the patient was emergently taken for a second ex-lap. After intubation a central line was placed, massive transfusion protocol initiated, and thromboelastography sent to guide resuscitation. A total 14U PRBC, 10U FFP, 2U PLT, and 4U fibrinogen concentrate were transfused. With ongoing resuscitation ventilation became difficult, which significantly improved after administration of furosemide. Ultimately a subtotal hysterectomy was performed. Total quantitative blood loss was 6.7L. The patient was transferred to the surgical ICU intubated and off pressors, extubated POD#1, and transferred to postpartum in stable condition on POD#2.

Discussion: Diagnosis of uterine rupture is shown to be delayed in up to 20% of cases and is associated with increased maternal morbidity including increased rates of transfusion and hysterectomy2. With the number of patients undergoing TOLAC increasing, anesthesia providers should be aware of this patient population and maintain a high degree of suspicion

for uterine rupture even after delivery.

References: 1. Tanos V, Toney ZA. Uterine scar rupture - Prediction, prevention, diagnosis, and management. Best Pract Res Clin Obstet Gynaecol. 2019;59:115-131. 2. Rottenstreich M, Rotem R, Hirsch A, et al. Delayed diagnosis of intrapartum uterine rupture - maternal and neonatal consequences. J Matern Fetal Neonatal Med. 2021;34(5):708-713.

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 09

Uterine Rupture During Induction of Labor for Second Trimester Fetal Demise

Presenting Author: Shannon Paquette, MD
Presenting Author's Institution: University of Texas Southwestern Medical Center, Texas
Co-Authors: Kelechi B. Anyaehie, MD, MPH - University of Texas Southwestern Medical Center
Susan Stanley, MD - University of Texas Southwestern Medical Center

Introduction: Management of IUFD in the setting of multiple prior cesarean deliveries (CD) can present a challenge due to limited data on outcomes. Both induction of labor (IOL) and surgical evacuation are options for women with IUFD and history of previous CD. Prior hysterotomy is the most common risk factor for uterine rupture (UR) during IOL, which increases in rate with the number of CDs. 2,3 Before 28 weeks gestation, vaginal misoprostol is the most efficient method of induction for IUFD. However, from 13-24 weeks gestation, IOL is less effective, with higher maternal morbidity compared to surgical evacuation.1

Case One: A 37-year-old G6P4A1 at 18 weeks gestation with 4 prior CDs presented with vaginal bleeding and preterm labor with positive fetal movement and fetal heart tones (FHT) of 90 BPM. Labor CSE was placed for analgesia and several hours later IUFD was confirmed. IOL was initiated and she received six doses of vaginal misoprostol throughout her labor course. On hospital day 2, she became tachycardic with mild RLQ pain. Hemoglobin was 5.1 g/dL. Bedside US was concerning for UR and she was taken for emergent exploratory laparotomy. She underwent general anesthesia with endotracheal intubation. UR was confirmed along the previous hysterotomy incision of the lower uterine segment with bilateral lateral extensions. A hysterectomy was performed maintaining integrity of the amniotic sac. She received 4 units pRBCs, 2 units FFP, and 2200 mL LR. Post-transfusion ROTEM and coagulation studies did not indicate need for additional transfusion and hemoglobin improved to 11.2 g/dL. She required minimal pressor support. She was extubated with epidural in place for post-op pain control.

Discussion: In this case, risk factors for IUFD included advanced maternal age, previous stillbirth, and 4 prior pregnancies.1 The patient received the recommended doses of misoprostol for IUFD prior to 28 weeks but her previous CDs were an independent risk factor for UR.2-3 The patient did not initially show obvious signs of UR as FHT were not being monitored given IUFD. She did have mild breakthrough pain with an epidural. 18 week UR is uncommon; 80% of ruptures occur at 28-36 weeks. Data for IOL for IUFD in women with prior CD before 24 weeks, second trimester UR, and rupture secondary to induction for IUFD are limited. Thus, vigilance for rupture should remain high during IOL in those at an increased risk of UR.

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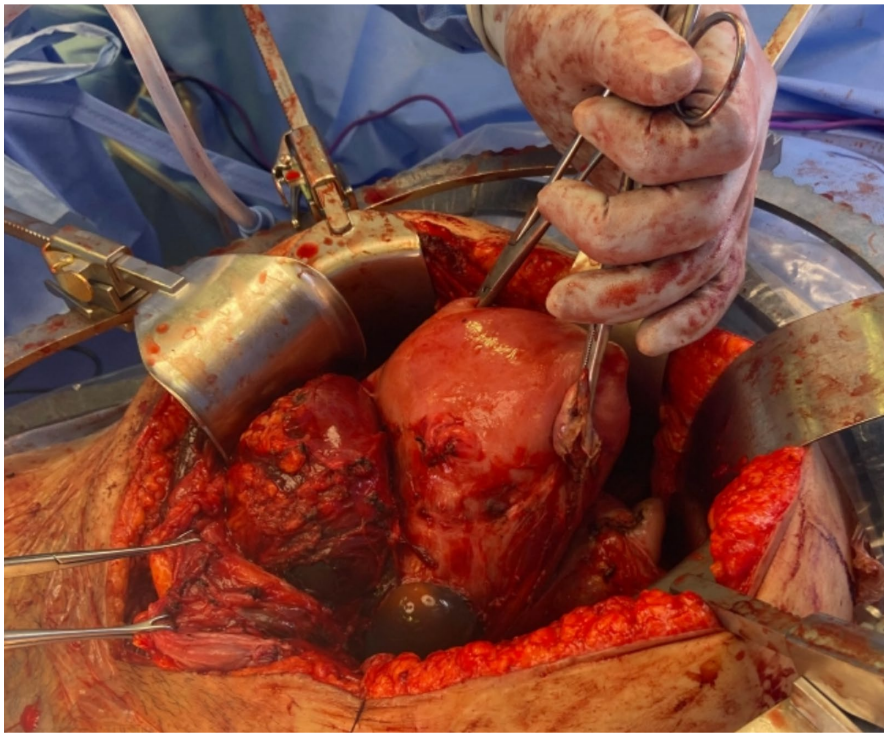

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 10

Successful Anesthetic Management of Spontaneous Splenic Rupture during Urgent Cesarean Delivery

Presenting Author: William Pinkston, D.O.
Presenting Author's Institution: Icahn School of Medicine

Introduction: Spontaneous peripartum splenic rupture (PSR) is an exceedingly rare event in the peripartum period.1-2 However, a delay in diagnosis and its highly variable presentation confers significant mortality risk to both the mother and fetus.1-4 The following case report involves an urgent cesarean delivery (CD) that was complicated by intraoperative spontaneous PSR, requiring splenectomy, massive transfusion, and ICU admission.

Case One: A 31-year-old female G3P2002 at 39 weeks was admitted for active labor and decreased fetal movement. She had regular prenatal care and was otherwise healthy. A combined spinal-epidural was successfully placed shortly after augmentation of labor. The remainder of her labor course was complicated by maternal tachycardia, hypotension, fever, and recurrent fetal heart rate decelerations. Antibiotic therapy was started and the decision to proceed with an urgent CD was made. Immediately after successful delivery of the infant, brisk bleeding was noted from the left upper quadrant and adequate uterine tone was confirmed. Additional surgical assistance was requested while the obstetric team attempted to temporize the bleeding, tranexamic acid given and the massive transfusion protocol was initiated. After further surgical exposure, a large splenic laceration was identified and attempts were made to fulgurate the bleed, which proved unsuccessful. Emergent splenectomy was performed and hemostasis achieved. Quantitative blood loss was 6.5 liters. The patient received nine units of PRBC, four units of FFP, one unit of platelets, one unit of cryoprecipitate, 4.5 liters of crystalloid. She was taken to the surgical ICU postoperatively intubated and was successfully extubated on postoperative day one.

Discussion: Diagnosis of PSR requires a high index of suspicion for non-obstetric causes of hemorrhage and early identification of contributing factors, although an exact cause is frequently unclear.1,3 Maternal mortality approaches 45% if diagnosis is delayed and fetal mortality ranges from 47-82%.4 While many cases of PSR occur spontaneously in otherwise healthy pregnant patients, known risk factors include infection, trauma, or chronic hematologic disease. Pregnancy-specific factors include advanced maternal age, multigestation, preeclampsia, HELLP, and ruptured ectopic pregnancy.1,2 Iatrogenic causes of peripartum PSR where excess fundal pressure after delivery have been described as well.3 In our case, PSR was fortunately quickly identified intraoperatively shortly after delivery with no clear iatrogenic cause. On postoperative day one, the patient tested positive for influenza B, which may have increased her risk for splenic congestion and eventual rupture.

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 11

Intrapartum Management of a Patient with History of Recurrent Spontaneous Postpartum Retroperitoneal Hemorrhages

Presenting Author: Talia Strulowitz, MD
Presenting Author's Institution: Icahn School of Medicine at Mount Sinai
Co-Authors: Nakiyah Knibbs, MD - Icahn School of Medicine at Mount Sinai

Introduction: Pelvic artery aneurysm is a rare cause of maternal hemorrhage. We present the management of parturient with prior history of retroperitoneal bleeding after vaginal delivery (VD) x2 secondary to an ovarian artery aneurysm presenting for vaginal delivery of her 9th child.

Case One: A 35-year-old G9P8 presented to the obstetric service with a history of two postpartum hemorrhages in the setting of spontaneous retroperitoneal bleeding. Her first 6 VD were uncomplicated. After her 7th VD, on postpartum (pp) day 3, the patient returned to the hospital with left flank pain and vaginal bleeding. CT angiogram revealed an ovarian artery aneurysm that was later embolized with resolution of the bleeding. Following her 8th VD, on pp day 1, she had vaginal bleeding and CT revealed another retroperitoneal hematoma. Imaging revealed a left ovarian aneurysm and the bleeding stopped spontaneously. For this 9th delivery, after a multidisciplinary discussion with MFM, anesthesiology and interventional radiology, the decision was made to proceed with embolization of the left ovarian artery aneurysm followed by induction of labor. Upon arrival to the IR suite, an epidural was placed. All obstetric surgical equipment and staff, as well as the NICU team, were present and ready for an emergent cesarean delivery in the IR suite. Lidocaine 2% with epinephrine was administered prior to the procedure. The FHR was monitored throughout. The angiogram demonstrated a hypertrophied left ovarian artery with supply to the uterus without significant supply to placenta. The ovarian artery was embolized. Post-embolization angiogram revealed stasis in the left ovarian artery. The FHR was stable throughout. The patient was transported back to L&D for induction of labor. Labor analgesia was provided with bupivacaine 0.0625% and fentanyl 2mcg/ml. The patient's labor progressed uneventfully, and she delivered a healthy baby boy, APGARs 9 and 9. Quantitative blood loss was 250ml. The mother remained on the labor and delivery floor for observation. She remained hemodynamically stable without bleeding. On pp day 1, repeat CT angiogram did not show an active arterial bleed. The patient and her baby were both discharged to home on pp day 3.

Discussion: The patient presented with an unusual source of bleeding requiring embolization prior to delivery, which could have impeded uterine blood flow. Preparation for an emergent cesarean delivery in IR was essential should the embolization result in a significant decrease in placental blood flow. A multi-disciplinary team, with careful planning and close communication, was critical to successfully managing this patient throughout the peripartum period.

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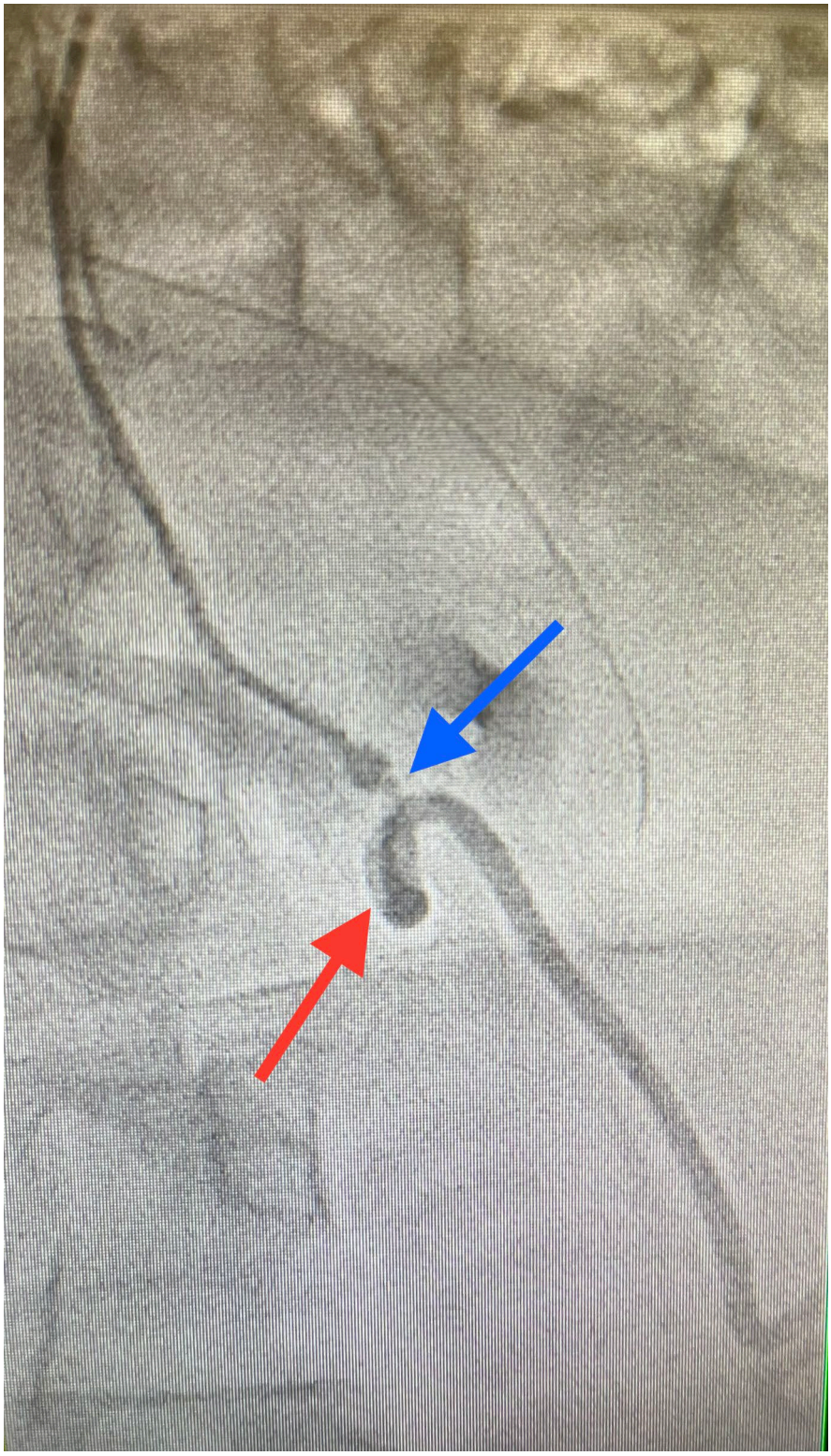

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 12

Mitigating Risks During Cesarean Delivery for Advanced Maternal Age with Significant Fibroid Burden

Presenting Author: Carlos Guardia, MD
Presenting Author's Institution: Louisiana State University Health Sciences Center, New Orleans - New Orleans, Louisiana

Introduction: In the realm of obstetric interventions, cesarean delivery in the presence of extensive fibroid burden poses a unique set of challenges with the potential for major blood loss often underestimated. Uterine fibroids, prevalent in 0.1-10.7% of pregnant women, exhibit an increased occurrence when women opt to defer childbirth until a later age.[1] This abstract explores the need for heightened awareness and strategic perinatal management to optimize maternal outcomes.

Case One: We present a 42-year-old G2P1 at 35 WGA with PMH of advanced maternal age, class III obesity (BMI 42), chronic HTN, prior cesarean delivery, multiple uterine fibroids, and iron deficiency anemia, with concurrent enoxaparin use. The multidisciplinary anesthetic plan involved careful consideration of the patient's complex medical history, including verifying timing of the last enoxaparin dose before employing a combined spinal epidural technique, pre-operatively placing an arterial line, establishing two large bore IV's, and ensuring blood availability in the operating room, with a contingency plan for conversion to general anesthesia if necessary. The cesarean delivery resulted in a significant blood loss exceeding 3.4 liters. Intraoperative management involved administering 3 units of PRBCs, 1 liter of albumin, 3 liters of normal saline and 700 cc of lactated Ringer's solution. Despite major blood loss, the patient underwent an uneventful surgery and recovery, ultimately leading to discharge in good health. This case highlights the crucial role of thorough pre-operative planning, particularly in cases of significant fibroid burden. It emphasizes the importance of a multi-disciplinary approach to address complications associated with advanced maternal age, perinatal uterine fibroids, and other medical comorbidities.

Discussion: Patients with a notable fibroid burden undergoing cesarean delivery benefit from strategic approaches aimed at minimizing the risk of hemorrhage. Considerations include evaluating fibroid location and number, and tailoring pre-operative planning to address the challenges posed by this special subset of parturients. Insights are provided on how medical professionals can adapt their approach to enhance patient safety and optimize outcomes in complex cesarean deliveries, shedding light on the significance of individualized care in mitigating risks associated with major blood loss and comorbidities.

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 13

Extremely Rare Case of Haemophilus Influenza Type B Bacteremia with Intrauterine Seeding

Presenting Author: Heidi Heyman, MD
Presenting Author's Institution: University of North Carolina
Co-Authors: Erin Dengler, MD, MBA - University of North Carolina at Chapel Hill

Introduction: Haemophilus Influenza can result in a range of clinical presentations, most notably pneumonia, bacteremia, and meningitis. Pregnancy is associated with a 17-fold increase in the incidence of invasive Haemophilus influenza, which is often associated with fetal demise, particularly at less than 24 weeks gestation when rates of fetal loss are >90% (1,2). Most cases in the United States and other industrialized countries are nontypeable Haemophilus influenza (NTHi), as the widespread availability of the Haemophilus influenza type B (Hib) vaccine has nearly eradicated this disease (2,3). We present a case of a parturient with bacteremia and intraamniotic infection secondary to Hib infection.

Case One: A 28yo G4P2112 presented at 22w5d with symptoms of upper respiratory infection, midline suprapubic discomfort, and vaginal bleeding. Obstetric history included a bicornuate uterus and 2 vaginal deliveries complicated by retained placenta. On admission, she was febrile to 38.9 degrees Celsius, tachycardic, and had a white blood cell count of 31.5. Urinalysis revealed possible infection. Chest X-ray and CT scan of the abdomen and pelvis were largely unremarkable. She was started on broad spectrum antibiotics: vancomycin, clindamycin and aztreonam for MRSA coverage and possible UTI. Blood cultures demonstrated Haemophilus influenzae type B and antibiotics were changed to gentamicin and ceftriaxone. On hospital day 2, she remained febrile, and exam showed a newly dilated cervix with purulent discharge concerning for intraamniotic infection seeded from her bloodstream. The patient was counselled regarding risks of dilation and evacuation with uterine infection and a bicornuate uterus versus induction of labor (IOL). The patient opted for IOL. In the setting of bacteremia, neuraxial analgesia was deemed contraindicated and a remifentanil PCA was offered. The patient delivered a live fetus who expired shortly thereafter.

Discussion: While exceedingly rare since the development of the Hib vaccine, Hib infections can pose significant harm to the parturient and unborn fetus. Prompt recognition and treatment are vital for optimizing outcomes. Special considerations for anesthetic management for vaginal delivery in patients with Hib infection include considering avoidance of neuraxial anesthesia in the setting of bacteremia to prevent bacterial seeding of the central nervous system.

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 14

Intrapartum Acute Abdomen Requiring Urgent Cesarean Delivery and Exploratory Laparotomy

Presenting Author: Ashwini Joshi, MD
Presenting Author's Institution: Massachusetts General Hospital
Co-Authors: Jack Curtis, MD - Massachusetts General Hospital
Chang Amber Liu, MD - Massachusetts General Hospital
Jayne Manigrasso, MD - Massachusetts General Hospital

Introduction: The management of acute abdomen in pregnancy includes both obstetric and non-obstetric considerations. Simultaneously, physiologic changes in pregnancy, particularly in labor, overlap with early sepsis and include increased heart rate, decreased blood pressure, increased respiratory rate, leukocytosis, and a mildly elevated lactate [1,2].

Case One: We present the case of a 28-year-old G3P0 at 40w2d who developed severe abdominal pain during spontaneous labor. Her course was initially notable only for fetal intolerance of lying supine or on the left side. An epidural was placed for labor analgesia with good effect. 13 hours into her admission, the patient reported sudden onset 8/10 abdominal pain. After obstetric evaluation, our anesthesia team was called to assist with pain control. Over the next hour, the patient became progressively more nauseous, febrile to 101.5F, tachycardic to 150 bpm with uterine tachysystole, and required multiple epidural boluses for left upper quadrant pain, supported with increasing phenylephrine boluses. Labs revealed a new leukocytosis to 14K and a lactate of 2.5. The abdomen was newly firm and tender. Due to concern for chorioamnionitis, maternal instability, and a nonreassuring fetal heart tracing, we proceeded urgently to Cesarean delivery. The epidural was dosed gradually with 2% lidocaine with epinephrine and bicarbonate in the OR with a low dose phenylephrine infusion running. Ampicillin, gentamycin, cefazolin, and azithromycin were given. In the OR, the patient continued to have nausea with brown bilious emesis. A liveborn female infant was delivered. A large LUQ mass and bowel perforation were then discovered. A multidisciplinary discussion took place between the anesthesia, OB, trauma surgery, surgical oncology, and colorectal surgery teams; the patient; and her family regarding the need for conversion to general anesthesia, emergent exploratory laparotomy, and bowel resection for sepsis source control. After adequate preoxygenation, rapid sequence induction and Glidescope intubation were performed. The patient was transported to the main OR for resection of a 35 x 20 cm intraperitoneal mesenteric mass, small bowel resection, and abdominal closure. Resuscitation with 4L LR, 1.25L of 5% albumin, 3 units pRBCs, and 1 unit FFP was required. Postoperatively, the patient went to the ICU intubated and on low-dose norepinephrine with an arterial line, three large-bore peripheral IVs, and capped epidural in place. She was ultimately discharged to home on POD 6. Final pathology was consistent with mesenteric fibromatosis.

Discussion: Acute abdominal pain in labor is most commonly related to obstetric causes, however a non-obstetric etiology must be considered. Fetal distress may be an indication for

surgical intervention [3]. Multidisciplinary communication is crucial to patient care and recovery.

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 15

Neuraxial Anesthesia to Facilitate Manual Reduction of an Incarcerated Gravid Uterus

Presenting Author: Raji Naamani, MD
Presenting Author's Institution: Cleveland Clinic
Co-Authors: Stephania Paredes, MD - Cleveland Clinic

Introduction: Incarceration of the gravid uterus (IGU), characterized by the entrapment of the uterus between the sacral promontory and the pubic symphysis, is a rare complication (1:3000 pregnancies) with consequences on both maternal and fetal health(1). Parturients present in the second trimester with urinary retention, abdominal or pelvic pain, constipation, and occasionally bowel ischemia or even uterine rupture(1). Fetal status can also be compromised due to impaired uteroplacental perfusion and restriction of uterine growth. Manual reduction at bedside is often sufficient to resolve the incarceration; however, surgical reduction may be necessary. Few cases in the literature describe anesthesia for manual reduction, and while multiple anesthetic options exist, there is currently no standard protocol or technique for management of such patients(2). We present the case of a parturient with IGU who received spinal anesthesia to allow manual reduction of the incarcerated uterus.

Case One: A 38-year-old lady, 168cm and 79kg, G5P2 at 15 weeks of gestation presented with acute, severe abdominal pain and urinary retention. Ultrasound exam revealed an incarcerated retroflexed gravid uterus. Despite multiple attempts at bedside manual reduction, the uterus remained entrapped and the patient could not tolerate the procedure due to severe pain. The anesthesia team was consulted and decided to administer a spinal block at the L3-L4 level. Intrathecal administration of Bupivacaine 0.75% (1mL) and Fentanyl (15mcg) provided adequate anesthesia to a T6 sensory level after 3 minutes, and hemodynamics remained stable using a brief phenylephrine (50mcg/min) infusion. The patient was moved from a supine to a knee-chest stance over a therapeutic balance ball, enabling successful manual reduction within 10 minutes, followed by placement of a donut pessary. Subsequently, the patient was transferred to recovery and discharged home the following day.

Discussion: In addition to providing analgesia, spinal anesthesia induces abdominal muscle relaxation which facilitates reduction of the incarcerated uterus while allowing the patient to remain awake, avoiding airway manipulation, and minimizing fetal drug exposure. The same muscle relaxant effect of spinal anesthesia is often utilized to aid external cephalic version (ECV) procedures. Patient positioning also becomes crucial to the success of the reduction, and optimal access may require unconventional positions. In our case, it was ideal to be in an “all-fours position” (see figure), which required a balance between achieving adequate analgesia and maintaining sufficient muscle strength and mobility to allow changes in position that may be needed during the procedure.

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 16

The Importance of Pregnancy Tests: Placental Abruption Mistaken for Abnormal Uterine Bleeding

Presenting Author: John W. Robison
Presenting Author's Institution: University of Mississippi Medical Center , Mississippi
Co-Authors: Dallas Domangue - University of Mississippi Medical Center
Shelby Claire Liddell - UMMC
Hunter Mace - University of Mississippi Medical Center

Introduction: Placental abruption is a relatively rare, but serious condition defined as early separation of the placenta prior to completion of the second stage of labor.1 Placental abruption has a reported incidence rate in 0.4-1% of pregnancies.2 The pathophysiology in placental abruption occurs following the rupture of maternal vessels within the endometrium.

Case One: We present a case of a 22-year-old female G3P2 with two prior cesarean sections and a BMI of 43 who presented to the emergency department with heavy vaginal bleeding and hypotension. The patient had no prior medical history and was not aware that she was pregnant. On presentation, the emergency department obtained multiple labs including a hemoglobin of 8. She was started on vasopressors and an A-Line was placed. Because the emergency department was concerned for abnormal uterine bleeding, the gynecology team was consulted. The gynecology team noticed a positive pregnancy test. Quickly a POCUS was performed significant for intrauterine pregnancy with fetal heart rate in the 140s, but with significant bleeding. The team had concerns for placental abruption vs uterine rupture, and the decision was made to proceed to with an emergency C/S. RSI was performed with propofol, etomidate, and succinylcholine. Tracheal intubation was performed with a 6.5 mm endotracheal tube with a glideslope. Initial dose of vasopressin 0.04 units/min and norepinephrine 10 mcg/min were used and weaned to off after resuscitation. Total blood products included 5 u pRBC, 3 uFFP, and 500cc of albumin. The abruption involved greater than 50% of the placenta. Following delivery of the placenta, 30 units of Pitocin were given, and a central line was placed for vascular access and for need vasopressors. The patient remained intubated due to concern for continued resuscitation and was taken to the intensive care unit.

Discussion: This case illustrates the importance of communication in life-threatening situations. Placental abruption is a leading cause of maternal morbidity and perinatal mortality, accounting for 5-8% of maternal deaths.1 Placental abruption is often a sudden, intense process that require immediate treatment and possibly advanced life support. This rapid loss of blood must be treated differently than other abnormal uterine bleed processes such as leiomyomas or polyps are commonly slow enough that the body is able to compensate.

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Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 17

Maternal Bladder Exstrophy Complicating Cesarean Delivery: A Multidisciplinary Approach to Care

Presenting Author: Benjamin Boudreau
Presenting Author's Institution: Michigan State University College of Human Medicine
Co-Authors: Allison Cropsey - Michigan State University College of Human Medicine

Introduction: Bladder exstrophy (BE) is a rare and complex medical anomaly that requires surgical intervention early in life. BE has an incidence of 3 to 5 cases per 100,000 live births with most patients capable of living an otherwise healthy life after surgical correction. Female patients with BE can become pregnant in adulthood and are at an increased risk for complications during delivery due to their unusual anatomy, making medical decision making difficult and multidisciplinary.

Case One: This report is a G1P0 27-year-old female at 36 weeks gestation with a medical history of surgically corrected BE who presented for a scheduled Cesarean Section. Patient self-reported 18 total surgeries including a Mitrofanoff Procedure. At 21 weeks gestation, a cesarean section was planned at 36 weeks with a multidisciplinary team of Anesthesiology, Maternal Fetal Medicine, Structural Urology, and OBGYN. Reconstructive Urology planned to catheterize the Mitrofanoff stoma and make the initial vertical incision then OBGYN would cut at the uterine fundus to perform the cesarean section. Given the patient's preference for an awake cesarean section, anesthesiology recommended a combined spinal-epidural (CSE) block with intrathecal morphine and the potential for a Transverse Abdominis Plane (TAP) block post-procedure. The cesarean section was performed to plan and the baby was delivered without complication. During the procedure, the patient complained of upper body tingling, to which 200μg total of fentanyl was administered. Post-procedure the patient had increased discomfort in the cephalad portion of her incision and received bilateral TAP blocks. The patient's pain was well tolerated and was discharged a few days later.

Discussion: This case report is significant for the multidisciplinary approach for an awake cesarean section complicated by rare anatomy. The anesthetic plan was discussed 85 days before the procedure in conjunction with the multidisciplinary team considering the complexity of the case. A CSE with a TAP block was recommended due to the length of the procedure, the large abdominal incision, and the preference of the mother to be awake. Postoperative TAP blocks were performed with liposomal bupivacaine given current literature that supports prolonged analgesia and less opioid use in combination with a neuraxial block.

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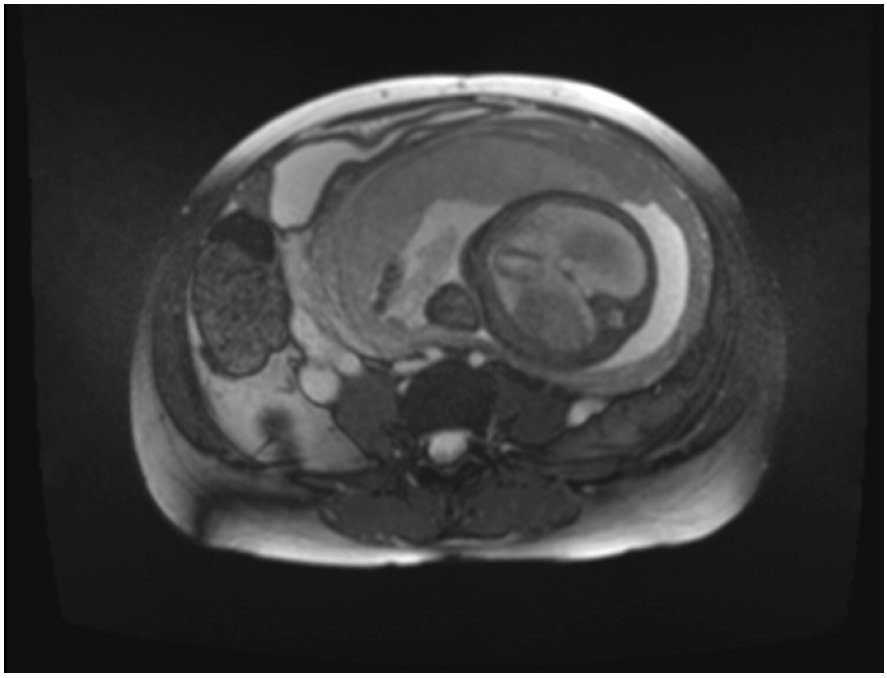

Abstract #: SAT – CR – BS 3 – BR 1 – Broken Uterus and Other Unusual Bleeders – 18

Our Missing Person

Presenting Author: Matthew Sikora, DO
Presenting Author's Institution: Metrohealth Medical Center - West Hollywood, California
Co-Authors: Johnathan Alter, MD - Metrohealth Medical Center
Marcos A. Izquierdo, MD - Metrohealth Medical Center
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Introduction: Patients with multiple c-sections are at a higher risk for increased adhesions, bowel injury, PPH, and uterine rupture if they present in precipitous labor. Care requires careful management which can be complicated by complex social situations, multiple comorbidities, no prenatal care, and drug abuse. This patient presentation is becoming more common at safety net hospitals and require prompt multidisciplinary team management to obtain the best outcomes.

Case One: Our patient is a 38y/o G9P7 who presented with vaginal bleeding and contractions. In care everywhere, the patient's PMHx included 8 prior sections, two ex-laps, and peritoneal myofibroblastic tumor last seen by oncology in 2020. Regarding the patient's social history, she explained she was missing person for 3 years and recently escaped. Her kidnappers sex trafficked her and she had bilateral upper extremity track marks and ulcerations on exam. She said her captors injected and got her addicted to fentanyl and crack. On presentation the FHR was overall reassuring. All teams worked to obtain labs, call the main OR, and coordinate gyn/onc and trauma surgery. Our concerns included: the urgency of delivery, multiple prior sections and bowel surgery, the possibility of dissecting a tumor and lack of imaging, prolonged fetal exposure to general anesthesia, and post- op pain control. CBC indicated normal platelets and the decision was made for CSE but have a low threshold for general anesthesia. After the CSE was placed additional peripheral access was obtained under US. The patient endorsed a T4 level, but required ketamine, midazolam, propofol, and dexmedetomidine to remain calm. OB utilized a midline incision, extensive adhesions were noted, and there was a 1.2L EBL. Baby was delivered with APGAR scores of 9 and 9. The procedure was uncomplicated, and she was transferred to PACU with an epidural infusion of bupivacaine and clonidine. The patient endorsed adequate pain relief; however, she requested her epidural be removed after 12 hours. Unfortunately, she left AMA the following morning.

Discussion: This patient's multiple concerns included high-risk surgery, increased risk of poor fetal outcome, maternal intoxication, difficult IV access, post-operative pain control, and complex social situation. We recommend a multidisciplinary team approach led by anesthesia and OB for prompt delivery. The reassuring fetal heart rate allowed us to obtain labs, consider neuraxial, and proceed with section. Anesthesia discussed the high likelihood of requiring general, however neuraxial was a priority for at least post-op pain relief and possibly avoiding general. After case debrief, all teams were happy with the outcome but ultimately saddened

the patient is most likely lost to follow up and back on the streets.

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Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 01

Maternal Cranial Arachnoid Cyst: Is Neuraxial Anesthesia Appropriate?

Presenting Author: Michael Wen, MD
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Introduction: Arachnoid cysts are fluid filled cavities within the arachnoid matter found both intracranially and extracranially. The estimated prevalence is 1.4% and the majority of cysts are asymptomatic, found incidentally, and do not require surgical intervention (Al-Holou 2013). There is still uncertainty regarding the safety of neuraxial anesthesia in the parturient. We describe a case of safely using spinal anesthesia for Cesarean delivery for a patient with a large posterior fossa arachnoid cyst.

Case One: A 42-year-old nullipara with a posterior fossa arachnoid cyst found incidentally on workup for neck and back pain 20 years prior presented for induction of labor at term after an uncomplicated pregnancy. The cyst (11cm x 5.5cm x 8 cm) exhibited a mass effect on the superior and left cerebellar hemisphere (Figure 1). The size and features were comparable to previous films. There were no signs or symptoms of elevated intracranial pressure (ICP). Multidisciplinary collaboration with maternal-fetal medicine and neurosurgical consultants concluded that there were no neurologic concerns for vaginal delivery (including Valsalva) and epidural analgesia would be feasible. Due to fetal intolerance of labor, the decision was made for Cesarean delivery. A spinal block was performed using a 25G Whitacre needle. The surgery proceeded uneventfully, and a healthy girl was delivered. The patient recovered well with no neurological sequelae, and she was discharged home on postoperative day four.

Discussion: Intracranial lesions, particularly with mass effect, pose concerns regarding mode of delivery and the feasibility of neuraxial techniques (Leffert 2013). With limited reports of intracranial arachnoid cysts in pregnancy, the concerns, particularly regarding intracranial pressure changes with neuraxial, remain (Cooper 2023). Our case supports the safe employment of spinal anesthesia in a woman with a large posterior cranial fossa cyst. Neurosurgical consultation confirmed reassuring characteristics (stable size, lack of symptoms, patent cisterns at the foramen magnum) that allowed for consideration of the broadest options for both mode of delivery and choice of anesthesia.

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Wen, Michael- Maternal cranial arachnoid cyst - Figure 1.pdf

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 02

Unexpected Subdural Hematoma After Dural Puncture Epidural: *A Case Without Warning Signs*

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Introduction: Intracranial subdural hematoma (SDH) is a rare, but life-threatening complication of neuraxial anesthesia. It is thought that persistent loss of CSF from the dural puncture causes intracranial hypotension, leading to caudal shift of the brain followed by traction-induced rupture of the dural bridging veins, venous walls or cerebral cortical veins (1). This is the first reported case of such an event following a dural puncture epidural (DPE), in a patient with no signs/symptoms of a postdural puncture headache (PDPH).

Case One: A 30 y.o. G1P0 at 39w4d was admitted in labor. Admission labs were normal. She received a DPE at L4-5 using a 25g Whitacre spinal needle placed coaxially via a 17g Tuohy. No CSF was visualized through the Tuohy and there was no suspicion for an accidental dural puncture. The patient had an uneventful vaginal delivery and was discharged 1 day later. On post-partum day 13, the patient presented to the emergency room for progressive left sided sensory loss beginning one day prior with a new right sided headache. She denied head trauma, anticoagulation, and antiplatelet use. CBC and coagulation labs were unremarkable. She did not develop preeclampsia or even mildly elevated blood pressure readings in the peri/postpartum period. CT brain showed a right 7mm SDH with a 3mm midline shift. Brain/neck CT angiograms were normal. She received levetiracetam, desmopressin, and was admitted to the intensive care unit (ICU). MRI didn't show vascular anomalies nor evidence of a CSF leak. The patient had serial CT/MRI scans which demonstrated stability of the bleed. Neurosurgery recommended a middle meningeal artery embolization, but the patient refused. She was discharged on antiepileptics and outpatient surveillance imaging.

Discussion: Neurosurgery attributed the SDH to CSF loss from the DPE. Other than a DPE with a 25g pencil point spinal needle, the patient had no factors predisposing her to a CSF leak or SDH in the peripartum period. Our patient lacked symptoms of intracranial hypotension such as positional headaches, nausea, vomiting, tinnitus, photophobia or neck stiffness (2). She did not have an explanation for her SDH such as hypertension, coagulopathy, or vascular anomalies. Patients with brain bleeds thought to be due to CSF leak should have prompt escalation to the ICU with neurosurgical evaluation for surgical interventions. This case illustrates the rare but severe risk of dural puncture, even with a spinal needle as small as 25g. It highlights the question whether the risks outweigh the benefits for an elective addition of a

DPE to the historical labor epidural.

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Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 03

Anesthetic Management of Symptomatic Chiari I Malformation in A Parturient

Presenting Author: Kevin M. Rychik, MD
Presenting Author's Institution: University of Connecticut
Co-Authors: Casey Cuccio, DO - University of Connecticut
Jamie Zorn, MD - Saint Francis Hospital and Medical Center
Introduction: Chiari I Malformation is a hindbrain maldevelopment characterized by downward displacement of cerebellar tissue 1. There are numerous reports of neuraxial anesthesia in patients with Chiari Malformation, including known and unknown diagnoses 2. However, anesthetic management remains unclear and controversial. An unintentional dural puncture may produce a cerebrospinal fluid pressure gradient, resulting in cerebral herniation. Additionally, manipulations involved in general anesthesia, including laryngoscopy and intubation, without optimization, can result in hypertensive responses and increased intracranial pressure, resulting in herniation 3.

Case One: A 25 year old parturient, gravida 3 para 2 with a Chari I Malformation, presented to labor and delivery at 36 weeks gestation due to worsening headaches, blurred vision, and unsteady gait. The presence of Chiari I Malformation was unknown during her first pregnancy, and she received an uncomplicated labor epidural. In her second pregnancy, a brain MRI, her first known imaging, revealed a Chari I Malformation with cerebellar tonsils 8.5 millimeters below the foramen magnum, and received uncomplicated spinal anesthesia for cesarean delivery. In her third pregnancy, her neurologic symptoms progressed, to diplopia, unsteady gait, and proprioceptive defects. She underwent general anesthesia for cesarean delivery. For intravenous induction she received 200 milligrams of propofol, 250 micrograms of fentanyl (2mcg/kg of total body weight of 127kg), and 100 milligrams of rocuronium. At the time of endotracheal intubation, she received two 10 milligram boluses of labetalol. She tolerated direct laryngoscopy and endotracheal intubation well, and blood pressure peaked at 130/53 at that time. The patient was hemodynamically stable throughout the case, and extubated under deep anesthesia.

Discussion: Anesthetic management of patients with Chiari Malformation possesses inherent risk overall; involving neuraxial or general anesthesia. To date, there are no published trials comparing parturients with intracranial pathology undergoing neuraxial versus general anesthesia. In each case a multidisciplinary discussion should be implemented.

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Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 04

Successful Vaginal Delivery after a Spinal Cord Injury Complicated by Autonomic Dysreflexia

Presenting Author: Kathryn Kim, MD
Presenting Author's Institution: UCLA - Los Angeles, California
Co-Authors: Shradha Khadge, MD – UCLA

Introduction: Autonomic dysreflexia (AD) is a potentially life-threatening disorder of the autonomic nervous system resulting from a spinal cord injury (SCI), typically at or above the level of T6. Although they may not perceive pain, any noxious stimulus below the level of injury, including bladder/bowel distension, precipitates an exaggerated sympathetic response, causing systemic vasoconstriction. The brain's compensatory signal to activate the parasympathetic system cannot pass through the SCI and sympathetic response remains unopposed, resulting in life-threatening hypertension and consequent baroreflex-mediated bradycardia. These episodes must be recognized, and irritating stimulus removed promptly to prevent strokes, seizures, MI, and death.

Case One: 24yo female G1P0 with a history of C5/C6 quadriplegia in 2018 secondary to a gunshot wound complicated by neurogenic bladder with suprapubic catheter, neuropathy, and constipation requiring manual evacuation. The patient reported episodes of AD daily which were predominantly triggered by bladder issues such as spasms or kinked catheters. Systolic blood pressure to 200s during these episodes had been recorded, along with tachycardia, shortness of breath, flushing, and headache. She had previously been taking antihypertensives for these episodes; however, she stopped due to low systolic pressures requiring daily midodrine. Patient presented at 37w4d for induction and desired vaginal delivery. An epidural was placed early prior to Foley balloon of cervix to avoid painful contractions that could elicit AD. A ClearSight non-invasive cuff was initially used for continuous hemodynamic monitoring, but due to intermittent malfunctioning, an arterial line was placed for accurate and reliable measurements. Sudden hypertensive episodes triggered by contractions were managed with careful titration of local anesthetic boluses and rate of epidural infusion. Patient required additional antihypertensives due to worsening contraction pain towards end of labor. Dense block with a 10ml of bupivacaine 0.5% bolus was given at complete dilation. Patient was able to Valsalva during contractions, delivered easily without assistive devices, and remained hemodynamically stable during pushing.

Discussion: Challenges for this parturient with AD included placement and confirmation of an efficacious epidural in a patient with abnormal sensation below C5, management of hemodynamic changes resulting from contractions leading to hypertension, as well as potential hypotension from the neuraxial block, and facilitating vaginal delivery in the setting of paraplegia. An alternative consideration included urgent cesarean delivery if AD remained uncontrolled after interventions with backup general anesthesia.

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Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 05

Anesthetic Management of Cesarean Delivery in a Patient with Cerebral AVM

Presenting Author: Vanna Cochran
Presenting Author's Institution: University of New Mexico School of Medicine

Introduction: Cerebral arteriovenous malformations (AVM) in pregnancy are rare but can cause significant morbidity and mortality due to risk of hemorrhage (3). Cesarean delivery is generally recommended over vaginal delivery due to concerns of increased intracranial pressure with pushing during the second stage of labor (4). There is limited information on best practices for anesthetic management of cesarean delivery in patients with cerebral AVM.

Case One: A 34yo G3 P2 in her 3rd trimester presented to the ED for right facial weakness and was found to have Bell's palsy. MRI of the brain incidentally showed a 3cm left temporal AVM. She had consultation with maternal fetal medicine and neurosurgery, and cesarean delivery was recommended. At 39w0d, the patient presented for her scheduled elective primary cesarean delivery with bilateral salpingectomy. For the cesarean delivery, the patient was given a single shot spinal with bupivacaine, morphine, and fentanyl. Standard ASA monitors were applied, and a phenylephrine infusion was started to maintain normotension. The surgery and postpartum course were uneventful.

Discussion: Risk factors for rupture of intracranial AVM include previous hemorrhage, AVM size, deep venous drainage, presence of aneurysm, and hypertension (6,7), and the anesthetic management of a patient with an AVM undergoing surgery should avoid hemodynamic instability and increased intracranial pressure. There have been case reports describing different anesthetic techniques including general, epidural, and single shot spinal anesthesia. Each technique has its own associated risks. Given that our patient was otherwise healthy with no prior history of AVM hemorrhage, and that it was a primary cesarean delivery with an anticipated straightforward surgical course, the decision was made to administer a single shot spinal with phenylephrine infusion. This case demonstrates the safe use of single shot spinal anesthesia for patients with cerebral AVM who are at low risk of hemorrhage.

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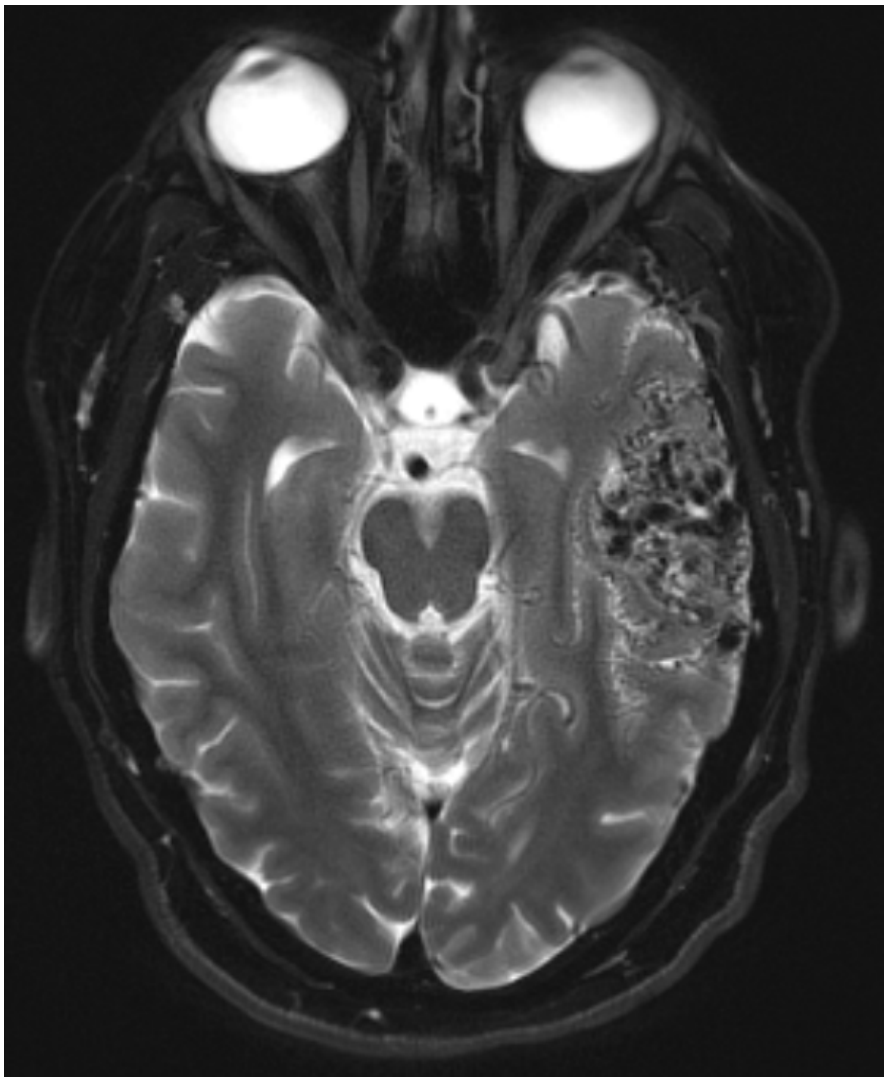

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 06

Cesarean Delivery and Posterior Craniotomy in a Patient with Von Hippel Lindau

Presenting Author: Leila Katabi, MD, MA
Presenting Author's Institution: University of Michigan - Ann Arbor, Michigan

Introduction: Von Hippel-Lindau (VHL) disease is a rare autosomal dominant disorder with an incidence of 1 in 35,000-65,000.1 Deletion of the VHL tumor suppressor gene increases the risk of visceral and central nervous system (CNS) lesions. Hemangioblastomas of the CNS affect 60-80% of patients and are most commonly cerebellar.2 The impact of pregnancy on the progression of intracranial hemangioblastomas is debated. Some suggests significant progression during pregnancy,3 while others refute this.4 Tumor resection is indicated when patients become symptomatic, typically due to elevated intracranial pressure (ICP).2

Case One: The patient was 34 yo G4P1 with VHL who presented at 34w4d. She was diagnosed with two cystic brain lesions five years prior but was lost to follow up. She presented to an outside hospital with worsening headaches, left sided weakness, and speech changes. MRI revealed two cerebellar lesions measuring 5.1 cm and 2.5 cm with significant mass effect, effacement of the fourth ventricle, and inferior tonsillar herniation of 13 mm. She was admitted to the neurosurgical intensive care unit (NICU) for monitoring while receiving therapy for fetal lung maturation. Due to the urgency of neurosurgical intervention, she underwent a combined cesarean delivery and posterior fossa craniotomy under one general anesthetic. After induction of general anesthesia, a frontal ventriculostomy was placed, followed by cesarean delivery. Given an uncomplicated delivery without concern for postpartum hemorrhage or administration of uterotonics, it was deemed appropriate to continue with neurosurgical resection. She was placed in the prone position for resection of two lesions confirmed to be hemangioblastoma on pathology. The patient recovered uneventfully in the NICU.

Discussion: General anesthesia offers many advantages for parturient with elevated ICP from space occupying lesions. The risk of herniation from labor and neuraxial anesthesia is avoided, hyperventilation can decrease ICP, and delivery can be combined with neurosurgical intervention. Combined cesarean delivery and neurosurgical tumor resection has been previously reported.1,5 An intrauterine tamponade device has been used prophylactically to minimize postpartum hemorrhage.5 Large volume resuscitation for hemorrhage poses risks for prone positioning, including vision loss.6 In addition, coagulopathy can have serious consequences for neurosurgical bleeding. Therefore, increased efforts to minimize postpartum hemorrhage may be wise. Multidisciplinary coordination and careful consideration of elevated ICP and risks of postpartum hemorrhage are necessary to care for parturients with space occupying brain lesions.

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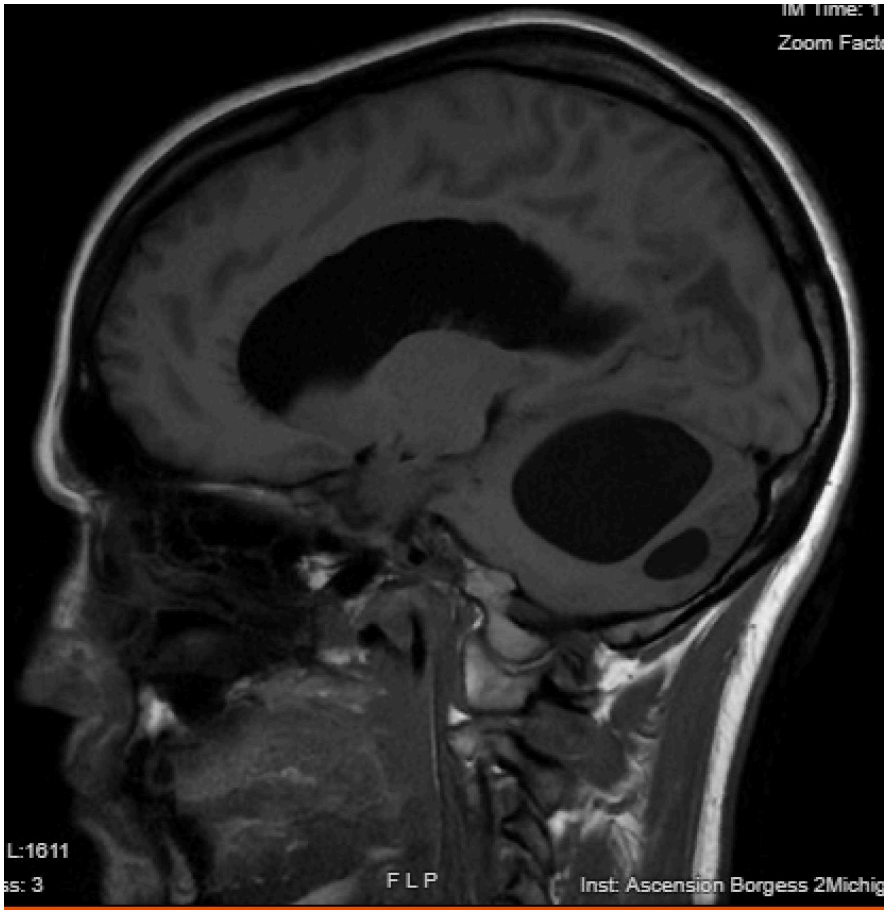
Neurosurg. 2008;108:210-22. 3. Frantzen C et al. Neurology. 2012;79:793-6. 4. Ye DY et al. J Neurosurg. 2012;117:818-24. 5. Rios AP et al. Eur J Obstet Gynecol Reprod Biol. 2012;165:370-2. 6. Edgcombe H et al. Br J Anaesth. 2008;100:165-83.



Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 07

Cesarean Delivery in a Spontaneously Laboring Patient with History of Fontan Circulation, Complicated by Intrapartum Stroke

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Co-Authors: Michael Marotta, MD - Northwell Health
Ralitza Peneva, MD - Medical University of South Carolina
Amber Priester, MD - Medical University of South Carolina

Introduction: Antenatal and intrapartum care of pregnant women with Fontan circulation requires multi-disciplinary collaboration due to complex physiologic changes. We present a patient with history of Fontan repair who presented in preterm labor and whose course was complicated by an intrapartum stroke.

Case One: A 19-year-old G2P0010 with a history of double inlet left ventricle with hypoplastic right heart status post Fontan palliation in childhood presented to triage with spontaneous preterm labor at 35 weeks gestation. Her antenatal course was complicated by Fontan conduit thrombus at 32 weeks, depressed ventricular function, and pulmonary hypertension. An interdisciplinary team following this patient prenatally formulated a complex coordination plan in the event of labor including cesarean section to avoid Valsalva, slow titration of epidural to avoid acute sympathectomy, and postpartum ICU admission for invasive hemodynamic monitoring. On presentation, she had rapidly progressing cervical change and was within twelve hours of most recent therapeutic dose of enoxaparin. Due to the need for urgent delivery, a cesarean under general anesthesia was planned. Immediately prior to delivery, the patient had an episode of paresthesias and altered mental status in the setting of transient hypertension. The differential diagnosis included eclamptic seizure versus stroke. A magnesium drip was initiated, and a preliminary CT head was negative. Given the need for urgent delivery, MRI brain was deferred until after surgery. After placement of arterial and central venous lines, the patient was induced under general anesthesia and intubated. She underwent an uncomplicated cesarean section with an estimated blood loss of 700 mL. At the conclusion of her surgery, she was extubated and transferred to the ICU. An brain MRI demonstrated an acute thrombotic right cerebellar stroke, and therapeutic anticoagulation with heparin was initiated 6 hours after delivery. She subsequently developed seizure activity and was treated with magnesium sulfate and levetiracetam. Neurologic examination improved. There was no further seizure activity. She was transitioned to therapeutic enoxaparin and discharged post operative day 7.

Discussion: In obstetric patients with history of single ventricle cardiac defects and Fontan repair, a multi-disciplinary approach is critical. The hemodynamic and hypercoagulable changes of pregnancy should be recognized to optimize patient care. Stroke and cardiovascular collapse should be included in differential diagnoses of severe complications.

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 08

Neuromyelitis Optica and Anesthetic Considerations for Cesarean Delivery: A Case Report

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Introduction: Neuromyelitis optica (NMO) is a rare, progressive autoimmune disorder of the central nervous system, characterized by transverse myelitis (TM) and optic neuritis with a relapsing-remitting course and permanent disability linked to relapses. Implications in pregnancy: a) titrating immunosuppressant medications, b) increased risk of preeclampsia/miscarriage, and c) relapse with permanent disability in the postpartum period.

Case One: A 27-year-old G1P0 at 36w0d with NMO, presented to L&D with abdominal pain, nausea, and blood in her urine. NMO signs at diagnosis included optic neuritis and bilateral lower extremity paralysis. The patient had chronic kidney disease, proteinuria and bilateral hydroureteronephrosis, chronic hypertension, and Indiana pouch bladder augmentation. Due to rising Cr, right upper quadrant pain, elevated blood pressures and concerns for superimposed preeclampsia, an urgent cesarean delivery (CD) was indicated. Anesthetic history included sensitivity to rocuronium with an intubating dose lasting 3.5 hours, and an uneventful thoracic epidural analgesia for an ex-lap. Despite previous epidural, the patient requested general anesthesia as she was recently unable to tolerate lying flat for an MRI. Given the urgent nature of the CD, patient preference, the likelihood of complex surgery with urology assistance, and anxiety and emesis in the OR, general anesthesia was induced with propofol, and RSI performed with rocuronium as demyelinating disease is a known contraindication to succinylcholine. While spinal cord (SC) lesions carry risk of autonomic dysreflexia, her disease was well controlled and MRI T-spine in 2020 did not reveal an active enhancing SC lesion. Therefore, invasive blood pressure monitoring was not done. The intraoperative course was uneventful though she did have respiratory distress in PACU requiring an additional 200 mg of sugammadex with immediate resolution. She was discharged home on POD 4. Her disease remained stable with no relapses at her 6-week neurology visit.

Discussion: Peripartum management of NMO patients requires careful consideration. Attention to frequency and intensity of acute relapses, degree of disability, presence of high spinal cord lesions, neurogenic bowel/bladder, superimposed preeclampsia, and immunosuppressant treatment is important. NMO per se is not an indication for a CD. Obstetric management depends on other coexisting maternal and fetal issues. Successful neuraxial and general anesthesia have both been described in the management of NMO patients, including labor epidural for vaginal delivery. However, there are reports of spinal anesthesia triggering NMO and TM. It is hypothesized that the presence of a prior spinal cord

lesion (i.e., demyelinated nerves) may lower the threshold for local anesthetic toxicity, thus exposing silent plaques and leading to a relapse. It is important to counsel these patients on the high risk of relapse in the postpartum period irrespective of the use of neuraxial techniques.

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 09

Superior Sagittal Sinus Thrombosis in a Viable Parturient

Presenting Author: Jessica Stockinger, MD
Presenting Author's Institution: Medical University of South Carolina
Co-Authors: Michael Reynolds, MD - Medical University of South Carolina
Joel Sirianni, MD - Medical University of South Carolina

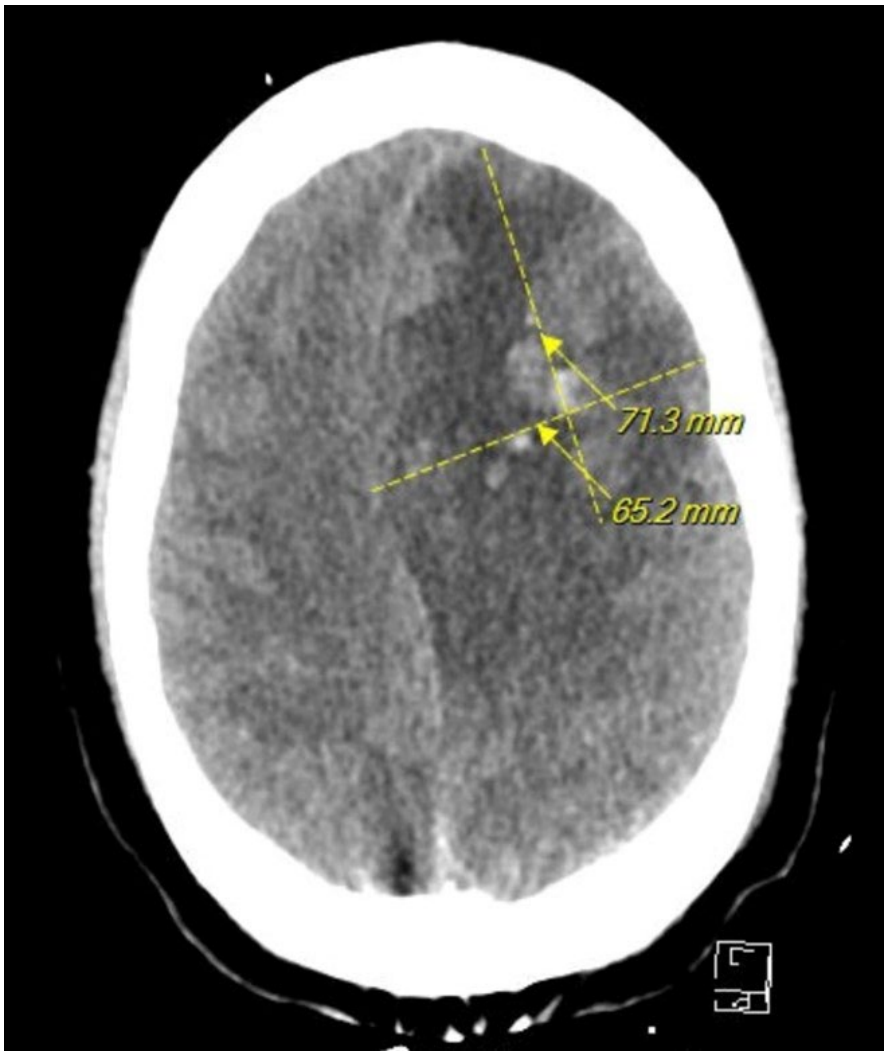
Introduction: Intracranial hemorrhage (ICH) in a laboring patient creates challenges for delivery and anesthetic planning. We present a parturient who experienced a central venous sinus thrombosis with ICH who went into labor requiring cesarean section (C/S) and thrombectomy.

Case One: A 23 year old G1 at 38 weeks presented with severe headaches for 24-48 hours. The patient lost consciousness while driving, was hospitalized, and diagnosed with a left frontal ICH. Upon transfer to our care, she had expressive aphasia and mild uterine contractions that quickly progressed to active labor. Repeat CT showed 6x5 cm left ICH, increased mass effect, and hyperattenuation of the superior sagittal sinus (SSS). Neurosurgery cleared the patient and emergent C/S under general anesthesia with TIVA commenced. Hypertonic NaCl and tight blood pressure control was maintained. She remained intubated and immediately underwent MRI that revealed SSS thrombosis and venous ICH with worsening midline shift. Within hours of C/S, she was taken for a successful emergent thrombectomy. A microcatheter was left in place for continuous tPA infusion and IV heparin infusion continued. Several hours post-op the patient had a worsening neurological exam and a tonic-clonic seizure. A repeat CT (Figure 1) showed worsening mass effect so an intracranial pressure (ICP) bolt was placed with ICP>50. Aggressive ICP management with mannitol, 3% NaCl, hyperventilation, propofol, and vecuronium did not improve ICP. Emergent decompressive craniectomy followed. Abdominal distension, anemia, coagulopathy, and increasing pressor requirement concerning for DIC occurred postop. FAST exam was positive and she underwent exploratory laparotomy where two liters of intraabdominal blood was evacuated. The patient remained ventilator dependent and ultimately underwent tracheostomy. Her neurological and respiratory status slowly improved and she was later decannulated and discharged on postop day 49. She had a successful cranioplasty 2 months after discharge.

Discussion: Management of active labor in the setting of ICH and elevated ICPs is complex and requires thoughtful planning from all teams involved. Given her ICH, elevated ICP, and active contractions, she could not safely undergo regional anesthesia or Valsalva maneuvers, so C/S under GA was the safest option for delivery. Intraoperative management must be carefully considered to minimize further ischemia and maintain uterine perfusion. To decrease ICP, decrease cerebral oxygen demand, and maintain CPP, a TIVA was utilized, tight BP control maintained, hypertonic NaCl given, $EtCO_2$ of 30 targeted, and the head of bed was elevated.

Anticoagulation for SSS thrombosis after major abdominal surgery led to difficult medical management and eventual DIC complicated her care further.

References: .



Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 10

Slow and Steady Births the Baby: A Case Study on Management of Parturients with Muscular Dystrophy

Presenting Author: Natalie Campbell, MD
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Introduction: Collagen VI related dystrophy (COL6-RD) is a rare autosomal dominant condition with variable phenotypic expression of progressive muscle weakness, joint contractures and respiratory failure. Ullrich congenital muscular dystrophy presents early (~age 11), while Bethlem muscular dystrophy typically presents late (~age 50). Intermediate COL6-RD form presents with independent ambulation past age 11 but need non-invasive positive pressure ventilation (NPPV) in late teens. Diagnosis is made based on exam and lab findings (CK, EMG studies) and is confirmed by genetics (COL6A1, COL6A2, COL6A3). Treatment focuses on aiding ambulation, activities of daily living and respiratory support with NPPV.

Case One: Our patient is a 22-year-old G3P1102 presenting at 31w2d with intermediate COL6A1-RD and severe restrictive lung disease requiring NPPV. She previously delivered two children via cesarean at 34 and 37 weeks due to progressive respiratory failure. Multiple family members are also affected, with her sister passing away after failed intubation, thought to be due to subglottic stenosis. Patient initially presented to the medical ICU with sepsis complicated by respiratory distress requiring continuous NPPV. Sepsis was treated and respiratory function improved. Multidisciplinary meetings of MFM, OB anesthesia, ICU and ENT worked to plan delivery at 34 weeks gestation. We chose slow titration of an epidural for surgical anesthesia. Arterial line was placed for monitoring of arterial blood gases. Given her sister's history we prepared the OR with advanced airway equipment and consulted ENT for possible surgical airway should respiratory decompensation requiring intubation occur. Patient ultimately had an uneventful cesarean with post-op disposition to medical stepdown unit for nightly BiPAP.

Discussion: Muscular dystrophy is a spectrum of conditions with important anesthesia considerations. These patients are at high risk for worsening weakness and respiratory distress perioperatively. Preparation with airway adjuncts, advanced equipment, and consideration of awake intubation is important as parturients have decreased FRC and can desaturate quickly when general anesthesia is indicated. Avoidance of neuromuscular blockers, opioids and respiratory depressants is important to prevent complications related to long term muscle denervation. Epidural anesthesia is preferred for cesarean to allow slow titration of surgical anesthesia and avoid complications of weakness and possible worsening respiratory distress that can arise with neuraxial block. Cesarean is the preferred mode of delivery as most partuients with muscular dystrophy are limited in positioning and strength for vaginal delivery. Parturients with muscular dystrophy should have early planning with a multidisciplinary team to ensure a safe delivery.

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Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 11

Anesthetic Management of a Parturient with Neurofibromatosis Type 1

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Presenting Author's Institution: Renaissance School of Medicine at Stony Brook University - Selden, New York
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Christopher Lee, MD - Department of Anesthesiology, Renaissance School of Medicine, Stony Brook University, NY, 11794

Introduction: Neurofibromatosis type 1 (NF1), also known as Von Recklinghausen syndrome, is an autosomal dominant neurocutaneous disorder caused by a mutation of the neurofibromin gene. This causes tumors to form along nerves in the skin, brain, and other parts of the body. NF1 commonly manifests with cafe au lait spots, noncancerous tumors called neurofibromas, or problems with the bones, eyes, and nervous system. This condition poses many anesthetic challenges, particularly in the parturient. This is because there may be significant neurofibroma-related cellular changes due to the hormonal changes of pregnancy. Additionally, the possibility of malignant transformation exists for the patient during gestation as well as postpartum.

Case One: We report a case of a 36-year-old G1P0 who presented at 19 weeks gestation for obstetric anesthesia consultation. She had a history of Neurofibromatosis Type 1 with bony deformities including scoliosis and splayed ribs. Patient history was significant for removal of non-cancerous skin-colored lesions on her chest and right shoulder at 18 weeks gestation. Multidisciplinary consultation was initiated for delivery planning in order to optimize outcomes. Workup of the patient included thoracic spine, brain, and lumbar spine MRI. Imaging revealed no acute abnormalities or significant neurofibromas, rendering neuraxial anesthesia safe to perform. The patient presented for elective induction of labor at 39 weeks gestation. Dural puncture epidural was performed without complication, and the patient had an uneventful delivery via cesarean section. She had an uncomplicated postpartum course as well. New onset sciatic pain was noted at MFM followup visit 6 weeks postpartum - this was noted as a possible indicator of neurofibroma growth. The patient was recommended for continued outpatient follow-up with dermatology for NF1.

Discussion: It is important to take the wide array of symptoms that present in a parturient with NF1 into account when planning their obstetric and anesthetic management. A multidisciplinary team including anesthesia, MFM, psychiatry, and dermatology was utilized in

this case to ensure the safety of the patient before, during and after pregnancy.

References: Odongo L et al. Fatal maternal complication due to neurofibromatosis type 1-associated giant pigmented plexiform neurofibromas in pregnancy: a case report and literature review. Afr Health Sci. 2022 Mar;22(1):160-163. PMID: 36032459; PMCID: PMC9382515. Xiong M et al. Eruptive neurofibromas in pregnancy. JAAD Case Rep. 2014 Oct 22;1(1):23-4. PMID: 27075131; PMCID: PMC4802530. Well L et al.. The effect of pregnancy on growth-dynamics of neurofibromas in Neurofibromatosis type 1. PLoS One. 2020 Apr 28;15(4):e0232031. PMID: 32343738; PMCID: PMC7188260.

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 12

Seizure Or No Seizure, That is the Question - Cesarean Delivery With a Vagal Nerve Stimulator

Presenting Author: Morgan Clinton, MS-3
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Co-Authors: Kristin Falce, MD - The University of Texas Health Science Center in Houston
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Introduction: Vagal nerve stimulation (VNS) is a safe and effective treatment option utilized in over 100,000 patients with drug-resistant epilepsy, and ongoing research is investigating its efficacy in anxiety, migraines, obesity, chronic pain, and heart failure. (1) VNS involves the intermittent electrical stimulation of the left cervical vagus nerve but the mechanism of action is unclear. When looking at the obstetric population, recent studies have found that more women now die during or after pregnancy due to non or poorly treated seizures rather than hypertensive disorders of pregnancy. (2) There is limited literature regarding the use of VNS in the peripartum period. Recent guidelines on management of VNS therapy during elective surgery recommend devices be deactivated before general and/or neuraxial anesthesia. (3) Similarly to a pacemaker, electrocautery could inadvertently be detected as tachycardia and lead to excessive vagal stimulation, as the device assumes that tachycardia indicates a seizure is commencing. Recurrent stimulation (as often as every 30 seconds in an active VNS) could exacerbate the sympathectomy that occurs with spinal anesthesia leading to bradyarrhythmia, refractory hypotension, or asystole. The safety of continuing VNS therapy during neuraxial analgesia is unclear.

Case One: We describe the use of epidural anesthesia in a cesarean delivery for placenta previa and gestational hypertension in a 38-year-old G1P0 with a history of drug-resistant epilepsy well-controlled by a VNS. She presented to OB triage at 35w2d for persistent headaches, was diagnosed with preeclampsia with severe features, and scheduled for urgent cesarean delivery. Interestingly, both the patient's neurologist and the LivaNova device representative recommended the VNS not be deactivated during the patient's procedure despite anesthetic guidelines. The patient herself was worried about a breakthrough seizure and stated her preference would be to leave the device on. After extensive discussion with all parties including OB, the neurologist and the patient, the anesthesia team proceeded via epidural anesthesia rather than spinal without deactivating the patient's device. A magnet was available to immediately terminate vagal stimulation should any cardiorespiratory complication arise. The patient delivered a healthy baby and the remainder of the cesarean section continued uneventfully. Because she demonstrated no signs of bradyarrhythmia or refractory hypotension during her delivery, the magnet was never utilized.

Discussion: Composing our anesthetic approach required balancing subspecialty and societal

recommendations versus weighing the risks of seizures and status epilepticus against the potential adverse cardiorespiratory effects that may be worsened by vagal nerve stimulation.

References: 1. Frontiers in Neurology, 2021 Jan;11:610379. 2. MBRRACE-UK – Saving Lives, Improving Mothers' Care, 2017 3. Anaesthesia. 2023 Jun;78(6):747-757

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 13

Neuroleptic Malignant Syndrome in Early Pregnancy

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Introduction: Neuroleptic Malignant Syndrome (NMS) is very rare in the general population and extremely rarer in first trimester pregnancy, where it becomes a life-threatening emergency. NMS is most likely to happen after starting medications that affect the neurotransmission of the dopaminergic system and calcium channels. NMS presents as abnormal muscle movements, rigidity, hyperthermia, mental status changes, and hemodynamic and autonomic instability. Complications of NMS can lead to rhabdomyolysis, hyperkalemia, arrhythmias, renal failure, and even death.

Case One: 29 yo F initially presented to OSH for management of acute psychosis consisting of bizarre thinking and behaviors, delusions, and derailment. Her PMH pertinent for mood disorder without psychosis. She was incidentally found to be pregnant. Records show that patient was started on aripiprazole, haloperidol, and quetiapine, but then subsequently developed fever, rigidity, profuse sweating, and dysautonomia. She was transferred to our ICU for treatment of presumed NMS versus malignant catatonia. Psychiatry, Neurology, MFM and Toxicology consults were obtained for management. Combined decisions lead to treatment with dantrolene, lorazepam, and bromocriptine. Neurology was concerned for possible nonneoplastic serum autoimmune encephalitis and so she was prophylactically treated with IVIG. Her course was complicated by PICC-associated septic thrombophlebitis and possible meningitis. Dantrolene taper in early hospitalization failed and was resumed at doses 1.5mg/kg q6h, maximum dose reached of 280 mg q6h transiently. Negative Brain MRI, TFTs, HIV and syphilis tests. Patient was unstable for transfer out of the ICU with plans for elective convulsive therapy being considered. Psychiatry filed for 303 status (granted) and for court ordered ECT treatment (which is pending of this abstract). Uterine US at 8+ weeks showed a viable pregnancy. Anesthesia Consult advocated GA and intubation if ECT pursued with numerous medication contraindications given NMS and pregnancy. Patient BMI = 41.6 and Airway exam: MPS = Class 4, a 4cm HM distance, and small mouth opening.

Discussion: Psychiatric illness complicates pregnancy in 15% of pregnancy with occasional serious emergencies in pregnancy or postpartum, and suicide/fetal harm being especially prevalent. NMS mimics other conditions such as catatonia, hyperthyroidism, encephalopathy, and extrapyramidal symptoms. If medical treatment fails ECT has been utilized effectively for NMS. Anesthetic concerns for ECT during pregnancy, plus informed consent issues will be discussed, with appropriate references.

References: 1. Mitta M, Garcia P, Lee JP, et al. (March 09,2019) A Case of Neuroleptic Malignant Syndrome in Pregnancy. Cureus 11(3): e4211. DOI10.7759/cureus.4211

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 14

Diffuse Central Venous Sinus Thrombosis (CVST) in Pregnancy with Elevated ICP and Ischemic Stroke: A High-Pressure Cesarean Delivery (CD)

Presenting Author: Kelsey De Silva, MD
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Introduction: The incidence of stroke is 30 in 100,000 pregnancies, with non-hemorrhagic causes such as arterial and cerebral venous thrombosis affecting 19.9 out of 100,000 pregnancies1. We present a case of dural venous sinus thrombosis in the third trimester with elevated ICP and therefore unique challenges to obstetric anesthesiology management.

Case One: A 26-year-old G2P1001 at 36w1d with no past medical history and prior uncomplicated pregnancy presented with severe headache, left-sided weakness, and altered mental status. On arrival code stroke was activated and stat MRA showed diffuse CVST of the sagittal and right transverse/sigmoid/jugular sinus with possible involvement of the inferior sagittal sinus (see image). Heparin infusion was initiated, and she was transferred to neurologic ICU (NSICU). Two hours after heparin initiation she had a seizure. CT following the seizure showed a new intraparenchymal hemorrhage in the right prefrontal cortex with a 2-millimeter midline shift. Continuous fetal monitoring was reassuring with no indication for immediate delivery. She remained on therapeutic anticoagulation with a tenuous neurologic status over the next 48- hours but began to show improvement on hospital day (HD) 3. With neurologic improvement the decision was made to proceed with CD on HD 7. Given elevated ICP she was not a candidate for Valsalva or neuraxial. Heparin infusion was stopped 6 hours prior to CD. Access was obtained with 2 large bore IVs and pre-induction arterial line. She was induced with propofol, remifentanil and succinylcholine with minimal change in blood pressure during video laryngoscopy and intubation. Anesthesia was maintained with TIVA (propofol and remifentanil). She received standard dose oxytocin following delivery and required no additional uterotonics. She received intraoperative TAP blocks. Quantified blood loss was 897 mLs. Heparin was restarted following surgery prior to transition to Lovenox. She was discharged on postpartum day 3.

Discussion: Although rare, CVST is a known complication of pregnancy even in the absence of other causes for hypercoagulability. As in this case, CD under general anesthesia may be the safest method of delivery when ICP is elevated. We took multiple precautions to monitor and prevent additional increases in ICP. Other considerations for delivery in the setting of CVST are to avoid methergine and tranexamic acid.

References: 1. Swartz RH et al. Int J Stroke 2017;12(7): 687-697.

CVST Attachment.pdf

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 15

Anesthetic Management of a Parturient with a Neurologically Compromising Spinal Cord Tumor

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Co-Authors: Caitlin Krol, MD - University of California San Diego
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Introduction: We present the case of a parturient with an intramedullary spinal cord tumor that intersects the disciplines of obstetric and neuroanesthesia.

Case One: A 31-year-old G1P0 woman at 35+2 weeks gestational age presented with worsening neck and back pain, reduced strength and sensation of the left upper extremity (UE) and bilateral UE paresthesias with neck extension. MRI revealed a 44 x 10 mm central cord tumor from C3-C6. Given the patient's neurologic symptoms and sufficient fetal maturity, the multidisciplinary team (obstetrics, neurosurgery, anesthesiology and neonatology) planned for delivery. Primary cesarean section (CS) was chosen to expedite delivery in preparation for neurosurgical intervention, avoid valsalva or positioning extremes and control the airway given concern for phrenic nerve compromise with new onset dyspnea and a C3-C6 tumor. Neurosurgery recommended neuromonitoring during CS and an awake fiberoptic bronchoscopy intubation (FOBi) to limit cervical spine trauma. The proposed risks of dural puncture included altering cerebrospinal fluid pressure, possibly worsening compressive symptoms or causing herniation and outweighed the risks of general anesthesia. CS management included an arterial line, goal mean arterial pressure (MAP) > 85 for spinal cord perfusion (SCP), awake FOBi and total intravenous anesthesia (TIVA) to facilitate neuromonitoring and reduce uterine atony. Sensory and motor signals were checked before and after positioning and during surgery. Apgars at 1 and 5 minutes were 2 and 8, respectively. The neonate was admitted to the NICU for respiratory distress. One week after an uneventful CS, the patient underwent prone spinal cord tumor resection. Perioperative management included breast feeding planning. With a 6-hour surgery, intraoperative breast pumping was deferred, with pre- and post-surgical pumping to reduce the risk of mastitis. Anesthetic included an awake FOBi, arterial line, goal MAP > 100 but limiting BP >140/110, maintenance via TIVA and neuromonitoring. Postoperatively, the patient had diminished sensation and proprioception of her left hemibody, but 5/5 strength in all limbs. She was discharged on postoperative day 5 with continued neurologic improvement.

Discussion: This patient had a successful outcome in context of a neurologically compromising spinal cord tumor while pregnant. Key discussion points include the unknown risks of neuraxial anesthesia with an intramedullary cervical spine lesion, awake FOBi and neuromonitoring during CS. Additionally, the competing hemodynamic goals between maintaining SCP and minimizing peripartum stroke risk were balanced during her tumor

resection that occurred in the acute postpartum period, while stroke risk is still elevated (1). We ultimately chose a conservative approach to this patient's anesthetic management that was guided by multidisciplinary input.

References: 1. Zambrano MD, Miller EC. Maternal Stroke: an Update. Curr Atheroscler Rep. 2019 Jun 22;21(9):33. doi: 10.1007/s11883-019-0798-2.

Kotadia, MRI Image.pdf

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 16

Labor Analgesia in a Patient with Resolved Transverse Myelitis

Presenting Author: Maya Menon, MD
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Erik B. Romanelli, MD, MPH - Montefiore Medical Center/Albert Einstein College of Medicine

Introduction: Transverse myelitis (TM) is a rare, acquired focal inflammatory disorder of the spinal cord often presenting with rapid onset weakness, sensory deficits, and bowel/bladder dysfunction. Incidences of transverse myelitis in pregnant women are rare. Causes are para infectious and autoimmune conditions like multiple sclerosis, neuromyelitis optica (Devic's disease), SLE, Sjögren's syndrome or sarcoidosis. Transverse myelitis has also been associated with spinal and epidural anesthesia.

Case One: 29 y old, G1P0, BMI 56, presented at 39w for IOL. Three years before presentation, the patient had a flu like illness with a runny nose and fever. After a week the patient went to the emergency with sudden onset B/L LL weakness, urinary retention and burning sensation from breast down. She had intermittent horizontal diplopia and altered sensation in trunk and inner thighs. She was started on Methyl prednisone. MRI and MRA revealed severe longitudinal extensive spinal cord thickening and myelitis from C3 to conus. Suggested causes were para infectious and/or autoimmune myelitis. Patient recovered completely from the episode with 1 week of steroid treatment. On presentation, patient did not have any neurological deficits. After neurology consultation, the increased risk of recurrence with neuraxial anesthesia was explained to the patient. Upon consent, a DPE was done, and labor analgesia was instituted with 0.0625% Bupivacaine with Fentanyl. She underwent C/S due to failed IOL and the epidural was used for surgical anesthesia. The patient recovered uneventfully and did not develop any complications postpartum.

Discussion: TM Patients requiring labor analgesia/C-section can be offered neuraxial anesthesia after discussion of risks and concerns. As this patient did not have any neurological sequelae and considering her risks for airway management, decision was made to proceed with epidural.

References: Pregnancy after spinal cord injury: altered maternal and fetal response to labour. Obstet Gynecol. 1983; 62: 59-63 PubMed,Google Scholar Berghella V;Spector T;Trauffer P;Johnson A. Pregnancy in patients with pre-existing transverse myelitis. Obstet Gynecol. 1996; 87: 809-812 Scopus (45);PubMed;Crossref;Google Scholar Bourre B., Marignier R., Zephir H., et al. Neuromyelitis optica and pregnancy. Neurology. 2012;78(12):875–879. doi: 10.1212/WNL.0b013e31824c466f. [PubMed] [CrossRef] [Google Scholar] Greene N., Dinges E.,

Ciliberto C., Sedensky M., Landau R. Spinal Anesthesia for Cesarean Delivery in a Woman with Neuromyelitis Optica. A & A Case Reports. 2014;2(9):108–110. [PubMed] [Google Scholar]
Hebl J. R., Horlocker T. T., Schroeder D. R. Neuraxial Anesthesia and Analgesia in Patients with Preexisting Central Nervous System Disorders. Anesthesia & Analgesia. 2006;103(1):223–228. [PubMed] [Google Scholar]

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 17

An Unusual Cause For A Positional Headache: A Case of Pneumorrhachis and Pneumocephalus Following Combined Spinal Epidural Placement for Labor Pain Management

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Introduction: Pneumorrhachis and pneumocephalus (PP) are the presence of air within the spinal canal and brain parenchyma or ventricular cavities, respectively. PP is associated with traumatic injuries of the cranium and iatrogenic causes. It is rarely symptomatic and usually an incidental finding. In the obstetric population, the symptomology of PP may mimic PDPH.

Case One: Our patient is a 31 year-old, G2P2002 with GHTN presenting in spontaneous labor. For labor analgesia, a CSE was placed uneventfully at L3-L4 level with 17G Tuohy needle and 27G Sprotte spinal needle with one attempt, using saline for LOR. No complications were noted. Twelve hours following an uncomplicated vaginal delivery, patient endorsed a severe, 10/10 "muscle soreness" pain originating in the lumbar region near the epidural insertion site, radiating bilaterally and cephalad to produce non-positional neck pain. Her pain was exacerbated with neck flexion, lateral rotation, deep breathing and breastfeeding. Lidocaine patches and muscle relaxants did not relieve the pain. On PPD#2, the neck pain was positional with sharp back pain and CT spine was performed. Neurological exam was intact. CT without contrast was significant for multiple foci of intracranial air intradural in location, intraspinal air and posterior epidural fat space air in the cervical, thoracic and lumbar regions. Neurosurgery was consulted and no neurosurgical intervention was indicated. Oral pain management was started with hydrocodone and delivery of continuous FiO2 of 100% oxygen every other hour to achieve nitrogen washout from the cerebrospinal spaces. By PPD #4, the patient was able to breastfeed, ambulate without difficulty, and shower without discomfort and was discharged in stable condition.

Discussion: PP most commonly due to trauma and asymptomatic. In this case, PP was most likely iatrogenic from introduction of air via CSE placement or epidural catheter. Another theoretical mechanism would be an excessive loss of CSF after dural puncture due to drainage during Valsalva (e.g., vaginal delivery) with trapping of air in the vacuum created inside the cranium. PP, although extremely rare in the obstetric population, should be considered in the differential diagnosis of neck pain, headache and back pain in the postpartum patient who received neuraxial placement. In this case, the back pain and uncomplicated procedure prompted a CT scan to confirm the diagnosis and initiate the correct therapy. Patients should be advised that PP will usually reabsorb spontaneously and completely without recurrence. It is important to recognize the various presentations from altered pressure within these compartments. The literature discusses more severe presentations of venous air embolism, convulsions, unilateral weakness of the lower extremities, cauda equina syndrome and

quadriplegia, and even cardiac arrest.

References: Krishna, P., & Gupta, M. (2015). The Journal of Emergency Medicine, 49(2). Shin, H., et al.. (2018). Journal of Medical Case Reports, 12(1).

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 18

Peripartum Management of a Parturient with Spinocerebellar Ataxia Type III

Presenting Author: Jazib Hassan, MD
Presenting Author's Institution: University of Chicago
Co-Authors: Caroline Thomas, MD - University of Chicago
Daniel Tobes, DO - University of Chicago Department of Anesthesia

Introduction: Spinocerebellar ataxias (SCAs) are inherited, progressive neurodegenerative disorders with gait and limb ataxia (1). SCA type 3, the most common form (20% of familial cases), is autosomal dominant (2). Treatment for SCA type 3 is supportive care, and effects of both pregnancy and regional analgesia on neurologic outcomes are unknown. This case report details successful anesthetic management of a parturient with SCA type 3, emphasizing considerations for a safe delivery.

Case One: A 38yo, G2P0010 female with history of SCA type 3 presented for antepartum anesthesia consultation. Her history was notable for micro-aspiration due to laryngeal dysphonia in addition to extremely limited physical status requiring intermittent wheelchair assistance. On physical exam, persistent ataxia, limb spasticity and rigidity, along with facial asymmetry and facial muscle fasciculations were noted. Her speech was dysphonic, but she could converse and answer questions appropriately. Her airway exam was Mallampati II but required help for mouth opening. After a multidisciplinary meeting delivery was planned via an assisted second stage due to patient weakness with valsalva. During labor, she received an uncomplicated straight epidural. Despite standard dosing, she had higher than expected sensory levels requiring dose adjustments. She had a persistent Category II FHR tracing remote from delivery, so the decision was made to proceed with primary cesarean delivery. She received 15ml of lidocaine 2% with epi/bicarb to achieve adequate surgical anesthesia. Delivery and recovery were uneventful, and the patient and infant were discharged on POD #4.

Discussion: In SCA patients, cerebellar involvement and ataxia is the hallmark, but peripheral neuronal issues such as distal-to-proximal axonal degeneration are also seen. Autonomic instability, respiratory insufficiency due to muscle weakness, and chronic aspiration can be associated with SCA type 3. Anesthetic considerations involve choosing between neuraxial and general anesthesia. Benefits of neuraxial analgesia include pain control during labor, the avoidance airway manipulation, and ensuring post-operative analgesia. Respiratory depressants such as IV opiates and Magnesium should be used with caution in SCA patients in labor due to risk of aspiration and respiratory insufficiency. Risks of general anesthesia include unpredictable response to non-depolarizing and depolarizing neuromuscular blockade agent, risk of aspiration, and risk of prolonged mechanical ventilation due to baseline muscle weakness. In conclusion, we report the successful use of labor epidural analgesia and its conversion to epidural anesthesia for cesarean delivery in a patient with SCA Type 3, with no

residual impact on the patient’s neurologic or functional status.

References: 1- Vadhanan PMID: 21772692 2- Rofaeel,PMID: 17541076

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 18

Peripartum Management of a Parturient with Spinal and Cerebellar Hemangioblastomas Secondary to Von Hippel-Landau Syndrome: A Case Report

Presenting Author: Leslie A. Goldberg, MD, PhD
Presenting Author's Institution: University of Minnesota - Lakeville, Minnesota

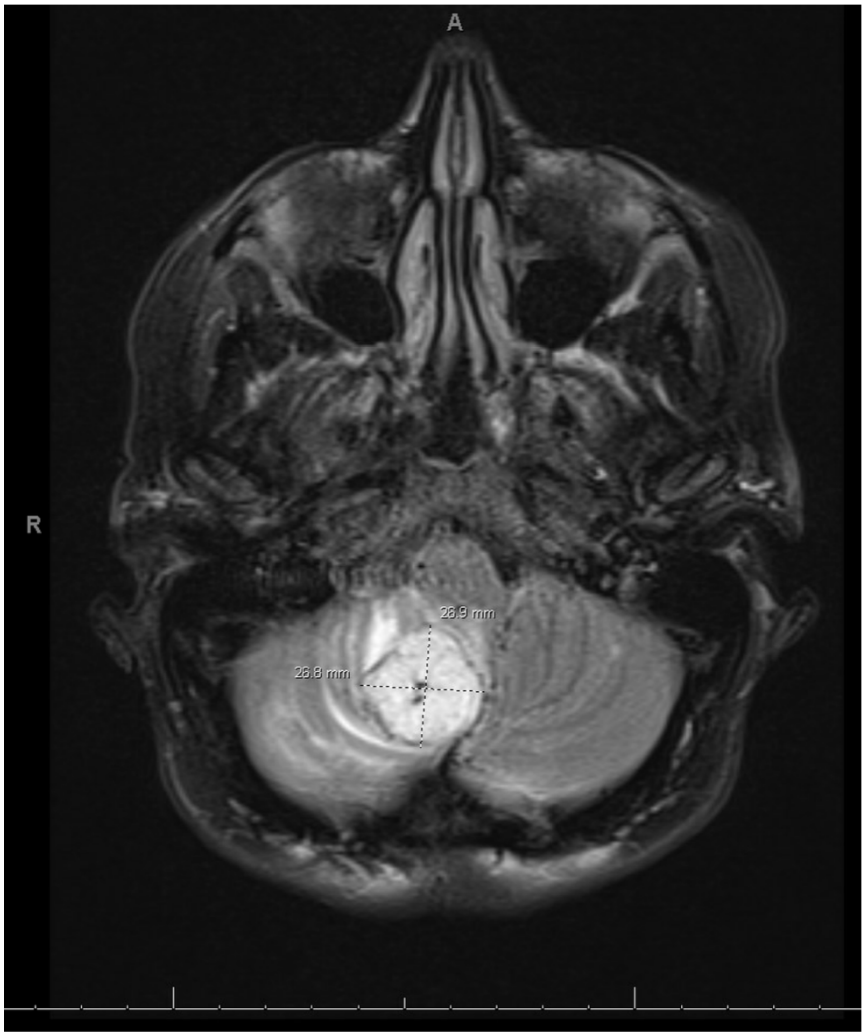
Introduction: Von Hippel-Landau (VHL) is a familial neoplastic autosomal dominant disorder caused by germline mutations of the tumor suppressor gene VHL, located on the short arm of chromosome 3. It is characterized by the presence of benign and malignant tumors affecting the central nervous system, kidneys, adrenals, pancreas, and reproductive organs1. We report the complex multidisciplinary anesthetic plan for cesarean delivery in a patient with VHL syndrome.

Case One: A 35 year old G7P0060 presented to labor and delivery at 32w5d gestational age with complaints of headache, neck pain and stiffness, dizziness, nausea and vomiting. Her past medical history was significant for polycystic kidney disease, anxiety, depression, and VHL syndrome with multifocal neural axis hemangioblastomas. She was found to have a recurrent right cerebellar lesion with obstructive hydrocephalus. Pregnancy was complicated by pre-eclampsia without severe features and gestational diabetes requiring insulin secondary to steroid use. Airway exam was unremarkable. Serial brain magnetic resonance imaging demonstrated a stable 2.6 x 2.3 x 2.9 cm medial right cerebellar hemisphere mass with surrounding vasogenic edema, effacement of the distal end of the fourth ventricle, and hydrocephalus of the lateral and third ventricles. Multiple presumed spinal hemangioblastomas were noted along the cervical/thoracic spine. The patient was transferred to the neurosurgical ICU for external ventricular drain (EVD) placement, with cesarean delivery under general anesthesia (GA) the following day, and suboccipital craniotomy on the third day. Pre-induction arterial line and EVD were transduced to ensure stable hemodynamics. A remifentanil induction with videolaryngoscopy was executed to blunt stimulation of tracheal intubation. Multimodal postoperative pain control utilized a transversus abdominis plane block and maximized opioid-sparing medications.

Discussion: Parturients with VHL can present with amplified neurologic symptoms due to the hemodynamic and hormonal physiologic changes of pregnancy resulting in enlarged multifocal vascular malformations1. Anesthetic plans should be tailored to VHL-associated lesion location and clinical manifestations. Although regional anesthesia has been successfully used for cesarean delivery, we planned GA due to clinically significant elevated intracranial pressure (ICP) and known VHL-associated lesions along the neural axis to avoid risk of fatal cerebellar herniation and theoretical hemangioblastoma rupture. Careful maintenance of hemodynamics and monitoring with EVD and pre-induction arterial lines were important to minimize acute increases in ICP. Multimodal opioid-sparing pain control was implemented to minimize hypercarbia from opioid-induced hypoventilation, which is also responsible for

increased ICP.

References: 1. Hayden MG, Gephart R, Kalanithi P, Chou D. Von Hippel-Lindau disease in pregnancy: a brief review. J Clin Neuroscien 2009;16:611–61



Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 20

Urgent Cesarean Delivery with Cervical Spine Tumor

Presenting Author: Michael Oyekan, MD
Presenting Author's Institution: University of Texas Southwestern - Dallas, Texas
Co-Authors: Kelechi B. Anyaehie, MD, MPH - University of Texas Southwestern Medical Center
Susan Stanley, MD - University of Texas Southwestern Medical Center

Introduction: Cervical spine tumors in pregnancy are rare and can present challenges in management especially in the setting of rapid tumor growth or decision for treatment options. Pregnancy hormones have the potential to accelerate the growth of malignant tumors. Progressive neurologic deficits may require emergent or urgent neurosurgical intervention and multidisciplinary planning, including potential perimortem cesarean delivery (CD), is pertinent to establish goals of patient care. We present a case of a parturient with cervical spine tumor and challenges in her care and delivery planning.

Case One: A 33-year-old G5P4A0, BMI 33 with PMH of known giant cell tumor of C2 spine initially presented with 2 month history of worsening occipital headache and neck pain at 8wks gestation. Although, prior biopsy revealed low concern for tumor growth during pregnancy, MRI showed tumor progression. She underwent subtotal resection, O-C5 fusion with C1-2 laminectomy by neurosurgery and was discharged to inpatient rehab. Two weeks later she underwent tumor embolization and repeat resection with O-C6 fusion for interval enlargement of tumor on MRI and new RUE weakness. She had short term symptomatic improvement however hospital stay was complicated by UTI, C. diff, and dyspnea. She developed progressive acute hypoxemic respiratory failure requiring BiPAP, likely due to aspiration pneumonitis vs diaphragmatic weakness from tumor compression. At 27 weeks and 5 days, patient suffered cardiac arrest after laying flat for cervical spine x-rays resulting in bradycardia and then asystole. Post arrest CD was deferred due to unclear benefit due to unknown cause of arrest and fetus' immaturity. ROSC was achieved after one round of compressions and one dose of epinephrine. One hour later, patient went into PEA arrest again after removal of BiPAP with ROSC after 1 round of CPR. Patient was intubated in the MICU and then transported for controlled urgent CD. Patient remained hemodynamically stable with low dose norepinephrine infusion and EBL was 1 liter.

Discussion: In parturients with inoperable spinal tumors and unfavorable prognosis, timing of delivery can present challenges. As demonstrated in this case, an assessment must be made to ensure that an urgent or perimortem CD is to benefit both mom and/or baby in the setting of worsening neurological symptoms. The patient had multiple comorbidities that could be the cause of arrest including her cervical spine mass. Coordinating CD post arrest to allow more optimal conditions for fetal survival may be indicated if medical and maternal interests align.

References: Katz V, Balderston K, DeFreest M. Perimortem cesarean delivery: were our assumptions correct? Am J Obstet Gynecol. 2005 Jun;192(6):1916-20; discussion 1920-1. doi: 10.1016/j.ajog.2005.02.038. PMID: 15970850. Kramer BW, et al. Prenatal inflammation and lung development. Semin Fetal Neonatal Med. 2009 Feb;14(1):2-7. doi: 10.1016/j.siny.2008.08.011. Epub 2008 Oct 8. PMID: 18845493; PMCID: PMC2652840.

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 21

A Rare Spinal Angiolipoma Causing Severe Myelopathy in a Parturient

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Co-Authors: Jane Huffnagle, DO, FAOCA, FASA - Thomas Jefferson University Hospital
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Introduction: Spinal angiolipomas (SALs) are rare, benign, extradural tumors associated with spinal cord compression1. There have only been 15 published cases of symptomatic SALs in pregnant women2. Here, we present a parturient with a SAL and severe myelopathy who underwent consecutive cesarean delivery and thoracic laminectomy with decompression at 39 weeks.

Case One: A 29 year-old G1P0 presented at 39 weeks for an elective induction for progressive back and leg that started at 17 wks; by 35 wks she needed ambulation assistance. At the induction, an MRI spine showed severe cord compression and a mass at T3-T8 (fig. 1). Physical exam had diminished lower extremity strength and sensation. After a multi-disciplinary discussion with the patient, we proceeded with an urgent c-section and thoracic laminectomy and decompression. In the OR, large IV access and A- line were placed, TXA was given, and a RSI was performed with propofol maintenance. After delivery, oxytocin, methergine, and misoprostol were used. The patient was positioned prone and TIVA and neuromonitoring accompanied the thoracic decompression. She was extubated in the OR. She ultimately recovered to full strength with no pathologic reflexes.

Discussion: We anticipated large fluid shifts and blood loss due to c-section under GA, a vascular mass with engorged vessels from pregnancy, and prone position. MAP was kept >85mmHg to prevent secondary spinal cord injury3. TIVA avoided inhaled anesthetics that interfere with neuromonitoring and can cause uterine relaxation and atony. Prone positioning meant routine postpartum assessment of uterine tone wasn't feasible thus several uterotonics and TXA, which also reduces bleeding in spine surgeries4, were used. Pregnancy worsens SALs due to normal cardiovascular changes and angiogenic hormones2. Treatment of SALs in pregnancy ranges from conservative to invasive based on severity of disease, rate of progression, and gestational age2. Vaginal delivery could worsen myelopathy due to increased intraabdominal pressure thus c-section may be indicated5. Repeat imaging may be needed as recurrence in future pregnancies is possible if incompletely resected2.

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Natural history and surgical treatment. Clin. Neuro. & Neurosurg. 2019;178:25-30. 3: Saadeh YS, et al. The impact of blood pressure management after spinal cord injury: a systematic review of the literature. Neurosurg. Focus, 2017; 43(5), E20. 4: Colomina MJ, et al. Intraoperative tranexamic acid use in major spine surgery in adults: a multicentre, randomized, placebo-controlled trial. Brit. Journ. of Anaes., 2017; 118, 3, pg 380-90. 5: Marinis A, et al. Ischemia as a possible effect of increased intra-abdominal pressure on central nervous system cytokines, lactate and perfusion pressures. Crit Care. 2010;14(2):R3

Figure 1 SOAP 2024.pdf

Abstract #: SAT – CR – BS 3 – BR 2 – It's not all in the Head – Sometimes the Spine is Broken – 22

Neuraxial Anesthesia in Parturients with Intracranial Arteriovenous Malformations

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Co-Authors: Mohamed IBRAHIM - Anesthesiology Dept at UTMB
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Introduction: Anesthetic management guidelines for patients with intracranial arteriovenous malformations (AVM) are limited due to the rarity of this abnormality. In pregnancy, this is a situation in which an extensive multidisciplinary team approach is needed to evaluate the risks and benefits for the parturient and the baby. In this case report, we present two cases of term pregnant patients who were diagnosed with cerebral AVMs before their pregnancy and explored the modality of anesthesia used in each pregnancy.

Case One: She was 27 years old G3P2, 38 weeks of gestational age with BMI 34 admitted to the UTMB (University of Texas Medical Branch) Labor and Delivery for her 3rd pregnancy. After her second cesarean delivery (C/S), she was diagnosed with cerebral AVM and underwent left occipital embolization. Her preoperative MRI showed AVM in the left occipital region involving the calcarine cortex without evidence of intracranial hemorrhage. Preceding discussions with the Maternal Fetal Medicine and Neurosurgery teams, the patient was scheduled for C/S and bilateral tubal ligation with a decision of combined spinal epidural anesthesia (CSE) management. The patient had no hemodynamic or neurological deteriorations. She recovered well postoperatively and was discharged after an uneventful postpartum course.

Case Two: She was 27 years old G1P0, 37 weeks of gestational age with BMI 31 presented to UTMB for scheduled C/S. The patient was initially diagnosed with cerebral AVM during her childhood and underwent gamma knife radiosurgery at 5 and 14 years old. Since then, she has had no seizure history or any neurological symptoms except minor headaches. MRI done preoperatively showed tortuous vessels in the right gyrus extending to the right basal ganglia standing for AVM or fistula formation. Multidisciplinary teams' discussions were made again, and epidural anesthesia was performed. After an uneventful postpartum period, she was discharged to follow up with neurology.

Discussion: In the case of an unruptured AVM found during pregnancy, case specific multidisciplinary discussions about the relative risks of neurosurgical intervention before or after cesarean delivery are needed. If the AVM is found during pregnancy, authors do not recommend pregnancy termination, but they propose cesarean section. For unruptured AVMs, patient counseling and discussing the risks of intervention vs risks of cautious continuation of pregnancy without intervention is recommended (1). We conclude that

neuraxial anesthesia during the C/S with meticulous attention to the hemodynamic and neurological stability of patients offers a safe and reliable way for the mother's and neonate's well-being.

References: 1-Gross BA, Du R. "Hemorrhage from AVMs during pregnancy". Neurosurgery 2012: 71:349-55.

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 01

Acute Intracranial Hemorrhage Requiring Emergent Cesarean Section

Presenting Author: Shonna Gaskin, MD
Presenting Author's Institution: University of Texas Health Science Center at Houston - Richmond, Texas

Introduction: Intracranial hemorrhage is a rare, yet potentially devastating event in pregnancy that poses significant risk to both the mother and the fetus.1 Studies show that if there is a hemorrhage from an arteriovenous malformation (AVM) during pregnancy, the risk of further hemorrhage is 27%, which is higher than the rebleeding rate in non-pregnant patients.3 Hemodynamic stability during labor and delivery is vital to prevent rebleeding in this patient population.

Case One: Our patient was a 22 year old G1PO at 37w4d who presented for emergent cesarean section due to intracranial hemorrhage. The patient initially presented with a headache and blurry vision of the right eye that progressed to eventual vision loss of the right hemifield. CT scan revealed a 2.5x1.5x3cm left parieto-occipital acute intraparenchymal hematoma and MRA brain was concerning for possible AVM. It was determined that the ICH was most likely due to an AVM in the setting of preeclampsia, requiring emergency cesarean section in order to prevent rebleeding and to allow for further diagnosis and treatment for the mother.1 An arterial line was placed prior to neuraxial placement for tight blood pressure control. We performed a low-dose combined-spinal epidural to avoid drastic hemodynamic shifts using 1 mL of 0.75% bupivacaine with dextrose 8.25%. We slowly titrated an additional 5 mL of 2% lidocaine via epidural catheter in order to achieve an adequate T4 level and epidural morphine for post-op pain control.

Discussion: Cesarean delivery was uneventful and on postoperative day 3, the patient underwent AVM resection. Anesthetic management was guided by the decision tree algorithm (fig.1). The patient was considered mild-to-moderate risk of herniation from dural puncture prompting neurosurgical consultation prior to neuraxial placement. According to multidisciplinary discussions, the neurological risk to the mother with neuraxial was determined to be low, and the decision was made for neuraxial anesthesia for better hemodynamic control, as well as the known benefits for both mother and fetus.2 This case demonstrates the importance of a multidisciplinary and individualized approach to manage high risk obstetrical patients with intracranial pathology. A tailored anesthetic plan must be made in order to avoid hypotension, which can reduce uteroplacental as well as maternal brain perfusion, but also to avoid hypertension, which can increase the risk of fatal maternal hemorrhage.

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Gaskin- Acute intracranial hemorrhage requiring emergent cesarean section .pdf

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 01

Cardio-Obstetrics: A Case of Repaired Tetralogy of Fallot Complicated by Right Heart Failure, Preeclampsia and Acute Kidney Injury

Presenting Author: James A. Conwell, DO
Presenting Author's Institution: Columbia University, New York
Co-Authors: Sandy Kim, MD - Columbia University
Ruthi LANDAU, MD - Columbia University

Introduction: Cardiovascular disease is the leading cause of maternal mortality in the United States.(1) We present the management of a pregnant patient with repaired Tetralogy of Fallot (TOF) with preeclampsia and postpartum heart failure (HF) following cesarean delivery (CD).

Case One: A 41-year-old G1P0, BMI 34.7 kg/m2, white woman with childhood repair of TOF and pre-pregnancy echocardiogram (TTE) with mildly dilated right ventricle (RV), normal systolic function, and free pulmonary regurgitation (PR), mWHO III and CARPREG II: 3, presented at 31 weeks with an episode of hypertension and dyspnea with HF diagnosis (severely dilated RV with preserved function and free PR on TTE, and episodes of ventricular tachycardia on Holter). Torsemide and metoprolol were started. She was discharged home with follow-up by the Cardio-Obstetrics Anesthesia team. She was admitted at 33+5 weeks with a diagnosis of preeclampsia (PEC) with severe features (creatinine 1.03 mg/dL and BNP 903 pg/mL). Nifedipine was increased, MgSO4 infusion started, with betamethasone in anticipation of CD at 34 weeks. For her CD, an arterial line was placed, followed by low-dose CSE (spinal hyperbaric bupivacaine 7.5 mg, fentanyl 15mcg, morphine 150mcg), and peripheral prophylactic norepinephrine (NE) infusion. Before incision, a T6 dermatomal level was achieved with 15 mL of supplemental epidural lidocaine 2% with epinephrine. A viable baby was delivered. Uterine atony resulted in QBL of 1.9 L, treated with oxytocin. NE was increased (max dose 8 mcg/min) and weaned by the end of the case. The patient was brought to the high-risk OB unit on MgSO4 infusion for postpartum care. Over hours, she became oxygen-requiring. Despite a stable creatinine (0.97 mg/dL), MgSO4 toxicity and hyperkaliemia were noted, for which she was given calcium gluconate and furosemide. Worsening renal function was attributed to right HF, with a peak creatinine of 1.47 mg/dL. She was treated with furosemide and dobutamine infusion, and oxygen was weaned. She was discharged home on POD 5.

Discussion: It is unclear if HF occurred due to PEC and MgSO4 toxicity or in the setting of TOF-associated RV failure. Pregnancy outcomes in women with repaired TOF are usually excellent, (2,3) though peripartum RV dilation and deterioration is a risk, especially in those with moderate-severe PR, (4) with evidence that RV dilation tends not to recover postpartum.(5) More research is needed on pre-conception pulmonary valve replacement to prevent RV failure.(6) This case highlights that TOF repair with PR should be considered a risk for peripartum RV failure, impacting future RV function, as well as the recognition of MgSO4

toxicity as the first sign of kidney injury in patients with PEC and HF.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 03

MRI to Diagnose Atypical PDPH: A Challenging Diagnosis of a Multifactorial Headache in a Patient with PDPH, PRES, Pre-Eclampsia and Migraines

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Presenting Author's Institution: Beth Israel Deaconess Medical Center / Harvard Medical School - Boston, Massachusetts
Co-Authors: Maria C. Borrelli, DO - Beth Israel Deaconess Medical Center / Harvard Medical School

Introduction: Post-dural puncture headache (PDPH) complicates about 1% of neuraxial labor anesthetics.1,2 The headache can be debilitating, intervene with ADLs and neonatal care, as well as have severe sequelae including life-threatening conditions, such as subdural hematoma.3,4 A clinical diagnosis, previous evidence associated MRI evidence of CSF spread with severity of symptoms. Appropriate diagnosis is crucial for prompt treatment and resolution of symptoms.

Case One: A 34-year-old nulliparous woman with a history of migraines underwent induction of labor and delivered a healthy infant under combined spinal and epidural analgesia. Placement of the epidural catheter required multiple attempts but had no overt complications. She was discharged home on post-partum day (PPD) #2 with a non-positional mild headache (HA) that she attributed to her migraines. She returned on PPD#4 with severe, 10/10 HA non-responsive to multiple medications. She was diagnosed with preeclampsia with severe features (sPEC) based on severe-range elevated blood pressures, elevated liver function tests, and persistent headache. Obstetric Anesthesia and Neurology were consulted. She received magnesium treatment, and underwent magnetic resonance imaging (MRI), notable for low CSF pressure findings and concern for posterior reversible encephalopathy syndrome (PRES). Spine MRI revealed extensive lumbar, thoracic, and cervical CSF pooling communicating with cerebral subdural collections suggesting extensive CSF leak. She underwent an urgent epidural blood patch (EBP) with partial relief of symptoms on PPD#7. She improved significantly on PPD#8 and by PPD#9 her headache completely resolved, and she was discharged home on PPD 9. She continues to do well.

Discussion: PDPH is a common adverse event of neuraxial instrumentation with potential rare catastrophic side effects.3,4 It is a clinical diagnosis, and imaging in PDPH is rare; however, previously co-existence of PDPH and PRES has been reported. PRES could potentially be misdiagnosed on imaging as it can be confounded by low CSF pressure findings,5 as common in PDPH. In this case, diagnosis was made difficult given the multifactorial nature of the headache without classic positional component and the association of PRES with sPEC. Further compounding was her history of migraines and the insidious onset of symptoms. MRI imaging facilitated the diagnosis of PDPH. Multidisciplinary approach to the treatment of this patient facilitated expert opinion, prompt treatment and good outcome. High suspicion for

PDPH diagnosis should be maintained in any patient who underwent neuraxial placement, and non-positionality of pain should not exclude the diagnosis. MRI imaging could be valuable in the diagnosis and differential diagnosis of postpartum headaches.

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PRES-PDPH Figure.pdf

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 04

Significant Maternal Morbidity in Parturient with Eclampsia

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Co-Authors: Ransom Chin - University of Connecticut

Introduction: Preeclampsia is a hypertensive disorder related to 2% to 8% of pregnancy-related complications worldwide. [1] Complications of preeclampsia include intracerebral hemorrhage, renal failure, hemolysis, elevated liver enzymes, low platelets, and eclampsia. [2] In this case, we are presenting anesthetic management of a parturient presenting with eclampsia complicated with an intracerebral hemorrhage requiring craniotomy after cesarean section (CS).

Case One: A 38-year-old female G2P0010 at 30 weeks gestation presented to the emergency department (ED), minimally responsive and hypertensive, with a systolic blood pressure of 237. According to her husband, she complained of severe headaches and suffered an episode of seizures. She was given 2 grams of magnesium in the ED and 20 mg of labetalol, with minimal blood pressure (BP) improvement. After being placed on a nicardipine infusion with subsequent improvement in systolic pressures to 140-150, she was brought to the operating room in a post-ictal state for an emergent CS. General anesthesia was induced with propofol and succinylcholine, and she delivered a baby with Apgar scores of 0 and 2. Once the placenta was removed, significant bleeding was noted, requiring blood products. As the fibrinogen level was 170, disseminated intravascular coagulation was considered the primary cause of bleeding. The patient received 2 units of fresh frozen plasma, 1 unit of cryoprecipitate, 1 unit of platelets, and two doses of carbaprost. Laboratory values that resulted during the CS showed platelets of 82, elevated liver enzymes, and anemia, consistent with HELLP syndrome. Her BP remained within normal limits during the procedure. The bleeding improved with the intervention, and she was transported to the intensive care unit (ICU), where she received 1 unit of RBCs. Approximately 3 hours after the CS, the patient was found to have right-sided hemiplegia during her extubation trial. Subsequent imaging revealed a 5 cm left frontal intraparenchymal hemorrhage with associated mass effect causing midline shift. The patient underwent left frontal craniotomy and AV malformation resection. The patient was extubated on postoperative day 5. Her BP was controlled with a nicardipine infusion before transitioning to oral labetalol, with scheduled Keppra for seizure prophylaxis. With residual right-sided hemiparesis, the patient was discharged to a rehabilitation center.

Discussion: Cerebrovascular accident remains a leading cause of morbidity and mortality in parturients with preeclampsia. Early recognition, adequate treatment, and timely interventions are key points in treating preeclampsia, as complications related to it may cause significant complications with persistent sequelae.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 05

Management of a Pericardial Effusion in a Pre-Eclamptic Parturient; Pericardiocentesis Prior to Cesarean Delivery

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Presenting Author's Institution: Icahn School of Medicine at Mount Sinai - New York, New York

Introduction: Pregnant women are susceptible to pericardial diseases. Pericardial effusion is the most common pericardial disease in pregnancy, with acute pericarditis being the second most common, and cardiac tamponade being very rare. In the setting of preeclampsia, in which vascular permeability increases, pericardial effusion may also occur.

Case One: A 41-year-old G1P0 with severe preeclampsia was admitted for induction of labor at 35 weeks. She received an epidural and experienced notable hypotension, which resolved with large doses of vasopressors. Overnight, she developed hypoxia (oxygen saturation of 91%) accompanied by dyspnea, requiring up to 10L of supplemental oxygen. A chest x-ray demonstrated bilateral interstitial infiltrates and cardiomegaly. A transthoracic echo demonstrated an EF of 65%, normal RV size, normal RA pressure, and a large 2-2.5 cm posterior pericardial effusion with no signs of tamponade. The patient was transferred to our hospital in case tamponade physiology developed. Upon transfer, OB MFM, OB anesthesia, interventional cardiology, L&D nursing, and CCU were involved. Initial vitals showed BP 140s-150s, HR 70s, SpO2 98% on RA, RR 15. Initial labs revealed BNP 118, arterial pH 7.45, pCO2 28, HCO3 20, troponin 3, lactate 1.1. The decision was made to perform an elective pericardiocentesis with drain placement, with continuous fetal monitoring, followed by a cesarean delivery due to category 2 fetal heart rate tracing. A cardiac operating room with ECMO on standby was prepared, in case hemodynamic compromise occurred during drainage. The patient's epidural had not been activated until the pericardiocentesis was performed with local anesthesia by interventional cardiology. Under ultrasound guidance, 720 cc of straw colored fluid was aspirated. Patient's hemodynamics were stable during this time, with a low-dose phenylephrine infusion. Once the drain was placed, the epidural was slowly loaded with 5 cc aliquots of lidocaine 2% with 1:200,000 epinephrine. A T4 level was achieved, and an uncomplicated cesarean section was completed with transfer to CCU for telemetry. The patient immediately showed signs of clinical improvement, endorsing minimal dyspnea and maintaining SpO2 >95% on room air. Pericardial studies showed an exudative effusion, with no evidence of TB or bacterial infection. Cultures were negative for anaerobes. Patient was started on colchicine and ibuprofen for presumed pericarditis and was discharged on POD5 with instructions to follow up with MFM and cardiology.

Discussion: Managing parturients with cardiac pathology is becoming more commonplace. The patient above required special monitoring and management at a tertiary center with advanced cardiac interventions, including potential ECMO. Proper care of these patients and

communication among interdisciplinary teams is crucial to optimize both maternal and fetal outcomes.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 06

Management Challenges in Severe Pre-eclampsia: A Case of Magnesium Toxicity

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Presenting Author's Institution: Medical College of Wisconsin - WAUWATOSA, Wisconsin
Co-Authors: Omar Dyara, DO - Medical College of Wisconsin

Introduction: Magnesium sulfate is the preferred drug for seizure prophylaxis in parturients with severe preeclampsia and eclampsia. Despite its rarity, magnesium toxicity can occur, even in centers providing the utmost maternal care. This case highlights the complexities of diagnosing magnesium toxicity in a pre-eclamptic patient admitted for labor induction.

Case One: A 32-year-old primigravida at 37 weeks with gestational hypertension and morbid obesity (BMI 46 kg/m^2) was admitted for labor induction. Severe pre-eclampsia was diagnosed upon admission, and standard magnesium therapy was started. Nursing checks for magnesium toxicity were scheduled every four hours. Labor progressed slowly, and an epidural was placed at L3-L4 upon the patient's request. Reduced urine output (25 ml/hour) was noted 36 hours post magnesium initiation, with normal creatinine and reflexes persistent at 2-3+. The patient began pushing about 48 hours into induction, lasting 2.5 hours with minimal progress. During this time, she reported shortness of breath and an inability to lie flat, and a stat chest X-ray was negative. The magnesium level was tested, and it was 9.6 mg/dl. A repeat lab two hours later returned the same result. Ultimately, the patient was consented for Cesarean Delivery. During surgery, the patient required oxygen for persistent shortness of breath. Towards the end, the patient displayed shallow breathing, followed by unresponsiveness. The patient was immediately intubated, transferred to the surgical ICU, treated for suspected magnesium toxicity, and successfully extubated later. It was later revealed that the lab could not measure magnesium levels beyond 9.6 mg/dl, posing a diagnostic challenge in this case and prompting a quality improvement initiative.

Discussion: Guidelines recommend clinical monitoring as the primary assessment for patients on magnesium, reserving serum levels for suspected toxicity or insufficient response despite clinical evaluation.1 In their meta-analysis of 9,556 patients receiving magnesium for pre-eclampsia, Smith et al. found a 1.3% incidence of respiratory depression and one maternal death attributed to magnesium toxicity.2 Arumugam et al observed a postpartum patient developing magnesium toxicity despite normal blood levels.3 Healthcare providers should use clinical judgment to determine the need for serum magnesium level measurements, aligning with the goal of optimizing patient care and minimizing unnecessary interventions.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 07

HELLP: A Diagnosis by Urine

Presenting Author: Lauren Hilt
Presenting Author's Institution: Medical College of Wisconsin - Milwaukee, Wisconsin
Co-Authors: Ayse Kula, MD - Medical College of Wisconsin

Introduction: HELLP syndrome refers to a complication of pregnancy characterized by hemolysis, elevated liver enzymes, and low platelets (HELLP). It has a variable clinical presentation, but the most common symptoms are upper abdominal pain, nausea, and vomiting. Hematuria is a rare presentation of HELLP. A case is presented when a diagnostic workup from a patient's urine led to the diagnosis of HELLP, emphasizing the importance of thorough assessments of a patient's clinical presentation.

Case One: A 24-year-old G1P0 woman presented to the labor and delivery unit at 33 weeks gestation for elevated blood pressure and was admitted for pre-eclampsia with severe features. Blood work was within normal limits on admission. Two days following her presentation, she continued to have severe range blood pressure and new onset right upper quadrant pain. Repeat labs were normal at Hgb 12, ALT 21, AST 26, and PLT 227. Induction of labor was initiated due to her new symptoms. Five hours after the most recent labs, the patient requested an epidural for labor analgesia. Epidural placement was uneventful. On subsequent placement of the Foley catheter, the urine was noted as a dark red and brown color by the anesthesia team. This prompted the request for repeat labs which revealed Hgb 10, ALT 1806, PLT 64, and AST unable to be measured due to hemolysis. Induction of labor then proceeded by emergent Cesarean delivery due to category II fetal tones. One unit of platelets was transfused during delivery. She then received one unit of PRBC and four units of platelets during her post-partum hemorrhage and peripartum period. The patient was closely monitored including neurologic checks every four hours. Her labs improved and stabilized. She did not have any neurological deficits and was discharged on post-partum day three in stable condition.

Discussion: HELLP syndrome can have severe maternal consequences. Clinical suspicion and evaluation of thrombocytopenia are essential to provide safe neuraxial anesthesia and minimize complications. Neuraxial hematoma, a thrombocytopenia-related complication, can be associated with significant morbidity such as motor deficits, paresthesia, and urinary or bowel dysfunction. This case demonstrates that critical consideration of how often labs in a patient with preeclampsia and coinciding right upper quadrant pain should be evaluated. In these patients, routine labs regardless of prior normal values before neuraxial catheter placement could be beneficial. Optimizing HELLP syndrome workup is critical to ensure quality care to minimize morbidity in neuraxial anesthesia.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 08

Progressive Encephalopathy in a Parturient with Reversible Cerebral Vasoconstriction Syndrome

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J D. Wakefield, DO - University of Alabama at Birmingham

Introduction: Reversible cerebral vasoconstriction syndrome (RCVS) is characterized by headache with or without focal deficits due to constriction of cerebral arteries. Up to 60% of patients with RCVS have a triggering factor to include the postpartum period and stress.[1,2]

Case One: A 26-year-old nulliparous female with T1DM presented at 37 weeks gestation with altered mental status, oriented only to self and reporting visual hallucinations. She denied further neurologic symptoms and lacked focal deficits. Labs were notable for hyperglycemia and hypomagnesemia. Her encephalopathy persisted despite correction of electrolyte and metabolic derangements. After multidisciplinary discussion, as the patient was unable to consent to neuraxial anesthesia or be coached through a vaginal birth, she underwent an uncomplicated cesarean section under general anesthesia (GA). She remained intubated to allow for MRI brain which demonstrated non-specific white matter changes. She developed postpartum pre-eclampsia, DKA, and interval development of aphasia and right-sided weakness. Lumbar puncture, UDS, and autoimmune workup were unrevealing. Repeat MRI under GA revealed bilateral acute and subacute infarcts and small petechial hemorrhage, cerebral angiogram demonstrated multifocal small vessel stenoses, and transcranial doppler showed diffuse vasospasm. Diagnosis was consistent with RCVS. After 3 weeks of waxing and waning neurologic symptoms, she was discharged to inpatient rehab with minimal deficit.

Discussion: Eclampsia and pre-eclampsia have been associated with RCVS due to the increase in vascular tone and endothelial dysfunction present in those conditions.[3] Most symptoms resolve in 3 weeks unless the condition has led to ischemic or hemorrhagic strokes with resulting deficits. Studies suggest that postpartum patients may have a higher risk of hemorrhagic RCVS that other patients.[4] This case demonstrates the importance of early imaging and diagnosis of RCVS in the peripartum period.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 09

Antepartum Psychosis in a Patient with Severe Pre-eclampsia

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Presenting Author's Institution: University of North Carolina
Co-Authors: Benjamin Cobb, MD - University of North Carolina
Erin Dengler, MD, MBA - University of North Carolina at Chapel Hill

Introduction: Psychosis during pregnancy is rare but can have immense consequences on patients and their health outcomes. Below we describe a case of antepartum psychosis in a patient with severe pre-eclampsia.

Case One: A 33-year-old G8P7008 at 39w4d presented as a transfer for repeat c-section in the setting of newly diagnosed pre-eclampsia with severe features by blood pressure and a reported history of 7 prior c-sections. The patient also had a history of cocaine use disorder and bipolar disorder requiring psychiatric hospitalizations. On presentation, the patient had persistent severe range blood pressures, and work-up was notable for cocaine on urine drug screen. She was continued on nifedipine and was counseled about management including repeat c-section. During these discussions, the patient was found to be psychotic with paranoid, delusional, and disorganized thought processes. She became agitated and threatened staff members. Given this, psychiatry was consulted and determined that she posed a danger to herself and did not have decision-making capacity. The patient was then placed on an involuntary commitment and was started on olanzapine with IV haloperidol as needed. Later that day, the decision was made by 2 physician-consent and in collaboration with the patient to proceed with c-section. The patient successfully underwent repeat c-section under combined spinal-epidural without any complications. During the rest of her hospitalization, psychiatry titrated her olanzapine. On post-operative day 5, psychiatry determined she was a low risk of harm to herself or others, and her IVC was lifted. Case management and CPS were involved in disposition planning. At discharge, plans were made for close blood pressure and mental health follow-up.

Discussion: Psychosis during pregnancy is a devastating condition that can have delirious effects such as poor fetal growth, fetal distress, stillbirth, placental abruption, post-partum hemorrhage, and increased risk of suicide. Risk factors include pre-existing mental health disorders, substance use, prior psychosis during pregnancy, and family history of psychosis (1). Interestingly, a recent case report and research suggest a possible connection between hypertensive disorders of pregnancy and mental illness, including psychosis (2). Management of psychosis is often multi-disciplinary and should include consideration of risks and benefits of medications, including anti-psychotics such as olanzapine (3).

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 10

Anesthetic Management of Cesarean Delivery for Decompensated Mitral Stenosis in the Setting of Preeclampsia with Severe Features

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Introduction: Severe mitral stenosis (MS) is an mWHO class IV condition with a high risk of maternal morbidity and mortality. We present a case of acute decompensated heart failure (HF) secondary to previously unknown severe MS complicated by preeclampsia with severe features.

Case One: A 39-year-old non-English speaking G3P2002 at 32w5d presented to labor and delivery for evaluation of severe hypertension. On initial evaluation, heart rate was 140 bpm, BP 151/100, and oxygen saturation 98%. Laboratory values confirmed a diagnosis of preeclampsia. An urgent bedside transthoracic echocardiogram (TTE) showed severe rheumatic MS with a mean gradient of 26mmHg, severe pulmonary HTN, and bi-atrial enlargement. Clinical deterioration occurred in L&D triage with worsening tachycardia and hypoxemia. Emergency response team was activated; metoprolol 5mg IV and furosemide 40mg IV were administered with clinical improvement. She was transferred to the cardiac ICU for further management. In the setting of pre-eclampsia with severe features and breech presentation, the MFM team recommended repeat cesarean delivery (CD) within 24-48 hours. Goals of care prior to delivery included expedited right heart catheterization and HF optimization with beta blockade and aggressive diuresis. RHC showed a RAP of 16mmHg, mean PAP of 32mmHg, and PCWP of 22mmHg with normal cardiac output. A multidisciplinary team met to discuss the plan for delivery and further maternal care. She underwent CD 40 hours after initial presentation. Following medical optimization, bedside TTE on the day of delivery demonstrated a mitral valve mean gradient of 11mmHg. She received a CSE with intrathecal opioid only and a carefully titrated epidural. Cardiac surgery placed femoral arterial and venous sheaths for expedited cardiopulmonary support if needed. Other access included a 9Fr Cordis with pulmonary artery catheter (PAC), arterial line, and large-bore peripheral IVs. Furosemide 40mg was given prior to incision in anticipation of autotransfusion with uterine contraction postpartum. A reduced (1 unit) bolus of oxytocin followed by 250mU/min of a concentrated infusion was started after cord clamping. She maintained hemodynamic stability throughout the procedure with minimal variation in PAC numbers following delivery. She recovered in the cardiac ICU and was discharged home POD5 on metoprolol, nifedipine, and furosemide. TTE on POD2 showed mean MV gradient of 13mmHg and estimated valve area of 0.7cm2.

Discussion: Acute HF occurs in up to 78% of pregnancies complicated by severe MS even when patients are asymptomatic prior to pregnancy. Our case presented a unique challenge due to undiagnosed severe MS complicated by preeclampsia with severe features requiring expeditious evaluation, management, and multidisciplinary coordination of care for a successful outcome.

References: 1. J Am Coll Cardiol 2001; 37: 893–9. 2. Obstet Med 2009; 2(1): 6–10. 3. Cardiol Clin 2021; 39(1): 151-61.

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 11

Anesthetic Management of an Obstetric Patient with History of Catastrophic Antiphospholipid Syndrome and HELLP

Presenting Author: Rebecca Minehart, MD, MSHPEd
Presenting Author's Institution: Massachusetts General Hospital/Harvard Medical School
Co-Authors: Teo Pulice, MD, MSc - Massachusetts General Hospital/Harvard Medical School

Introduction: Antiphospholipid syndrome (APS) impacts fertility and pregnancy, sometimes progressing to life-threatening catastrophic APS (CAPS), with rapid-onset thrombosis affecting multiple organ systems. In pregnant patients, CAPS may overlap with HELLP syndrome, with one progressing to another. We present a case with an evolving differential diagnosis including HELLP syndrome and CAPS.

Case One: A 29 yo G3P0 at 30w6d presented with acute epigastric pain, nausea and vomiting. In a prior 23-wk pregnancy she had HELLP syndrome and CAPS with diffuse thrombosis (hepatic, splenic and renal infarctions requiring dialysis and prolonged ICU stay), requiring a dilation and evacuation, and was on therapeutic enoxaparin. Vital signs were normal but initial abnormal labs showed dropping platelets of 97 K/uL (from 170 K/uL), AST 53 U/L, ALT 55 U/L, PTT 88.7 sec, urine protein 161.5 mg mg/dL, and urine protein/creatinine 1.12 mg/dL. She was diagnosed with partial HELLP syndrome versus evolving CAPS. Considering her history and worsening maternal status, urgent Cesarean delivery under general anesthesia was planned. Large bore IV and radial arterial line were placed and blood products were ready in the OR along with a rapid infusion device. Magnesium sulfate infusion (2g/hr) was continued. A rapid sequence induction was performed with propofol, fentanyl, and succinylcholine. Her airway was secured via video laryngoscopy, and she received PONV prophylaxis. Anesthesia was maintained using propofol infusion titrated to EEG monitor. She remained hemodynamically stable without vasoactive agents. Upon delivery, oxytocin infusion was initiated. She received hydromorphone and acetaminophen for postoperative analgesia. EBL totaled 600 mL despite her anti Factor Xa level being therapeutic (rather than an expected trough). Postoperatively, she was extubated uneventfully. She had persistent transaminitis without RUQ tenderness. A RUQ ultrasound revealed patent hepatic vasculature. Her platelets recovered to 143 from a nadir of 53. She did not meet criteria for CAPS, so no treatment beyond therapeutic anticoagulation with enoxaparin was administered, and she was discharged home on postoperative day 4.

Discussion: HELLP syndrome and CAPS during pregnancy may overlap, making diagnosis challenging (see Table), though treatment options differ. For HELLP syndrome, prompt delivery is indicated for pregnancies >= 34 weeks and pregnancies < 34 weeks with severe complications. For CAPS, mainstays are therapeutic anticoagulation, glucocorticoids, therapeutic plasma exchange, or IVIG. Multidisciplinary teamwork is essential.

References: 1. Erkan D, Ortel T. CAPS. UpToDate. Published September 15, 2023. 2. Gomez-Puerta JA et al. Ann Rheum Dis 2007. 3. Sibai, B. HELLP syndrome. UpToDate.Published November 27, 2023. 4. Erkan D. Arthritis Rheumatol 2021. 5. Bitsadze V et al. Int J Mol Sci 2024. . 6. Haram, K et al. BMC pregnancy and childbirth 2009.

CAPS HELLP SOAP abstract table.pdf

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 12

Management of a Parturient Presenting with Preeclampsia and Peripartum Cardiomyopathy

Presenting Author: Lillye Anderson, MD
Presenting Author's Institution: Massachusetts General Hospital - Boston, Massachusetts
Co-Authors: Jayne Manigrasso, MD - Massachusetts General Hospital

Introduction: The patient is 35-year-old G2P1001 with hypothyroidism, obesity (BMI 39), and postpartum hypertension who presented to a community hospital at 38 weeks and 6 days gestation with new dyspnea on exertion and orthopnea. She was found to be hypertensive to 160/100 mmHg and hypoxic requiring 4 liters of oxygen via nasal canula. Labs were notable for an elevated NT-proBNP, troponin, and creatinine, as well as proteinuria. On workup, her CT was negative for a pulmonary embolism, and her transthoracic echocardiogram (TTE) showed a reduced left ventricular ejection fraction (LVEF). She was transferred to our institution (a Maternal Level IV center) and was diagnosed with preeclampsia with severe features. A repeat TTE revealed an LVEF of 20% and chest x-ray showed pulmonary edema and bilateral pleural effusions. Her clinical presentation was consistent with maternal cardiovascular WHO Risk Class IV indicating an extremely high risk of maternal mortality or severe morbidity.(1) Due to worsening fetal distress and maternal decompensation, the decision was made to proceed with an urgent cesarean delivery.

Case One: Preoperatively, she received labetalol for severe range blood pressures (prior to knowledge of acute heart failure) and furosemide. A radial arterial line and a large bore central line were placed for blood pressure monitoring and vasoactive administration. An inadvertent dural puncture occurred during placement of a combined spinal-epidural, and an intrathecal (IT) catheter was threaded. An initial spinal dose of 0.8ml 0.75% bupivacaine in dextrose, 15mcg fentanyl and 100mcg morphine was given. An additional 1ml of 0.5% bupivacaine was given via IT catheter to obtain a T4 sensory level due to non-reassuring fetal tracing. She was supported on escalating doses of norepinephrine after her spinal and was started on a milrinone infusion for inotropic support in anticipation of post-delivery autotransfusion and afterload reduction in the setting of preeclampsia. Additional doses of IV furosemide were given intraoperatively for ongoing diuresis. Delivery proceeded uneventfully with Apgar scores of 2 and 4. She was continued on milrinone and norepinephrine postoperatively and transferred to the cardiac ICU for further management. She was weaned from vasopressors and inotropes within 24 hours. She underwent coronary CT scan which was unrevealing, supporting a non-ischemic etiology for her cardiomyopathy. She was initiated on goal-directed medical therapy and discharged on POD #5.

Discussion: Patients with pre-existing maternal cardiovascular disease are at increased risk of preeclampsia, which is associated with diastolic dysfunction and, in rare cases, peripartum cardiomyopathy.(2,3) Early recognition of cardiomyopathy is essential and requires prompt transfer to a center with the appropriate level of care to optimize outcomes.(4)

References: 1. Meng ML et al. Anesthesiology 2021. 2. Bello N et al. JACC 2013. 3. Gammill HS, et al. Circulation 2018. 4. ACOG. Obstet Gynecol 2019.

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 13

Magnesium Toxicity and Cesarean Section Avoidance with the Help of Patient-Accessed EMR

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Introduction: Intravenous (IV) magnesium is commonly used in obstetrics and has numerous indications, importantly seizure prophylaxis in those with eclampsia and preeclampsia with severe features.1 Magnesium levels should be closely monitored after administration due to the potentially life threatening side effects that occur at toxic levels. We summarize a case of magnesium toxicity in a 32 year old G1P000 at 25 weeks 6 days gestation with preeclampsia that was discovered by patient's family after an alert from patient-accessible Electronic Medical Record (EMR).

Case One: A 32 year old G1P000 female with chronic hypertension presented with elevated blood pressure. Preeclampsia labs were notable for elevated serum creatinine to 1.86. The patient was admitted to the labor and delivery unit and started on IV magnesium for seizure prophylaxis. The next morning, the patient called out with shortness of breath. Vital signs were remarkable for hypothermia to 91 °F, bradycardia with HR in the 30s-40s, and fetal bradycardia with HR in the 80s. Preparations were made for stat cesarean delivery. During these preparations, the patient's husband received an EMR push notification showing Mg levels >9.7 mg/dL. He notified the primary team, and this prompt notification prevented a stat cesarean section. IV magnesium was then discontinued, and 2 grams IV calcium gluconate were given. Following administration of calcium gluconate, the patient began to have symptomatic improvement. The patient was discharged with close return precautions and planned delivery at the betamethasone window due to superimposed preeclampsia with severe features.

Discussion: The recommended therapeutic level of magnesium to treat eclamptic seizures is 4-7 mEq/L 2. Common side effects in the therapeutic range include nausea, vomiting, and headache 1. All patients receiving magnesium should have their vital signs, ECG, patellar reflexes, and urine output closely monitored throughout administration to prevent toxicity1. Signs of magnesium toxicity begin with EKG changes including prolonged PR interval and widened QRS at 5-10 mEq/L; loss of deep tendon reflexes and muscle weakness at 10 mEq/L; respiratory arrest and heart block at 15 mEq/L; and potential cardiac arrest at 20 mEq/L1. Treatment of hypermagnesemia includes promptly stopping magnesium infusion at the first sign of toxicity as well as administration of IV calcium gluconate 1-2 grams over a 10-minute span 1,2. Efficient monitoring and recognition of magnesium toxicity, now possible with

patient-accessible EMR, is crucial to successful patient outcomes in the setting of obstetric anesthesia.

References: 1. Scott T, Hyers B. Magnesium in pregnancy [Internet]. 2023 [cited 2023 Dec 26]. Available from: https://www.openanesthesia.org/keywords/magnesium-in-pregnancy/ 2. Kutlesic, M.S., Kutlesic, R.M. & Mostic-Ilic, T. Magnesium in obstetric anesthesia and intensive care. J Anesth 31, 127–139 (2017). https://doi-org.ummc.idm.oclc.org/10.1007/s00540-016-2257-3

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 14

Late Postpartum Preeclampsia with Severe Features from Retained Products of Conception

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Introduction: Postpartum preeclampsia is a diagnosis of exclusion characterized by new onset hypertension 48 hours after delivery, theorized to be caused by placental-mediated endothelial cell dysfunction. In cases of delayed-onset postpartum preeclampsia, most women experience symptoms within 10 days postpartum, even without a history of pregnancy-related hypertensive disorders (1). We present a case of a previously healthy woman who developed postpartum preeclampsia 3 weeks post-delivery that was likely triggered by retained placental tissue.

Case One: A 40-year-old G3P2 parturient presented to labor and delivery (L&D) for scheduled repeat cesarean delivery (CD). Her pregnancy was complicated by advanced maternal age. No chronic or gestational hypertension was detected during pregnancy. She had a CD under spinal anesthesia, her postpartum course was uneventful, and she was discharged home on postoperative- day (POD) 2. She returned to the clinic 3 weeks after delivery for routine follow-up and mentioned having consistent bleeding since delivery. An ultrasound was performed and was suspicious for retained products of conception. Four days later she underwent a dilation and curettage in the operating room under general anesthesia with laryngeal mask airway. Her systolic blood pressure before induction was in the 160s to 170s and she was treated with labetalol. General anesthesia was induced with propofol and maintained with short-acting opioids and sevoflurane. Hydralazine was required during emergence for a systolic blood pressure of 200 mmHg. Blood was sent to evaluate for pre-eclampsia. In the PACU she remained with severe range blood pressures requiring further intravenous antihypertensive therapies and a diagnosis of preeclampsia with severe features was made. Labs were notable for urine protein: creatinine ratio of 3.18. She was placed on a magnesium drip for 12 hours and was discharged on POD 1. Due to blood pressure normalization immediately after the procedure, she was not placed on blood pressure medications at home. She returned to the clinic 2 weeks later where blood pressure and labs were normal.

Discussion: Due to disease mitigation through placental removal, postpartum preeclampsia is rare, accounting for approximately 5.7% of preeclampsia cases (2). Consequently, there is limited guidance on managing postpartum preeclampsia. Early identification can be facilitated by considering associated hypertensive symptomatology and maternal risk factors (3). Anesthesiologists are in a unique position to identify and treat postpartum preeclampsia in patients presenting for procedures in the postpartum period. Clear multidisciplinary communication and management goals are essential to optimize patient safety and wellness.

References: 1. PMID 21979459 2. PMID: 28694309 3. PMID: 17447188

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 15

Refractory Preeclampsia in a Post-Kidney Transplant Parturient

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Introduction: Pregnant renal transplant recipients have an increased risk of preeclampsia compared to the general population.[1,2] During the initial two years following transplantation, obstetric complications such as stillbirth, preterm delivery, and neonatal death are most prevalent.[3] We present the case of a parturient with end-stage renal disease status post kidney transplantation who developed severe, superimposed preeclampsia refractory to antihypertensive medications.

Case One: A G3P0020 female with a history of HTN, ESRD s/p DDKT on tacrolimus, moderate asthma, and obesity, was admitted at 32.1 weeks' gestation for severe-range blood pressures (BP), dizziness, and unilateral leg edema. Serum creatinine was elevated to 0.61 mg/dl from a pregnancy nadir of 0.45 mg/dl. Her oral antihypertensive regimen was up-titrated with an appropriate response. On hospital day 1, she required maximization of both IV labetalol and hydralazine. Steroids and magnesium were then given with subsequent normalization of her BP. On hospital day 3, the patient again developed severe-range BPs with associated chest pain and shortness of breath. In response, maximum dose IV hydralazine was given, an arterial line was inserted, and nicardipine infusion initiated. Her EKG was unremarkable and TTE revealed diastolic dysfunction. Given persistent dyspnea in the setting of uptrending BNP levels, the patient was diuresed, then taken for urgent cesarean delivery under low-dose, combined spinal-epidural anesthesia. Her delivery was complicated by a postpartum hemorrhage of 2371 mL due to uterine atony for which oxytocin IV and rectal misoprostol were given. On POD #1, the patient developed acute hypoxic respiratory failure and hemorrhagic shock due to large volume ascites (2.5L) and a large rectus sheath hematoma. The patient was managed with a paracentesis, IR-guided inferior epigastric artery embolization, and aggressive cardiopulmonary resuscitation. Her postoperative course was also complicated by a hospital acquired pneumonia and acute kidney injury. The patient was eventually discharged on POD#5 in stable condition.

Discussion: Parturients post-kidney transplant frequently present with pre-existing HTN and proteinuria, which can pose challenges in identifying superimposed preeclampsia.[2] Obtaining baseline levels of proteinuria can be helpful in identifying worsening renal function in severe preeclampsia. Additionally, ascites and pleural effusions are an atypical manifestation of severe pre-eclampsia that may portend a worse prognosis.[4] Providers must maintain a high level of suspicion in post-kidney transplant patients despite nonspecific signs of preeclampsia. Management of these patients should be multidisciplinary, including transplant medicine, nephrology and cardiology.

References: 1. Shah P et al. Current Hypertension Reports. 2018; 20(59). 2. Shah S et al. BMC Nephrology. 2019; 20(24). 3. Deshpande NA et al. Am J Transplant. 2011;11(11):2388–404. 4. Baha et al. Am J Obstet and Gynecol. 200(5).

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 16

Management of Pregnant Patient with Acute Respiratory Failure

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Co-Authors: Elena Averbakh, MD - University of Minnesota
Liliana Goelkel Garcia, MD - University of Minnesota

Introduction: Acute Respiratory Failure (ARF) is rare in pregnancy affecting only 1 in 500 pregnancies. However, when it occurs it can be detrimental to the mother and fetus. Causes of ARF in pregnancy can be obstetric-related or unrelated to pregnancy. Physiologic changes of pregnancy and the presence of fetus make ARF difficult to recognize and manage. We present a challenging case of diagnosis and management of ARF in a pregnant patient.

Case One: 37-year-old G4P0212 with a history of chronic HTN, T2DM on insulin, bipolar disorder, and IV drug use. Patient was admitted at 20w2d for diabetic foot infection and hyperglycemia. She developed ARF and pulmonary edema of unclear etiology. Initial imaging and cultures were negative for pneumonia. She received 1U pRBC, however, transfusion reaction was deemed unlikely by Transfusion Medicine. Maternal-fetal Medicine team had a low suspicion of preeclampsia, and an echocardiogram ruled out a cardiogenic source. CT PE did not show definitive pulmonary edema. She further deteriorated with worsening dyspnea and mental status changes, requiring endotracheal intubation and emergent Cesarean Section at 23w4d. Resolution of ARF after delivery suggested undiagnosed preeclampsia as the culprit. Intraoperative hemorrhage caused hemorrhagic shock and need for pressors. Postoperative complications included MRSA-VAP, lacunar stroke, and neonatal demise in the first week of life due to extreme prematurity. Pt was extubated on POD#6 and discharged on POD#10 on1-3LO2 via NC.

Discussion: ARF in pregnancy is rare but potentially life-threatening for the mother and fetus. Diagnosis might be challenging in pregnant patients as ARF can be caused by a variety of pregnancy-specific and pregnancy-unrelated conditions. This case highlights difficulties in identifying parturient-related ARF etiology and management for the mother and fetus.

References: Lapinsky SE. Management of Acute Respiratory Failure in Pregnancy. Semin Respir Crit Care Med. 2017 Apr;38(2):201-207. doi: 10.1055/s-0037-1600909. Epub 2017 May 22. PMID: 28561251. Seashore J, Duarte A. Acute Respiratory Distress Syndrome in Pregnancy. In: Lapinsky SE, Plante LA, eds. Respiratory Disease in Pregnancy. Cambridge University Press; 2020:139-147. MIGHTY, H. E. (2010). Acute Respiratory Failure in Pregnancy. Clinical Obstetrics and Gynecology, 53(2), 360–368. https://doi.org/10.1097/GRF.0b013e3181deb3f1 Aiken, C. E. (2024). Respiratory disease in pregnancy. Obstetrics, Gynaecology and Reproductive Medicine, 34(1), 6–10. https://doi.org/10.1016/j.ogrm.2023.10.002

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 17

Delayed Recognition of Post-Partum Hemorrhage in Setting of Severe Pre-Eclampsia

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Co-Authors: Michael Marotta, MD - Northwell Health
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Introduction: Post partum hemorrhage (PPH) is a leading cause of maternal mortality. Many steps can be taken to prevent mortality and morbidity from PPH including early recognition with quantitative blood measurement and hemorrhage protocol bundles1. Here we present a patient with a >3L EBL following delayed implementation of our hemorrhage protocol.

Case One: A 39-year-old female G8P1243 at 35w6d with a past medical history of cHTN, prior pregnancies complicated by pre-eclampsia and classical cesarean section, opioid use disorder maintained on Methadone, and scoliosis presented with elevated blood pressure (BP). On admission her BP was 150/90s. Admission labs showed a hemoglobin of 9.4 and platelets of 245. The decision was made to proceed with cesarean due to non-reassuring fetal status shortly after arrival. A combined spinal epidural was placed in the OR, however on aspiration the catheter was found to be intrathecal. During the case, the patient required activation of the intrathecal catheter with 7.5mg of bupivacaine, and subsequently IV versed and ketamine during closure. She was hypertensive throughout the case and lost 1.2 L of blood. In recovery she was initially hemodynamically stable with BP of 124/63. Post operative labs showed Hb of 6.6, Plt 181, Fibrinogen 154 and INR 1.27. She was mildly somnolent which was attributed to sedation given during c-section. Blood products were being administered. Several hours later, anesthesia was called to the bedside to provide sedation for fundal message. Upon arrival the patient was lethargic, tachycardic, and pale. The obstetric team had ordered 2u RBCs, 2u FFP, and 1u Cryoprecipitate since leaving the OR. Repeat labs were sent shortly before our arrival but not resulted. It was reported that BPs had been 160/110 despite continued blood loss and lethargy had increased. We activated our maternal hemorrhage protocol, placed additional IV access and arterial line and administered an additional 4u RBCs, 4u FFP, 1u of platelets and 1u cryoprecipitate. The Hb prior to resuscitation resulted with a Hb of 3.6. A Bakari balloon was placed, and urgent uterine artery IR embolization was arranged. She required ICU stay following a successful procedure. During that time, she was treated for preeclampsia with magnesium and nicardipine. She left the ICU on POD3 and was discharged home on POD5.

Discussion: This case demonstrates a delayed recognition of severe maternal hemorrhage in the setting of pre-eclampsia masking hypotension despite intravascular depletion. Quantitative tracking of blood loss may have led to earlier recognition. Once severe hemorrhage was noted our emergency hemorrhage protocol allowed for rapid stabilization of the patient.

References: ACOG Committee Opinion. Quantitative Blood Loss in Obstetric Hemorrhage. 2019.

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 18

Advanced Molar Pregnancy in a Grand Multiparous Patient

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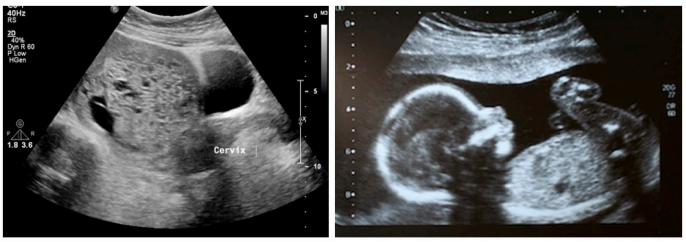
Introduction: Molar pregnancy, although rare, will continue to be encountered by anesthesia and obstetric providers. Caring for patients with a molar pregnancy, especially advanced gestational age, continues to necessitate careful anesthetic management and knowledge of the disease state. Both complete and incomplete molar pregnancy have been associated with perioperative morbidity and mortality involving multiple organ systems, specifically endocrine, pulmonary, and cardiovascular (1,3,4). These patients may experience hyperemesis gravidarum, pre-eclampsia prior to 20 weeks, hyperthyroidism leading to high output heart failure, pulmonary embolization of trophoblastic tissue at time of removal, or DIC (1,4). These features can provide additional challenges to an otherwise uncomplicated D&C. This case presents a unique contribution to the knowledge of molar pregnancy given the late stage at which it was first diagnosed.

Case One: A 41-year-old G13P11 presented for first prenatal appointment at approximately 24 weeks since last menstrual period. She reported mild nausea indistinguishable from her previous first trimester experiences. Bimanual exam revealed 18-week sized uterus. Transvaginal ultrasound revealed grape/snowstorm like appearance of material with no evidence of fetal tissue. B-HCG 488,325 and TSH 0.25. Vital signs were unremarkable. She elected to undergo D&C for removal of tissue with possible TAH/BSO reserved for life-threatening bleeding to preserve fertility (3). Clinical assessment for signs and symptoms of hyperthyroidism was performed preoperatively and discussed with an endocrinologist (2). The patient was thought to be low risk for development of thyroid storm, and a treatment algorithm was established should her clinical course change. General anesthesia was initiated with RSI. A post-induction arterial line was placed as well as additional large bore access. Blood products and uterotonics were available in case of hemorrhage. On uterine evacuation a significant amount of heterogenous products were removed. At the procedure's end, bimanual exam showed a firm, 8-week-sized uterus. Transabdominal ultrasound confirmed clean endometrial stripe throughout with no bleeding from cervix. The patient was extubated successfully, and final pathology was complete hydatidiform mole. Patient was discharged on postop day 4.

Discussion: Complete molar pregnancy presents the obstetric anesthesiologist with several clinical considerations. With increasing progression of molar pregnancy, a proportional increase in potential complications may be anticipated, typically related to climbing b-HCG values (1,4). Choosing an anesthetic plan can be nuanced and risks and benefits of both general and neuraxial should be discussed (2). Although an overall successful and low

comorbidity case, the advanced age at first detection and presentation forced careful anesthetic consideration of all potential complications.

References: 1. PMID: 21712876 2. PMID: 29284889 3. PMID: 17459690 4. PMID: 22439034



A. Grape/Snowstorm Appearance (https://radiopaedia.org/articles/molar-pregnancy-2?lang=us)
B. Normal 20w pregnancy (https://utswmed.org/medblog/pregnancy-ultrasound-scary/)

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 19

Eclampsia in a Sixteen-Year-Old Parturient Complicated by Retinal Detachment and Posterior Reversible Encephalopathy Syndrome (PRES) Requiring Emergent Cesarean Delivery

Presenting Author: Bryan Wakefield, MD
Presenting Author's Institution: Vanderbilt University Medical Center
Co-Authors: Stephanie K. Woodward, MD - Vanderbilt University Medical Center

Introduction: Eclampsia complicated by posterior reversible encephalopathy (PRES) with mass effect and retinal detachment is an exceedingly rare clinical scenario requiring thoughtful anesthetic care. We will describe and discuss a recent case at our institution.

Case One: A sixteen-year-old G1P0 parturient at 36 weeks gestation with limited prenatal care presented to the children's emergency department (ED) via emergency medical services (EMS) after being found unresponsive at home by her siblings. Her family endorsed that the patient suffered severe headaches and vision changes for the 3 days prior. On exam, she was significantly altered but protecting her airway. Her vital signs were notable for severe range blood pressures. Due to concern for an unwitnessed seizure, head imaging was obtained and revealed PRES with associated mass effect in the posterior fossa. Her condition began to deteriorate as she became increasingly more agitated, requiring escalating doses of intravenous (IV) sedatives. The admitting obstetric team decided emergent cesarean delivery (CD) was warranted. The patient was taken to the operating room (OR) and 2 mg of IV midazolam and 16 mcg of IV dexmedetomidine were given for agitation before rapid sequence induction was performed with propofol and succinylcholine. Intubation and CD were uneventful with estimated blood loss of 600 milliliters. She was extubated to room air following the case and taken to recovery. Her blood pressure normalized on oral antihypertensives. The rest of her hospital stay was complicated by blurry/decreased vision in her left eye. She was ultimately diagnosed with left sided retinal detachment on follow up magnetic resonance imaging and ophthalmologic examination. Following discharge, her blood pressures remained normal on oral antihypertensives, and retinal detachment resolved on last ophthalmologic follow up.

Discussion: Utilizing this case, we plan to highlight the following learning points for discussion: Anesthesia for cesarean delivery for parturients with eclampsia calls for careful risk, benefit analysis between neuraxial anesthesia and general anesthesia.1 What factors were considered in this case? The pathophysiology of PRES is disputed.2 What are the proposed mechanisms of PRES? What differentiates it from other manifestations of cerebral edema? A recent systematic review showed that 51% of women with eclampsia who had neuroimaging were diagnosed with PRES. 3 How did the presence of mass effect on this patient's imaging impact the anesthetic considerations of her case? Pre-eclampsia/eclampsia complicated by retinal detachment is a rare condition in pregnancy.4 How is it managed medically, and when would surgical intervention be required? What is the prognosis for long term visual

impairment?

References: References: 1. PMID: 21489768 2. PMID: 23212858 3. PMID: 38074208 4. PMID: 32933916

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 20

A Parturient with Metastatic Choriocarcinoma and a Viable Fetus

Presenting Author: Neva P. Lemoine, MD
Presenting Author's Institution: Vanderbilt University Medical Center - Nashville, Tennessee

Introduction: Gestational trophoblastic neoplasia (GTN) is defined as the malignant proliferation of placental trophoblastic cells.[1] GTN encompasses all malignant gestational trophoblastic diseases (GTD), including choriocarcinoma, with an incidence of 1:50,000 in pregnancy.[4,5] Choriocarcinoma with a coexistent viable fetus, as presented in this case, is rarer still.

Case One: A 35-year-old G4P3003 at 28w5d presented with hemoptysis and dyspnea for 1 month. Chest CT showed extensive pulmonary lesions, and a CT head demonstrated a hypodense area in the left hemisphere with edema, suspicious for metastatic disease. β-hCG was 5.2 million. Further maternal workup showed pre-eclampsia with normal echo, and significantly elevated thyroid levels. OB ultrasound found no evidence of fetal or placental abnormalities. Gyn-Oncology was consulted due to high suspicion for GTN, and with Maternal-Fetal-Medicine, recommended an expeditious delivery in the setting of potential decompensation and urgent chemotherapy. After neurosurgical consultation, weighing risks of increased intracranial pressure and cerebral edema from metastatic disease and avoiding deterioration of her respiratory status with general anesthesia, neuraxial anesthesia was deemed safe for cesarean delivery (CD). Neuraxial anesthesia could also blunt the effects of her hyperthyroid state. In the operating room, a combined spinal-epidural was dosed to a T6 level to preserve respiratory effort. The patient remained stable on 4L nasal canula during the CD. After removal of an abnormal placenta, masses were discovered and extracted from the uterus. The patient was then transported to the ICU. In the postpartum period, a brain MRI did not show metastasis, but 2 recent right cerebellar infarcts were identified. Chemotherapy was initiated on postoperative day (POD) 2. The patient required intubation on POD 6 for worsening respiratory status due to bleeding metastatic sites and pulmonary edema from pre-eclampsia. She was extubated on POD 12 and cleared for discharge on POD 25 with plans to continue chemotherapy. Final pathology of the placenta and masses showed choriocarcinoma.

Discussion: GTN in pregnancy poses significant risk to mother and fetus. Maternal risks include abnormal bleeding, pre-eclampsia, eclampsia, thyroid storm, persistent GTD, preterm delivery, and abruption.[2] Choriocarcinoma typically metastasize to the lungs and brain and can hemorrhage, causing respiratory failure and cerebrovascular accidents.[3] Despite its high likelihood to present with widely metastatic disease, high-risk GTN remains highly treatable and curable in most cases with a response rate (80%) to primary treatment and a low relapse risk (< 5%) after complete response.[1] In this case, the pulmonary, neurological and endocrinological complications of GTN posed great risk to the mother creating challenges in

her anesthetic management.

References: 1. PMID: 36648416 2. PMID: 29779493 3. PMID: 37758451 4. PMID: 36763119 5. PMID: 35464325

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 21

Atypical Presentation of Eclampsia

Presenting Author: Soshana Clerizier, MD
Presenting Author's Institution: Weill Cornell Medicine - New York, New York
Co-Authors: Stefanie Yuen, CRNA - New York Presbyterian

Introduction: Eclampsia is a life-threatening condition of pregnancy with an incidence of 1-10/10,000 deliveries1. Eclampsia occurs from 28 weeks (w) gestation until 6w after birth and presents as one or more grand mal seizures (60 seconds of facial twitching and muscle contractures) or a coma in the setting of preeclampsia1. Atypical eclampsia lacks these signs and represents up to 8% of all eclampsia cases2. We describe a patient with atypical eclampsia during cesarean section (C/S).

Case One: A healthy 32-year-old G1P0 at 39w presented for elective induction of labor. The patient was normotensive during labor and got a spinal/epidural for pain. 27 hours later, the patient had a C/S for arrest of dilation. The epidural was dosed with 10 mL of 2 % lidocaine with epinephrine and 2 mg of morphine after birth. During the C/S, uterine atony was treated with oxytocin, misoprostol, methylergonovine, and carboprost; and a blood loss of 2575 mL was managed with tranexamic acid and 2 units of PRBC. While closing skin, the patient developed altered mental status (nystagmus and memory loss), rigidity, tachycardia (HR 150s bpm), and hypertension (HTN 171/135 mm Hg). A code stroke was called; an arterial line, additional IV access, and a central line were placed. Within 15 minutes of symptom onset, a 4 gm magnesium sulfate bolus was started. 1 hour later, the patient was AOx3 and hemodynamically stable. The following preeclampsia labs were noted to be elevated: UPC (412), CR (1.36 from baseline < 1), and UA (7.8). CBC was stable (H/H @ 11/33). The patient had a negative head CT. The patient was watched overnight in the ICU and was continued on magnesium for 24 hours. Labs were trended for elevated creatinine and LFTs, which resolved within 48 hours. The patient was discharged on POD3 and had a full recovery without sequalae.

Discussion: While the pathophysiology of eclampsia remains unclear, the leading theory is increased blood brain barrier permeability and cerebral circulation autoregulation failure resulting in hypoperfusion, cerebral edema, microbleeds, and eclamptic seizures1. As a result, eclampsia is a diagnosis of exclusion based on patient history and physical exam. Differential diagnoses considered in this case were stroke, local anesthetic toxicity, and drug reactions (ex. methylergonovine). Neurologic changes, HTN, improvement to magnesium, proteinuria, negative head CT, and improvement in postop labs were all factors in diagnosing this case as atypical eclampsia. The patient's full recovery without sequelae was likely due to early recognition of neurological changes and HTN, timely initiation of magnesium, and coordination of resources.

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Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 22

Anesthetic Considerations for Cesarean Hysterectomy for Complete Molar Pregnancy with Coexisting Fetus: A Case Report

Presenting Author: Zach Wright, MD
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Co-Authors: Annalese G. Neuenschwander, MD - University of Alabama at Birmingham

Introduction: Combined hydatidiform molar pregnancy with coexisting fetus (CHMCF) is a rare condition with an estimated incidence of 1 in 20,000-100,000 pregnancies.1 These patients are at high risk of hyperthyroidism, preeclampsia, preterm birth, intrauterine fetal demise and metastatic invasion to lung and brain.2 Additionally, there is risk for maternal hemorrhage and molar tissue embolization leading to rapid cardiopulmonary decompensation.

Case One: A 28-year-old G5P4004 with history of bipolar disorder, acute psychosis, substance abuse disorder and asthma with CHMCF was transferred to our institution at 33 weeks' gestation for delivery planning. The diagnosis was confirmed with elevated hCG levels, multiple chromosomal free DNA (cfDNA) suggestive of triploidy and ultrasound showing a 10cmX10cmX4cm lesion in the anterior uterine wall. On presentation to our hospital patient denied any vaginal bleeding, had stable vitals HR 76, BP 100/66 sPO2 99% on room air, normal thyroxine stimulating hormone (TSH) levels 1.106 U/ml and chest Xray negative for lung metastasis. Gyn-oncology and maternal fetal medicine decided to perform a cesarean hysterectomy at 34 weeks as patient did not desire any future pregnancy and wanted to avoid chemotherapy. Combined Spinal anesthesia was performed in the operating room after securing two wide bore peripheral intravenous access, arterial line and standard ASA monitor. Phenylephrine infusion was started at 0.5mcg/kg/hr after administration of intrathecal bupivacaine and was titrated to maintain mean arterial pressure at 75mmHg. Uterine incision was complicated by bleeding from the molar tissue, fetus was delivered promptly, and bleeding was controlled with ligation of bilateral uterine artery. Estimated blood loss from procedure was 1000ml and one unit of PRBC was transfused. Post operatively patient remained hemodynamically stable and was transferred to L and D floor, pathology confirmed complete hydatidiform mole with areas of abnormally adherent placenta. Patient hCG levels are now trending down and there is no evidence of residual disease.

Discussion: Cesarean hysterectomy can be a treatment option in localized CHMCF for selected patients. Anesthetic management includes screening the patients for hyperthyroidism, preeclampsia and metastatic disease preoperatively. Intraoperatively, availability of blood products, adequate intravenous access and arterial line are of utmost importance for management of hemorrhagic and embolic complication from malignant invasion of molar tissue and possible abnormal placentation.

References: 1. Zilberman SN. BJOG 2020; 127: 1450–1457. 2. Elizabeth C. Ann Clin Case Rep. 2023; 8, 2483.

Abstract #: SAT – CR – BS 3 – BR 3 - We did not Forget Preeclampsia/HELLP and a Few Other Placental Zebras – 23

A Lifesaving Misdiagnosis of Eclampsia

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Introduction: Splenic artery aneurysm (SAA) rupture in pregnancy is rare with an incidence of 3.6/100,000 and a maternal and fetal mortality rate of 75% and 95% respectively (1). Physiological changes of pregnancy (increased circulating volume, oestrogen, progesterone and relaxin) promote aneurysm formation and enlargement (2). As a result, pregnancy is a major risk factor for SAA rupture with 69% occurring in the final two weeks of gestation and 13% during labour (1). It can present atypically and should be a diagnosis to consider in the collapsed pregnant patient.

Case One: A previously healthy 40 year old nulliparous women presented at 34 weeks gestation with diffuse left sided abdominal pain, pre-syncope, diaphoresis and dyspnoea. The pain improved and she was discharged home, however five days later was re-admitted with severe pain, followed by an unresponsive episode with involuntary movements. This was diagnosed as eclampsia and she was immediately prepared for a STAT cesarean section, receiving 4g magnesium. Prior to induction of general anesthesia vital signs were BP 98/52 mmHg, HR 102 bpm, RR 16, O2 sats 100% and GCS 14/15. Post-induction, severe hypotension required epinephrine boluses and 1.5L of blood was found in the abdomen. The aorta required manual compression while a trauma surgeon from a neighboring hospital arrived to perform a splenectomy. The patient was resuscitated following our massive hemorrhage protocol and her baby was born 16 min after the decision to operate with an APGAR of 3 and arterial pH of 6.84. Both mother and baby continue to make excellent progress.

Discussion: A ruptured SAA can present in two ways; either sudden cardiovascular instability or rarely via a double rupture phenomenon. In the latter, the ruptured aneurysm fills the lesser omental sac and after 6-96 hours this ruptures into the peritoneal cavity causing hemodynamic instability (1). Had SAA been considered at the first presentation, a peri-mortem cesarean delivery and massive transfusion may have been prevented. Despite this missed diagnosis, we believe the double rupture phenomenon allowed time for the patient to re-present to hospital prior to the rupture of the omental sac. Furthermore, the misdiagnosis of eclampsia resulted in prompt operative delivery, correct surgical management and activation of our massive hemorrhage protocol. The diagnosis of SAA rupture can be challenging and therefore we wish to highlight it to providers assessing patients with non-obstetric abdominal pain.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 01

Peripartum Management of a Patient with Vascular Ehlers-Danlos Syndrome and Loeys-Dietz Syndrome Complicated by Aortic and Carotid Dissections

Presenting Author: Jacob M. Nieb, MD
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Introduction: Aortic dissection in pregnancy is associated with severe morbidity and mortality for both the mother and fetus. At an incidence of 4-5 per 1,000,000 pregnancies, aortic dissection is the third most common maternal cardiovascular cause of death.1 The physiological changes that occur with pregnancy and labor put severe stress on maternal vasculature, increasing the risk for postpartum dissection.1 Thus complex planning is required to manage the parturient throughout delivery.

Case One: Our patient was a 32-year-old G3P1011 at 33w5d with vascular Ehlers-Danlos Syndrome (vEDS) and Loeys-Dietz Syndrome complicated by type B aortic and left carotid artery dissections. A multidisciplinary meeting between obstetrics, cardiology, vascular surgery, and obstetric anesthesiology determined the safest course of delivery was scheduled cesarean delivery in a cardiac operating room with vascular surgery on standby. This delivery occurred during the late preterm period to avoid the hemodynamic changes associated with spontaneous labor that could lead to worsening of her existing dissections. The anesthetic plan was general anesthesia, as opposed to neuraxial anesthesia, given the patient's underlying vEDS and known dural ectasias on her most recent MRI. A preinduction arterial line and large bore intravenous access were placed. Rapid sequence induction and endotracheal intubation via video laryngoscopy were uncomplicated. Esmolol was administered throughout delivery to minimize tachycardia. Cesarean delivery was complicated by postpartum hemorrhage due to uterine atony requiring oxytocin, carboprost tromethamine, and misoprostol. Tranexamic acid, desmopressin, packed red blood cells, and cryoprecipitate were also administered. The patient was extubated in the operating room and admitted to the surgical intensive care unit for monitoring and transferred to the floor on postpartum day two. Her dissections remained stable on all postpartum imaging.

Discussion: No randomized controlled trials exist to support the management of parturients with genetic aortopathy. As such, the timing, mode of delivery, and anesthetic technique are guided by case reports and expert opinion. Existing literature supports that patients with chronic dissections should be delivered in the late-preterm and early term period.1 Regarding mode of anesthesia, patients with vEDS are at high risk for hematoma formation during neuraxial placement, favoring general anesthesia.1,2 Finally, coordination of care between multiple medical and surgical subspecialties allows for the safest delivery of this patient population with the ability to rapidly respond to emergencies should they occur.

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MRI Aortic Dissection.pdf

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 02

Delivery with Severe Pulmonary Artery Hypertension

Presenting Author: Kaitlyn Brennan, DO, MPH
Presenting Author's Institution: Vanderbilt University Medical Center
Co-Authors: Mikaela Biavati, DO – Vanderbilt University Medical Center
Susan Eagle, MD - Vanderbilt University Medical Center
Kathryn Lindley, MD - Vanderbilt University Medical Center
Aleksandra Polic, MD - Vanderbilt University Medical Center

Introduction: Pregnancy in the setting of pulmonary arterial hypertension (PAH), also known as Group I pulmonary hypertension (PH), is a mWHO IV condition, with maternal mortality approaching 25%.1 Patients with PAH are advised to avoid pregnancy as it will worsen their underlying disease state due to expected physiologic changes.1,2 For patients who elect to proceed with pregnancy, an experienced cardio obstetrics team may result in improved outcomes.3 We describe the care, including nuanced shared decision making, of a parturient with PAH.

Case One: A G1P0 at 14w2d presented to our cardio obstetrics group to establish care. Her PMH was significant for PAH treated solely with calcium channel blockers (CCB). Her baseline PA pressures were 58/24(36) and her right ventricle (RV) was mildly dilated with normal function. At 20w, sildenafil was started due to new RV dysfunction noted on transthoracic echo (TTE). Late preterm cesarean delivery was advised, but she strongly preferred a term induction of labor (IOL). She presented for IOL at 37w0d. After an arterial line was placed, dural puncture epidural (DPE) was performed. This was slowly dosed with 10cc of 0.125% bupivacaine, 5 mcg/cc fentanyl, and a continuous infusion of 8cc/hr of 0.0625% bupivacaine/2mcg/cc fentanyl. At 6 cm, the patient developed a compound presentation, with fetal hand through the cervical os. Attempts to reduce the hand were unsuccessful, she developed signs and symptoms of chorioamnionitis, and urgent CD was recommended. The epidural was slowly dosed with 10cc of 2% lidocaine w/ 1:200,000 epinephrine, 100mcg of fentanyl, and 3mg of morphine. Norepinephrine, dobutamine, and inhaled epoprostenol were started for RV and hemodynamic support. 5 Fr catheters were placed in her femoral artery and vein for emergent extracorporeal membrane oxygenation (ECMO) access. The patient requested the team forgo recommended pulmonary artery catheter (PAC) placement due to prior emotional trauma. TTE was utilized to provide real time assessment of RV function. At delivery, she developed hypotension and severe RV dysfunction on TTE. This improved with the addition of vasopressin, uptitration of norepinephrine, and increased dobutamine. She was transferred to the ICU postoperatively. Her norepinephrine and vasopressin infusions were weaned as her block receded. Dobutamine and epoprostenol were weaned on PPD 1 and 2 respectively. She was discharged on PPD5 and readmitted PPD14 with endometritis.

Discussion: Parturients with PAH require a multidisciplinary cardio-obstetric team and advanced

planning. Expert recommendations may be discordant with patient preferences, and designing a safe plan in this setting requires flexibility. Regional anesthesia is preferred, and a CVP may aid in the recognition of RV failure , which requires prompt treatment, often with inotropes.2 In the absence of a PAC, continuous TTE is a reasonable method to assess intraoperative RV function.3

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 03

Severe Rheumatic Mitral Stenosis with Secondary Pulmonary Hypertension Requiring Percutaneous Balloon Mitral Valvuloplasty in Pregnancy

Presenting Author: Katherine Bartz, MD
Presenting Author's Institution: UCSF
Co-Authors: Pedram Aleshi, MD – UCSF

Introduction: Rheumatic mitral stenosis (MS) is the leading valvular lesion in pregnancy, representing 90% of maternal cardiac disease in low-resource and 30% in high-resource countries.1,2 MS with NYHA class III/IV symptoms poses a 6-10% maternal mortality risk.2 Maternal and fetal complications escalate with MS and NYHA class severity, often from maternal right-heart failure due to pHTN and RV dysfunction.1,3,4 Fetal complications result from fixed maternal valvular obstruction, causing placental insufficiency, leading to IUGR, low birth weight, preterm birth (PTB) and fetal death.1,3,4,5 Preconception optimization is used to mitigate risks, but acute peripartum deterioration may occur, necessitating valvular intervention during pregnancy.2,5,6 Percutaneous balloon mitral valvuloplasty (BMV) is the procedure of choice. With reported 94-99% success and known safety, BMV carries reduced maternal and fetal risk compared to traditional valvular surgery.2,4,5 Our case demonstrates successful BMV in a patient with severe rheumatic MS and pHTN.

Case One: A 41-year-old G3P1 woman at 20w1d with mild rheumatic MS and prior PTB at 23w complicated by neonatal death presented for cerclage. Further evaluation revealed severe MS with pHTN and NYHA class III symptoms. TTE showed a mean MV gradient of 21mmHg, mitral valve area (MVA) of 1.0cm2, PASP of 90mmHg and mild RV dysfunction. Urgent BMV under GA was completed. Pre-BMV TEE showed a mean MV gradient of 20mmHg, MVA of 0.9cm2 and trace MR. The MV was dilated with a 24mm balloon. Post-BMV TEE showed a mean MV gradient of 11mmHg, MVA of 1.9cm2 and mild MR. She was then extubated, transferred uneventfully to the ICU and discharged on POD#3.

Discussion: Collaborative management involving cardiologists, anesthesiologists and obstetricians improve severe MS outcomes in pregnancy.6 Pregnancy-induced elevations in HR and plasma volume expansion exacerbate LV outflow obstruction, increasing left atrial and PA pressures.2,3,4,5 Patients with MS in pregnancy are at risk for pulmonary edema, atrial tachyarrhythmias and thromboembolic events.3,5 Beta-blockers are therapy mainstays, with diuresis and anticoagulation as clinically indicated.3,5 BMV is recommended for severe MS with NYHA class III/IV symptoms during pregnancy despite medical optimization.4,5 As demonstrated in this case, BMV reliably improves MVA (+1.0cm2) and mean MV gradients (-9mmHg).2 Reductions in maternal cardiovascular complications, NYHA class, PTB and low birth weight are also seen.2,5 While well-tolerated, BMV risks include acute MR (13%), valvular restenosis (2%) and fetal radiation exposure.2,5 This case underscores successful BMV in a patient with severe rheumatic MS and pHTN, emphasizing the necessity of a multidisciplinary approach to managing

complex cardiac pregnancies.

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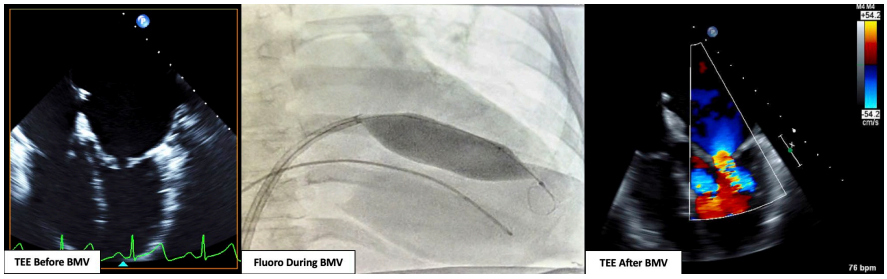

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 04

Role for Nitric Oxide in Management of Severe Pulmonary Hypertension Secondary to Large Atrial Septal Defect

Presenting Author: Jianing Jenny He, MD
Presenting Author's Institution: UT Southwestern

Introduction: Pulmonary arterial hypertension, defined as mean PA pressure >25 mmHg, significantly increases risk of maternal mortality.1,2 It limits maternal ability to accommodate the physiological changes of pregnancy and therefore presents potentially life-threatening challenges during labor and delivery. WHO group 1 pulmonary hypertension is associated with an overall mortality rate of 25-56%, especially in the third trimester.3

Case One: A 32-year-old G1P0 with class 2 obesity (BMI 35) and severe Group 1 pulmonary hypertension with PA pressure 103/35 mmHg (mean 58 mmHg) and PVR 5.6 WU due to unrepaired large secundum atrial septal defect (ASD) with deficient posterior rim, presented at 12 weeks for surgical termination of pregnancy. While most terminations of pregnancy at our institution are performed under spinal or general anesthesia, the plan for this patient was sedation with propofol infusion, but the procedure was aborted because the patient developed airway obstruction resulting in labored breathing and excessive usage of accessory muscles which precluded obstetric ultrasound imaging and targeted suctioning. The procedure was ultimately completed with a revised anesthesia plan using inhaled nitric oxide via face mask at 40 ppm and 10 liters per minute, titration of continuous epidural analgesia, and hemodynamic support with epinephrine and vasopressin.

Discussion: Management of pulmonary hypertension remains a challenge as pregnancy occurs in older women and PAH is disproportionally diagnosed more frequently in women aged 30 or older.4 Most labor units are not equipped or staffed to care for severe cases. All anesthesia types carry risks altering gas exchange and hemodynamics that could exacerbate right-to-left shunts. Inhaled nitric oxide has been shown to selectively reduce pulmonary resistance without affecting systemic resistance.5,6 Paired with titration of neuraxial anesthesia, nitric oxide may be an effective tool in preventing a reverse shunt during labor and delivery.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 05

Every Breath You Take: Cystic Fibrosis and Pulmonary Hypertension in The Parturient

Presenting Author: Lakshmi A. Nerusu, MD
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Co-Authors: Thomas Lambert III, MD - Ohio State University Wexner Medical Center Department of Anesthesiology
Uma Sasso, MD - The Ohio State University Wexner Medical Center

Introduction: Cystic fibrosis (CF) is a rare, autosomal recessive disorder of abnormal transmembrane chloride and sodium ion transport, affecting the respiratory, gastrointestinal, and endocrine tracts. New medications have improved life expectancy and allow more women to conceive and maintain successful pregnancies. The prevalence of CF deliveries has increased 5-fold since the year 2000 (1). Care for these patients in the peripartum period may be complicated by poor pulmonary function, respiratory infection, pregestational diabetes, preterm labor, and Cesarean delivery (2). We present a case of a patient with CF who presented in preterm labor with worsening respiratory symptoms and pulmonary hypertension (PH), requiring urgent repeat Cesarean delivery.

Case One: A 25-year-old G2P1001 woman with CF at 34w3d gestational age presented with shortness of breath and uterine contractions. Pulse oximetry was 93% on room air. Her thick secretions required her to sit reclined to cough effectively. No jugular venous distension or peripheral edema was noted. Because PH had been observed in her second trimester, echocardiogram was repeated prior to surgery and remained unchanged: low-normal RV function with RVSP ~50 mmHg, trace tricuspid regurgitation, and normal LV function. No PFTs were available. These factors suggested that she was not in right heart failure and her intolerance of the supine position was due to her CF exacerbation. A radial arterial line and 2 peripheral intravenous lines were placed. The patient was co-loaded with 250mL crystalloid and given supplemental oxygen. Isobaric 0.5% bupivacaine was selected to allow for adequate spread of local anesthetic despite patient's need to remain reclined. Uncomplicated spinal anesthesia was performed at the L3-L4 with 10mg bupivacaine, 15mcg fentanyl, and 100mcg morphine. This dose was used to account for her pulmonary status and small stature, as well to minimize hemodynamic instability. Norepinephrine infusion was initiated to offset the predicted sympathectomy of the spinal anesthetic. Oxytocin was used as the primary uterotonic, but no bolus was given. The patient tolerated the procedure well and was transported to the cardiac ICU for postoperative monitoring. She was discharged on postoperative day 4.

Discussion: Though increasing amounts of CF patients require peripartum care, little guidance exists on PH in this population. Avoidance of general anesthesia, hypoxia, hypercarbia, as well as medications known to increase pulmonary vasoconstriction is desirable. Invasive monitoring may optimize hemodynamics and guide fluid management. Delivering in a hospital with ECMO accessibility should be prioritized in patients with severe PH. A multidisciplinary approach and

careful postoperative monitoring minimize maternal complications and improve outcomes.

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Nerusu, CF + PHTN in Parturient.pdf

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 06

Complex Care for a Parturient with Supra-Systemic Pulmonary Hypertension

Presenting Author: Kylie Grady, MD
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Co-Authors: Kumiko Chino, MD - UPMC Magee-Womens Hospital
Maria Nanez, MD - UPMC Magee-Womens Hospital
Alexandra Nicholas, MD - UPMC Magee-Womens Hospital

Introduction: Primary pulmonary arterial hypertension (PAH) is the most common of the five types of pulmonary hypertension (PH) among women of reproductive age.Societal guidelines recommend against pregnancy in patients with PAH due to high maternal and fetal mortality. These patients require multi-specialty care coordination and careful anesthetic management.

Case One: A 27 year old female G3P2 at 7 week gestation with known severe PAH with new onset dyspnea, chest pain, syncopal episodes, and oxygen requirement. She had a mixed picture of WHO class 1 and class 4 pulmonary hypertension with PASP of 104 mmHg by RHC 2 years ago. At this time, she was counseled against pregnancy given her severe disease, but was lost to follow up. She was maintained on apixaban, ambrisentan, and riociguat, but self discontinued all medications upon becoming pregnant. A CTA showed acute on chronic saddle PE and TTE showed a compressed LV severely dilated RV with moderate dysfunction, severe tricuspid regurgitation, dilated IVC, and PASP of 181 mmHg. Due to her severe uncontrolled PAH, even after medical optimization with dieresis, she was considered high risk for major cardiac events and maternal mortality and agreed to termination, which was completed without complication under minimal sedation with an inhaled pulmonary vasodilator, invasive arterial monitoring, and a paracervical block.

Discussion: Patients with PAH, considered WHO risk class 4, are extremely high risk for morbidity and mortality. Planning their care requires assembling a multidisciplinary team and ensuring availability of advanced resources. Our pregnancy heart team consisted of OB and cardiac anesthesia, MFM, cardiology, pulmonology, CT surgery, and family planning. Due to the patient's symptoms and supra-systemic PA pressure, we anticipated little to no reserve for tolerating hypercarbia, hypoxia, pain, or significant intravascular volume changes. For this reason, we elected for conscious sedation with a paracervical block, rather than moderate or deep sedation. Our model of coordinated care allowed us to move the patient, along with her care team, from our obstetric hospital to our hospital with CT surgery and advanced mechanical circulatory support. To ensure contingency resources were readily available, the procedure was performed in a cardiac OR with femoral ECMO placeholders and perfusion on standby. The ability to deliver safe outcome to this complex cardiac patient was attributed to having a pregnancy heart team who can assemble the appropriate personnel and resources between our sub-specialty hospitals.

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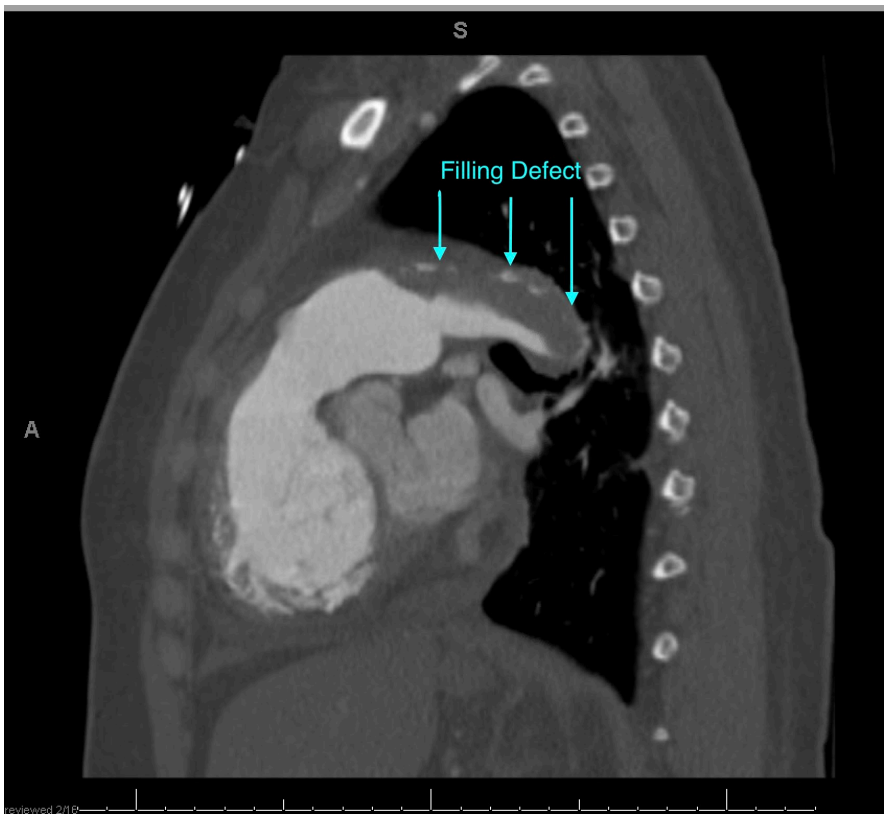

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 07

Anesthesia for Cesarean Delivery in the Setting of Severe Pulmonary Hypertension, Repaired Congenital Diaphragmatic Hernia and Significant Thoracolumbar Kyphoscoliosis

Presenting Author: Rhiannon Kelsh-Lasher, MD, PhD
Presenting Author's Institution: Albany Medical Center
Co-Authors: Saroj Pani, MD - Albany Medical Center

Introduction: Severe pulmonary Arterial Hypertension (PAH) is considered a contraindication to pregnancy(1,2). The right ventricle and pulmonary vasculature do not adapt well to increased blood volume and cardiac output, as well as decreased system vascular resistance. Multi-disciplinary counseling and vigilance is required for patients with PAH that become pregnant. Parturients with PAH will often present with further congenital cardiopulmonary disease, cardiomyopathy or chronic thromboembolic disease that advances their morbidity and mortality.

Case One: Here we present a 28 year old G2P0010 at 23 + 5 wga with worsening dyspnea and O2 desaturation in the setting of severe PAH, right-sided pulmonary hypoplasia, abdominal situs inversus, kyphoscoliosis status post rod fixation and congenital diaphragmatic hernia status post repair. Transthoracic echocardiography (TTE) demonstrated LVEF >55%, dilated RV and RV systolic pressure of 65 mm Hg. Her decrease in functional capacity was attributed to emphysema and severe PAH in pregnancy. Due to her extensive cardiopulmonary pathologies and decreased exercise tolerance, the decision was made to schedule a primary cesarean section at 32-34 wga. After consultation with spine surgery, the patient was not deemed to be a candidate for neuraxial anesthesia due to severe kyphoscoliosis from T3-L5 with prior instrumentation (Figure 1). Prior to induction of general anesthesia, a preoperative arterial line, central line and pulmonary artery (PA) catheter were placed with cardiac anesthesia assistance. Intraoperative TEE was utilized to assess RV performance during and immediately post-delivery. Delivery of the fetus was uneventful, however there was notable RA/RV dilation seen on TEE with a concomitant rise in mean PAP, which transiently resolved with inodilators. She was extubated on minimal pressor support. Interestingly, she was noted to have a mild post-partum cardiomyopathy with LVEF 40-49%. Post-operatively, bilateral quadratus lumborum (QL) catheters were placed and her cardiopulmonary status was closely monitored in the ICU.

Discussion: This case highlights the multisystem organ disease that can accompany significant PAH and the need for multidisciplinary consultation. We anticipated right heart dysfunction following delivery and she did, in fact, have notable RV/RA dilation post-delivery. In a case where general anesthesia is necessary, this highlights the benefit of having intraoperative TEE and PA catheter data to guide RV optimization and pressor/inotropy titration.

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Spine Xray Kelsh Lasher.pdf

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 08

Anaesthesia for Caesarean Delivery in a Pregnant woman with Acute Type B Aortic Dissection and Marfan Syndrome

Presenting Author: Eugene Tuyishime, MBBS, MMed, MSc
Presenting Author's Institution: Western University - Canada, Ontario
Co-Authors: Zachary Androschuk, BSc - Western University
Kevin Armstrong, MD, FRCPC - Western University
Puentes Wilfredo, MD - Western University

Introduction: Type B aortic dissection is associated with high maternal and neonatal mortality. However, there is lack of enough data to inform the best management plan mainly due to inability to design randomized control studies with a search low incidence condition (1). Therefore, we aim to report a case of a 36 years old primiparous with acute Type B aortic dissection at 35 weeks of gestation who underwent caesarean section under general anaesthesia followed by aortic surgical repair.

Case One: 36 years G1P0 presented to a community hospital with severe chest and back pain. A diagnosis of type B aortic dissection was confirmed on CT-Scan. She was managed by labetalol infusion and transferred to our Hospital for further management. She was known for dilated aortic root of 41 mm since 2019. Both her dad and her brother have Marfan syndrome. On arrival, her heart rate 77 beats/min, blood pressure 135/78 mmHg, and saturation 96%. The fetal heart rate was 110 beats per minute. Her investigations were unremarkable other than leukocytosis of 15 and hemoglobin of 124. However, over the subsequent hours her lactate increased to 4.7 four hours later. After initial assessment, she was initiated on nitroglycerin infusion and continuous fetal monitoring. Given her clinical presentation of a complicated type B aortic dissection on a pregnancy 0f 35 weeks, and rising lactate, a decision was made for urgently delivering her baby as well revascularizing her SMA. She underwent general anesthesia with endotracheal intubation. The right radial arterial line and right internal jugular central venous line were placed. Two anesthesiologists (obstetric and cardiac) were available. The following procedures were performed successfully: 1) cesarean section, 2) right external iliac to SMA retrograde bypass, 3) exploration of right renal artery, and 4) cholecystectomy. She was discharged on day 15 after surgery and the DNA testing conducted before discharge confirmed the diagnosis of Marfan Syndrome.

Discussion: Type B aortic dissection in pregnancy is managed according to its severity, gestational age (GA), and maternal and fetal status. Surgical or endovascular repair is indicated in case of complication. If GA is below 28 weeks, the aortic repair is done before delivery while if GA is above 28 weeks a cesarean section is done first followed by immediate aortic repair. There are other high-risk features to monitor among patients with type B aortic dissection who may benefit from early aortic repair: refractory pain or hypertension, bloody pleural effusion, readmission, entry tear located on the lesser curve, and false lumen diameter > 22 mm. The

anesthesia goals are to maintain a normal heart rate,, blood pressure, and preload, while avoiding increases in systemic vascular resistance or myocardial contractility.

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CT Angiography at 3 weeks.pdf

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 09

Anesthetic Management of a Parturient with Severe Tricuspid Regurgitation and Pulmonary Hypertension: A Case Report

Presenting Author: Matthew Roche, MD
Presenting Author's Institution: Department of Anesthesiology and Perioperative Medicine, Western University, London, ON, Canada
Co-Authors: Saleh Al-Nahdi, MBBS - Department of Anesthesiology and Perioperative Medicine, Western University, London, ON, Canada

Introduction: Pulmonary arterial hypertension (PAH) is a condition that is poorly tolerated in pregnancy. This leads to a significantly higher maternal mortality rate between 10-56%. Current guidelines recommend against pregnancy in these patients1. Despite the risks, many patients with PAH choose to continue with pregnancy. In this report, we describe the anesthetic management of a parturient with severe tricuspid regurgitation (TR) and PAH.

Case One: Our patient is a 31-year-old G20010 with severe TR due to recurrent tricuspid valve endocarditis in the setting of previous intravenous drug use. In the third trimester, on transthoracic echocardiogram she was found to have a right ventricular systolic pressure of at least 40-45 mmHg. Septal flattening was noted in systole and diastole suggestive of right ventricular (RV) pressure and volume overload. She was admitted to hospital at 35 weeks due to new pitting edema of 1 week and NYHA class II symptoms. A right heart catheterization was discussed with her which ultimately was declined. Other medical history included multiple lumbar surgeries and previous epidural abscesses. At 36 weeks gestational age, she underwent an elective caesarean section (CS). Anesthetic management consisted of a general anesthetic in the main operating room. A pre-induction arterial line was placed then a titrated induction was used consisting of midazolam, fentanyl, ketamine, and propofol along with a low-dose epinephrine infusion. A 9 French introducer was then placed along with a Swan-Ganz catheter. Pulmonary arterial pressures were ultimately revealed to be normal. The CS was uneventful and she had a planned ICU admission for monitoring and diuresis. She was transferred to the ward on postoperative day 1 and discharged home on postoperative day 4.

Discussion: Although there have been advances in the management of PAH, the mortality rate in pregnancy remains high. Pregnancy provokes significant changes to maternal physiology which are not well-tolerated in patients with PAH and pulmonary vascular remodeling. The final pathway of the pathophysiology of PAH and pregnancy is RV strain/failure1. Both general and neuraxial anesthesia have been used successfully for these patients2. Due to our patient's history of multiple back surgeries, and potential unreliability of neuraxial, we opted for a planned CS under general anesthetic. Hemodynamic goals are avoiding precipitants of increased pulmonary vascular resistance and RV afterload while maintaining systemic vascular resistance2. Ultimately, multidisciplinary management with specialized providers is paramount for these high-risk patients.

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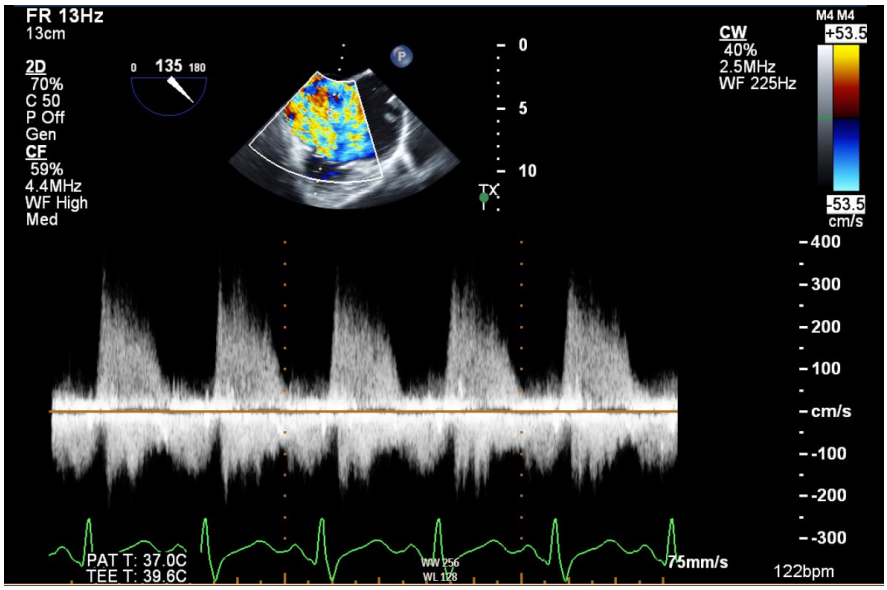

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 10

Medically Indicated Termination of Pregnancy due to Idiopathic Pulmonary Arteriolar Hypertension

Presenting Author: David A. Gutman, MD, MBA
Presenting Author's Institution: Medical Unviersity of South Carolina - Charleston, South Carolina
Co-Authors: Bradley Campbell, MD - Medical University of South Carolina
Cooper Pitts, BS - Medical University of South Carolina

Introduction: Idiopathic pulmonary arteriolar hypertension is associated with high morbidity and mortality. This is further exacerbated by pregnancy due to the physiologic changes of pregnancy. While the need for termination may seem evident to those in the medical fields, this is an immensely complicated and difficult decision for the mothers that are forced to make the final decision.

Case One: We present a 33yo F, G2P1 at 13w5d with past medical history significant for World Health Organization (WHO) Group 1 PAH on pulmonary dilators with sildenafil and ambrisentan who presented for planned termination. She was referred to Maternal Fetal Medicine (MFM) from her initial prenatal care appointment and educated on the risks of pregnancy with pulmonary HTN, including high rates of maternal and infant mortality and the recommendation for PAH patients to avoid pregnancy. Given these risks, she ultimately expressed her desire to terminate the pregnancy. Upon admission, transthoracic echocardiogram was obtained and noted to be significant for moderate-severe PHTN, reduced RV function, septal flattening, and RVSP of 60mmHg. She was transferred to the MSICU for further management under Pulmonary Critical Care specialists and titration of pulmonary vasodilator therapy. She underwent right heart catheterization the following day, which demonstrated elevated right heart pressures. Swan-Ganz catheter was left in place for perioperative pulmonary artery pressure monitoring. A multidisciplinary meeting was held between Obstetric and Cardiac Anesthesia, ICU, Cardiology, and Pulmonary Critical Care providers with the decision to perform D&C with epidural anesthesia under the supervision of a cardiac anesthesiologist. Intraoperatively, an epidural was placed at the L3-4 level and slowly loaded with 2% Lidocaine. Continuous blood pressures were monitored via radial arterial catheter, and neuraxial-induced hypotension was controlled with vasopressin and low-dose epinephrine infusions. CVP and PAP were continuously monitored throughout the case, and maintained at the patient's pre-operative baseline. The patient tolerated the procedure without any apparent complications. Since discharge, the patient has had numerous ED visits for dyspnea and syncope. Several months after her operation, she was transferred back to MUSC from OSH for management of her PAH, with concern for medication non-compliance and substance abuse.

Discussion: IPAH presents a significant challenge for medical management, further complicated by pregnancy. According to the Modified WHO Classification of Maternal Cardiovascular Risk,

PAH of any cause holds a Class IV rating, meaning pregnancy is contraindicated and carries an extremely high risk of maternal mortality or severe morbidity. If the pregnancy is ultimately decided upon, management of these patients requires a multidisciplinary approach and discussions regarding options and risks as early as feasible to reduce the risk of maternal complications.

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 11

Management of a Pregnant Patient with Severe Rheumatic Mitral Stenosis, Aortic Regurgitation and Severe Pulmonary Hypertension. Balloon Mitral Valvuloplasty- What, Why, When, and How?

Presenting Author: Maya Menon, MD
Presenting Author's Institution: Montefiore Medical Center/Albert Einstein College of Medicine - Bronx, New York
Co-Authors: Mohamed Fayed, MD - Montefiore Medical Center
Nickhil Patel, MD - Montefiore Medical Center
Shamantha Reddy, MD, FASA, MD, FASA - Montefiore Medical Center/Albert Einstein College of Medicine

Introduction: Cardiac diseases in the gravid patient have been on the rise in the United States in the recent years and is one of the rising causes of maternal mortality. The physiological changes during pregnancy exacerbate issues with MS, making the timing of any intervention crucial.

Case One: A 24y G1P0, presented with a history of Rheumatic Heart Disease (RHD) since the age of 14. Echo revealed severe AR & severe MS. Mean trans mitral gradient of 17 mmHg and mitral valve leaflet area of 1 cm2 associated with severe pulmonary hypertension and pulmonary artery systolic pressure of 65 mmHg was seen. At 32 weeks, we decided to proceed with a Balloon Mitral Valvuloplasty to provide temporary relief of MS before the increase in plasma volume in the third trimester and in the immediate postpartum. A multidisciplinary team including neonatologists, obstetricians, cardiac surgeons, Interventional cardiologists, perfusionists & a second cardiac anesthesiologist was assembled for a possible emergency C-Section. The procedure was done under general anesthesia with TEE guidance. Post procedurally, mean trans mitral gradient decreased to 5.7 mmHg and mitral valve area increased to 2.3 cm2. During the scheduled C-Section at 39 weeks, the patient received a low dose CSE. Arterial line and transthoracic echo were used to monitor the patient with transesophageal echo on standby. Cell saver was used to minimize allotransfusion. Hypotension from sub arachnoid block was mitigated by phenylephrine infusion which was tapered off intraoperatively. The patient was hemodynamically stable throughout the surgery and recovered uneventfully.

Discussion: -The use of the Abascal echocardiographic score to assess mitral valve morphology provided valuable insights into the expected outcomes of BMV. -Due to the coexisting AR with the MS, ECMO, Impella and other LVAD were not suitable choices for hemodynamic support. Hence, the decision to proceed with BMV to optimize MS was taken. -Minimally invasive procedures to optimize the patient in the second trimester can reduce the risk of general anesthesia and morbidity and mortality during delivery. -The case emphasizes the critical role of a multidisciplinary team, perioperative planning, intraoperative adaptability & consideration of individual patient factors in achieving positive outcomes in such complex scenarios.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 12

HELLP! Pulmonary Hypertension: Anesthetic Management of a Parturient with HELLP Complicated by Undiagnosed Pulmonary Hypertension for Urgent Caesarian Delivery

Presenting Author: oluwadunsin bakare
Presenting Author's Institution: UTGSM
Co-Authors: Matthew Ison – UTGSM

Introduction: Pulmonary hypertension among pregnant women carries a high maternal mortality rate as high as 30-56%. PH is classified into 5 main groups, Groups 1 (pulmonary arterial hypertension) and Group 2 (congenital heart disease) being the two most common causes in pregnant women. Societal guidelines recommend against pregnancy in patients with PH because of an inability of the right ventricle to adapt to the volume shifts and hemodynamic changes associated with pregnancy, labor, and delivery. However, women with diagnosed PH can decide to become pregnant and others might not be diagnosed until during pregnancy.

Case One: A 29y/o G2P1 presented at 35weeks at the advice of her physician due to recent diagnosis of pre-eclampsia. She also noted a remote cardiac pathology that was discovered during her previous pregnancy in Guatemala but did not receive follow up evaluation. She endorsed shortness of breath and fatigue. NYHA II. CTPE showed cardiomegaly with findings suggestive of elevated right heart pressures. An ECHO was then ordered which demonstrated severely elevated right heart pressures (RSVP 120+) and an EF of 45%. A multidisciplinary discussion with OB, cardiology, pulmonology, heart failure medicine, and anesthesia was conducted to ensure adequate optimization of patient before proceeding with surgery. She was diuresed with 40mg Lasix. Although there was concern for HELLP, an epidural was deemed to be the safest anesthesia choice to avoid the extensive hemodynamic swings that can be seen with general anesthesia or spinal. An A-line was placed for invasive BP monitoring, CVL with PA catheter was also employed to monitor PA pressures. Anesthesia was then achieved with a slowly titrated epidural total of 20mg 2% lidocaine with 5mcg/ml epinephrine given over 20 minutes. Due to the severity of her pulmonary hypertension, it was decided to pre-emptively cannulate for ECMO with femoral arterial and venous lines with CT surgery on standby. Per pulmonology recommendation, intravenous epoprostenol 6ng/kg/min intraoperatively. Further diuresis with 20mg IV Lasix was also provided. Surgery was uneventful with successful delivery. The patient received 100mg fentanyl and 3mg morphine for post-op management and was admitted to the ICU for further evaluation and management.

Discussion: Pulmonary hypertension in the parturient is a comorbidity with a high mortality rate. Goal is to avoid increased pulmonary vascular resistance that can lead to right heart overload and cardiac collapse. Diligent evaluation and anesthetic planning with a multidisciplinary team approach should be employed to facilitate safe outcomes.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 13

Management of the Parturient with Idiopathic Pulmonary Hypertension

Presenting Author: Courtney Dorris, MD
Presenting Author's Institution: University of Kansas Medical Center

Introduction: Pulmonary hypertension is a rare disease in pregnancy but is associated with high maternal morbidity and mortality that must be carefully managed for successful outcomes for mother and baby. During a normal pregnancy, pulmonary blood flow increases with compensatory mechanisms to allow the pulmonary artery pressure to remain the same. This, along with decreases in systemic vascular resistance and venous return, create an even more dangerous state for the parturient with pulmonary hypertension. If the right ventricle then becomes dysfunctional, the stress of labor can lead to acute cardiac decompensation.

Case One: This case study will review the successful delivery of a 34-year-old G2P0101 female with pre-existing idiopathic pulmonary hypertension due to careful multidisciplinary planning between pulmonology, obstetric, anesthesiology, intensive care unit, and nursing teams. The patient followed closely with pulmonology prior to pregnancy who managed her medications including a treprostinil pump, tadalafil, and aspirin which was continued through delivery. Planning included serial echoes every four weeks until the third trimester then echoes every two weeks to weekly as needed, early epidural and induction of labor in the medical intensive care unit, with a controlled second stage of labor and forceps-assisted vaginal delivery. Once the patient was at 37 weeks gestation, she was admitted to the medical intensive care unit and her previously placed peripheral intravenous central catheter was accessed, followed by arterial line placement, and then epidural catheter. Dural puncture epidural was performed and induction proceeded with safe delivery of the baby and hemodynamic stability of the patient. While she had one episode of chest tightness during admission and after delivery, it was not found to be cardiac in nature. Her echocardiogram prior to discharge revealed a pulmonary artery pressure of 37.

Discussion: Though most adverse events associated with pulmonary hypertension occur during labor or within one month post-delivery, the rest of this patient's recovery was unremarkable due to the thorough management of her disease process. With collaborative team planning and management, successful outcomes for both mother and baby were achieved.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 14

Undiagnosed Pulmonary Hypertension in Pregnancy Complicated by Postpartum Hemorrhage

Presenting Author: Shonna Gaskin, MD
Presenting Author's Institution: University of Texas Health Science Center at Houston - Richmond, Texas
Co-Authors: Roy Lei, MD - The University of Texas Health Science Center in Houston

Introduction: Pulmonary Hypertension in pregnancy is known to be a high-risk complication with maternal mortality risk reaching 30-56%.2 With the implementation of the multidisciplinary approach, there may be a decrease in the high mortality rate previously reported.1 Perioperative management of pulmonary hypertension in the obstetric population can be further complicated by additional risk factors.

Case One: A 43 y/o G4P0 at 25w6d di-di twins by IVF presented for urgent primary cesarean delivery who was found to have pulmonary hypertension. Patient reported that her prenatal care was in Ghana and denied a previous diagnosis of pulmonary hypertension. When visiting the United States, patient experienced contraction pain, palpitations, and SOB which prompted her to seek medical care. Upon workup, echo showed RV dilation and RVSP of 73mmHg. After arterial line placement, the OB anesthesia fellow performed an uneventful spinal using 1.6ml bupivacaine 0.75% with dextrose, 15mcg fentanyl, and 0.15mg morphine as the spinal dose. Cesarean delivery was complicated by postpartum hemorrhage likely 2/2 uterine atony. An additional 10U of synthetic oxytocin was added to a premixed 30U/500ml synthetic oxytocin infusion at the surgeons request, as well as tranexamic acid 1000mg administered. Despite PPH, patient remained hemodynamically stable throughout the procedure. In the post-operative period, patient was noted to have hemodynamic instability, requiring norepinephrine infusion and transfusion of blood products. Patient continued to experience persistent post-operative bleeding, and was subsequently taken back to the OR for emergent exploratory laparotomy.

Discussion: Due to potential for cardiac instability, intra-operative precautions were taken which included placement of an arterial line prior to neuraxial procedure, defibrillator pads in the case of arrhythmia, placement of arterial and venous femoral catheters for access by CTS in the event ECMO was needed. Postpartum hemorrhage likely 2/2 uterine atony was complicated by contraindications to both methylergonovine and carboprost tromethamine due to pulmonary hypertensive pathology. Despite remaining hemodynamically stable intra-operatively, postpartum hemorrhage persisted requiring take-back to the OR resulting in an emergent total abdominal hysterectomy. After an extensive postpartum hospital course, patient was discharged home on post-operative day nine.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 15

Perioperative Considerations in Managing Aortic Dissection in the Context of Pregnancy and a Rare Genetic Mutation (MYH11)

Presenting Author: Jeric Israel B. Julian, DO
Presenting Author's Institution: Oregon Health & Sciences University (OHSU) - Portland, Oregon

Introduction: Cardiovascular disease is the leading cause of maternal mortality in the United States. Among these pathologies is aortic dissection, a diagnosis that carries an extremely high risk for mortality. While connective tissue disorders and non-syndromic aortic aneurysm mutations are the most significant risk factors in developing dissections, pregnancy itself carries an inherent elevated risk of developing aortopathies due to the hemodynamic and hormonal changes associated with pregnancy and labor. In the context of pregnancy, management of aortic dissections becomes more complicated. When planning aortic arch repairs in the setting of pregnancy, timing and staging are key to minimizing fetal and maternal mortality rates. Although cardiac surgery in the 3rd trimester confers the lowest fetal mortality rate, waiting until then confers an increase in maternal mortality rate from 4.6% to 8.8%. Regarding staging, a single-staged procedure (cesarean section immediately followed by aortic arch repair) has been shown as the only independent factor associated with lower fetal mortality.

Case One: We present a 31-year-old-G1P0 female at 25w1d with recently diagnosed MYH11 gene mutation, a mutation associated with aortic aneurysms and dissections, who presented with abdominal pain. Her work-up would reveal a CTA consistent with a 5.7 cm ascending thoracic aortic dissection. (Figure 1). Her family history was remarkable for a sister who also has a history of MYH11 mutation, and coincidentally, an acute aortic dissection at 26 weeks gestation. Her overall history and imaging suggest that her dissection was chronic, which led to a multi-disciplinary meeting to discuss optimal management. The consensus was in favor of a single-stage procedure at 26 weeks gestation and the aortic arch repair was not deemed emergent given the patient's clinical stability. However, at 25w6d gestation, the patient clinically deteriorated due to a slow-evolving bowel ischemia that ultimately perforated. She underwent emergent classical cesarean section followed by exploratory laparotomy and small bowel resection, which was complicated by severe uterine atony and post-partum hemorrhage. Intraoperative findings revealed long segments of patchy necrosis and spillage of succus. After a series of operations, the patient recovered and underwent a successful aortic arch repair eighteen days after her initial bowel perforation.

Discussion: This case highlights the complexity of managing aortic dissection in pregnancy and the importance of a multi-disciplinary approach. It also highlights the benefits of establishing outpatient medical care, the utility of a well-incorporated family history, and the potential dangers of framing bias.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 16

Anesthetic Planning and Management of a Parturient with Severe Aortic Regurgitation Due to a Dilated Aortic Root Complicated by Thrombocytopenia and Platelet Dysfunction

Presenting Author: Britton Huskey, MD
Presenting Author's Institution: University of Tennessee Medical Center Knoxville - Knoxville, Tennessee

Introduction: Heart disease complicates < 1% of pregnancies but is the leading cause of maternal mortality in the US. Women with valvular disease may not tolerate the hemodynamic changes of labor and delivery, even when asymptomatic before pregnancy. A short and pain-free labor and delivery helps to minimize any hemodynamic fluctuations that could negatively affect the regurgitant lesion, which is why neuraxial anesthesia is an important aspect of their management. When this is complicated by conditions typically contraindicating neuraxial management, such as thrombocytopenia, further guidelines must be investigated. (1)

Case One: A 22 year old female G1P0 at 38 weeks presents for labor induction vs primary cesarean delivery due to a moderate to severe aortic regurgitation and a mildly dilated aortic root and ascending aorta of 4 cm. These findings were detected on echo earlier this pregnancy when the patient was admitted to the hospital at 24 weeks due to exertional dyspnea and chest pain. She has a past medical history of prior but not active pulmonary hypertension, patent ductus arteriosus status post repair in 2002, and history of thrombocytopenia of unknown origin and platelet dysfunction believed to be due to either DiGeorge syndrome, MHY9 gene mutation, or Immune thrombocytopenic purpura. Prior to admission, a multidisciplinary discussion was held about the management of this patient. Cardiology cleared her for attempting vaginal delivery as long as hypertension was avoided and Hematology recommended receiving 2 units of platelets and a dose of Desmopressin prior to epidural placement and removal. The patient received the previously listed medications and an arterial line prior to an epidural being placed. The patient proceeded to successfully deliver vaginally.

Discussion: Since vaginal delivery would necessitate an epidural to prevent hypertension, the advantage of a cesarean section under general anesthesia would be removing the risk of complications from epidural placement in someone with thrombocytopenia. The disadvantage of this route is there is also an increased risk of bleeding with her cesarean section secondary to those same platelet issues. Additionally the patient would not be able to witness her child's birth. However, literature does support that pregnant women with valvular heart disease can tolerate labor very well secondary to pregnancy resulting in lower systemic vascular resistance and a higher circulating volume as long as pain and blood pressure are adequately controlled. With the additional challenge of her platelet history, hematology guidelines are of paramount importance in order to allow placement of an epidural catheter as safely as possible.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 17

Peripartum Type A Aortic Dissection Requiring Emergency C Section and Aortic Repair: A Case Report

Presenting Author: Hannah Schmucker, MD
Presenting Author's Institution: Ochsner Clinic Foundation - New Orleans, Louisiana

Introduction: Aortic dissection in a parturient is rare but has a high mortality. Pregnancy itself is a risk factor for aortic dissection. Risk factors for aortic dissection while pregnant include connective tissue disorder, pre-existing hypertension, and pre-eclampsia with resultant hypertension. We report a type A aortic dissection in a G7P6 parturient requiring emergency section.

Case One: A 42yoF G7P6 at 34w6d with PMH of anxiety, hypertension, advanced maternal age, and tobacco use presented to outside ED with acute R neck pain radiating to chest and back that began the night prior. Prior deliveries were uncomplicated vaginal deliveries. Her only home medication was nicardipine. In the ED her vitals signs were BP 148/94, HR 88, and RR 18. Physical exam was unremarkable. OBGYN evaluated her with no contractions nor decelerations identified on EFM/TOCO. EKG, CBC and BMP were within normal limits. D-dimer was elevated to 6,206. CTA revealed type A thoracic aortic dissection. Patient started on esmolol and nicardipine drips and transferred to our facility. After multidisciplinary discussion, the decision was made to proceed with emergency cesarean delivery followed by CT surgical aorta repair. In the OR patient received versed and ketamine. The anesthesia team placed a preinduction arterial line, initiated general anesthesia, intubated the patient, and placed a 12Fr introducer for potential resuscitation. Cesarean section was performed via a vertical midline incision and low transverse hysterotomy. Infant was born with APGARS 1/4/8 followed by placement of a Bakri balloon for bleeding prophylaxis. Intraoperative findings included normal appearing ovaries, fallopian tubes, uterus, and placenta. Intraoperative echo showed Stanford Type A dissection from STJ extending through the thoracic aorta with no aneurysmal disease. CT surgery then began their portion of the case. CPB and circulatory arrest were initiated and the aortic arch was repaired. Total CPB time was 154 minutes. Patient received 2L crystalloid, 500cc cell saver, and 2u FFP. Estimated blood loss was 750cc. She was transported to ICU intubated. POD1 patient was extubated. Bakri balloon removed with 30cc. She discharged home POD7. Her child was admitted to the NICU for apnea of prematurity and improved. He was monitored until he met nutritional goals discharging home on day 14.

Discussion: Time to diagnosis is important for outcomes of aortic dissection in the parturient. The mortality rate for untreated aortic dissections increases by 1–3% per hour after presentation. Mortality is 25% during the first 24 hours and up to 70% at 1 week and 80% at 2 weeks1. Clinicians must have a high index of suspicion for aortic dissection and good coordination with other specialties in order for a successful outcome.

References: Pitt MP, Bonser RS. The natural history of thoracic aortic aneurysm disease: an overview. J Card Surg. 1997 Mar-Apr;12(2 Suppl):270-8. PMID: 9271756.

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 18

Anesthetic Management of a Parturient with Moyamoya Disease for Vaginal Delivery

Presenting Author: Raji Naamani, MD
Presenting Author's Institution: Cleveland Clinic
Co-Authors: Jose Diz Ferre, MD - Cleveland Clinic Foundation

Introduction: Moyamoya disease (MMD) is a chronic vasculopathy characterized by intracranial arterial narrowing, particularly affecting the internal carotid arteries and Circle of Willis, leading to collateral vessel formation(1). It most commonly manifests with cerebral ischemic events but can also present with complications of collateral vessel growth, such as intracerebral hemorrhage(1). Surgical revascularization is the primary treatment for MMD. Physiologic changes of pregnancy, including hyperventilation and hypercoagulable state, may increase the risk of ischemic stroke(2). Though cesarean delivery has been more often described in the literature for these patients, we present the case of a parturient with MMD who delivered vaginally.

Case One: A 33-year-old primigravida with incomplete prenatal care presented at 34w4d gestation with preterm premature rupture of membranes and a fully dilated cervix. Medical history included MMD complicated by ischemic left middle cerebral artery stroke (status post STA-MCA bypass), seizures controlled on levetiracetam, and chronic hypertension. Decision was made to proceed with vaginal delivery, with vacuum-assistance if necessary to minimize valsalva, and a labor epidural was initiated. Vital signs remained within normal limits throughout, and no vasopressors or invasive monitoring were utilized. The delivery was uncomplicated, without need for vacuum assistance, and an IUD was placed immediately per patient request.

Discussion: Managing MMD and the physiologic changes in labor can be challenging given the primary goals of maintaining cerebral blood flow (CBF) and controlling blood pressure(2). Neuraxial anesthesia blunts the sympathetic response to pain, promoting normocapnia (maintaining CBF) while reducing risk of intracranial bleeding secondary to hypertension. It also allows ongoing neurological assessments, facilitates an assisted second stage of labor, minimizes risk of maternal aspiration and neonatal depression due to anesthetics, and avoids the increase in cerebral metabolic rate with tracheal intubation. A vaginal delivery mitigates the higher blood loss and thromboembolic risk of a C-section, and vacuum-assistance could help prevent increases in systemic and intracranial pressure with valsalva. If general anesthesia is required, an adequate plane of anesthesia is needed before laryngoscopy to avoid hypertension. It is also critical to target normovolemia and avoid hypocapnia, alkalosis, hypothermia, or hemorrhage-induced hypotension which could all worsen cerebral ischemia.

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Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 19

Splenic Artery Aneurysm Rupture in a Pregnant Patient at 30 Weeks Gestation: A Case Report

Presenting Author: Sunti Barahi
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Co-Authors: Sean Crawford, Vascular Surgery - University of Toronto
Shiri Shinar, Obstetrician and Gynecologist - University of Toronto

Introduction: Splenic artery aneurysm (SAA) is an exceedingly rare anomaly, with rupture often seen in pregnancy due to increased blood volume and hormonal changes [1, 2]. SAA is often asymptomatic and is typically discovered incidentally during imaging or in a setting of an acute presentation. SAA ruptures can lead to fatal hemorrhage, especially due to late diagnosis and hence, delayed treatment. We present a case of SAA rupture in a pregnant patient, with initial unknown diagnosis and its successful management.

Case One: A 37 year old, primigravida presented to labor and delivery triage at 30+5 week of gestation with syncopal episode, difficulty breathing and left upper quadrant abdominal tenderness. Past medical history was significant for type 2 diabetes, ventral epigastric hernia. Her BMI was 44kg/m^2. On examination, her blood pressure was 70/30 mmHg, heart rate was 144 beats/minute, and SPO2 was 100%, without any obvious vaginal bleeding. However, her abdomen was tender on palpation. Norepinephrine infusion and fluid bolus were started. Bedside ECG and echocardiogram were normal. Labs showed Hemoglobin: 123mg/dl, Platelets: 361x10^9/L, WBC: 20.13x10^9/L. Emergency cesarean section was called for fetal bradycardia. General anesthesia with endotracheal intubation was administered uneventfully, and arterial line and central venous catheter were secured. After the delivery of the baby and closure of uterus, a gush of blood appeared from epigastric region. Meanwhile, the patient was still hemodynamically unstable with hemoglobin now dropping to 83mg/dl. General and vascular surgeons were called, who found a ruptured SAA. Exploratory laparotomy with splenectomy and SAA repair were done with supraceliac aortic compression to control bleeding. Total blood loss was 15 liters and massive transfusion protocol was activated. She received transfusion of 22 units of packed red cells, 12 units of plasma, 8 grams of fibrinogen, and 2 pooled platelets. She was later transferred intubated in stable condition to ICU (Fig 1). Unfortunately, the baby did not survive. Her recovery was complicated by reintubation and wound infection. After meticulous dressing and physiotherapy, she was discharged from the ICU and finally sent home.

Discussion: SAA rupture in pregnancy is a life threatening condition. Rapid Focused Assessment with Sonography in Trauma scan would be helpful in the diagnosis. Prompt diagnosis and multifaceted treatment approach is the key for both maternal and neonatal survival [3]. Further research could illuminate the association of SAA with pregnancy, high BMI and management strategies.

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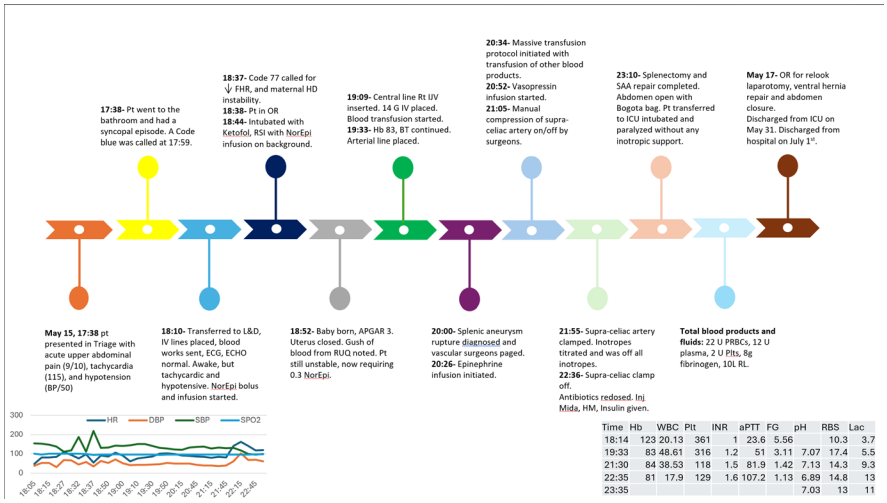
pregnant women. JVS 2014;60:1520-23 2. de Vries JE et al., Complications of splenic artery aneurysm other than intraperitoneal rupture. Surgery 1982;91:200-4 3. MacFarlane JR et al., Rupture of splenic artery aneurysm during pregnancy. AJOG 1966;95:1025-37



Time	Hb	WBC	Plt	INR	aPTT	FG	pH	RBS	Lac
18:14	123	20.13	361	1	23.6	5.56		10.3	3.7
19:33	83	48.61	316	1.2	51	3.11	7.07	17.4	5.5
21:30	84	38.53	118	1.5	81.9	1.42	7.13	14.3	9.3
22:35	81	17.9	129	1.6	107.2	1.13	6.89	14.8	13
23:35							7.03	13	11

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 20

Navigating the Storm: Anesthetic Management of a Rare Case of Pheochromocytoma During Pregnancy

Presenting Author: Rebecca S. Himmelwright, MD
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Co-Authors: Terrence Allen, MD - Duke University Department of Anesthesiology
Jatin Anand, MD - Duke University Department of Anesthesiology
Jennifer E. Dominguez, MD, MHS - Department of Anesthesiology, Duke University

Introduction: Pheochromocytomas are uncommon in the general population and rare among obstetric patients (1:54,000). While improved medical and surgical management has decreased maternal and neonatal mortality, morbidity remains high. We present the management challenge of a young woman found to have a large, active pheochromocytoma (pheo) in her third trimester before safely undergoing a cesarean delivery under neuraxial anesthesia.

Case One: A 30-year-old G6P3023 with obesity, chronic hypertension and history of preeclampsia underwent a workup for labile blood pressure at 26-weeks-gestation revealing dramatically elevated urine metanephrines (>27k mcg/24h) and a large (9.8x6.7cm) left adrenal mass consistent with a pheo. At the time, she reported episodic tachycardia, hypertension, flushing, and headache alternating with hypotension and presyncope. Simple stimuli (e.g. stress or left lying) provoked a catecholamine surge. She was hospitalized for the remainder of her antepartum course. Blood pressure control and symptomatology improved with titration of alpha and beta blockade therapy leading up to a cesarean delivery at 34-weeks. After extensive discussion, neuraxial anesthesia (NA) was deemed the optimal anesthetic technique for her delivery. A PICC line was obtained preoperatively, and an arterial line was placed prior to NA. A combined spinal epidural technique was performed at L3-4; a decreased spinal dose (9mg hyperbaric bupivacaine, 15mcg fentanyl, 100mcg morphine) established the block and a surgical anesthetic level to T3 was obtained with gradual epidural boluses of buffered lidocaine 2%-epi 1:200K. A magnesium sulfate infusion was initiated at 2g/hr on arrival to the OR and boluses (2-4mg/kg) were administered throughout the case. A dexmedetomidine infusion (0.2-0.4mcg/kg/hr) provided anxiolysis. An esmolol infusion was required throughout (25-50mcg/kg/min) to prevent tachycardia. Norepinephrine and clevidipine infusions were required for hypotension and hypertension, respectively. Blood pressure peaked at 186/94 during topicalization for NA and nadired at 93/47 with uterus reinsertion otherwise, BP was maintained within 20% of baseline. Transversus abdominis plane blocks were performed with liposomal bupivacaine prior to transport to the intensive care unit for recovery. There she transitioned oral antihypertensive and anti-impulse therapy before discharging home on postoperative day 2 with plans for interval adrenalectomy in 4-6 months. Her infant was discharged home after an uneventful 2-week NICU course.

Discussion: A committed multidisciplinary team (MFM, OB anesthesia, endocrinology, and endocrine surgery) was essential in the management of this patient. Preoperative optimization over several weeks achieved AP stability allowing for successful delivery under NA after shared decision making regarding the anesthetic technique.

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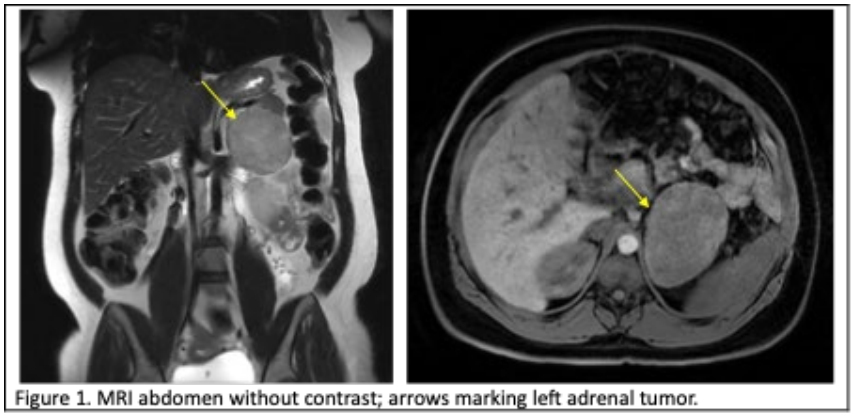

Figure 1. MRI abdomen without contrast; arrows marking left adrenal tumor.

Abstract #: SAT – CR – BS 3 – BR 4 – Oh No - Pulmonary Hypertension, Dissecting Aortas & Pheochromocytoma – 21

Pregnancy and Type IV Ehlers Danlos Syndrome

Presenting Author: Komal Chaudhry, MD
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Co-Authors: Phillip Cato, MD - University of Tennessee Graduate School of Medicine
Ashley Hambright, MD - University of Tennessee Graduate School of Medicine

Introduction: Ehlers Danlos Syndrome (EDS) is a collection of six genetic connective tissue disorders with a prevalence of 1 in 5,000 individuals. Of these, approximately 5% are type IV, which has an autosomal dominant inheritance pattern. This subtype leads to vascular complications secondary to a structural defect of type III collagen. Ultimately, this causes gastrointestinal, obstetric, and arterial fragility or rupture and is associated with a reduced life expectancy of approximately 48 years.

Case One: A 25-year-old female patient, G3P0 at 33 weeks' gestation, presented for a primary cesarean delivery due to a history of type IV EDS. Her past medical history included hypertension, anemia, post-operative nausea/vomiting, and bowel perforation requiring small bowel resection. At 26 weeks' gestation, she underwent head CT angiogram which showed bilateral cervical internal carotid artery (ICA) nonocclusive dissections, left upper and right mid-cervical ICA saccular aneurysms, and possible nonocclusive basilar artery and bilateral petrous segment ICA dissections. Vascular surgery recommended strict blood pressure control (less than 120/80 mmHg), transfusion as appropriate for anemia, and desmopressin if needed in the peripartum period. The patient was evaluated in the pre-anesthesia clinic and counseled on the risks and benefits of neuraxial versus general anesthesia. Following this discussion, she opted to undergo general anesthesia for her delivery. A 16-gauge midline and 18-gauge peripheral IV was used for vascular access, and typed and cross-matched blood was readily available. Rapid sequence induction was performed with 200 mg propofol, 180 mg succinylcholine, and 100 mg esmolol. Intraoperatively, the patient received bilateral TAP blocks and 1 mg hydromorphone to manage post-operative pain. She remained hospitalized for treatment of wound cellulitis and was discharged on post-operative day six.

Discussion: Parturient patients affected by type IV EDS are recommended either termination of pregnancy prior to 16 weeks' gestation or early delivery at 32 weeks' gestation given a maternal mortality rate of 20%. Literature recommends avoidance of invasive blood pressure monitoring in non-emergent situations due to considerable risk of vascular wall dissection, although use of ultrasound can mitigate this complication. While successful neuraxial anesthesia in patients with type IV EDS has been reported, there is no obvious benefit over general anesthesia in these patients and further investigations are needed to estimate risks of hematoma formation, perforation, or nerve injury.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 01

A Case of Serotonin Syndrome During Intrapartum Cesarean Delivery

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Introduction: Serotonin syndrome (SS) is a rare but potentially life-threatening syndrome caused by overstimulation of serotonin receptors leading to autonomic hyperactivity, altered mental status, and neuromuscular aberrations (1). We present a case of SS during intrapartum cesarean delivery (CD) after administration of commonly used medications.

Case One: A healthy 31-year-old G1P0 presented for induction of labor for polyhydramnios. After a prolonged labor course with epidural analgesia, she underwent a CD for arrest of descent. Epidural lidocaine, fentanyl, and morphine were administered for surgical anesthesia. Ondansetron was administered. Shortly after delivery, epidural chloroprocaine was given for breakthrough pain. Refractory uterine atony despite prophylactic oxytocin was treated with methylergonovine. Midazolam and promethazine were administered for significant anxiety and persistent nausea, respectively. The patient developed acute alternating somnolence and combativeness. After initial hypotension, she experienced significant hypertension, tachycardia, and hyperthermia to 39.9°C. Upper extremity hypertonicity also developed. The patient stabilized after 1.5 hours of supportive care with an abrupt return to baseline mental status. Postoperatively, the patient's creatinine kinase peaked to 1972 U/L. Workup was negative for thyroid storm, sepsis, preeclampsia, and posterior reversible encephalopathy syndrome. The neurology service was consulted, and SS was felt to be the likely diagnosis. Potential serotonergic triggers identified were fentanyl, ondansetron, promethazine, and methylergonovine (Table 1). The patient was discharged uneventfully on postpartum day 4.

Discussion: This case of intraoperative SS was characterized by autonomic instability, altered mentation, and pyrexia in a healthy parturient after exposure to multiple medications with serotonergic properties. SS is a clinical diagnosis; the differential includes neuroleptic malignant syndrome (NMS), malignant hyperthermia, anticholinergic toxicity, thyroid storm, and sepsis. Many clinical features of SS and NMS overlap, but SS is distinguished by neuromuscular hyperreactivity (hyperreflexia, myoclonus) and shorter time course while NMS is characterized by sluggish neuromuscular response (rigidity) and slower resolution over days. Given the acute onset and resolution of symptoms, SS was deemed most likely. Management of SS includes discontinuation of serotonergic agents, sedation with

benzodiazepines, supportive care with the goal to normalize vital signs, and treatment with a serotonin antagonist. Fentanyl, ondansetron, and methylergonovine are all commonly used medications during CD that each have potential serotonergic effects (2). Despite their frequent use, there are no known reports of peripartum SS. Care should be taken, as SS can recur upon subsequent exposure to serotonergic medications.

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Wen- A Case of Serotonin Syndrome During Intrapartum Cesarean Delivery Table.pdf

Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 02

Took Much of a Good Thing: High Dose Aspirin and Neuraxial Anesthesia

Presenting Author: Sara Dryden, MD
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Co-Authors: Erin Dengler, MD, MBA - University of North Carolina at Chapel Hill

Introduction: Spinal epidural hematoma (SEH) is a potentially devastating complication of neuraxial anesthesia. Low-dose Aspirin (ASA) is commonly prescribed to parturients as prophylaxis for Pre-eclampsia. While low-dose ASA is nearly universally accepted as safe (1), there are limited recommendations on high dose ASA and the risks associated with neuraxial placement. This case brings the question of safety regarding neuraxial anesthesia in a patient taking 1690mg of ASA daily.

Case One: A 36yo G1P0 at 39 weeks gestation was admitted for induction of labor (IOL) for Multiple Sclerosis, well controlled off medication. Additional history included chronic hypertension on prophylactic low-dose ASA, iron deficiency anemia and obesity (BMI 41 kg/m2). During anesthesia evaluation, the patient reported taking a high dose ASA pain reliever twice daily for the past two weeks, totalling 1690 mg of ASA per day. Given the relative contraindication to neuraxial and concern for post-partum haemorrhage, IOL was postponed. The patient was scheduled to return in 5-7 days. However, 3 days later the patient presented with spontaneous rupture of membranes. Hematology was consulted, and platelet function assay and serum Salicylate level obtained to elucidate safety of neuraxial placement. Following a risk/benefit discussion and detailed informed consent, the patient requested a labor epidural which was completed without complication. Labor progressed with a persistent Category II tracing. Following a fetal bradycardia event, urgent Cesarean delivery was performed. The fetus was delivered without complication, under epidural anesthesia.

Discussion: There is limited published data on high-dose ASA and safety of neuraxial anesthesia. ASRA guidelines recommend no change in practice for patients on low-dose ASA (1). It is generally accepted that ASA alone, without additional antithrombotic medications or bleeding conditions, does not increase risk of spinal hematoma (2). ASA inhibits platelet function for the life of the platelet, but varying dosages may affect function differently. Low-dose ASA (< 325mg) inhibits the synthesis of thromboxane A2, decreasing platelet aggregation. High dose ASA (1.5-2g/day), also inhibits prostacyclins (inhibitors of platelet aggregation), causing a thrombogenic effect, theoretically decreasing bleeding risk (1). European guidelines address high dose ASA (>200mg), recommending waiting 3-7 days from last dose prior to neuraxial anesthesia (3). Ultimately, there is little evidence to inform safety of neuraxial anesthesia in patients on high-dose ASA. Patient education, risk/benefit discussion and shared decision making must guide care.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 03

Maternal Arrest from High Spinal after Local Anesthetic Bolus Through a Replacement Epidural Catheter Following Prior Placement of an Intrathecal Catheter

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Co-Authors: Greg Ginsburg, MD - Massachusetts General Hospital/Harvard Medical School

Introduction: Total spinal anesthesia is a rare life-threatening complication associated with accidental dural puncture. We report a case of total spinal anesthesia and maternal arrest following emergent chloroprocaine bolus through a replacement epidural catheter proximate to prior unintentional intrathecal catheter placement.

Case One: A 30-year-old G1P0 at term presented in active labor. Immediately after a seemingly uneventful epidural catheter placement, 2mL of clear fluid was aspirated. The catheter was presumed to be intrathecal and removed. A second epidural catheter was placed without complication, and the epidural functioned normally. Approximately ninety minutes after this, fetal bradycardia necessitated emergent cesarean delivery. Following negative epidural catheter aspiration, 20mL 3% chloroprocaine was quickly administered. She rapidly became unresponsive and PEA was noted. A maternal code was initiated. The fetus was rapidly delivered and she had eventual ROSC and a full recovery without sequelae. She later developed a classic post dural puncture headache which resolved after epidural blood patch.

Discussion: We theorize that a dural hole from the initial intrathecal catheter provided a conduit for epidural chloroprocaine to migrate intrathecally, thus resulting in total spinal physiology and cardiac arrest. Epidural overdose, catheter migration, or unidentified intrathecal catheter are other possible mechanisms. Alternative management strategies for this clinical scenario include modifying epidural boluses, proceeding to general anesthesia directly, or continuing with an intrathecal catheter. All have risks; a lower dose may result in inadequate surgical level, and/or perhaps a similar total spinal physiology. General anesthesia entails its own risks and would be an unconventional choice with a normally functioning epidural, even with a known prior dural puncture. Placing and using the initial intrathecal catheter may have prevented this unusual scenario. However, an intrathecal catheter raises alternative concerns which often center around lack of familiarity, potential for mismanagement or overdose, and risk of infection (1-3). We are unaware of any guidelines or literature which establish a safe time period between unintentional dural puncture and subsequent epidural bolus for surgical level. Many epidurals placed following unintentional dural puncture may appear to function normally, though lack of careful level testing may obscure those that function more robustly. We advocate to consider lightly dosing such epidurals in the early hours after placement, given this case, which suggests extra caution at least within the first 90 minutes.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 04

We Remember it all Too Well - the Time our Patient got an Entire Epidural Bupi/Fentanyl Bag Bolused I.V.

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Presenting Author's Institution: George Washington University Hospital
Co-Authors: Andrew Canonico, MD - George Washington University Hospital
Marius Fassbinder, MD - George Washington University Hospital

Introduction: Bupivacaine, combined with opioids, is used in epidural infusions for labor analgesia. The mixture is considered safe when administered correctly; however, improper administration of narcotics and/or local anesthetics can lead to serious complications like CNS, LAST (local anesthetic systemic toxicity), respiratory and/or cardiovascular collapse. A medication error can occur at any stage of the medication use process (i.e. prescribing, dispensing, and administering a medication). In this report, we examine the case of a medication error involving the inadvertent administration of a large dose of bupi & fentanyl in a laboring patient on the obstetric unit.

Case One: A 36 yo F, G6P4 at 39 weeks gestation, presented for elective induction of labor. Her med hx included BMI 45 kg/m2, asthma, iron deficiency anemia, and migraines. While in labor, the patient requested an epidural for analgesia. A combined spinal epidural was performed, and 2.5 mg bupi was given intrathecally. An epidural catheter was placed successfully but was not attached to an epidural pump. It was relayed to the bedside nurse to waste the epidural solution bag (250ml of 0.0625% bupi+ 2mcg/ml fentanyl) instead of attaching it to an infusion pump & epidural catheter. The patient had a spontaneous vaginal delivery approximately 30 minutes after block placement. 90 minutes after the delivery, the anesthesia resident on the labor floor was informed the patient had received all 250ml of the epidural bag as an I.V. bolus over 20 minutes. On exam, the patient reported lightheadedness. Intralipid was given with the rapid response team at bedside. Afterwards, the patient was transferred to the ICU for continuous EKG, oxygenation, and ventilation monitoring. This patient did not show any clinical signs of respiratory depression. Following 12-hours of monitoring, she was transferred back to the antepartum floor and was discharged home on postpartum day 2.

Discussion: The maximum safe dose of bupi depends on factors such as the route of administration, the site of injection, additional adjuncts, etc. The maximum safe dosage is 2.5-3 mg/kg. In this case, the amount of bupi given to the patient was well below the maximum safe dose due to our dilute infusion (157mg vs. max dose of 324mg). Regardless, it is important to act quickly if there is suspected LAST symptoms from inadvertent medication administration. Fentanyl overdose can lead to serious respiratory depression, cardiovascular collapse, and even death. Signs of opioid toxicity include extreme sedation, respiratory depression, pinpoint pupils, and unconsciousness. Managing an overdose requires prompt

recognition and appropriate intervention including assessing a patient's airway, breathing, and circulation, providing supportive care and naloxone administration.

References: Morau, Didier MD*; Ahern, Sinead FCARCSI†. Management of Local Anesthetic Toxicity. International Anesthesiology Clinics 48(4):p 117-140, Fall 2010. | DOI: 10.1097/AIA.0b013e3181faa464

Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 05

Managing Labor Pain in a Patient with Lidocaine Allergy: A Case Study in Epidural Anesthesia Alternatives

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Presenting Author's Institution: University of Kentucky, Kentucky
Co-Authors: Erica Davis, MD - University of Kentucky
Jon Holzberger, MD - University of Kentucky
Joshua Lopez, MD - University of Kentucky

Introduction: Local anesthetic (LA) allergies are rare, but if identified, pose a major challenge in providing analgesia in labor. Amides are the most common class of LA used in labor epidurals, so avoidance in a patient with possible allergy leaves limited alternative options, such as the ester LA chloroprocaine. While chloroprocaine is used commonly for emergent C/S for neuraxial surgical block, there are only limited case reports where chloroprocaine has been used as an infusion during labor. This is because it undergoes rapid hydrolysis by pseudocholinesterase.

Case One: This is a case of a 19yo F G1P0 at 36w4d for IOL who had recent acute cholecystitis with perforation requiring gall bladder drainage as well as PMH of asthma, gastroschisis and lip augmentation. Patient reported 2 episodes of reactions to lidocaine. Once it was for a forearm tattoo, where lidocaine cream caused localized swelling and hives. Another episode was before lip injections, when again lidocaine cream on her lips caused severe facial swelling (Image 1) and procedure cancellation. She had not had any other LA exposure or formal allergy testing and wanted to avoid lidocaine. During her IR drain placement, chloroprocaine was used for the skin. After discussion with pharmacy, a chloroprocaine infusion syringe was prepared with 1.5% chloroprocaine and fentanyl 2mcg/ml. After uncomplicated epidural placement, 5ml of the solution was given as the intrathecal test dose, followed by another 5cc for T10 level and then the infusion was started at 12ml/hr with 5ml patient-controlled boluses available every 20 minutes. The patient became hypotensive and was lightheaded with T6 levels 20 minutes after placement, so the infusion was reduced to 8cc/hr and she remained hemodynamically stable and comfortable. When she was 9cm dilated she required 2 x 5ml boluses of 3% chloroprocaine due to perineal discomfort and back pressure along with 100mcg fentanyl. At 9cm a C/S was called due to recurrent late fetal decelerations and arrest of dilation for 4 hours. She required 15cc of 3% chloroprocaine (given in 5cc aliquots) for a T6 surgical level. This was along with 50mcg fentanyl epidurally and she had no issues during her C/S. Morphine was avoided due to the efficacy concerns with recent chloroprocaine, and she had an IV PCA for post op analgesia. She did well and was discharged day 2 post C/S and was referred for formal allergy testing.

Discussion: This is a unique case where a patient with allergy to topical lidocaine was requesting an epidural in labor. After literature review, and discussion with the patient and

pharmacy, she successfully had labor analgesia and C/S with neuraxial chloroprocaine. Dosing the epidural for labor analgesia required some titration due to limited experience, with an 8cc/hr dose optimal for our patient. We did not see tachyphylaxis despite the infusion running for over 24 hours and 660mg chloroprocaine given in total.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 06

Intrathecal 3% Chloroprocaine for Cesarean Section in a Patient with Lidocaine Anaphylaxis

Presenting Author: Damon Wallace, MD
Presenting Author's Institution: University of North Carolina - Durham, North Carolina
Co-Authors: Erin Dengler, MD, MBA - University of North Carolina at Chapel Hill

Introduction: Amide-based local anesthetics are ubiquitous in the practice of obstetric anesthesia. Ester-based local anesthetics like chloroprocaine, however, are typically reserved for rapid onset of epidural analgesia in the setting of vaginal laceration repairs and manual placental extractions, PCEA for patients with lidocaine allergies (1), and conversion of labor epidurals for emergent Cesarean deliveries. Its use as an intrathecal anesthetic in this population is most commonly seen with cervical cerclage placements (2). Due to its short duration of action and less predictable intrathecal spread, it has generally been avoided as a spinal anesthetic for C-sections given effective alternative options. In patients with contraindications to amide-based anesthetics, chloroprocaine can be used as a safe alternative.

Case One: We present the case of a morbidly obese (BMI-57) 27-year-old G5P0131 woman with documented anaphylaxis to lidocaine. Her obstetric history is significant for a successful vaginal delivery using 3% chloroprocaine PCEA. She was admitted for superimposed pre-eclampsia with severe features (blood pressure) at 32w3d and was additionally found to have a transverse lie. She underwent a primary C-section after refusal of ECV using intrathecal chloroprocaine. She received a combined spinal-epidural using 3% chloroprocaine for skin infiltration, 1.8mL (54mg) 3% chloroprocaine, 15mcg fentanyl, and 100mcg morphine for intrathecal dosing with a sensory level to T4 bilaterally. She required 10mL 3% chloroprocaine and 85mcg fentanyl via her epidural for supplemental analgesia as her initial level faded around 52 minutes after intrathecal injection. The C-section was completed without complication in 39 minutes under this neuraxial technique.

Discussion: Although anaphylaxis to local anesthetics is rare, it presents significant issues for the anesthesia team. There is little data on the use of intrathecal chloroprocaine in obstetrics apart from cerclage placement. The ED90 of intrathecal chloroprocaine with fentanyl for cerclage placement is reported as 49.5mg (3). Given this and its isobaric preparation, we administered a slightly higher dose for this procedure with the plan to re-dose through the patient's epidural catheter. Therefore, we present this case as an example of an alternative technique for neuraxial anesthesia in patients with allergies to amide-based local anesthetics, especially in those at high risk from general anesthesia.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 07

Local Anesthetic Resistance in Patient Scheduled for Cesarean Section

Presenting Author: Bradley Skene, DO
Presenting Author's Institution: Ochsner Health - New Orleans

Introduction: Local anesthetics (LA) are widely used for surgical anesthesia; insufficient analgesia is often attributed to patient fears, inadequate dosing, or improper administration. In situations when these factors are excluded, case reports exist of proposed LA resistance, a potentially perplexing problem for the anesthesiologist and proceduralist.

Case One: A 38-year-old woman, G4P2 presented for obstetric anesthesia consultation as a referral from her obstetrician due to a history of failed epidurals and spinals during her prior deliveries. At the time of consultation, the patient's estimated gestation age was 31 weeks and she was scheduled for a repeat Cesarean section in approximately 2 months. The patient reported two prior surgical deliveries, one 20 years ago and another 16 years ago, both had failed epidurals including one with a failed spinal. Both ultimately resulted in general endotracheal anesthesia (GETA). The patient denied issues with GETA. Per the patient's report, there was no issues with placement of the epidurals or spinal, but she did not achieve sufficient surgical analgesia. Additionally, she endorsed having no analgesic effect from LA used in dental procedures. The patient has a history of Wolff-Parkinson-White syndrome treated with cardiac ablations attempted with LA, but also had to be converted to general anesthesia. The patient was adopted and her family history is unknown. She has not had any genetic testing performed. The patient's previous anesthetic records were located at an outside hospital and were not available for review. Given the patient's prior uncomfortable and traumatic experiences with LA failure, and suspected resistance to local anesthetics, she was offered a GETA for her upcoming delivery. At 39 weeks gestational age, the patient presented for Cesarean section and underwent an uncomplicated delivery with GETA. She recovered uneventfully and discharged from the hospital three days later.

Discussion: This case demonstrates the discovery of repeated LA failures with presumed diagnosis of LA resistance in a parturient planned for repeat Cesarean section. Little is known regarding the mechanism of LA resistance. In a recent literature review by Marti et al. (1), five different mechanisms and risk factors for LA resistance are evaluated including a voltage-gated sodium channel receptor mutation, exposure to scorpion stings, Ehlers-Danlos syndrome, high opioid consumption, and MCR1R mutation in red-haired individuals. These studies may offer some insight into possible risk factors, however, there still remains a dearth of evidence and the possibility of LA resistance must remain on every anesthesiologists' differential diagnoses when troubleshooting LA failure.

References: (1) Marti F, Lindner G, Ravioli S. Resistance to local anaesthetics: a literature

review. British Journal of Anaesthesia. 2022; 129(2):e43-e45.

Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 08

Motor-Sparing Epidural Anesthesia with Lidocaine for Cesarean Delivery

Presenting Author: Kayla Robinson, MD, MS
Presenting Author's Institution: University of Mississippi Medical Center - Jackson, Mississippi
Co-Authors: Chawla L. Mason, MD, n/a - University of Mississippi Medical Center
Kimberly K. Thomas, MS3 - University of Mississippi Medical Center

Introduction: Neuraxial anesthesia is the preferred option for cesarean delivery (C/S). However, failed block remains a complication of neuraxial techniques, necessitating block assessment. Multiple block assessment methods have been described in the literature, even those recommending motor assessment using the Bromage scale. But what happens when an unexpected differential blockade occurs? Herein, we present an interesting case of a motor-sparing epidural anesthetic for cesarean delivery.

Case One: Our patient is a 19 year-old primigravida who presented to our hospital at 34 weeks, 3 days gestation for PPROM. She was admitted to labor and delivery (L&D) for induction of labor. Anesthesiology was consulted, and a lumbar epidural was placed. 0.1% Ropivacaine with 2 mcg/mL Fentanyl solution was initiated at 6 mL/hr. 5 hours later, persistent variable decelerations were noted on fetal tracing. Decision was made to proceed to operating room (OR) for urgent C/S. A 20 mL Lidocaine 2%, 2 mEq $NaHCO_3$, and 100 mcg Epinephrine solution was used to up-dose the epidural. 5 mL was given in L&D suite then 5 mL 10 minutes later. In the OR, patient was able to lift herself from the L&D stretcher onto the OR table. A sensory level via soft touch was discovered to be T8 bilaterally. 15 minutes later, she was still able to lift her buttocks off the OR table using her heels. On exam, she had 5/5 motor strength throughout. Another 5 mL was given . Sensory level was rechecked using 3 modalities: soft touch, pinprick, and ice and was collectively T5 bilaterally. The surgeon performed caliper testing, which the patient did not feel. It was concluded that the patient had full sensory block with motor-sparing. An uneventful, painless C/S was performed. No clinically significant motor blockade was ever appreciated during or after the case. Patient underwent uneventful PACU stay with full return of sensation within an hour.

Discussion: It has long been postulated that differential blockade occurs when small fibers are preferentially blocked and large, myelinated motor fibers are most resistant to local anesthetics. Continuous epidural Ropivacaine is commonly used for postoperative and labor analgesia due to its motor-sparing properties. Our case suggests that epidural Lidocaine in bolus dosing might possess similar properties and further support the assumption that fiber size predicts fiber susceptibility.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 09

Labor Analgesia in Patients with CYP Isoform Mutations

Presenting Author: Meredith Albrecht, MD
Presenting Author's Institution: Medical College of Wisconsin
Co-Authors: Catherine Drexler, MD - Medical College of Wisconsin

Introduction: Genetic polymorphism exists among patients and has implications in terms of the optimum drugs to be used. Anesthesiologist should be prepared to deal with such variations and be able to formulate backup plans based on how patients respond to various medications.

Case One: 40 year old female G1P0 37 wks presented for IOL due to preeclampsia. Patient mentioned she is fast metabolizer of local anesthetics (LA)& opioids gave her no pain relief. After IOL, patient requested epidural analgesia where lumbar (L3-L4) epidural was placed uneventfully & 0.1% bupivacaine with 2mcg/ml fentanyl started at 12ml/hr.Patient reported pain relief with T6 sensory level to ice.After an hr,patient became uncomfortable with decreased sensory level (L1).Hand boluses resulted in adequate pain relief & increased sensory level for only 30-40 mins. This process reoccurred multiple times.The duration of pain relief was consistent even with different concentration of bupi (0.125%, 0.25%) & 2% lidocaine with epi.Given her history with LA (rapid resolution of blocks with dental work), we switched LA class from amide to ester.1.5% -2% chlorprocaine with fentanyl provided her with improved pain control until delivery. Patient‘s history prompted genetic testing where she was found to have several CYP isoform mutations.

Case Two: Patient’s sister underwent genetic testing & was found to have similar mutations (CYP1A2 rapid metabolizer affecting amide LA & OPRM1 affecting mu receptors, rendering opioids ineffective but increasing susceptibility to side effects).When she presented for IOL due to gDM,lumbar epidural was offered using chloroprocaine with dexmedetomidine infusion (3750mg &125mcg in 250ml of NS).Unfortunately, she ended up having a C-section due to fetal intolerance.Epidural was dosed with chloroprocaine & 0.2% tetracaine for surgical anesthesia. For postoperative pain, epidural infusion with chloroprocaine & IV ketamine infusion were started.

Discussion: Epidural anesthesia is a safe choice to provide pain relief during labor.We report 2 cases of genetic polymorphism affecting various receptors (altering response to opioids & amide LA). Pharmacogenetics is a field which studies molecular mechanisms that underlie individual differences in drug metabolism, efficacy&side effects.Chloroprocaine has been used for labor analgesia due to its favorable safety profile: rapid onset, short maternal, &fetal plasma half-lives &low placental transfer due to rapid metabolism.Its limiting factor is when used in epidural infusion, it decreases the efficacy of epidural opioids &cause tachyphylaxis. This was clearly the case in both our patients especially the second patient who required

tetracaine bolus for her surgical anesthesia.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 10

Thoracic Dural Puncture Epidural for Parturient with Prior Lumbar Spine Surgeries

Presenting Author: Mohammad A. Nawaz, MD
Presenting Author's Institution: Rutgers Robert Wood Johnson Medical School - Edison, New Jersey
Co-Authors: Abdul Moiz Khan, BA, MBS - Noorda College of Osteopathic Medicine

Introduction: Neuraxial anesthesia is a cornerstone of pain management during childbirth, with approximately 71% of parturients choosing a form of neuraxial analgesia.1 Its use in pregnant women with a history of back surgery presents unique challenges as altered spinal anatomy can complicate neuraxial blocks.2 This case illustrates the critical role of adaptability in neuraxial anesthesia for this population.

Case One: We present a 34-year-old parturient G3P1011 with a history of IV drug use, morbid obesity, prior Cesarean delivery, unspecified degenerative disc disease with two laminectomies at L4-S1, L4-S5 posterolateral fusion, small postoperative pseudomeningocele at L4 and L5, and grade 1 anterolisthesis at L3-L4 along with a small disc bulge at L1-L2 and L2-L3. Patient did not want to take her maintenance buprenorphine-naloxone and stated, “I don’t want another C-section”. MRI of the lumbar spine was reviewed extensively, and a DPE was performed at the T12-L1 space. A CSE Tuohy was used for the penetration of the spinal ligaments. LOR to air was felt at a depth of 9.5cm. A 25G spinal needle was used to puncture the dura and CSF was seen. Spinal needle was then withdrawn, and a catheter was threaded easily into the epidural space and secured at 15cm at the skin with a negative test dose. With fentanyl 2mcg/ml-bupivacaine 0.125% through the epidural, the patient reported being comfortable during contractions. Right-sided lower back pain persisted which was present prior to epidural placement. Patient had a successful NSVD of a liveborn infant with Apgar scores 9/9. She also underwent suture repair of a first-degree perineal laceration and a right vaginal tear without requiring additional analgesia.

Discussion: Despite extensive spine surgeries, a thoracic DPE was successfully placed at the T12-L1 level for labor analgesia. On imaging, there was spinal stenosis and disc bulge at L1-L2 and L2-L3 and obliterated epidural space at L3-L4 and L4-L5, as well as prominent scar tissue. Neuraxial technique at these spaces would have been challenging with a high risk for accidental dural puncture.2 The patient was made aware of the risk of accidental spinal cord puncture due to the DPE being placed above the termination of the conus medullaris. However, there have been multiple documented cases of thoracic spinal anesthesia being utilized successfully for various abdominal surgeries.3 The patient was informed that the adequacy of the DPE would be uncertain, and if the analgesia was unreliable, other modalities would be considered. A DPE was performed since an intentional dural puncture would help confirm successful placement given the altered spinal anatomy and potentially provide superior analgesia.4 The importance of pre-procedural evaluations, understanding altered

anatomy, and involving patients in the decision-making cannot be understated.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 11

Low Thoracic Epidural Post-Cesarean Analgesia and Pompe Disease: A Case Report

Presenting Author: Edwin Haring, MD
Presenting Author's Institution: Robert Larner College of Medicine, University of Vermont
Co-Author: Paige Georgiadis, MD - Department of Anesthesiology, University of Vermont Medical Center

Introduction: Pompe disease (PD) is an autosomal recessive glycogen storage disease causing progressive neuromuscular weakness (NMW) and respiratory insufficiency (RI). Although not associated with increased pregnancy or delivery risk, PD-related NMW and RI can worsen in pregnancy1, necessitating careful anesthetic planning2,3.

Case One: A 40-year-old G1P0 at 35 weeks estimated gestational age and PD presented with spontaneous rupture of membranes and history notable for superior vena cava thrombosis, type 2 diabetes mellitus, obstructive sleep apnea, and BMI = 45.9. She presented nine years prior with four-limb girdle weakness and orthopnea. Since diagnosis of PD at that time, she is maintained on enzyme replacement therapy. Recent PFTs and echocardiogram were normal. Primary cesarean section ensued uneventfully in the main OR after T9-10 epidural placement and single-shot spinal. Afterwards, she transitioned to the floor with continuous plain bupivacaine 0.125% epidural infusion and a single epidural morphine 2 mg dose twelve hours after delivery. Non-opioid adjuncts were acetaminophen, ketorolac, abdominal binder, and cold packs. She reported good analgesia without systemic opioids until just prior to epidural removal 40 hours after delivery. She took three doses of oxycodone 5 mg during her hospital stay, avoided RI, ambulated early and visited NICU frequently.

Discussion: This is the novel use of low thoracic epidural post-cesarean analgesia for a patient with PD. The low thoracic epidural with single epidural morphine dose promoted enhanced recovery by facilitating early ambulation, maternal-infant bonding, minimized systemic opioid use, and avoidance of RI. The thoracic epidural was effectively used intraoperatively to bolster neuraxial anesthesia. Timing of anticoagulation with neuraxial procedures and impact of epidural morphine on urinary function were additional considerations.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 12

Labor Analgesia in a patient with Spina Bifida Occulta

Presenting Author: Roy Lei, MD
Presenting Author's Institution: The University of Texas Health Science Center in Houston
Co-Authors: Rafat Hossain, Resident - UTH Houston

Introduction: Spina bifida occulta is a genetic disorder which leads to failure of vertebral fusion. The CDC notes that annually, it is present in 1 in every 2758 births, with Hispanic mothers being affected the most. This scenario becomes even more complicated when it comes to labor analgesia as standard neuraxial procedures may lead to adverse effects.

Case One: Patient was a 30-year-old G1P0 female at 40w5d who was admitted to Labor and Delivery for induction of labor due to premature rupture of membranes. Patient's overall pregnancy course was complicated by cervical dysplasia, pre-eclampsia without severe features, and inconsistent prenatal care due to lack of insurance. On day 2 of admission, patient requested an epidural for labor analgesia. Upon inspection of the patient's back while she was sitting up for epidural placement, a tuft of hair was noted midline in her lumbar region. She noted that she had always had this patch of hair, and that she also suffered from chronic sciatica her whole life. During bedside exam of the area by the anesthesia resident and attending, there was distinct hypertrophy of the musculature and no visible pit. Using the ultrasound, the spinous processes were followed from the cervical spine down to the area of concern; however, near the lumbar spine, imaging became more obscure, and the lumbar spinous processes were not visualized. After discussion with colleagues and patient, the decision was made to avoid neuraxial placement given the risk profile. The patient was given a remifentanil PCA for labor analgesia. Later that day, the patient underwent a cesarean delivery, under general anesthesia, due to arrest of descent Newborn's spine was intact without dimple, tufts or lesions. In our poster, we will discuss the risks of neuraxial placement in patients with spina bifida occulta, the spinal anomalies that lead to these increased risks, and discuss alternate forms of labor analgesia for these patients.

Discussion: Unknown or undisclosed spina bifida occulta can be a highly consequential comorbidity in pregnancy, especially when it comes to neuraxial placement. Complications from placement of neuraxial include difficulty finding the epidural space requiring multiple attempts, inadvertent dural puncture, and possibility of permanent neurological damage. Though diagnosis of Spina bifida occulta requires MRI, ultrasound can discern concerning spinal anatomy and help formulate a quick bedside assessment of whether neuraxial placement can be safely performed. For these patients, alternate forms of labor analgesia such as remifentanil PCA may be safer and have proven to be effective.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 13

"Can I get an epidural?" Prenatal Neuraxial Ultrasound in Patients with Spine Pathology

Presenting Author: Marcos A. Izquierdo, MD
Presenting Author's Institution: Metrohealth Medical Center - Broadview Heights, Ohio
Co-Authors: Clodagh Mullen, MD - MetroHealth Medical Center
Matthew Sikora, DO - Metrohealth Medical Center

Introduction: Prenatal anxiety can have negative impacts on a woman's birthing experience, fetal growth and is strongly associated with post-partum depression1. Maternal prenatal stress can also increase the risk of fetal cognitive, behavioral, and emotional problems into childhood2. A major contributor to prenatal anxiety is tied to the uncertainty of a patient's ability to receive neuraxial anesthesia. This is particularly true for patients with spine pathology. Neuraxial ultrasound performed in the third trimester can answer this uncertainty and reduce maternal anxiety.

Case One: The patient was a healthy G1P0 at 31 weeks gestation with thoracolumbar scoliosis repair 14 years prior presenting for prenatal anesthesia consult. She had been told that she would not be a candidate for an epidural and was considering an elective cesarean delivery under general anesthesia to avoid labor pain. The only information available from her surgery were the postoperative X-rays. Prenatal neuraxial ultrasound was performed, with images acquired. After marking her back at the identified interspaces and recommended insertion point, a picture was taken. The surface anatomy picture and the ultrasound images were uploaded to EMR along with the consult note with recommendations for epidural placement. The patient presented overnight at term in spontaneous labor. Having the prenatal consult available with attached patient images, the on-call anesthesiology team was able to confidently place the epidural with first pass success. The patient progressed to complete and delivered comfortably five hours later.

Discussion: Preprocedural neuraxial ultrasound can improve the efficacy of labor epidurals while reducing complications3. An often-overlooked benefit is the ability to arm the patient with knowledge on her candidacy for epidural placement months before arriving to labor unit, and the relief of this anxiety before delivery. In this patient, by demonstrating her candidacy for a labor epidural, an unnecessary general c-section was avoided. Comfort level with neuraxial ultrasound amongst anesthesia staff is variable and the ability to provide prenatal ultrasound images can provide a road map to success when a complex neuraxial patient arrives in labor. In patients with spinal pathology, this workflow is not only crucial to optimize the patient's birth experience, but the effect on other patient-centered outcomes should not be minimized. As a safe, effective, and inexpensive tool for the obstetric anesthesiologist, we recommend the use of ultrasound in prenatal consults to optimize neuraxial placement.

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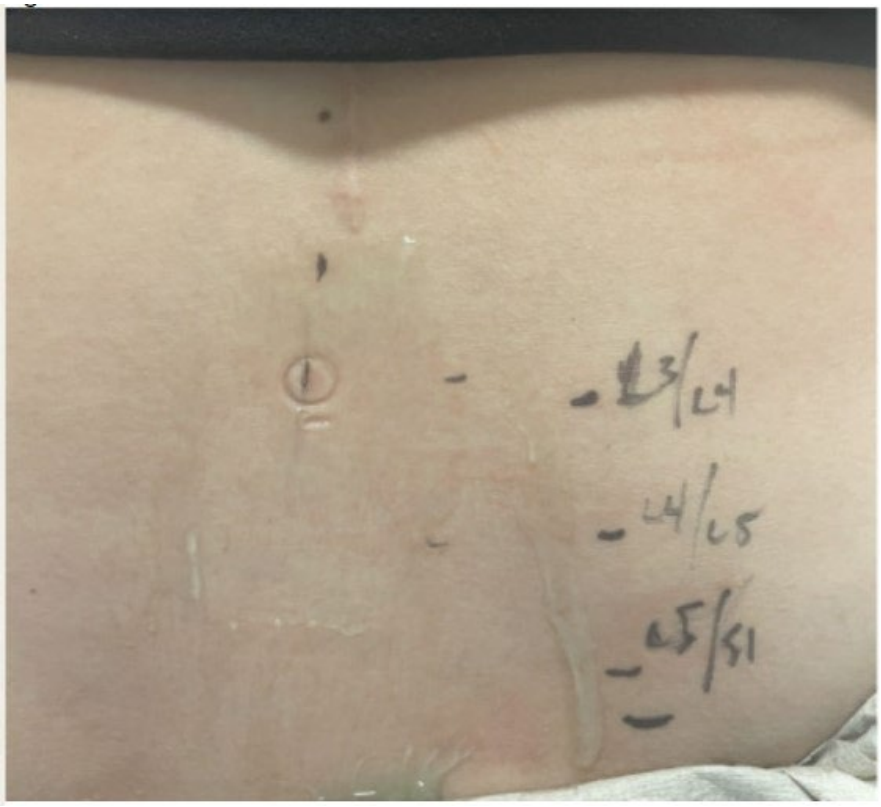

Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 14

An Atypical Presentation of Pneumocephalus Following Epidural Analgesia

Presenting Author: Hunter Brooks, MD
Presenting Author's Institution: Riverside Community Hospital
Co-Authors: Marwa Sidani, MD - HCA/Riverside Community Hospital

Introduction: Pneumocephalus is a rare complication of epidural anesthesia. Findings of pneumocephalus overlap considerably with those of postdural puncture headache (PDPH) but can be distinguished by rapid onset and maximum intensity at onset1. Diagnosis is confirmed by computed tomography (CT) scan of the brain. Distinguishing between these diagnoses and anticipating their possible co-occurrence has important implications for management of patient complications.

Case One: We report an atypical presentation of pneumocephalus following epidural catheter placement in a 30-year-old parturient. Epidural placement was performed in standard fashion without accompanying return of cerebrospinal fluid from the epidural needle. The patient received adequate labor analgesia and tolerated the procedure with only transient central back pain. Approximately eight hours after placement, the patient developed bifrontal and occipital headache with associated photophobia, neck stiffness and shoulder pain. CT of the brain confirmed the presence of small gas collections abutting the dorsum sellae and the prepontine cistern. Six days later, when persistent symptoms raised concern for PDPH, an epidural blood patch (EBP) was performed. The patient's headache resolved approximately eight hours following EBP.

Discussion: Pneumocephalus may be an under-diagnosed cause of acute headache following epidural analgesia due to absence of routine CT imaging and false attribution of symptoms to PDPH. Although commonly associated with clinical evidence of dural puncture, pneumocephalus can occur without CSF return from the epidural needle. The possibility of co-occurring pneumocephalus and PDPH should be considered and EBP should be offered to patients whose symptoms are suggestive of PDPH. Use of saline alone or small volumes of air within the loss of resistance syringe are practical options to avoid iatrogenic pneumocephalus.
This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 15

HORNER'S SYNDROME A Transient Complication After Lumbar Epidural Anesthesia

Presenting Author: Marshall Reviere, n/a
Presenting Author's Institution: University of New Mexico School of Medicine
Co-Authors: Emily McQuaid-Hanson, M.D. - Department of Anesthesiology and Critical Care Medicine, University of New Mexico School of Medicine

Introduction: In obstetric practice Horner's syndrome (HS), a rare complication of lumbar epidural anesthesia, commands attention due to its rarity and the potential anxiety it may cause to both medical staff and patients.

Case One: A 30yo G1P0 requested an epidural shortly after presenting for term IOL. The procedure was complicated by multiple attempts, with classic LOR at L2/L3 and positive DPE for CSF. After a negative test dose, the epidural was started with a clinician bolus of 8mL bupivacaine 0.0625%+fentanyl 2mcg/mL and was programmed for a 9mL PIEB dose every 40mins with an 8mL PCEA every 10mins. 74mins after initial bolus, the patient developed ptosis and miosis of the right eye consistent with HS. The epidural infusion was paused, and HS symptoms improved 30mins later. Epidural was restarted as a continuous infusion of 8mL/hr with standard PCEA 60mins after being paused. The patient went on to have an uncomplicated SVD and had full resolution of symptoms by the time of discharge.

Discussion: Horner's syndrome (HS), a triad of unilateral miosis, ptosis, and anhidrosis, is attributed to blockage of sympathetic pre-ganglionic fibers of the face and eye originating from the anterior horn cells of C8-T1, and occasionally as low as T4.6 HS is more common in pregnant women, with reported incidences as high as 1.3%.2,4 The mechanism of HS after labor epidural is uncertain but may be due to reduced epidural space, combined with elevated epidural pressure.1,3,7 Positioning may play a role, with findings of higher levels of epidural spread in patients in the lateral decubitus position.1,5 Most cases of HS are self-limited and will resolve if the epidural infusion is paused. Rarely, HS can precede a high sympathetic blockade with cardiovascular shock, maternal hypotension and fetal bradycardia, requiring close monitoring. The role of PIEB dosing in HS is not well studied, however, it has been shown to increase the spread of local anesthetic in the epidural space as compared to CEI. Theoretically, the increased pressure that occurs with PIEB dosing could contribute to the pathophysiology of HS.8 In our patient, pausing PIEB and restarting CEI allowed the patient to have adequate labor analgesia without recurrence of HS.

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Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 16

Laboring Chiari Malformation with a Tethered Cord: to Place or Not to Place?

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Introduction: The Arnold Chiari malformation Type 1 (AMC-1) has been shown to be strongly associated with tethered spinal cord.1 Tethered cord syndrome (TCS) is clinically relevant because of greater potential for direct spinal cord trauma while performing regional anesthesia, due to the low-lying and posteriorly displaced conus medullaris.2,3 The neuraxial treatment of patients with both ACM-1 and TCS continues to be a topic of ongoing discussion. Should anesthesia providers safely proceed with neuraxial anesthesia in patients with AMC-1 and a tethered spinal cord?

Case One: A 23-year-old G1P0 parturient at 39w2d with past medical history of asymptomatic ACM-1, spina bifida occulta with tethered spinal cord status post release, neurogenic/atonic bladder status post Mitrofanoff procedure with multiple stoma revisions, BMI 39, sleep apnea, migraines, chronic hypertension, and asthma presented for induction of labor. Imaging was performed to guide delivery planning for both neuraxial and potential cesarean surgical approach. A prior brain MRI demonstrated low-lying cerebellar tonsils, and a recent head CT confirmed no increased intracranial pressure. A lumbar MRI showed normal morphology of spinal cord and cauda equina with a low-lying conus that terminated at L2-3. L4-5 showed posterior element agenesis with malformation of ligamentum flavum, and posterior epidural fat that communicated with the paraspinal fat in the interspinous space. Upon epidural request, neuraxial ultrasound mapping of L3-4 interface was performed with skin demarcation. An attempt at L3-4 resulted in an unintentional dural puncture with the 17G Tuohy needle. The needle was removed, and a second attempt was made in the L2-3 interspace. This attempt was successful, and the patient had an otherwise uncomplicated vaginal delivery. She was closely monitored in the postpartum period for a post dural puncture headache, but she remained asymptomatic.

Discussion: The combination of ACM-1 and TCS in laboring patients continues to be a challenge for the obstetric anesthesiologist. Balancing the risk of worsening ACM symptoms and/ or causing direct spinal cord trauma can outweigh the benefits of neuraxial labor analgesia. Clinical decision making can be enhanced by pre-delivery MRI and day of delivery neuraxial ultrasound. Patient expectations should always be set to include block failure, pain rescue techniques, as well as general anesthesia should a cesarean delivery be necessary.

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McKay,R.S. (2011). Obstetric anesthesia and uncommon disorders. Cambridge: Cambridge University Press.

Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 17

An Individualized Approach to Neuraxial Anesthesia Following Selective Dorsal Rhizotomy

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Introduction: Selective dorsal rhizotomy (SDR) is a surgical procedure performed during childhood for selected patients with cerebral palsy complicated by spasticity. The procedure involves laminectomy and severing of malfunctioning spinal sensory roots under EMG guidance. Patients are prescribed intensive postoperative physical therapy, and together these interventions can provide substantial improvement in function. Baseline sensory and motor function is generally preserved and chronic paresthesias or dystonias are rare (1). There is a paucity of guidance available regarding obstetric anesthetic management following SDR. A search of the literature revealed only one case series consisting of two obstetric patients with a history of SDR, which demonstrated no complications following administration of neuraxial anesthesia (2). The literature regarding neuraxial anesthesia in patients with history of other spinal surgery or spinal disease suggests that these techniques are usually successful, though patients with existing spinal canal pathology may have a higher risk of neurologic complications such as paresthesia, pain, and weakness (3).

Case One: Our patient was a twenty-eight-year-old G1P0 with cerebral palsy who underwent SDR at age five. The patient reported no sensory deficits and was able to ambulate with a walker. Lumbar spine exam revealed palpable midline spinous processes, and ultrasound of the lumbar spine showed visible anterior complexes (figure 1). Spinal anesthesia with 1.6mL 0.75% hyperbaric bupivacaine, 100 mcg morphine, and 15 mcg fentanyl was administered at the L3-L4 interspace on first attempt without imaging guidance. Adequate block to T4 level was achieved and cesarean delivery proceeded without complications. The patient's strength/sensation returned to baseline approximately 4 hours after the initial spinal dose.

Discussion: We conclude that it is reasonable to attempt neuraxial anesthesia in select patients with a history of SDR, after a detailed discussion with the patient regarding risks, benefits, and the limited evidence. The approach should be informed by the patient's anatomy, taking into consideration any scar tissue, altered neurologic function, and any changes to the anatomy of the spine. Imaging should be obtained beforehand if available to ensure that the subarachnoid space is accessible. The patient should be counseled on alternative anesthesia/analgesia options, which should be available if needed.

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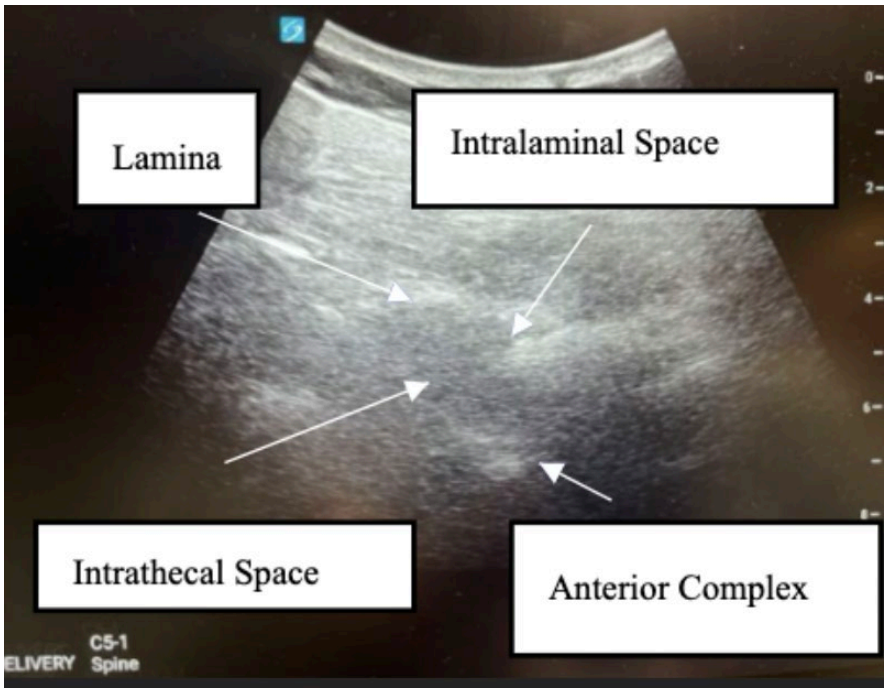

Abstract #: SAT – CR – BS 3 – BR 5 - Neuraxial Challenges, Complications and Adverse Drug Reactions – 18

Delayed Removal of Fractured Spinal Needle

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Introduction: Retained neuraxial instruments are uncommon in obstetric patients. The rates of fractured needles and epidural catheters is estimated at 1:5000 to 1:11000 including obstetric and non-obstetric cases [1,2]. Removal of foreign bodies risks further damage to surrounding structures, increasing complexity in managing these cases. When needle fracture does occur, neurosurgery should be consulted, and appropriate imaging should be obtained as soon as possible.

Case One: A 47-year-old patient presented with chronic back and neck pain, as well as muscle weakness in her left leg. An endoscopic assisted exploration and removal of L4 foreign body was planned by neurosurgery. Her previous medical history is unremarkable, surgical history includes three cesarean deliveries (CD) and a hysterectomy. She first experienced radicular back and leg pain after placement of the neuraxial anesthetic at the time of her last CD in 2003. The needle fracture reportedly was not disclosed to the patient. She continued with complaints of low back and left leg pain with muscle weakness in the left leg. In 2016, a computed tomography (CT) scan and CT myelogram confirmed a metallic object noted in the L4 vertebral body, extending across the thecal sac, and terminating adjacent to the L4 facet (figure 1, 2). Anesthetic management included a standard IV induction, maintenance with a combination of inhaled and intravenous anesthetics, with SSEP and EMG monitoring. The neurosurgeons uneventfully removed a 3.5 cm metal fragment from the L3-L4 disc space with a transforaminal approach without changes in SSEP/ EMG activity (figure 3,4,5). The patient emerged from anesthesia uneventfully and was discharged on POD 1, able to mobilize without difficulty and is continuing to improve with physical therapy.

Discussion: There are a few case reports of neuraxial needle fracture, with increasing reports in the past few years. In a recent case review, there were 26 cases reports with 17 cases in obstetrics [3,4]. Most cases occurred with Whitacre needles [3]. Most common practices that led to breakage included redirection of the spinal needle without replacement of the stylet, incomplete withdrawal of the spinal needle out of the introducer, and uncoordinated movement of introducer and spinal needle [5]. Studies have demonstrated the stylet is key to strengthening needles but does not affect the rate of deformation of the needle/ stylet combination [6]. Strategies on management vary from removal, partial removal, and retention of the foreign body. However, all experts recommend consultation with neurosurgery and disclosure to the patient [2]. Ongoing reporting of such incidents in the medical literature is

important to further clarify risk factors and provide management options.

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Delayed Removal Figures.pdf

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 01

Newly Diagnosed Mediastinal Mass in a Patient Requiring Urgent Cesarean Delivery

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Introduction: A mediastinal mass may cause extrinsic airway compression, obstruct cardiac venous return, or obstruct cardiac output leading to cardiovascular collapse. During anesthesia, maintenance of spontaneous ventilation and avoidance of muscle relaxants is recommended. We report a case of newly diagnosed large mediastinal mass during pregnancy.

Case One: A 29-yo G2P1 at 35 weeks presented with cough for 3 weeks and worsening back and right chest pain. She was known to the MFM service due to homozygous Factor V Leiden mutation requiring full anti-coagulation with enoxaparin. Testing was negative for COVID, influenza and RSV. CXR→ large mediastinal mass extending into the right hemithorax with cardiac compression and moderate pericardial effusion. Fetal evaluation was reassuring. She was transferred to a higher level of care for multi-disciplinary evaluation, complicated by the timing on Friday afternoon of a 3-day holiday weekend. Physical exam showed she could not lay flat due to uncontrollable coughing. CTPE→ mass displacing and compressing cardiac structures; suspicious for lymphoma, thymic lesion, or germ cell tumor. TTE→ large mediastinal mass abutting the main PA but not causing functional stenosis and normal atrial and ventricular size and function. Oncology recommended immediate biopsy to guide treatment. The CardioThoracic Surgery (CT) service was concerned that cardio-respiratory status could deteriorate quickly. Multi-disciplinary consultation with MFM, OB anesthesia, and CT anesthesia resulted in the decision to move to delivery in the main OR with CT placing femoral ECMO cannulas proactively prior to cesarean delivery and Interventional Radiology (IR) performing percutaneous biopsies of the mass under local anesthesia. In the operating room with standard monitors and arterial line, a CSE was placed in the sitting position using light sedation (per patient request). Hyperbaric bupivacaine 7.5 mg was administered to achieve T12 sensory anesthesia adequate for placement of femoral artery and vein ECMO sheaths. Percutaneous biopsies were obtained by IR under ultrasound guidance after she was comfortably positioned with head elevated. Once complete, the epidural catheter was dosed slowly with 100 mcg fentanyl and 2% lidocaine with epinephrine to reach a T4 sensory level using phenylephrine to maintain hemodynamics. With her husband present, a vigorous infant was delivered with Apgar scores 7/9. Epidural morphine 3mg was administered and the case was completed uneventfully. She recovered in the CT-ICU on telemetry. The mass was identified as a T-cell lymphoma and she began chemotherapy a few days postoperatively.

Discussion: This case highlights optimal patient care resulting from a rapid multi-disciplinary

response. The care plan expedited urgent cesarean delivery with OB anesthesia and MFM, supported by CT surgery and CT anesthesia, while IR obtained biopsies to expedite Oncology's plan of care.

References: PMID 29457072 PMID: 36399369

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 02

Anesthetic Management of Placental Abruption in the Setting of Alcoholic Hepatitis

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Introduction: Alcohol use disorder is not uncommon among reproductive-age women, with the percentage of those having alcoholic liver disease continually increasing. The number of these women presenting for obstetric services is likewise increasing, posing several challenges to the anesthesiologist. We report a case of a patient with alcoholic hepatitis who suddenly developed placental abruption requiring emergent Cesarean section.

Case One: A 27-year-old G2P1 female at 29 weeks gestation with alcohol use disorder was admitted for evaluation of jaundice. Her reported last drink was at 8 weeks gestation, however lab workup revealed a PEth > 1300ng. Additional labs included Hgb 10.3, platelets 103, AST 80, ALT 13, total bilirubin 11.0, and INR 1.7. HELLP syndrome was ruled out due to absence of schistocytes on peripheral blood smear. Alcoholic hepatitis was diagnosed and prednisolone 40mg daily was started. An EGD was ordered for evaluation of varices given evidence of portal hypertension. While awaiting EGD, she began having painful, frequent uterine contractions and vaginal bleeding concerning for placental abruption. Maternal-Fetal Medicine recommended proceeding with delivery and she was taken to the operating room urgently for Cesarean section. Neuraxial anesthesia was deferred due to the emergent nature of the case and patient's known coagulopathy. Rapid sequence induction was performed and she was intubated without complication. Significant coagulopathy was encountered and further complicated by uterine atony, leading to approximately 3.4L of blood loss. TEG-guided transfusion was initiated, including a total of 4 units packed RBCs, 4 units fresh frozen plasma, 1 unit of platelets, and 6 packs of cryoprecipitate. She remained intubated and was taken to the ICU post-operatively, where she remained hemodynamically stable without further hemorrhage and was extubated on POD #1. Her post-operative course was largely uncomplicated and she was discharged home on POD #4.

Discussion: Pregnancy in a patient with alcoholic liver disease presents challenges for both the patient and the medical team, including the anesthesiologist. Adverse maternal outcomes include increased rates of preterm delivery, hemorrhage, and Cesarean delivery. From a coagulation standpoint, patients with liver dysfunction typically have low levels of coagulation factors and platelets, so that they can be both hypo- and hypercoagulable simultaneously. Fluid status can be challenging to assess and subsequently manage, as these patients can appear hypervolemic due to edema and ascites yet be intravascularly volume depleted. In patients with portal hypertension, increased blood flow through esophageal veins could complicate airway management if bleeding if variceal bleeding is encountered.

References: Griffiths S, Nicholson C. Anaesthetic implications for liver disease in pregnancy.

BJA Education. 16(1):21-25. Cooper KM, Kaluri S, Devuni D. Alcohol-associated liver disease and pregnancy. Clin Liver Dis (Hoboken). 22(6):206-210.

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 03

Disseminated Herpes Simplex Virus 2-Induced Hepatitis During Pregnancy

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Introduction: Pregnancy is an immunosuppressed state, placing parturients at higher risk for infection including herpes simplex virus (HSV) hepatitis [1,2]. Timely recognition and treatment of HSV hepatitis is challenging, as the differential diagnosis is extensive. Findings concerning for acute liver failure (ALF) should prompt a broad workup including preeclampsia, acute fatty liver of pregnancy, Hemolysis Elevated Liver Enzymes and Low Platelets (HELLP) syndrome, as well as viral infections including HSV [1-3]. Here, we report a case of intrapartum HSV-induced hepatitis.

Case One: A 17-year-old G2P0010 at 21w5d with a past medical history of Crohn disease on infliximab and recent COVID-19 infection requiring hospitalization for steroids was transferred to our hospital for transaminitis after an initial presentation for epigastric pain and dyspnea. Labs were notable for elevated aspartate aminotransaminase (AST) and alanine aminotransaminase (ALT) (4286 and 1630 U/L, respectively), International Normalized Ratio (INR) of 1.7, and fibrinogen of 183. On arrival, she was tachycardic, but was normotensive, mentating appropriately, and maintaining adequate oxygenation on room air. Subsequent labs were notable for worsening coagulopathy (INR 3.7, fibrinogen 102), transaminitis (AST 8618, ALT 2458), and elevated total bilirubin (3.8). An abdominal ultrasound revealed normal direction of blood flow without evidence of thrombosis. Workup for acute liver failure included testing for Hepatitis A, B, and C, Epstein-Barr Virus (EBV), cytomegalovirus (CMV), varicella zoster virus (VZV), and Human Immunodeficiency Virus (HIV), all of which were negative. Acetaminophen levels were negligible. Autoimmune workup including anti-nuclear antibodies, F-actin antibodies, anti-mitochondrial antibodies, alpha-1 antitrypsin, and ceruloplasmin were unremarkable. Further laboratory workup revealed significant HSV-2 viremia, and a presumptive diagnosis of HSV hepatitis was made. Liver biopsy was deferred in the setting of ongoing coagulopathy, and she was started on high-dose acyclovir. A transplant evaluation was begun, however her ALF improved and then normalized over the next two weeks. She continued 21 days of acyclovir and was discharged with home health and close obstetric follow-up.

Discussion: Though rare, HSV hepatitis is particularly catastrophic in pregnancy, with a high mortality rate if not recognized and treated rapidly [4]. ALF should prompt a broad workup, but uncommon infections including HSV should not be overlooked, especially when patients are receiving systemic immunosuppression. Starting acyclovir with clinical suspicion of HSV hepatitis can greatly improve maternal outcomes, though evidence is not strong in improving fetal outcomes [5]. As seen in this case, early detection and treatment may prevent risk of maternal mortality and eliminate the need for liver transplantation.

References: 1. PMID: 28580213 2. PMID: 24897084 3. PMID: 16260566 4. PMID: 9114181 5. PMID: 6481915

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 04

Anesthetic Considerations in a Second Trimester Pregnant Patient with Decompensated Cirrhosis

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Presenting Author's Institution: Michigan State College of Human Medicine
Co-Authors: Jessica E. Park, MS1 - Michigan State University College of Human Medicine

Introduction: As treatment of cirrhosis in patients of childbearing age improves, pregnancy and delivery becomes more common, with hopes of improving maternal and fetal mortality. However, literature remains limited for delivery and pregnancy outcomes pertaining specifically to patients with decompensated cirrhosis, as pregnancy in these patients is relatively rare. As a result, safely managing these patients intraoperatively involves unpredictability and requires an abundance of caution.

Case One: Here we present a 21-year old nulliparous female with a 2-year history of decompensated cryptogenic liver cirrhosis, portal HTN, esophageal varices, and complex psychiatric history with prior opioid use. Antepartum The patient was admitted at 22+2 weeks gestation for pancytopenia and severe abdominal and back pain, unable to be weaned off IV opioids. A multidisciplinary care conference was convened for peripartum management, determining the patient should ideally be transferred to a hospital with a specialized liver transplant team and controlled delivery. Intrapartum At 23+6 weeks gestation prior to transfer, the patient went into preterm labor requiring an urgent primary classical cesarean section due to breech presentation. Thrombocytopenia and coagulopathy necessitated general anesthesia rather than neuraxial. Massive transfusion protocol in the main OR was activated for anticipated hemorrhage, secondary to cirrhosis and uterine atony. The neonate was delivered and transferred to the NICU. The patient required multiple blood products and medications for postpartum hemorrhage. PCA opioid and post-operative TAP blocks were administered as a part of multimodal pain control. The patient was extubated and transferred to PACU in stable condition. Postpartum The patient was admitted to SICU and then transferred to the general medicine floor on PPD3. The patient required additional blood products in her postoperative course. After meeting postpartum goals, the patient was discharged home on PPD6. The patient continues to have recurrent readmissions for management of her cirrhosis related abdominal pain, ascites, and SBP.

Discussion: Here we present a successful urgent, primary classical cesarean section under general anesthesia at 23+6 weeks in a patient with decompensated cirrhosis. Unfortunately, the baby expired at 11 days of life (ie, 25+3 weeks). This case affords the opportunity to discuss the importance of proactive multidisciplinary care and anesthetic planning for patients with complex comorbidities. While not all outcomes were ideal, diligently following anesthetic protocols allowed this patient to have as safe of a delivery as possible.

References: Kosian P, Jansen C, Chang J, Praktiknjo M, Ayub TH, Gembruch U, Merz WM.

Maternal and Perinatal Outcome in a Contemporary Cohort of Patients with Portal Hypertension: A Single-Center Experience. Journal of Clinical Medicine. 2023; 12(9):3088. https://doi.org/10.3390/jcm12093088

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 05

Cesarean Section at 28 Weeks in a Parturient with History of Liver Transplant and Impending Renal Failure

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Introduction: With the success of solid organ transplantation, recipients are increasingly able to carry pregnancies to delivery. Anesthesiologists must consider physiologic changes of the transplanted organ during pregnancy, protection of graft function, and drug interactions with immunosuppressive agents when planning anesthetic management. These complex parturients require considerable discussion between several interdisciplinary teams and coordination of resources when preparing for a safe and optimized delivery. We present a patient with a history of liver transplant and coagulopathy with prolonged hospitalization complicated by renal failure, hepatosplenomegaly, and a new lung mass necessitating pre-term caesarian delivery under general anesthesia.

Case One: A 36-year-old G1P0 with a past medical history of paroxysmal nocturnal hemoglobinuria, polycythemia vera, and budd chiari now status-post liver transplant complicated by venous sinus thrombosis, splenomegaly on ruloxitinib, anemia and thrombocytopenia presented at 21 weeks with hemoptysis. She was found to have new 10 cm right upper lobe mass with associated hemorrhagic pleural effusion. She underwent bronchoalveolar lavage and thoracentesis. The pleural effusion was thought to be due to aspiration in the setting of recent EGD, and the mass likely to be hematoma. The patient improved with IV antibiotics. Hospitalization was complicated by massive hepatomegaly with associated ascites requiring multiple large volume paracentesis and acute kidney injury requiring CRRT. Liver US showed stenotic cavo-cavostomy at the IVC with patent vasculature. Graft function was normal. It was decided the patient should undergo primary c-section at 28 weeks given her condition and concern for worsening abdominal hypertension. All major blood products were available during surgery. She was evaluated pre-operatively by the anesthesia team. Neuraxial anesthesia was contraindicated due to coagulopathy. The patient ultimately underwent cesarean under general endotracheal anesthesia at 28 weeks and 2 days. She returned to the ICU for one day and was discharged two weeks later with no further RRT requirement. There were no apparent anesthetic complications.

Discussion: Involvement of several interdisciplinary teams are needed to optimize medical management and evaluate delivery timing's potential effect on maternal end organ damage. Weighing maternal morbidity of continued pregnancy against neonatal morbidity of preterm delivery is necessary. Anesthetic considerations for delivery and the peripartum period in liver transplant patients include drug metabolism, concurrent renal dysfunction, risk of

thromboembolic events, bleeding, graft function, transfusion complications, immunosuppression, and infection.

References: A. Madej, et al. Delivery Method in Patients After Liver or Kidney Transplantation, Transplantation Proceedings, Volume 50, Issue 7, 2018, Pages 2150-2153.

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 06

Neuraxial Anesthesia in an Obstetric Patient with Thrombocytopenia After Liver Transplant

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Tina Yu, MD - University of California Los Angeles (UCLA) Department of Anesthesiology

Introduction: Obstetric patients with thrombocytopenia are frequently denied neuraxial anesthesia for increased risk of spinal epidural hematoma. A platelet count of > 70k is generally accepted as a safe threshold for neuraxial anesthesia. Platelet counts < 50k is associated with increased risk of spinal epidural hematoma and neuraxial anesthesia is typically avoided. For patients with platelet counts between 50- 70k, competing risks and benefits may justify proceeding with neuraxial procedure. There is insufficient evidence to recommend specific tests (PT/INR, ROTEM) to aid in decision making for safe neuraxial anesthesia and no evidence from studies to determine a correct platelet transfusion threshold prior to a neuraxial procedure.

Case One: 26-year-old G2P1 at 39w3d with history of liver transplant for extrahepatic biliary atresia and chronic thrombocytopenia (50k-70k) secondary to splenomegaly was admitted for induction of labor. In a prior pregnancy, patient received an epidural after platelet transfusion for thrombocytopenia (50k) and had a histamine reaction (dyspnea and lightheadedness) that self-resolved. This pregnancy, platelets were 58k and her INR was within normal limits. Given her prior transfusion reaction and elective nature of the epidural, a ROTEM analysis was performed for coagulopathy assessment. EXTEM MCF was >45, EXTEM A10 borderline at 40, INTEM A10 was 38 and MCF 48 and FIBTEM A10 >10, suggesting a possible small benefit from platelet transfusion but was otherwise reassuring. After a multidisciplinary discussion with inpatient liver transplant, OB anesthesia and patient, a platelet transfusion was deferred, and epidural placed at L3-L4. Patient reported inadequate pain control and catheter was pulled back 1.5 cm. A repeat test dose detected an intravascular catheter. Epidural was removed and replaced at L2-L3 with negative test dose and adequate pain control. The patient did not develop any bleeding complications from her epidural placement or removal. Due to protracted labor, a cesarean section was performed successfully with the epidural.

Discussion: Decision to pursue neuraxial anesthesia in this thrombocytopenic patient required multidisciplinary planning and consideration of relevant factors. These factors include bleeding history, thrombocytopenia etiology, maternal comorbidities, obstetric risk factors, airway examination, risks and benefits of anesthetic options, and patient preference. We used these factors to inform clinical decision-making and formulate a thorough risk-benefit discussion. We used ROTEM analysis as a tool to determine if a platelet transfusion was indicated prior to epidural placement. Although the results were somewhat indeterminant, it

helped guide our decision not to pursue a platelet transfusion prior to epidural placement.

References: Bauer ME, et al. Anesth Analg. 2021 Jun 1;132(6):1531-1544. Estcourt LJ, et al. Cochrane Database Syst Rev. 2018;4:CD011980

ROTEM analysis SOAP DEIDENTIFIED.pdf

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 07

Hypofibrinogenemia in Pregnancy: AFLP vs HLH

Presenting Author: Aaran Varatharajan, MD
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Shangari Varatharajan, BS - University of Toledo College of Medicine

Introduction: Acute fatty liver disease (AFLD) of pregnancy, occurring in 1-3 cases per 10,000 deliveries in the U.S., is rare yet potentially severe. 1980s data indicated a 70% mortality rate, now reduced to around 2%. Increased awareness, better perinatal care, and early intervention contributed to this decline. Despite the improved mortality rate, effective management requires an anesthesiologist's understanding of AFLD pathophysiology and its obstetric impact.

Case One: A 25-year-old G2P1001 at 35w6d presented with new-onset leg pain, jaundice, rash, and fever. Emergency labs showed abnormal values, including Sodium (124), Total Bilirubin 7, AST/ALT 765/290, LDH 1329, Lactic Acid 2.7, Fibrinogen 156, in the context of fever. Urgent cesarean section was performed due to suspected Acute Fatty Liver Disease (AFLD) of pregnancy. Anesthetic management included a combined spinal-epidural (CSE) with fentanyl, morphine, and 0.75% bupivacaine with a phenylephrine infusion. The infant was delivered without complications (APGAR Scores of 7 and 9) and the patient had no immediate post-operative issues. Post-surgery, the patient was transferred to the SICU for hepatic failure monitoring. Hepatology consultation yielded negative results for hepatitis A/B/C, ADAMST13, normal immunoglobulins, and negative blood cultures. Ultrasound findings were nonspecific, consistent with hepatocellular disease. Despite resolving fevers with antibiotics, elevated liver function tests persisted, leading to a liver biopsy and transplant consultation. Subsequent labs indicated concerns for hemophagocytic lymphohistiocytosis and DIC. The patient received 2 units of FFP and cryoprecipitate for coagulopathy. Hematology consultation and a normal bone marrow biopsy followed. The formal AFLD diagnosis, based on the Swansea criteria, was treated with N-acetylcysteine, resolving elevated LFTs.

Discussion: Managing acute fatty liver of pregnancy (AFLP) requires a nuanced, multidisciplinary approach with vigilant monitoring. The anesthesiologist plays a multifactorial role in obstetric perioperative care, ICU management, and potential liver transplantation assessment. Early detection and critical care advancements have transformed AFLP from a highly fatal complication to a treatable condition.

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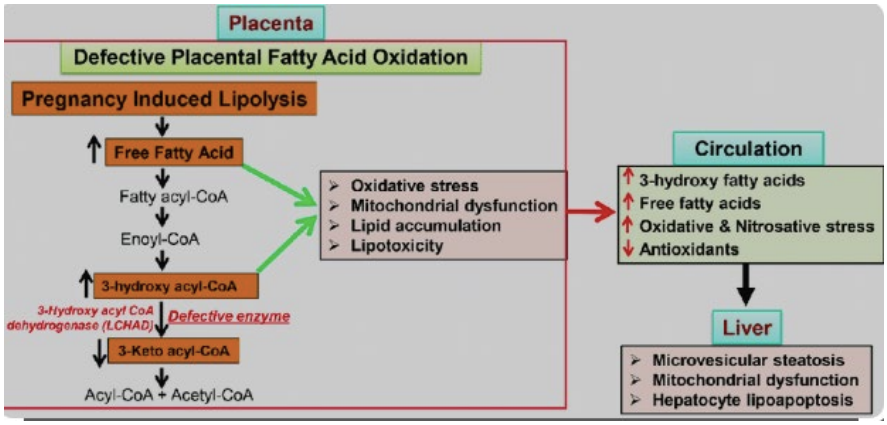

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 08

Maternal Mortality: Acute Liver Failure Presentation and Management

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Introduction: Liver dysfunction in pregnancy is rare but can result in significant morbidity. For instance, acute fatty liver of pregnancy (AFLP) is often diagnosed in the third trimester after a sudden and catastrophic presentation associated with significant peripartum mortality. We present the management challenge of a young woman admitted to the intensive care unit (ICU) following intrapartum cesarean delivery with profound metabolic decompensation, acute liver dysfunction, and ultimately fatal multisystem organ failure.

Case One: A 27-year-old primiparous female with obesity, gestational hypertension, anemia, and delayed prenatal care was admitted for a post-term induction. Her labor course was complicated by preeclampsia and an emergent cesarean delivery under epidural anesthesia for fetal bradycardia and chorioamnionitis. She was transferred to the postpartum ward with her infant after an unremarkable PACU recovery. She was transferred to the ICU 11-hours postpartum (PP) for dyspnea and somnolence. Initial evaluation revealed severe anion gap metabolic acidosis with lactate above assay and pH below assay, disseminated intravascular coagulopathy, anuric renal failure, respiratory distress, and acute liver dysfunction. Initial resuscitation included emergent dialysis, broad antimicrobials, and treatment of electrolyte and coagulation derangements. Within 24 hours of ICU arrival, she had worsening encephalopathy, hypoxic respiratory failure requiring intubation, and hypotension with biventricular dysfunction prompting inotrope initiation. Over the subsequent week, her acute liver dysfunction progressed to fulminant failure. Despite continuous renal replacement therapy and a trial of plasmapheresis, she developed ARDS and recurrent SVT, with ongoing lactic acidosis. Her persistent comatose state precluded liver transplant candidacy. A multidisciplinary team worked to exclude the diagnoses of septic shock, HELLP, and HLH. Despite maximal medical support, the patient expired on PP day 11. Autopsy was notable for diffuse visceral necrosis, and cardio-spleno-hepatomegaly with macro- and microvesicular steatosis consistent with AFLP.

Discussion: Extensive overlap in the clinical and biochemical presentations of pregnancy-associated liver diseases presents diagnostic and therapeutic challenges. Mitochondrial dysfunction and defective fatty acid oxidation are thought to contribute to AFLP's

characteristic infiltrative disease and may provide an insight to treatment as the long held standard therapy of placenta removal and supportive care may be insufficient in cases of postpartum fulminant liver failure. There is a deficit of robust, evidence guided practice in the critically ill obstetric population, therefore collaboration is imperative to rapidly diagnose, treat, and improve outcomes in these rare, highly acute scenarios.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 09

Acute Fatty Liver of Pregnancy at 17 Weeks 6 Days in a Patient with Intrauterine Fetal Demise

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Introduction: With an incidence of 1:7000–15,000 pregnancies, acute fatty liver of pregnancy (AFLP) is a rare, potentially life-threatening complication that typically presents in the third trimester or early postpartum period. The earliest reported case occurred at 18-weeks gestation and was diagnosed at 19w6d3.

Case One: We present a 17yo G1P0 at 17w6d who presented with fetal demise in utero (FDIU) and was ultimately diagnosed with AFLP. She initially presented to an outside hospital with three days of abdominal pain, nausea, and vomiting. She was tachycardic but otherwise hemodynamically stable and afebrile. Ultrasound revealed fetal demise consistent with 17w gestation and her labs were notable for severe metabolic acidosis with pH 7.04, CO2 5, lactate 9.9 and severe new onset transaminitis with AST/ALT 1260/1055. RUQ ultrasound showed fatty infiltrate of the liver. Given concern for septic abortion, she was transferred to our institution for further management. On arrival her labs showed worsening transaminitis (peak AST/ALT 8626/5511), coagulopathy with INR 3.3, leukocytosis, and elevated ammonia and urate, meeting 8 Swansea criteria for AFLP. Extensive workup for infectious, autoimmune, drug-induced, and ischemic etiologies were all negative, and she did not have any hypertension or thrombocytopenia consistent with HELLP. She underwent correction of her coagulopathy and then proceeded for urgent dilation and evacuation (D&E), which was uneventful. Postoperatively she was admitted to the ICU for close monitoring and evaluation for possible need for liver transplant; however, her course was uncomplicated and she recovered rapidly with resolution of her metabolic acidosis and >50% reduction in her transaminases within 24 hours. Her liver indices continued to improve without intervention and she was ultimately discharged on postoperative day 6, at which time her AST/ALT were 65/799.

Discussion: AFLP is characterized by acute hepatic failure that can progress to coagulopathy, electrolyte abnormalities, and multisystem organ dysfunction. Early identification, prompt delivery, and comprehensive supportive care often in the ICU are key in management. This case demonstrates that AFLP can occur as early as 17 weeks gestation and should be considered when determining appropriate anesthetic care for pregnant patients with acute hepatic abnormalities.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 10

A Cloudy Clinical Picture: Acute Fatty Liver of Pregnancy Complicated by Septic Shock

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Introduction: AFLP is a rare disorder, most often occurring in the third trimester, that affects 1-3 in 10,000 pregnancies, with a mortality of 2%.1 A variable and non-specific clinical presentation can mimic or be concomitant with other common pathologies in pregnancy such as pre-eclampsia, HELLP, or sepsis, potentially resulting in delayed diagnosis or misdiagnosis. We present a case of a parturient with AFLP and coexisting sepsis.

Case One: A 34-year-old G1P0 female at 34w0d with a history of mild asthma presented with new onset hypertension and facial edema. Workup revealed hypoglycemia; leukocytosis; elevated creatinine, bilirubin, urea, ammonia, and transaminases; and abnormal coagulation studies, resulting in a Swansea score of 8, consistent with acute fatty liver of pregnancy (AFLP) with indication for urgent delivery. Neuraxial procedures were contraindicated in the setting of coagulopathy. A healthy neonate was delivered during Cesarean under general anesthesia, with an estimated blood loss of 750ml. On POD 3, she had increasing abdominal tenderness and serosanguinous output from the incision. Imaging revealed arterial bleeding from the hysterotomy, prompting emergent exploratory laparotomy on POD 4 with evacuation of 1.5L of blood. While transaminases normalized, there was persistent leukocytosis, coagulopathy, and high-output drainage from the incision. On POD 5, she underwent bedside wound exploration and vacuum placement. She received weight-dosed preoperative cefazolin for all procedures. On POD 6, she developed new hypotension, hypothermia, tachycardia, lactic acidosis, and leukopenia concerning for septic shock. She was admitted to the MICU on vasopressor support with blood cultures growing cefazolin-resistant Serratia. Despite aggressive resuscitation, the patient passed away from multiorgan failure on POD 10.

Discussion: Infection is common in AFLP, with one study showing infectious complications in 53% of patients.2 Normal physiologic changes of pregnancy, along with the systemic inflammatory response to AFLP and associated laboratory derangements can complicate the early diagnosis of sepsis, leading to significant maternal morbidity and mortality.3 In this case, the patient did not have classic signs of infection, such as fever or tachycardia, prior to clinical deterioration. Laboratory aberrations and coagulopathy were contributed to previously diagnosed AFLP, and resolving transaminases were falsely reassuring. While pregnancy-specific sepsis scoring systems exist, they have not been validated in patients with other underlying pathophysiology, such as AFLP.4 This case demonstrates the complex management of AFLP and the importance of maintaining a broad-differential and a low-threshold to pan-culture critically-ill parturients who fail to improve after delivery.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 11

Anesthetic Management During Cesarean Delivery of a Parturient with Anti-PL-12 Antisynthetase Syndrome, Severe ILD, And Heart Failure

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Introduction: Anti-synthetase syndrome is a rare autoimmune disorder characterized by myositis, arthritis, Raynaud phenomenon and interstitial lung disease (ILD). Patients with anti-PL-12 antibodies typically have more severe ILD, with an estimated 5-year mortality of over 45% (1,2). We present a case of a parturient with severe ILD secondary to anti-PL-12 antisynthetase syndrome and heart failure due to non-ischemic cardiomyopathy who underwent cesarean delivery.

Case One: A 35-year-old G3P0 female with anti-PL-12 antisynthetase syndrome complicated by ILD on baseline oxygen, non-ischemic cardiomyopathy and pulmonary hypertension was admitted to the ICU at 27w4d for non-invasive ventilation due to worsening dyspnea. TTE showed left ventricular systolic function of 20-25%. Her symptoms worsened despite treatment and a multidisciplinary decision was made to proceed with cesarean section in the cardiac OR at 30w. Due to severe orthopnea and hypoxia, general anesthesia was planned. The patient was positioned in steep reverse Trendelenburg on the operating table and an arterial line was placed. After pre-oxygenation, the patient was induced with ketamine and propofol and intubated. A central line with pulmonary artery catheter, TEE probe, and a femoral artery sheath were placed in case ECMO were required. Intraoperative TEE showed LVEF 10-15% and mild to moderate global RV hypokinesis. General anesthesia and hemodynamic stability were maintained with propofol and norepinephrine infusions. The patient became increasingly difficult to ventilate on the anesthesia ventilator with peak airway pressures greater than 50 cmH20 necessitating manual ventilation to achieve appropriate tidal volumes and maintain oxygen saturation. ABG showed PaCO2 76 mmHg compared to baseline of 46 mmHg. Pulmonary artery pressures were elevated above 80/50 mmHg. An ICU ventilator and inhaled nitric oxide were initiated, ventilation improved rapidly, and PAPs decreased, preventing ECMO cannulation. The cesarean delivery proceeded without complication. Post-operatively, the patient returned to the ICU intubated and sedated. She was weaned off iNO and extubated to HFNC on postpartum day 1. She was weaned to baseline NC on postpartum day 3 and discharged home on day 8.

Discussion: Although existing case reports demonstrate the safety of neuraxial anesthesia for delivery of parturients with antisynthetase syndrome, severe lung disease may necessitate

general anesthesia due to patient limitations. Patient counseling regarding the potential for prolonged intubation or ECMO is essential. A multidisciplinary approach with close monitoring is crucial to evaluate worsening cardiopulmonary status in these patients in the peripartum period. In this case, switching to a high-quality ICU ventilator prevented the need for ECMO and its significant risks.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 12

T- Cell Lymphoblastic Lymphoma with Anterior Mediastinal Mass in Pregnancy

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Introduction: Lymphoma is the fourth most common malignancy diagnosed during pregnancy with an increasing incidence.1 Approximately 1 in 6000 pregnancies are complicated by a new diagnosis of lymphoma. It is important to assess for possible anterior mediastinal mass when developing anesthetic management.

Case One: A 30 y/o G1P0 at 29w4d presented for emergent cesarean delivery Patient had been recently diagnosed with T- Cell lymphoblastic Lymphoma several days prior to presentation to hospital. Patient reported that several months prior, she noticed lumps in her scalp that increased in size over time. She then developed palpable cervical lymphadenopathy bilaterally prompting biopsy of scalp lesions. Biopsy revealed T- Cell lymphoblastic Lymphoma and bone marrow biopsy showed evidence of leukemic cells. Patient was transferred for higher level of care and was being prepared for initiation of chemotherapy when she developed right sided facial palsy with inability to smile, raise right eyebrow, or close her right eye. Patient denied headache, nausea and vomiting, or gait disturbances. CT brain completed at outside hospital did not reveal an intracranial lesion. MRI chest showed a 12 cm anterior mediastinal mass and left pleural effusion. Antepartum chemotherapy management included cyclophosphamide. An image-guided thoracentesis was performed, removing 460mL of serous fluid from the left pleural cavity due to increasing oxygen requirements. Patient was transferred to higher level of care for remainder of her antepartum care. The next day, patient was taken for urgent cesarean section due to non-reassuring fetal heart tracing, category II strip, and abnormal BPP. Patient oxygenation status had improved and did not show symptoms from anterior mediastinal mass.The anesthesia resident performed an uneventful spinal using 1.4 ml bupivacaine 0.75% with dextrose 8.25%, 15mcg fentanyl, and 0.15mg morphine used as spinal dose.

Discussion: Intraoperative management included having advanced airway technique equipment readily available in the event of failed neuraxial in the setting of anterior mediastinal mass. Cesarean delivery was uneventful and patient continued chemotherapy treatment in the postoperative period.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 13

Treatment of Chronic Myeloid Leukemia in Pregnancy and Anesthetic Considerations: A Case Report

Presenting Author: Monica Lu, MD
Presenting Author's Institution: The University of Texas Health Science Center at Houston

Introduction: Chronic myeloid leukemia (CML) is a myeloproliferative disorder caused by the BCR-ABL fusion gene, formed by a t(9;22) translocation known as the Philadelphia chromosome. It is marked by dramatic leukocytosis with presence of immature neutrophil precursors. Incidence of CML during pregnancy is 1 in 75,000. When blasts exceed 5%, neuraxial anesthesia has greater theoretical risk of intrathecal seeding of blast cells, precipitating central nervous system blast crisis with a high mortality rate. However, there are no current guidelines for anesthetic management in pregnancy complicated by CML.

Case One: A 29-year-old female G3P2 presented with vaginal bleeding. Transvaginal ultrasound revealed viable intrauterine pregnancy at 6 weeks. She also reported blurry vision, easy bruising, and weight loss. WBC count was 684 x 10^9/L and hemoglobin was 7.0 g/dL. Peripheral smear noted 1% blasts. Detection of BCR-ABL by FISH and bone marrow biopsy confirmed a new diagnosis of CML. She underwent urgent leukapheresis and was discharged with weekly interferon alpha injections. At 31 and 34 weeks, she completed two courses of hydroxyurea. WBC count was monitored by her hematologist during treatment (see figure). The patient presented at 37 weeks and 3 days for scheduled induction of labor. Labs showed WBC 83 x 10^9/L with 1% blasts, hemoglobin 8.5 g/dL, platelets 345 x 10^9/L. Risks and benefits of neuraxial anesthesia were discussed with the patient and a multidisciplinary care team. Since blasts were 1%, decision was made to proceed with careful epidural placement to avoid inadvertent dural puncture. Patient later required emergent primary cesarean section due to non-reassuring fetal heart tones. 15 mL of 3% epidural chloroprocaine was given. A single male infant was delivered with Apgar scores of 8 and 9. 3 mg morphine and 8 mL 2% lidocaine were given via epidural catheter for postoperative analgesia. Estimated blood loss was 900 mL. Post-delivery hemoglobin was 7.3 g/dL. Dasatinib was started and WBC count continued to decrease.

Discussion: Guidelines for CML management during pregnancy are limited. Cesarean section under general anesthesia has been acknowledged as a safe option to prevent CNS seeding of blast cells. However, general anesthesia carries disadvantages such as airway complications and aspiration risk. This case demonstrates successful epidural use for labor analgesia in a parturient with CML.

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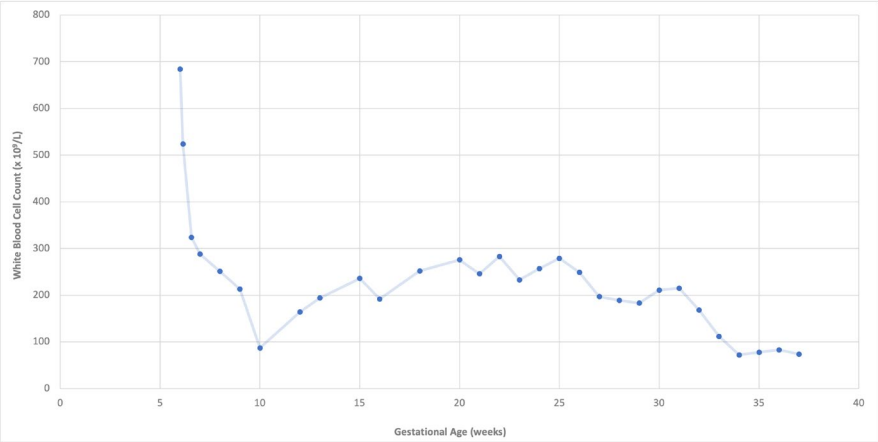

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 14

Resection of Large Intrathoracic Recurrent Metastatic Hepatoblastoma at 26 weeks Gestation

Presenting Author: Jarrett Perry, MD
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Introduction: Hepatoblastoma accounts for 1% of primary pediatric malignancies. Most cases will present with elevated Alpha-fetoprotein level. Recurrence of hepatoblastoma in adulthood is rare

Case One: A 36 year-old G2P0 at 20 weeks with placenta previa was found to have markedly elevated Alpha-fetoprotein level during routine prenatal care. The patient has a past medical history significant for metastatic hepatoblastoma which was treated by tumor resection, chemotherapy and radiation. Given the patient's history, MRI of the chest and abdomen was performed, which showed a 7.3cm x 6cm left upper lobe mass. Biopsy confirmed diagnosis of recurrent metastatic hepatoblastoma. Tumor progression was monitored with serial imaging. Interval MRI at 26 weeks, showed growth of the tumor (9.2cm x 8.8cm x 6.8cm) with increasing mass effect on the mediastinum and subclavian vein, and new left lower lobe mass. Multidisciplinary planning determined that rapid progression warranted immediate surgical intervention given mediastinal involvement. A course of betamethasone was given for fetal lung maturity. At 26.2 weeks, the patient presented for open thoracotomy with left upper lobe resection, left lower lobe resection with possible cardiopulmonary bypass. A preinduction radial arterial line was placed as was a T5-T6 thoracic epidural for postoperative pain control. Continuous fetal monitoring began preinduction. A rapid sequence intubation was performed and a 35 Fr double lumen endotracheal tube was placed. Endotracheal tube placement was confirmed by fiberoptic bronchoscopy and single-lung ventilation was initiated. The left upper lobe was successfully resected without need for cardiopulmonary bypass. Estimated blood loss was 1,600mL. The patient intermittently was supported with a phenylephrine infusion , 4L of crystalloids, and 2 units of packed red blood cells. The epidural catheter was dosed with hydromorphone; the patient was weaned from vasopressors and successfully extubated. The fetal heart rate tracing was stable throughout. Postsurgical recovery occurred in the intensive care unit. The patient began contracting on POD 0 with concern for fetal deceleration and new onset vaginal bleeding. Emergency cesarean delivery for preterm labor in the setting of placenta previa and non-reassuring fetal status was performed under general anesthesia for presumed placental abruption. The patient was profoundly hypotensive requiring vasopressor support, fluid resuscitation and transfusion. After extubation she was transferred back to the ICU, for continued fluid resuscitation and vasopressor management.

Discussion: The need for thoracic surgery requiring one-lung ventilation during pregnancy is rare. Physiologic changes of pregnancy including airway anatomy, decreased pulmonary

function can make intubation and single lung ventilation particularly challenging. Multidisciplinary contingency planning and discussion was paramount to successful resection of this rare tumor.

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 16

Anesthetic Neuraxial Implications of Chronic Myeloid Leukemia in the Obstetric Patient

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Introduction: Chronic Myeloid Leukemia (CML) accounts for 10% of pregnancy-related leukemias with a large proportion of patients reaching term gestation1. Tyrosine Kinase Inhibitors (TKIs) are the standard treatment for CML providing a deep and sustained molecular remission of the pathogenic BCR-ABL1 transcript. Importantly, not all patients enter pregnancy with an appropriate molecular remission of their CML and treatment with TKIs is contraindicated during pregnancy1. This results in increased risk of disease progression and circulating leukemic cells 1. Inadvertent seeding of blast cells into the central nervous system (CNS) carries severe and fatal consequences if a CNS blast crisis occurs. The use of general anesthesia for emergency cesarean delivery in patients with circulating blasts has been described2-4. However, anesthetic neuraxial considerations for labour analgesia in pregnant patients with CML have not been addressed.

Case One: Consent was obtained. A 37-year-old G7P4 parturient with CML was admitted at 33 weeks gestation with threatened preterm labour. Since her last delivery she had been diagnosed with CML and treated with imatinib, a TKI. A loss of major molecular response to imatinib (BCR-ABL1 transcript log reduction above -3) was achieved prior to pregnancy. Cessation of imatinib resulted in disease progression with a BCR-ABL1 transcript level increase by 20 weeks gestation. Peginterferon alpha-2a was initiated and after a multidisciplinary assessment, induction of labour was planned. Peripheral blood smear at 37 weeks revealed no circulating blasts and rare immature myeloid cells. After a risk discussion with the patient, she received remifentanil patient-controlled analgesia, thus avoiding the use of neuraxial analgesia and any risk of blast cell translocation into the CNS. A healthy baby was delivered by spontaneous vaginal delivery.

Discussion: CML in obstetric patients pose unique challenges to anesthesiologists given the risk of blast cell seeding into the CNS with neuraxial techniques. This can occur via 2 main mechanisms:1) direct transfer of blast cells from blood and 2) through the "tissue coring" phenomenon. In the presence of no blast cells and optimal CML control, the probability of direct transfer is considered very unlikely. However, a safe level of BCR-ABL1 transcript

suppression for neuraxial anesthesia has not been established. Also, there is still a risk of translocating extramedullary blast infiltrates in skin, ligament, and muscle into CNS with needling, even when an introducer is used. A tissue coring incidence of 41% with Whitacre 25G, 56% with Quincke 27G and 80% with Quincke 25G needles have been reported5. Therefore, the safe use of neuraxial techniques in this population remains highly controversial, and a patient specific risk discussion involving a multidisciplinary team is essential.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 16

Anesthetic Management of an Obstetric Patient with New Diagnosis Of Leprosy
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Introduction: Leprosy, also known as Hansen's disease, is a chronic infectious disease caused by Mycobacterium Leprae. Primarily affecting skin, mucous membranes, and peripheral nerves, it can progress to profound multi-organ involvement1. Despite recognized effects of leprosy in the general population, the effects on pregnancy are not well known. Pregnancy carries an elevated incidence of first clinical presentation and increased risk of disease progression2. Also, 40% of patients will develop more severe states of leprosy, known as reactional states, resulting in increased skin lesions, acute neuritis and vasculitis1. Only one case report describes the anesthetic management during emergency cesarean delivery in a patient with leprosy3. There is a paucity of literature describing anesthetic considerations, patient optimization during pregnancy, and anesthetic options during labour and delivery in this population.

Case One: Consent was obtained. A 37-year-old G14P9 at 26+5 weeks gestation presented with new diagnosis of leprosy during 1st trimester of pregnancy. She had a history of anemia, obesity, previous post-partum hemorrhage and eclampsia requiring ICU admission. A skin lesion in her left shin associated with pruritus and numbness was found to be positive for leprosy. Treatment was initiated with dapsone, rifampicin and moxifloxacin. Comprehensive pre-anesthesia assessment did not reveal any features of advanced disease at term. The patient had a dural-puncture epidural for induction of labour and uneventful vaginal delivery.

Discussion: Leprosy is a complex disease with important anesthetic implications, including potential difficult airway management caused by erosive anatomical changes to the uvula, vocal cords, and epiglottic area. In advanced disease, facial bone resorption and deformation of the nasopharynx can further complicate airway management. Respiratory dysautonomia leads to impaired cough reflex and increased risk of aspiration. This compounds the already high aspiration risk associated with pregnancy. Advanced disease states are characterized by thrombocytopenia, profound lower limb neurologic deficits, and dissemination of skin lesions which may involve the lumbar area. These features may preclude the use of neuraxial techniques for labour analgesia. Finally, prompt treatment and close expert monitoring throughout pregnancy by a multidisciplinary team is necessary as this patient population is at risk of having leprosy-associated complications with progression of pregnancy. This is the first report to describe the successful use of neuraxial analgesia and the anesthetic implications of leprosy in a pregnant patient.

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Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 17

Anesthetic management of a parturient with Swyer-James-MacLeod Syndrome

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Co-Authors: Ilana Sebbag, MD - Western Univesity, University of British Columbia

Introduction: Anesthetic management of parturients with Swyer James MacLeod Syndrome (SJMS) can be challenging due to significant obstructive pulmonary disease. SJMS is a rare acquired postinfectious pulmonary disorder which increases patients risk for respiratory complications (1). We describe the anesthetic considerations and management of a pregnant woman with SJMS undergoing labor and vaginal delivery.

Case One: A 28-year-old G1P0 woman with SJMS was referred to the Anesthesia clinic at 30 weeks gestation. Her SJMS was complicated by bronchiectasis, chronic Mycobacterium Xenopi infection with a 4.1 cm cavitary lung lesion and ongoing smoking. During pregnancy she experienced worsening SOB and wheezing with exertion, a daily productive cough and poor weight gain. PFTs demonstrated severe obstruction with FEV1 of 37%, FEV1/FVC ratio of 47% and vital capacity of 70% with preserved DLCO. Pulmonary medications included Olodaterol, Salbutamol, Tiotropium and Fluticasone. Her long-term mycobacterium treatment was held during pregnancy and in the week prior to delivery was started on cefuroxime for findings on CXR. A multidisciplinary conference was held, including Respirology, Anesthesia and Maternal Fetal Medicine. It was decided to monitor closely and proceed with hospital admission for optimization of respiratory function prior to induction of labor with epidural analgesia and assisted second stage. She was admitted at 35 weeks gestation for worsening symptoms and treated with incentive spirometry and regular inhaler treatments. She was induced at 36 weeks gestation with a foley catheter for cervical ripening. She went into spontaneous labour and had a combined spinal epidural (CSE) placed at L4/5 for labor analgesia. The block was initiated with 2.5mg of Bupivacaine intrathecally and maintained with epidural infusion at our local standard concentration and rate which provided excellent pain relief. She was encouraged to labor in a semisitting position. During contractions she quickly fatigued and was unable to hold a valsalva for more than 3 to 4 seconds. The decision was made to proceed with a forceps assisted vaginal delivery, and a vigorous healthy female infant was born without complication. Both she and baby did well and were discharged home 2 days later.

Discussion: There are limited reports of anesthetic management of SJMS during pregnancy (2). Prior case reports described titrated epidural for delivery and spinal anesthetic for emergency cesarean section. We describe the uneventful anesthetic management of a pregnant woman with significant SJMS having labor and assisted vaginal delivery with early CSE analgesia.

References: 1. Smith, M. M., Barbara, D. W., Smith, B. C., Sprung, J. & Weingarten, T. N. Anesthetic implications for patients with swyer-james syndrome. J. Cardiothorac. Vasc.

Anesth. 28, 925–930 (2014). 2. Al-Bakri, O. et al. Swyer-James-MacLeod syndrome in pregnancy: A case report. Obstet. Med. 16, 187–188 (2023).

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 18

Cesarean Delivery in a Patient with Epidermolysis Bullosa Dystrophica

Presenting Author: Katina S. Kassicieh, MD
Presenting Author's Institution: Department of Anesthesiology and Critical Care Medicine, University of New Mexico, Nebraska
Co-Authors: Pearl M. Huynh, MS - University of New Mexico School of Medicine

Introduction: Epidermolysis bullosa (EB) is a rare genetic skin disorder that can be autosomal dominant or recessive1,2. It is a blistering disease that occurs due to a mutation in type VII collagen and can range from mild to severe with scar formation and reduced life expectancy3. EB increases the risk of pregnancy complications, and although patients are not discouraged from becoming pregnant, pregnancy is rare due to disease severity and potential for inheritance4. Anesthetic implications at delivery include organ system and airway involvement, and the need to meticulously avoid friction or shearing forces that can cause lesions4. We present a case of repeat cesarean delivery (CD) in a woman with severe EB.

Case One: A 28-year-old G3P1 with EB presented for repeat CD at term. Her previous pregnancy had been complicated by preeclampsia with severe features requiring CD, and she had a short pregnancy interval of one year. Medical history was significant for malnutrition and low BMI in the setting of esophageal strictures and G-tube dependence. Anesthesia history was significant for limited jaw mobility and reported difficult intubation. Previous CD was performed under spinal anesthetic and was uncomplicated. The patient was admitted one day prior to surgery. A PICC line was placed and wound care applied Mepilex dressing to pressure points, including her back, leaving a small window for the neuraxial block. On the day of surgery, standard ASA monitors were placed using modifications to avoid use of adhesives or use Avance Film where necessary. An inflating patient transfer system with sheepskin padding at pressure points was used for all transfers. Combined spinal-epidural (CSE) was performed using betadine prep applied by dabbing, and the patient was positioned sitting parallel on the OR table so that there was minimal repositioning after CSE. The epidural was secured with Avance Film. Difficult airway equipment was prepped and available in the room. Anesthetic management and surgical procedure were uneventful.

Discussion: Preoperative planning for this case included multidisciplinary collaboration, avoiding and preparing for a potentially difficult intubation, and addressing skin fragility. Specialized products were used including Mepilex and Avance Film dressings, the Prevalon Turn & Position transfer system, and sheepskin padding. Modifications led to suboptimal monitoring, with ECG leads only intermittently capturing and a poor pulse oximeter waveform - issues that were exacerbated by intraoperative shivering. This case highlights the necessity for a detailed, multidisciplinary approach to managing EB during cesarean delivery, contributing to a successful outcome.

References: 1. Pfendner EG. Dystrophic Epidermolysis Bullosa. 2006 Aug 21 2. Shah N. Case

Rep Womens Health. 2019 Sep 5;24 3. Boria F. Actas Dermosifiliogr.. 2019 Jan-Feb;110:1 4. Araujo M. Int J Obstet Anesth. 2017 May:30:68-72

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 19

Primary Cesarean Delivery Complicated by Recessive Dystrophic Epidermolysis Bullosa

Presenting Author: Bryan Wakefield, MD
Presenting Author's Institution: Vanderbilt University Medical Center
Co-Authors: Neva P. Lemoine, MD - Vanderbilt University Medical Center
Pauline Ripchik, MD - Vanderbilt University Medical Center
Jordan E. Yokley, MD – VUMC

Introduction: Epidermolysis bullosa (EB) is a group of rare genetic disorders characterized by skin and mucosal tissue fragility. Recessive dystrophic EB (RDEB) is the most severe form, characterized by nonhealing wounds, extensive scarring, microstomia, and pseudo syndactyly. The wounds created by minimal trauma can become infected, and sepsis is a leading cause of death in adults with RDEB.1 Nearly all of these physical manifestations carry an anesthetic implication. Skin damage frequently occurs after adhesive is applied. This includes adhesive dressings, tape, and the adhesive found on ECG leads. The scrubbing motion associated with chlorhexidine prep often results in extensive skin sloughing. The perioral scarring common in these patients makes intubation perilous, and direct laryngoscopy (DL) can further damage fragile oral mucosa.1,2 Here we describe the anesthetic management of a parturient with RDEB.

Case One: A 29-year-old G1P0 at 37w0d presented for induction of labor (IOL). Her pregnancy was complicated by RDEB with extreme skin fragility, microstomia, esophageal strictures, and syndactyly of fingers and toes. She used a wheelchair for mobility, as walking was painful and precipitated pedal skin breakdown. She had a history of difficult IV access and severe anxiety surrounding IVs, and a midline catheter was placed on admission for access. This was fully covered with a Mepitel® dressing and outlined with Mepitac® tape. A transparent adhesive dressing was placed over the Mepitel® to maintain sterility. After arrival for IOL, the patient expressed her preference for a primary cesarean delivery. In the operating room, her skin was prepped with betadine, applied in a dabbing motion with sterile gauze, and a combined spinal-epidural was placed with 1.6 cc of 0.75% bupivacaine, 15 mcg of fentanyl, and 150 mcg of morphine, resulting in a T8 level. This was supplemented with 4 cc of 2% lidocaine. The epidural catheter was secured with a large Mepitel® dressing. Gauze padding was placed under a noninvasive blood pressure cuff, and ECG leads sans adhesive were attached with Mepitac® tape to minimize skin damage. Her intraoperative course was uncomplicated. Her postpartum (PP) stay was prolonged as a result of poor pain control due to denuding of the superior epidermis near the Pfannenstiel incision site. There were no areas of skin damage on her back, chest, or arms. She was discharged on PPD6.

Discussion: RDEB is exceedingly rare, with an estimated prevalence of < 1:6,000,000.1 The obstetric anesthetic considerations are numerous and include the safe securement of lines and monitors; difficulty with positioning for procedures due to contractures; and potential for challenging airway management due to esophageal strictures, perioral scarring, and limited

neck movement, making DL ill-advised if not impossible.1,2 These patients require extensive planning to minimize the risk of skin breakdown and ensure safety during the peripartum period.

References: 1. PMID: 34403382 2. PMID: 34687549

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 20

Anesthetic Management of a Morbidly Obese Parturient Undergoing Cesarean Delivery: A Case Report

Presenting Author: Ashley Elser, MD
Presenting Author's Institution: University of Arkansas for Medical Sciences
Co-Authors: Cash Arcement, MD - University of Arkansas for Medical Sciences
Nadir Sharawi, MBBS - University of Arkansas for Medical Sciences

Introduction: We present a 26-year-old primigravida female at 37 weeks, 3 days gestation with chronic hypertension, asthma, obstructive sleep apnea (non-compliant with CPAP), and super morbid obesity (BMI 93.5 kg/m2) admitted for induction of labor due to a non-reactive non-stress test. The patient's significant body habitus warranted profound concern for both obstetrical and anesthetic management, especially if general anesthesia was required for emergent cesarean delivery (CD).

Case One: A serial induction was planned during daylight hours when full staffing and maximal resources were available. Two bilateral forearm 18 gauge intravenous cannulas and a right arm double-lumen peripherally inserted central catheter were placed for adequate intravascular access. Blood pressure was initially monitored with continuous noninvasive monitoring (ClearSight). A radial arterial line was obtained after active labor was established. An epidural catheter was placed without difficulty before performing amniotomy in the operating room rather than on the bariatric bed for procedure optimization. Prior to delivery, she experienced sudden onset slurred speech. A neurological exam was normal. However, cerebral vascular accident was suspected. An emergent CT scan was unremarkable. A few hours later she returned to baseline with presumed etiology being an anxiety attack. Fetal heart rate remained at baseline throughout. Due to arrest of dilation and rupture of membranes for almost 24 hours, a decision was made to proceed with primary CD. The epidural was bolused for surgical anesthesia, and the patient was optimized in the event of conversion to general anesthesia. Optimization included appropriate ramping, availability of video laryngoscopy and difficult airway cart including fiberoptic scope, and utilizing Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE). Surgery was uneventful and the epidural catheter was removed. Prophylactic subcutaneous heparin was initiated and the patient was encouraged to mobilize. Four hours after delivery she developed altered mental status and increasing oxygen requirements. An arterial blood gas demonstrated a respiratory acidosis. She was transferred to the ICU for initiation of bilevel positive airway pressure and management of respiratory failure. Her symptoms and respiratory status improved and she was discharged on postpartum day 3.

Discussion: This patient's body habitus posed several risks for peripartum management. Ensuring adequate IV access, appropriate blood pressure monitoring with invasive monitors as needed, early use of neuraxial analgesia with frequent block assessment, and preparation for emergent CD with general anesthesia are important planning consideration in this population.

In addition, patients with obesity have an increased risk of postoperative complications.

References: 1. “Adult Obesity Facts.” CDC and Prevention. https://www.cdc.gov/obesity/data/adult.html 2. Kim, Anesth Pain Med (Seoul). 16 (4): 313-321. 2021.

Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 21

Anesthetic Management for an Urgent Cesarean Delivery in a Super-Super Morbidly Obese Patient with Metabolic Syndrome

Presenting Author: Shashank S. Shettar, MD, FASA
Presenting Author's Institution: University of Oklahoma Health Sciences Center, Oklahoma
Co-Authors: Rachel Abraham - University of Oklahoma Health Sciences Center

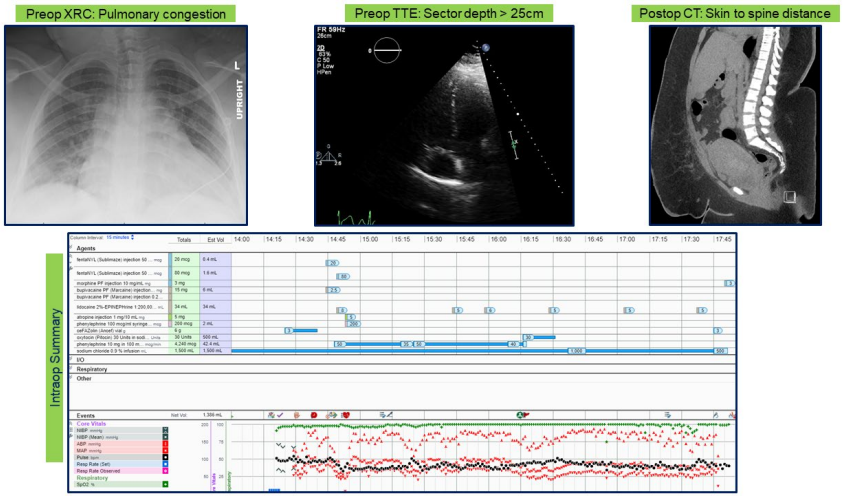
Introduction: Background: More than one-third of the world's population is classified as obese or overweight. Obesity is a complex condition in which body fat distribution is associated with a proinflammatory state and metabolic alterations, affecting multiple organ systems. We present the challenging anesthetic management of a patient with metabolic syndrome scheduled for an urgent cesarean delivery.

Case One: Case Report: A 26-year-old G2P1 female with past medical history of super-super obesity (BMI 72), severe OSA, obesity hypoventilation syndrome, chronic respiratory failure, DM, persistent asthma, diastolic heart failure, chronic HTN with superimposed preeclampsia with severe features was scheduled for an urgent cesarean delivery. Patient presented with symptoms of worsening shortness of breath, pulmonary congestion, elevated BNP, headache and severe range blood pressures. A multi-disciplinary team of maternal-fetal-medicine, pulmonology, cardiology, NICU and obstetric anesthesia was involved in planning and coordinating care for this patient. She was started on diuretics, continuous BiPAP and anti-hypertensives, and decision was made to proceed with urgent cesarean delivery. Anesthesia team planned for combined spinal-epidural (CSE) technique with pre-procedure invasive arterial line monitoring. Operating room setup included difficult airway cart including video-laryngoscope, patient positioning ramp, shoulder roll, underbody warmer, epidural positioning device, vasopressor and emergency medications. Two wide-bore peripheral IV were secured preoperatively. The CSE block consisted of intrathecal fentanyl 20mcg and bupivacaine 2.5mg followed by carefully titrated epidural block with incremental doses of 2% lidocaine with 5mcg/mL epinephrine. Patient was optimally positioned with preparation for emergency airway management and phenylephrine infusion initiated. Baby was successfully delivered, the procedure lasted for 4.5 hours. Epidural anesthesia was titrated using intermittent doses of lidocaine, and epidural morphine was administered at the end of case. Patient tolerated the procedure well, was transferred to ICU postoperatively and discharged home on POD 7.

Discussion: Anesthetic management of morbidly obese pregnant woman remains a challenging problem – choice of anesthesia, altered pharmacokinetic profile of anesthetic medications, airway management, positioning, monitoring, managing co-morbidities and postoperative care. This case highlights the importance of a multi-disciplinary approach in successful management of high-risk parturient. Patient was thoroughly counselled emphasizing that emergent cesarean delivery was not an option given unacceptably high risk of intra-operative complications given her multiple co-morbidities. Maternal obesity increases

risk of preeclampsia, gestational diabetes, cesarean delivery, hemorrhage, fetal macrosomia, preterm/stillbirth.

References: 1.Lee KK, et al. Hypertension. 2015;66:938–44 2. Alberti KG, et al. Circulation. 2009;120:1640–5



Abstract #: SAT – CR – BS 3 – BR 6 – Liver, Lungs, and Lumps – 22

Hypertriglyceridemia-Induced Acute Pancreatitis in Pregnancy

Presenting Author: Walter M. Taylor, III, MD
Presenting Author's Institution: NewYork-Presbyterian - Weill Cornell
Co-Authors: Latha Panchap, MD - NewYork Presbyterian - Weill Cornell
Kyle Sullivan, MD - New York Presbyterian- Weill Cornell

Introduction: Acute pancreatitis (AP) occurs in only 0.01-0.1% of pregnancies, however it carries significant morbidity and mortality for both mother and fetus (1,2). Gallstone, alcohol, and hypertriglyceridemia (HTG)-induced AP are the most common etiologies, but HTG-induced AP carries a particularly high maternal mortality of nearly 20% (2). Guidelines for HTG management in pregnancy do not currently exist, thus therapy relies primarily on prevention and multidisciplinary care for these complex cases.

Case One: A 37 year-old G5P0040 female with previous recurrent pregnancy losses on enoxaparin presented with acute back pain, nausea, and vomiting at 38w6d. Her pregnancy had been complicated by GDM, which was managed with diet. Upon presentation to OB triage, vitals were within normal limits. Workup demonstrated HTG-induced pancreatitis with a manual triglyceride level of 3137mg/dL. GI, MFM, and ICU triage were consulted with plan to induce and begin insulin infusion. An arterial line was placed followed by labor analgesia using a DPE technique. An epidural infusion using programmed intermittent epidural bolus was started. Ultrasound revealed a thrombus in the right radial artery shortly after line placement; another was placed on the contralateral side. POCUS revealed moderate right pleural effusion with depressed cardiac function. In the setting of up-trending creatinine and lactate, the decision was made to proceed with low transverse caesarean section (LTCS) with plan to transfer to MICU for initiation of PLEX postoperatively. A surgical level of epidural anesthesia was achieved using lidocaine 2% with EPI 1:200k in divided doses. The surgery was uncomplicated and the baby was delivered without incident. PLEX was ultimately deferred as triglycerides were found to be down-trending and insulin drip was discontinued. Patient was started on fenofibrate 145mg daily. Daily post-op labs showed continued down-trend of cholesterol and TG. She was discharged on POD4 with outpatient PCP appointment.

Discussion: HTG-induced AP is an uncommon but serious complication of pregnancy. Pre-pregnancy optimization in at-risk patients and early recognition of HTG portend a better outcome for both mother and fetus. Given the high morbidity and mortality of HTG-induced AP, multidisciplinary medical attention is warranted. Further research is necessary to develop guidelines to direct therapy.

References: (1) Cruciat G, et al. Hypertriglyceridemia Triggered Acute Pancreatitis in Pregnancy - Diagnostic Approach, Management and Follow-up Care. Lipids in Health and Disease. 2020. (2) Gupta M, et al. Prevention and Management of Hypertriglyceridemia-Induced Acute Pancreatitis During Pregnancy: A systematic Review. The American Journal of Medicine. 2022.

(3) Madro A. Pancreatitis in Pregnancy - Comprehensive Review. International Journal of Environmental Research and Public Health. 2022.

Program Material
Sunday, May 5, 2024

Opening Remarks
Emily Sharpe, MD

SOAP/ASRA Panel: PDPH Beyond the Guidelines: How to Improve Patient Care
Moderator: Lisa Leffert, MD
Panelists: Vishal Uppal, MD; Wouter Schievink, MD; Alexandra Schyns-van den Berg, MD; Sharon Orbach-Zinger, MD

Concurrent Sessions

Sol Shnider Track #3 (Main Stage)
1. Three Perils of Intrapartum Cesarean Deliveries: Pain, PPH, and PTSD
   Moderator: Brendan Carvalho, MD
   Panelists: Daniel Conti, MD; Sharon Dekel, MD; Leziga Obiyo, MD
2. PRO/CON: NPO in Labor vs. Fed in Labor
   Fasting: Mark Zakowski, MD
   Fed: Manny Vallejo, MD
3. Addressing Maternal Disparities: Three Areas to Improve Your Patients Outcomes
   Moderator: Fatoumata Kromah, MD
   Panelists: Emily Naoum, MD; Sarah Nizamuddin, MD; Paloma Toledo, MD

Oral Research Presentations #2 (Breakout Room)
Moderator: Ashraf Habib, MD

1. Effect of Ephedrine, Phenylephrine, and Norepinephrine on Myometrial Contractility – Wafa Bellan, MD
2. Readability, quality and accuracy of ChatGPT and BARD for common questions about obstetric anesthesia – Donald Lee, MD
3. A New Machine Learning Model for the Prediction of Severe Maternal Morbidity Using a Large Retrospective Cohort – Taylor Maney, MD
4. Development and validation of a prognostic model for maternal cardiovascular morbidity events in patients with hypertensive disorders of pregnancy - Marie-Louise Meng, MD
5. Noninvasive continuous versus intermittent oscillometric arterial pressure monitoring and maternal hypotension during cesarean delivery: A randomized controlled trial - Sun-Kyung Park, MD
6. Erector Spinae Plane Block with Liposomal Bupivacaine for Post Cesarean Delivery Analgesia: A Pilot Study – Sara Feldman, MD
7. Local Anesthetic Systemic Toxicity in Pregnancy: A Retrospective Cohort Analysis – Shobana Murugan, MD
8. Trends in neuraxial labor analgesia utilization by race and ethnicity among nulliparous individuals undergoing spontaneous vaginal delivery, United States, 2007-2022 – Emily Stockert, MD

Case Reports and Research Abstracts #4 (Breakout Rooms)

Room 1 – POCUS & failures
Room 2 – AFE and emergencies - Case Reports
Room 3 – Cardiovascular - Case Reports
Room 4 – CS Pain
Room 5 – PDPH Depression & … oxytocin
Room 6 - Communication OR efficiency education SIM

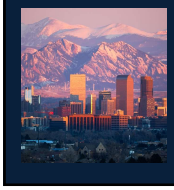
PDPH, beyond the guidelines

Moderator:

Lisa Leffert
Chair, Yale Department of Anesthesiology, New Haven, USA
Nicholas M Greene, Professor

Speakers:

Vishal Uppal
Associate Professor, Department of Anesthesia,
Dalhousie University, Halifax, Canada



Sharon Orbach-Zinger
Associate professor of Anesthesia, Tel Aviv University, Tel Aviv
Head of Obstetric Anesthesia, Rabin Medical Center, Petach Tikvah, Israel

Alexandra Schyns-van den Berg
Anesthesiologist, Albert Schweitzer Hospital, Dordrecht, Netherlands

Wouter Schievink
Professor of Neurosurgery, Department of Neurosurgery, Cedars-Sinai, Los Angeles, USA
Director of CSF Leak Program and Vascular Neurosurgery, Cedars-Sinai

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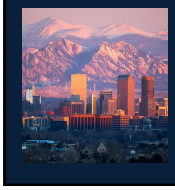

Disclosures

Vishal Uppal (@Ropivacaine)
Associate Editor Canadian Journal of Anesthesia
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Alexandra Schyns-van den Berg (@Euklaas)

Wouter Schievink (@WouterSchievink)
Medical Advisory Board, CSF Leak Foundation

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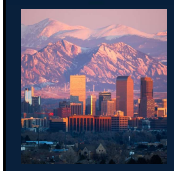

Vishal Uppal
PDPH Management: Insights from Multi-Society Guidelines

Sharon Orbach-Zinger
Preventing and treating PDPH, a clinical case

Alexandra Schyns-van den Berg
Understanding the underlying pathophysiology?

Wouter Schievink
Low pressure CSF Headaches from a different perspective: SIH

3

4

Consensus Practice Guidelines #PDPH

JAMA Network Open

Consensus Statement | Anesthesiology

Consensus Practice Guidelines on Postdural Puncture Headache From a Multisociety, International Working Group
A Summary Report

Vishal Uppal, MBBS, MSc; Robin Russell, MBBS; Rakesh Sondekoppam, MD; Jessica Ansari, MD; Zafeer Baber, MD; Yian Chen, MD; Kathryn DelPizzo, MD; Dan Sebastian Dirzu, MD; Hari Kalagara, MD; Narayan R. Kissoon, MD; Peter G. Kranz, MD; Lisa Leffert, MD; Grace Lim, MD; Clara A. Lobo, MD; Dominique Nuala Lucas, MBBS; Eleni Moka, MD; Stephen E. Rodriguez, MD; Herman Sehmbi, MD; Manuel C. Vallejo, MD; Thomas Volk, MD; Samer Narouze, MD, PhD

5

6

Introduction

- Post-dural puncture headache (PDPH) is a known complication
- Usually postural and presents within 48 h of the procedure
- Associated with complications: SDH, CVST, cranial nerve dysfunction, chronic headache, and backache
- Lack structured recommendations

7

Methods

- Delegates: ASRA Pain Medicine, ESRA, SOAP, OAA, ASSR, and AIHS
- Ten review questions
- Literature searches for each question in MEDLINE
- Narrative review / US Preventative Services Task Force grading
- Two rounds of voting using a modified Delphi approach

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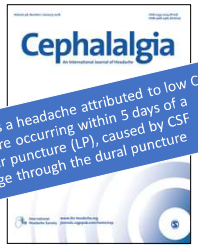
Questions 1-10

- Q1: Clinical features
- Q2: Patient factors
- Q 3: Procedural characteristics
- Q 4: Prevention
- Q 5: Conservative measures
- Q 6: Procedural interventions
- Q 7: is imaging
- Q 8: Contraindications to an EBP
- Q 9: When and how EBP be performed?
- Q 10: Long term complications and follow-up

9

Q1: When should PDPH be suspected?



PDPH is a headache attributed to low CSF pressure occurring within 5 days of a lumbar puncture (LP), caused by CSF leakage through the dural puncture

PDPH should be suspected if headache or neurological symptoms, which may be relieved when lying flat, occur within five days of a neuraxial procedure (Moderate Level of Certainty).

Inpatients who have received a neuraxial procedure should be reviewed and evaluated for symptoms of PDPH (Grade A; High Level of Certainty).

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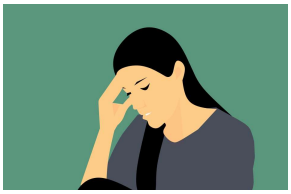
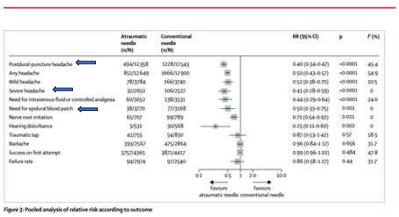
Q2: Patient factors?



Factor	Level of Certainty
Age ✓	High
Sex ✓	High
Body mass index ✗	Moderate
Comorbidities	
Headache ✓	Moderate
Smoking ✓⇩	Low

11

Q3: Procedural factors



- Risk of PDPH 60% lower when atraumatic needles
- NNT=5

12

Q3: Procedural factors

Needle type: Non-cutting spinal needles ✅ (Grade A; High Level of Certainty).

Needle size: If using a cutting needle for LP, narrower gauge needle ✅ (Grade A; High Level of Certainty).

13

Q4: What measures may be used to prevent PDPH?

Intrathecal catheter: ❓ (Low Level of Certainty).

A prophylactic EBP: ❌ (Grade C; Low Level of Certainty).

Routine injection of any substance intrathecally or epidurally ❌ (Grade I; Low Level of Certainty).

14

Q5: What conservative measures may be used to treat PDPH?

Bed rest ❌: Temporizing measure for symptomatic relief (Grade C; Low Level of Certainty).

Hydration: Oral fluids ✅; intravenous fluid ❌ (Grade C; Low Level of Certainty).

Paracetamol and NSAIDs: ✅ (Grade B; Low Level of Certainty).

Opioids: Short-term ✅; Long-term ❌ (Grade C, Low Level of Evidence)

15

Q5: What conservative measures may be used to treat PDPH?

Caffeine: ✅ maximum dose of 900 mg per day (200-300 mg if breastfeeding) (Grade B; Low Level of Certainty).

Other medications: ❌ Evidence does not support the routine use of hydrocortisone, theophylline, triptans, adrenocorticotropic hormone/cosyntropin, neostigmine/atropine, piritramide, methergine and gabapentin in the management of PDPH (Grade I; Low Level of Certainty).

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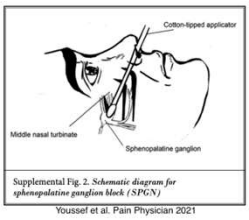
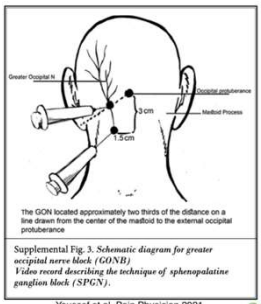
SPGN & GONB



Supplemental Fig. 2. *Schematic diagram for sphenopalatine ganglion block (SPGN)*

Youssef et al. Pain Physician 2021



The GON located approximately two thirds of the distance on a line drawn from the center of the madtoid to the external occipital protuberance

Supplemental Fig. 3. *Schematic diagram for greater occipital nerve block (GONB)*
Video record describing the technique of sphenopalatine ganglion block (SPGN).

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Q6: What procedural interventions may be used to treat PDPH?

Sphenopalatine ganglion blocks (SPGBs) : ❌ (Grade I; Low Level of Certainty).

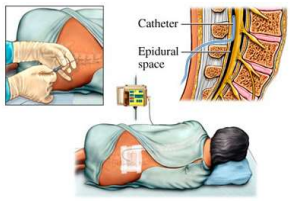
Greater occipital nerve block (GONB): ✅ spinal anesthesia with a narrower gauge (22G or less) needle (Grade C; Moderate Level of Certainty).

Acupuncture: ❌ (Grade I; Low Level of Certainty).

Spinal and epidural morphine: ❌ (Grade D, Low Level of Certainty).

18

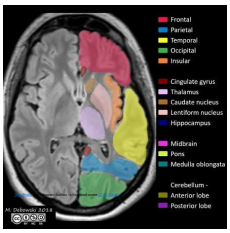
Q6: What procedural interventions may be used to treat PDPH?



- Epidural saline - temporary benefit ❗ ❓ (Low Level of Certainty).
- Epidural dextran ❌, gelatin ❌ or hydroxyethyl starch ❌ (Grade I; Low Level of Certainty).
- Fibrin glue ❌. (Grade I; Low Level of Certainty).
- Fibrin glue - refractory to EBP or when autologous blood injection is contraindicated (Grade I; Low Level of Certainty).

19

Q7: Is imaging required in PDPH management?



- Consider brain imaging ✅ (Grade C; Low Level of Certainty)
  - Non-orthostatic headache is present or
  - Develops after initial orthostatic headache, or
  - Headache onset is more than five days
- Neuroimaging in postpartum period ✅ (Grade B; Moderate Level of Certainty)
  - Focal neurological deficits
  - Alterations in consciousness, or seizures

20

Q8: Epidural Blood patch

21

Q8: What are the contraindications to an epidural blood patch?

- The risk of epidural hematoma is low if
  - Platelet count ≥70,000 x 10^6/L providing there is no defect in platelet function or other abnormality of coagulation (Moderate Level of Certainty).
- Prophylactic antibiotics ❓ (Low Level of Certainty).

22

Q9: Epidural blood patch (when and how?)

- Success rates varying between 33% and 91% (Low Level of Certainty).
- Consider: Refractory to conservative therapy and impairs activities of daily living (Grade: B; Moderate Level of Certainty).

- Severe neurological symptoms (e.g., hearing loss, cranial neuropathies) (Grade: C; Moderate Level of Certainty).
- One space below, this level (Grade B; Moderate Level of Certainty).

23

Q9: Epidural blood patch (when and how?)

- Recommended volumes are between ✅ 15-20 mL of blood (Low Level of Certainty).
- ❌ >30 mL blood (Moderate Level of Certainty).
- ✅ Strict aseptic technique (Grade B; Moderate Level of Certainty).
- ❌ Blood cultures before an EBP (Grade D; Low Level of Certainty).
- ❓ Immobilization following EBP ❓ (Low Level of Evidence).

24

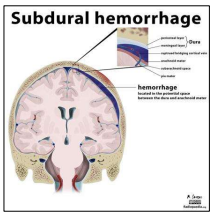
Q10: Long-term complications of PDPH? and followed-up?

✅ Association between PDPH and

- Chronic headache, backache, neckache, depression, cranial nerve palsy, SDH or CVST (Moderate Level of Certainty).

❓ Whether EBP mitigates, prevents, or treats these sequelae (Low Level of Certainty).

✅ Follow-up with until headache resolves (Grade B; Moderate Level of Certainty).



25

Q10: Long-term complications of PDPH? and followed-up?

Urgent neuroimaging and referral
(Grade B; Moderate Level of Certainty).

- Worsening symptoms despite an EBP
- New focal neurologic symptoms, or
- A change in the nature of headache

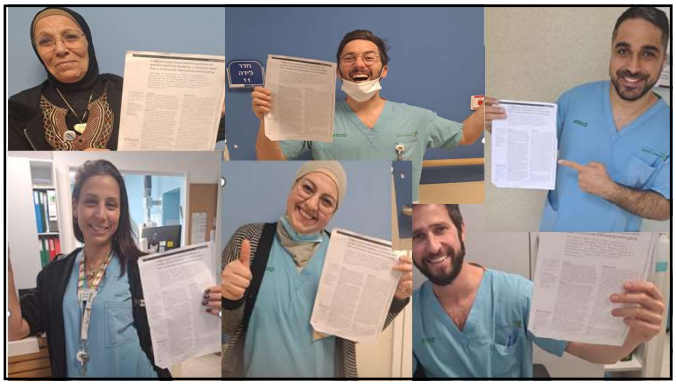
26

Summary

Current approaches to the treatment of PDPH is far from uniform and hindered by the paucity of evidence

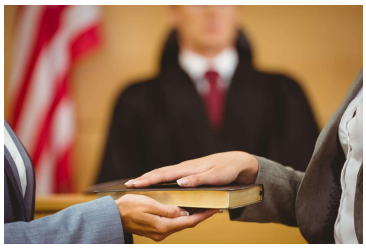
These guidelines provide a framework for individual clinicians to assess risk, confirm the diagnosis and provide a more systematic approach to its management

27



28

" We vow to follow the guidelines"



29

30

January 1st , 2024-

- G1 P0
- 5”1
- 195 lbs
- Wants a vaginal delivery & an epidural
- Healthy except:
  - Chronic anxiety (untreated during pregnancy)
  - Extreme fear of childbirth
  - Severe needle phobia

31

32

33

What would you do now?

- Prayer only..
- Inject intrathecal saline
- Inject Intrathecal Saline and Intravenous Cosynotropin

34

We inserted an intrathecal catheter.

Consensus Statement | Anesthesiology
Consensus Practice Guidelines on Postdural Puncture Headache From a Multisociety, International Working Group
A Summary Report

Preventing PDPH

Intrathecal catheter: ? (Low Level of Certainty).

35

Consensus Statement | Anesthesiology
Consensus Practice Guidelines on Postdural Puncture Headache From a Multisociety, International Working Group
A Summary Report

Intrathecal catheter: ? (Low Level of Certainty).

Routine injection of any substance intrathecally or epidurally ✗ (Grade I; Low Level of Certainty).

Systemic drug administration for PDPH prophylaxis (Grade ✗ I, Low Level of Certainty)

36

The effect of placement and management of intrathecal catheters following accidental dural puncture on the incidence of postdural puncture headache and severity: a retrospective real-world study

Outcome	ITC Saline (n=82)	No ITC Saline (n=137)	aOR (95%CI)	P value
PDPH	46.3%	63.5%	0.85 (0.73-0.99)	0.04
EBP	14.6%	41.6%	0.75 (0.64-0.87)	<0.001

Binyamin et al, Anaesthesia 2023

37

Prophylactic Cosyntropin

Outcome	Prophylactic Cosyntropin (n=73)	No Prophylactic Cosyntropin (n=59)	P values
PDPH	57%	66%	0.7
EBP	57%	58%	0.08

Liu et al, IJOA 2023

38

Prophylactic Cosyntropin- after ITC saline

Outcome	Prophylactic Cosyntropin (n=78)	No Prophylactic Cosyntropin (n=500)	OR (95%CI)	P value
PDPH	53.8%	58.2%	OR 0.8 (0.51-1.4)	0.5
EBP	12.8%	40.8%	OR 0.21 (0.1-0.43)	<0.001

Orbach-Zinger et al, Anaesthesia 2023

39

40

41

Paracetamol and NSAIDs: ✓ (Grade B; Low Level of Certainty).

Opioids: Short-term ✓; Long-term ✗ (Grade C, Low Level of Evidence)

Caffeine Maximum dose 900 mg/day (200-300mg for breastfeeding) (Grade B; low level of evidence) ✓

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42

24h

No Blood Patch!!!!!!!

43

What would you do now?

Start other medication

Sphenopalatine Ganglion Block

Greater Occipital Nerve Block

44

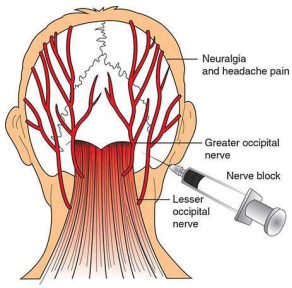
Other medications: ✗ Evidence does not support the routine use of hydrocortisone, theophylline, triptans, adrenocorticotropic hormone/cosyntropin, neostigmine/atropine, piritramide, methergine and gabapentin in the management of PDPH (Grade I; Low Level of Certainty).

Sphenopalatine ganglion blocks (SPGBs) : ✗ (Grade I; Low Level of Certainty).

Greater occipital nerve block (GONB): ✅ spinal anesthesia with a narrower gauge (22G or less) needle (Grade C; Moderate Level of Certainty).

45

Greater Occipital Nerve Block



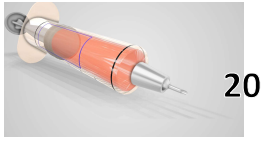
46

48h

Epidural Blood Patch???

47

PAIN CLINIC



20 mL blood

48

52h

Epidural Blood Patch

Recommended volumes are between ✓ 15-20 mL of blood (Low Level of Certainty).

Radiological guidance can be considered in cases when landmark guidelines are difficult ✓ Grade 1, Low Level of Certainty)

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49

64h

My headache is worse now

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50

Consensus Statement | Anesthesiology

Consensus Practice Guidelines on Postdural Puncture Headache
From a Multisociety, International Working Group
A Summary Report

Urgent neuroimaging should be performed for any PDPH with worsening symptoms despite an EBP

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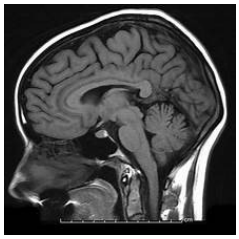
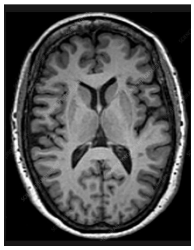
Normal MRI





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52

66h

My positional headache is worse but no way are you sticking me with a needle again

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53

What would you do now?

Start other medication

Sphenopalatine Ganglion Block

Convince her to do an EBP

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54

Alexandra Schyns-van den Berg

I get by with a little help from

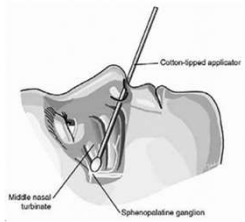
A SPGB may affect intracranial vasodilation. Try it

What can with this impo woman?

55

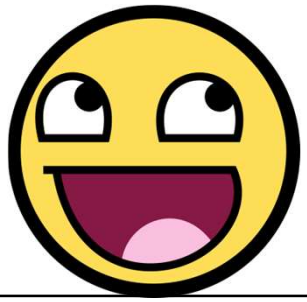
67h

Sphenopalatine Ganglion Block



56

Complete resolution of symptoms, 24 hours, 48 hours, 2 weeks & 8 weeks



57

I forgot to put lidocaine on the sphenopalatine swab

58

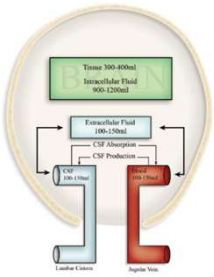
PDPH is a result of disruption of normal CSF homeostasis

CSF loss through a leak in the spinal meninges
- Persistent?

1. Traction on pain-sensitive meningeal and intracranial vessels
2. Intracranial vasodilation secondary to:
   - Traction on intracranial vessels
   - Traction on meningeal structures
   - ?

59

Monroe-Kellie doctrine



Third Circulation

60

Q4: What measures may be used to prevent PDPH?

- Sealing the dural hole, prevent CSF loss
- Maintaining CSF pressure
- Promote healing

?

- Increasing CSF subarachnoid pressure
- Sealing the dural hole

?

- Maintaining CSF pressure
- Reduce CSF loss
- Dilute neurotransmitters

Intrathecal catheter: ❓ (Low Level of Certainty).

A prophylactic EBP: ❌ (Grade C; Low Level of Certainty).

Routine injection of any substance intrathecally or epidurally ❌ (Grade I; Low Level of Certainty).

61

Q5: What conservative measures may be used to treat PDPH?

Other medications: ❌ Evidence does not support the routine use of hydrocortisone, theophylline, triptans, adrenocorticotropic hormone/cosyntropin, neostigmine/atropine, piritramide, methergine and gabapentin in the management of PDPH (Grade I; Low Level of Certainty).

- Stimulate CSF production by the choroid plexus
- Anti-inflammatory effects
- Stimulate β-endorphin release
- Promote dural healing

?

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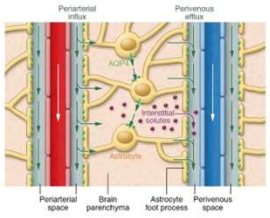
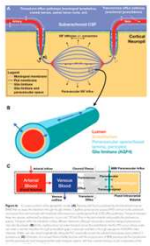
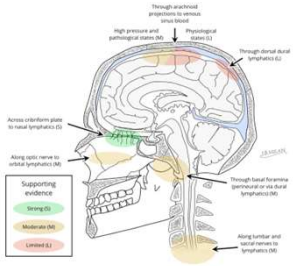
Glymphatics





63

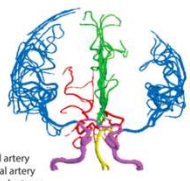
CSF Outflow



64

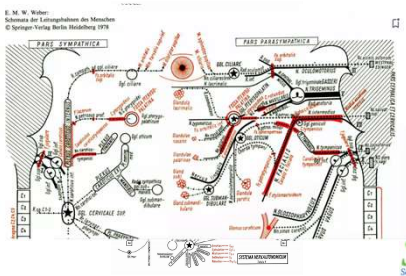
Cerebral Blood Flow Regulation

- Immediate response to changes CPP
- Local response to vasoactive substances, CO_2, H^+, adenosine, hypocapnia and hypercapnia
- Innervation with Autonomic Nervous System fibres and fibres from Trigeminovascular system



65

Autonomic nervous system



66

41st ESRA
Annual Congress
The art of vast manoeuvres
4. — 7. Sep. 2024
Prague
50th Annual Regional Anesthesiology and Acute Pain Medicine Meeting
May 1-3, 2025
Rosen Shingle Creek | Orlando, FL
#ASRASPRING25

67

1

2

3

Pain During Cesarean Delivery

- Systematic review -> 54 RCTs with low risk of bias
- Overall prevalence 14.6% (13.3-15.9 CI) 510/3497 pts in elective cesarean deliveries
- Prevalence of GA conversion was 0.1%
- Pain: 10.2% (9.0-11.4% CSE + Spinal but 30% (26.5-34.5) with epidural

Anaesthesia
Peri-operative medicine, critical care and pain
Association of Anaesthetists

Review Article | Full Access

Inadequate neuraxial anaesthesia in patients undergoing elective caesarean section: a systematic review

R. Patel, J. Kua, N. Sharawi, M.E. Bauer, L. Blake, S. R. Moonesinghe, P. Sultan

First published: 22 January 2022 | https://doi.org/10.1111/anae.15657 | Citations: 19

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- Single center prospective
- 46/399 (11.5%; 95% CI: 8.6, 15.1) reported intraoperative pain
- Outcome: patient reported pain (interviewed within 48 hr)

ELSEVIER
Anaesthesia Critical Care & Pain Medicine
journal homepage: www.elsevier.com

Original Article

Pain during cesarean delivery: A patient-related prospective observational study assessing the incidence and risk factors for intraoperative pain and intravenous medication administration

Jose Sanchez, Rohan Prabhu, Jean Guglielminotti, Ruth Landau *

Table 1
Incidence of self-reported pain. Among the 46 women reporting pain, 14 (30.4%) reported pain at the start of the CD, 24 (50%) during the CD, and 8 (19.6%) both at the start and during the CD.

	Number of women	Number of women reporting pain	Incidence [95% CI]	*p*-value [a]
All CD	399	46	11.5% [8.6–15.1]	n.a.
Timing				0.003
Planned	155	13	8.4% [4.5–13.9]	
Unplanned but not intrapartum	93	5	5.4% [1.8–12.1]	
Intrapartum	151	28	18.5% [12.7–25.7]	
Urgency				> 0.99
Emergent	39	4	10.3% [2.9–24.2]	
Non-emergent	360	42	11.7% [8.5–15.4]	

Abbreviations: CD: cesarean delivery; CI: confidence interval; n.a.: not applicable.
[a] From Fisher exact test.

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Pain During Intrapartum Cesarean Delivery

- Attributes that increase the risk for intraoperative pain
  - Epidural Topup
  - Higher prevalence of emergent deliveries
  - Psychological and emotional context:
    - More likely to be emergent
    - More likely to have deviated from existing expectations/birth plans
    - More likely to be sleep deprived and/or fatigued
    - More likely to be for fetal indications -> parental stress as to health of child

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Other risks and complications of an intrapartum cesarean delivery:

Post operative Nausea	~20%
Endometritis	11%
Postpartum Hemorrhage	3%
Wound complications	2%
Post Dural Puncture Headache	1-2%
DVT or PE	240 per 100,000
High Spinal	23 per 100,000
Maternal Death	13 per 100,00
Neurological Complication	1.2 per 100,000
Epidural Hematoma	0.5 per 100,000

7

What constitutes pain during cesarean delivery?

2020 IASP Definition of Pain:

"Pain: An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage."

8

Our assessments don't match that of our patients…

- Prospective, single center observational study
- Elective cesarean deliveries under spinal anesthesia
- 23/192 (11.9%) reported intra-operative pain
- "8 parturients (34.7%) reported pain before the baby was delivered, 15 (65.2%) reported pain after the baby was delivered, while 5 (21.7%) of them re-ported pain both before and after the baby was delivered"

EJP European Journal of Pain | EFIC

ORIGINAL ARTICLE | Open Access

Intraoperative pain during caesarean delivery: Incidence, risk factors and physician perception

Amir Keltz, Philip Heesen, Daniel Katz, Ido Neuman, Anna Morgenshtein, Karam Azem, Yair Binyamin, Eran Hadar, Leonid A. Eidelman, Sharon Orbach-Zinger

First published: 27 August 2021 | https://doi.org/10.1002/ejp.1856 | Citations: 4

- Obstetricians perceived intraoperative pain in 8 out of 193 parturients (4.1%). The false- positive rate (when the obstetrician thought there was pain, but the pa turient did not report any pain) of obstetricians' assessment of intraoperative pa (yes/no) was 2.4%, the false- negative rate (when the obstetrician thought ther was no pain, but the parturient reported pain) was 82.6%.
- Anaesthesiologists perceived intraoperative pain in 32 out of 193 parturients (16.7%). The false- positive rate of anaesthesiologists' assessment of intraoperative pain (yes/no) was 12.3%, the false- negative rate was 52.2%. Both anaesthesiologists and obstetricians underestimated maternal pain"

9

But what do patients feel during cesarean delivery?

Can't it be normal operative sensation?

10

Table 1
Demographic characteristics of study participants

Participants	Number
Total patients	20
Age (years)	
21–30	10
31–40	10
ASA physical status	
2	9
3	11
Prior CS	
Yes	7
No	13
Type of anaesthesia	
Spinal	12
Epidural	6
CSE	2
Urgency of surgery	
Elective	7
Non-elective	13
Surgical factors	
Uterine exteriorisation	5
Tubal ligation	4

ASA: American society of Anesthesiologists. CS: caesarean section. CSE: combined spinal-epidural.

Contents lists available at ScienceDirect

International Journal of Obstetric Anesthesia

journal homepage: www.elsevier.com/locate/ijoa

ELSEVIER

Original Article

Surgical sensation during caesarean section: a qualitative analysis

A. Jiang [a,*], T. Perry [a], K. Walker [b], A. Burfoot [b], L. Patterson [a]

[a] Department of Anesthesiology and Perioperative Medicine, Kingston Health Sciences Centre, Kingston, Ontario, Canada
[b] Department of Sociology, Queen's University, Kingston, Ontario, Canada

Semi-structured interviews by phone within 1 week of delivery

11

Contents lists available at ScienceDirect

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ELSEVIER

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Surgical sensation during caesarean section: a qualitative analysis

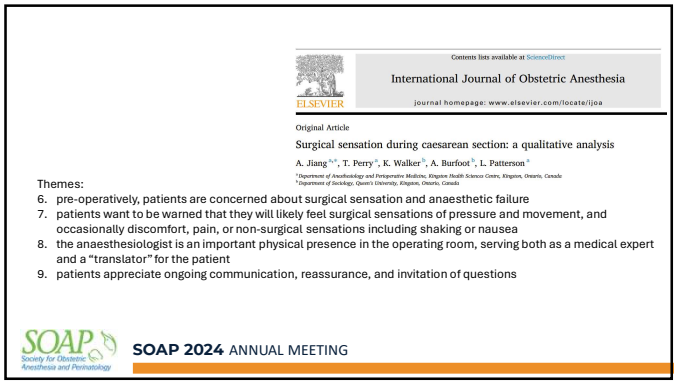
A. Jiang [a,*], T. Perry [a], K. Walker [b], A. Burfoot [b], L. Patterson [a]

[a] Department of Anesthesiology and Perioperative Medicine, Kingston Health Sciences Centre, Kingston, Ontario, Canada
[b] Department of Sociology, Queen's University, Kingston, Ontario, Canada

Themes:

1. patients most frequently reported pressure and movement sensation
2. most participants did not report surgical pain
3. there was variation in the intensity of sensation reported by patients
4. the highest number of patients recalled sensation with delivery, and the fewest number of patients recalled sensation after delivery
5. environmental factors and emotions affected the perception of surgical sensation

12



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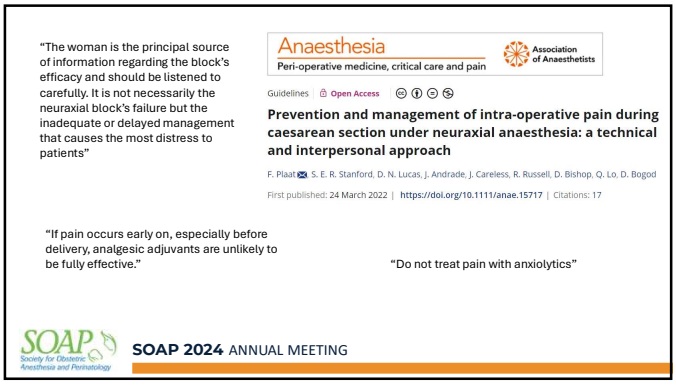

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Management of Intraoperative Pain During Cesarean Delivery

1. Treat it!
   1. IV anxiolysis: Dexmedetomidine, Midazolam,
   2. IV analgesia: Narcotics, Ketamine,
   3. Epidural Analgesia: Local Anesthetic, Fentanyl, Clonidine
   4. Inhaled: Nitrous Oxide
   5. Intraperitoneal Local Anesthetic
   6. Local Anesthetic infiltration
2. Evaluate it
   1. Pressure or Sharp
   2. Laterality, Midline, Nonlocalized?
3. Consider and Offer General Anesthesia
4. Surgical Pause if possible

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Intravenous Therapies for Intraoperative Pain:

	Pros	Cons
Dexmedetomidine	• Low Fetal/neonatal risk • Does not affect memory consolidation • Minimal respiratory effect	• Limited total anxiolytic potency • Limited total analgesic potency • Some hemodynamic cost
Benzodiazepines	• Potent anxiolytic • Anti-emetic benefit • Minimal hemodynamic effect	• Respiratory depression • Unpredictable amnestic effect but not uncommon amnestic effect
Narcotics	• High analgesic potency	• Respiratory depression • Emetogenic
Ketamine	• Non-opoid receptor site of action • May produce euphoric, pleasant sensory effects	• Risk of dysphoric reactions • May limit ability to communicate with patient • Unpredictable amnestic effects

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Prevention of intra-operative pain: Neuraxial Anesthesia for Intrapartum Cesarean Delivery

- Maintain functioning labor epidurals
- Rigorously perform testing prior to incision
- Pre-emptively redose epidurals as indicated pharmacokinetically and by exam if surgery is ongoing
- Consider alpha-2 agonists
- Prepare patients for the expected spectrum of intraoperative sensation and maintain ongoing communication

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Prevention of intra-operative pain: Replace epidurals instead of topping them up?

- Small, single center, retrospective propensity matched case/control study
- 124 cases and 124 controls

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Prevention of intra-operative pain: Replace epidurals instead of topping them up?

A comparison of anesthetic outcomes between activation and removal of epidural catheters for patients who underwent unscheduled intrapartum cesarean delivery

Table 1. Continued

	Epidural catheter removed (N = 124)	Epidural catheter activated (N = 124)	*P* value
Intrathecal bupivacaine dose (mg): mean (SD)[f]			
Single injection spinal	10.2 (1.4)	NA	
Combined spinal epidural	9.6 (1.4)[f]	NA	
Minutes from skin incision to wound closure: median (IQR)	46 (37–57)	47 (39–57)	0.62
Anesthetic outcome			**<0.01**
Conversion to general anesthesia	12 (9.7%)[g]	23 (18.6%)	
One or more systemic anesthetic adjunct medications	23 (18.6%)	54 (43.6%)	
No systemic anesthetic adjunct medication administered	89 (71.8%)	47 (37.9%)	
Conversion to general anesthesia prior to incision	11 (91.7%)	21 (91.3%)	1.0

[a]N = 111; [b]N = 113; [c]N = 110; [d]N = 115; [e]N = 112; [f]N = 114; [g]Fetal intolerance to labor signified fetal heart rate decelerations that resolved upon cessation of oxytocin and fetal heart rate abnormalities was not explicitly documented as an indication for cesarean delivery; [h]*P* = 0.04; [i]N = 93; [j]Three patients had conversion to general anesthesia due to inability to obtain a new neuraxial technique.
IQR indicates interquartile range; NA, not applicable; SD, standard deviation.

Prevention of intra-operative pain: Replace epidurals instead of topping them up?

A comparison of anesthetic outcomes between activation and removal of epidural catheters for patients who underwent unscheduled intrapartum cesarean delivery

Table 2. Multivariate logistic regression (odds of regional only vs adjunct/general anesthesia)

	Odds ratio	95% CI	*P* value
Cohort: withdrawn vs activated epidural catheter	4.298	2.45, 7.56	<0.01
Parity: 1-unit increase	1.067	0.81, 1.41	0.65
History of depression	0.666	0.35, 1.27	0.22
Combined spinal epidural vs regular epidural	1.427	0.64, 3.19	0.39
Dural puncture epidural vs regular epidural	1.12	0.55, 2.29	0.76
Number of physician-administered boluses of rescue labor analgesia: 1-unit increase	0.956	0.66, 1.38	0.81
Time from last neuraxial placement and entering operating room: 30-min-increase	0.996	0.97, 1.02	0.74

Prevention of intra-operative pain: Replace epidurals instead of topping them up?

Limitations and potential safety issues:

- Risk of high spinal
- Delay in setting of urgent delivery
- What if urgency increases during a de novo neuraxial procedure
- Additive risks of an additional neuraxial procedure (headache, paresthesia, unintended dural puncture, epidural hematoma, nerve injury)
- Risk of inability to complete a repeat procedure

Prevention of intra-operative pain: Alpha-2 agonists?

- Double Blind RCT
- n-=78
- 3 groups
  - Bupivacaine alone
  - Bupivacaine + Clonidine
  - Bupivacaine + Clonidine +Fentanyl

OBSTETRIC ANESTHESIA

Intrathecal Clonidine and Fentanyl with Hyperbaric Bupivacaine Improves Analgesia During Cesarean Section

Benhamou, Dan MD; Thorin, Dominique MD; Brichant, Jean-Francois MD; Dailland, Philippe MD; Milon, Dominique MD; Schneider, Markus MD

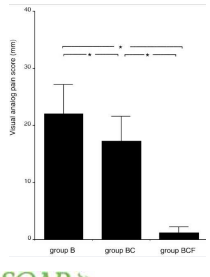
Author Information

Anesthesia & Analgesia 87(3):p 609-613, September 1998. | **DOI:** 10.1213/00000539-199809000-00022

	Group B (n = 26)	Group BC (n = 26)	Group BCF (n = 26)
Dermatomal spread after intrathecal dose (dermatomes blocked)	14 ± 2	15 ± 2*	16 ± 2*
Patients requiring additional local anesthetics to reach T4 (%)	18	0*	0*
Intraoperative pain (% of patients)	35	23*	0*
Regression to two segments (min)	70 ± 33	95 ± 56	111 ± 64†
First analgesic request (min)	137 ± 35	183 ± 80	215 ± 79†

Group B = intrathecal bupivacaine, Group BC = intrathecal bupivacaine-clonidine, Group BCF = intrathecal bupivacaine-clonidine plus fentanyl.
* $P < 0.05$ for Groups BC and BCF versus Group B.
† $P < 0.05$ for Group BCF versus the other groups.

Prevention of intra-operative pain: Alpha-2 agonists?



OBSTETRIC ANESTHESIA

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	Group B (n = 26)	Group BC (n = 26)	Group BCF (n = 26)
Duration of Bromage score 1 motor block (min, mean ± so)	158 ± 47	172 ± 62	162 ± 59
Intraoperative nausea-vomiting (% of patients)	41	14*	13*
Shivering (% patients)	11	17	4
Sedation (% of patients)	29	40	65†
Pruritus (% of patients)	0	0	25†
Ephedrine (total dose, mg, mean ± so)	25 ± 16	21 ± 14	27 ± 19
Additional lactated Ringer's solution (mL, mean ± so)[a]	1118 ± 752	1138 ± 713	1042 ± 593
UA pH (mean ± so)	7.30 ± 0.06	7.29 ± 0.07	7.31 ± 0.06
Apgar score			
1 min	9 (4–10)	9 (7–10)	9 (8–10)
5 min	10 (9–10)	10 (8–10)	10 (9–10)

Group B = intrathecal bupivacaine, Group BC = intrathecal bupivacaine-clonidine, Group BCF = intrathecal bupivacaine-clonidine plus fentanyl.
* $P < 0.05$ for Groups BC and BCF versus Group B.
† $P < 0.05$ for Group BCF versus the other groups.
[a]Lactated ringer's solution infused during onset of the block and during surgery.

Prevention of intra-operative pain: Alpha-2 agonists?

British Journal of Anaesthesia
Volume 120, Issue 2, February 2018, Pages 228-240

The impact of neuraxial clonidine on postoperative analgesia and perioperative adverse effects in women having elective Caesarean section–a systematic review and meta-analysis

T.K. Allen[1], A. [illegible], B.M. Mishriky[2], B.Y. Klingler[1], A.S. Habib[1]

JOURNAL ARTICLE

The effect of addition of intrathecal clonidine to hyperbaric bupivacaine on postoperative pain and morphine requirements after Caesarean section: a randomized controlled trial

International Journal of Obstetric Anesthesia

Intrathecal clonidine as an adjuvant for neuraxial anaesthesia during caesarean delivery: a systematic review and meta-analysis of randomised trials

Comparison of the ED50 of intrathecal hyperbaric ropivacaine co-administered with or without intrathecal dexmedetomidine for cesarean section: A prospective, double-blinded, randomized dose-response trial using up-down sequential allocation method

Liability of intraoperative pain

- Most other surgical procedures done under neuraxial or regional are accompanied by sedation
- British closed claims: liability equivalent to intraoperative awareness
  - "Pain during operative delivery is the commonest negligence claim relating to regional anaesthesia against obstetric anaesthetists in the UK 2. Between 2000 and 2010, the damages awarded for claims relating to obstetric anaesthesia exceeded £19 million, representing 3.8% of all successful obstetric claims to the NHS Litigation Authority (NHSLA) and totalling well over £3 billion"

Anaesthesia
Peri-operative medicine, critical care and pain
Association of Anaesthetists

Original Article | Free Access

Learning from the Law. A review of 21 years of litigation for pain during caesarean section

K. McCombe, D. G. Bogod

First published: 01 November 2017 | https://doi.org/10.1111/anae.14119 | Citations: 29

Future Directions:

- Large prospective Studies to identity the true incidence of pain during cesarean delivery are needed
- Further characterization of patient experience of pain is needed
- Further study to elucidate causative pathway of increased risks of intraoperative pain during intrapartum cesarean delivery (and if any of these can be ameliorated)

Concluding thoughts

- Intrapartum Cesarean Delivery is high risk for intraoperative pain and discomfort
- There is urgent need for robust study to evaluate optimal pathways for evaluation, management, and prevention of intraoperative pain during cesarean delivery
- Call to action: We have an obligation to enhance surveillance of rates of intracesarean pain and developing systems and practices to lower them

SOAP 2024
ANNUAL MEETING

Perils of Intrapartum Cesarean Deliveries:

Postpartum Hemorrhage

Leziga T. Obiyo, MD, MPH

May 5, 2024

1

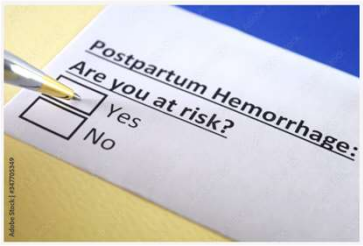
SOAP 2024
ANNUAL MEETING

No financial disclosures

2

Learning Objectives

- Illustrate the perils of postpartum hemorrhage (PPH) for intrapartum cesarean deliveries (CD)
- Review literature about the perils of PPH
- Identify tips for best practices to manage of PPH



3

Current Knowledge

- Hemorrhage is the leading cause of global maternal mortality
- ACOG definition – 1000 mL blood loss with signs/symptoms of hypovolemia
- Causes of postpartum hemorrhage
- 4T's: tone, trauma, tissue, thrombin
  - Uterine atony makes up 70-80% of PPH cases

Say et al. *Lancet Global Health* 2014
ACOG Practice Bulletin October 2006: postpartum hemorrhage
Reale et al. *A&A* 2020

4

The Perils of Postpartum Hemorrhage

DECREASED TONE

Decreased receptor expression, density and available binding sites → desensitization phenomenon

- Prior oxytocin exposure attenuates oxytocin-induced contractility in human myometrium

TRAUMA

Thin lower uterine segment → hysterotomy extensions

- more likely 2nd stage intrapartum CD

Image source: Adobe Stock/fotoduets

Nguyen-Lu et al. *Can J Anesth* 2015
Balki et al. *Obstet Gynecol* 2006
Balki et al. *Anesthesiology* 2013
Merrer et al. PLoS One 2021
De La Torre et al. *Am J Obstet Gynecol* 2006

5

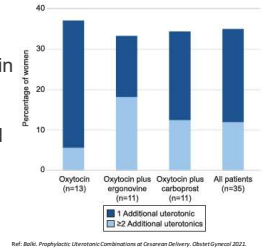
The Problem

Most patients require higher doses of oxytocin to achieve adequate uterine contraction.

Additional uterotonic agents may be required

CLINICAL IMPLICATIONS

- Recommend load 3 IU oxytocin + infusion to achieve adequate tone
- Approximately 50% require additional uterotonics



Ref: Balki. Prophylactic Uterotonic Combinations at Cesarean Delivery. Obstet Gynecol 2021.

Balki et al. *Obstet Gynecol* 2021
Balki et al. *Obstet Gynecol* 2006
Onwochei et al. *Can J Anesth* 2020

6

Original Research

The interrater reliability and agreement of a 0 to 10 uterine tone score in cesarean delivery

Naida M. Cole, MD; Ibrahim Abushoshah, MD; Kara G. Fields, MS; Daniela A. Carusi, MD, MSc; Julian N. Robinson, MD; Brian T. Bateman, MD, MSc; Michaela K. Farber, MD

- Prospective study conducted at a single tertiary obstetrical care center
  - 2 obstetricians used 0 to 10 numeric rating score to rate uterine tone at 3 and 10 minutes after cesarean delivery by palpation
    - 0 – no tone = completely atonic uterus
    - 10 – excellent tone = completely contracted uterus
- Uterine tone scores at 3 and 10 minutes from 62 unique obstetricians
- Conclusion: 0 to 10 numeric rating scale demonstrated good - excellent interrater reliability

Clinical implications: reliable method to communicate degree of uterine tone

7

Single-center, RCT of patients undergoing intrapartum CD

- Oxytocin + IM methergine vs oxytocin + IM placebo

Primary outcome: additional uterotonic agents

Conclusion: Prophylactic methergine + oxytocin reduced need for additional uterotonics and rates of PPH

Original Research

Prophylactic Methylergonovine and Oxytocin Compared With Oxytocin Alone in Patients Undergoing Intrapartum Cesarean Birth

A Randomized Controlled Trial

Nicole Masse, MD, Franklin Dexter, MD, PhD, and Cynthia A. Wong, MD

Table 2. Primary and Secondary Outcomes

Outcome	Oxytocin and Methylergonovine (n=80)	Oxytocin (n=80)	RR	Mean Difference	95% CI
Primary					
Administration of additional uterotonic agents	16 (20)	44 (55)	0.4	—	0.2–0.6
Methylergonovine	0	39 (49)			
15-methyl prostaglandin $F_{2\alpha}$	14 (18)	29 (36)			
Misoprostol	8 (10)	5 (6)			
Secondary					
Satisfactory uterine tone[e#]	64 (80)	33 (41)	1.9	—	1.5–2.6
Postpartum hemorrhage[f#]	28 (35)	47 (59)	0.6	—	0.4–0.9
Blood transfusion[g]	4 (5)	18 (23)	0.2	—	0.1–0.6
Quantitative blood loss (mL)[h]	967±429	1,315±915.1	—	348	124–572
Difference in preoperative and postoperative day 1 hemoglobin levels (g/dL)[i]	2.4±1.1	2.9±1.0	—	0.6	0.2–0.9

Clinical Implication – PPX methergine *could* reduce risks associated with uterine atony

8

Original Research

Intravenous Calcium to Decrease Blood Loss During Intrapartum Cesarean Delivery

A Randomized Controlled Trial

Jessica R. Ansari, MD, MS, Alla Yarnoik, MD, MS, Guillermina Michel, BS, Deirdre Lyell, MD, Haley Hedlin, PhD, David N. Cornfield, MD, Brendan Carvalho, MBBCh, FRCA, and Brian T. Bateman, MD, MS

Single-center, block-randomized, placebo-controlled, double-blind superiority trial

- IV IG calcium chloride vs placebo

Primary outcome: quantitative blood loss

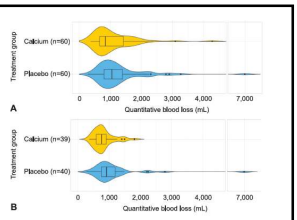


Table 2. Secondary Hemorrhage Outcomes Among All Study Participants and the Prespecified Subgroup of Study Participants, Excluding Patients With Nonatonic Bleeding[a]

Cohort and Secondary Outcome	Calcium	Placebo	RR or Absolute Difference (95% CI)[b]
All study participants	(n=60)	(n=60)	
PPH incidence[d]	24 (40.0)	34 (56.7)	0.71 (0.48 to 1.03)
2nd-line uterotonic	18 (30.0)	24 (40.0)	0.75 (0.46 to 1.23)
Blood transfusion	5 (8.3)	9 (15.0)	0.56 (0.20 to 1.56)
Absolute change in hematocrit[f]	7.8 (6.6–9.2)	9.7 (8.1–11.7)	−2.0 (−3.6 to −0.2)
Prespecified subgroup of study participants	(n=39)	(n=40)	
PPH incidence[d]	8 (20.5)	17 (42.5)	0.48 (0.24 to 0.99)
2nd-line uterotonic	10 (25.6)	17 (42.5)	0.60 (0.32 to 1.15)
Blood transfusion	1 (2.6)	3 (7.5)	0.34 (0.04 to 3.15)
Absolute change in hematocrit[f]	6.2 (5.2–7.6)	9.5 (7.5–11.9)	−3.2 (−4.9 to −1.1)

Image Sources: *Ansari. Calcium to Prevent Atonic Postpartum Hemorrhage. Obstet Gynecol 2023.*

Results

- Median blood loss 840 mL (calcium chloride) vs 1051 mL (placebo)

Clinical implication: potential strategy to decrease postpartum hemorrhage

9

Best Practices

<u>Recognition</u>

- **Uterine Tone Score**

<u>Readiness</u>

- Adequate IV access
- Type & Screen
- Massive Transfusion Protocol

<u>Response</u>

- Uterotonics available
  - **PPX Methergine**
- Antifibrinolytics
- **Calcium Chloride**
- Surgical vs non-surgical interventions

10

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Ansari J et al. Intravenous Calcium to Decrease Blood Loss During Intrapartum Cesarean Delivery: A Randomized Controlled Trial. *Obstetrics & Gynecology* 143(1):p 104-112.

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Balki M et al. Oxytocin pretreatment attenuates oxytocin-induced contractions in human myometrium in vitro. *Anesthesiology*. 2013;119(3):552-561.

Balki M et al. Prophylactic Administration of Uterotonics to Prevent Postpartum Hemorrhage in Women Undergoing Cesarean Delivery for Arrest of Labor: A Randomized Controlled Trial. *Obstet Gynecol*. 2021;137(3):505-513.

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de la Torre L, González-Quintero VH, Mayor-Lynn K, et al. Significance of accidental extensions in the lower uterine segment during cesarean delivery. *Am J Obstet Gynecol*. 2006;194(5):e4-e6

Masse N et al. Prophylactic Methylergonovine and Oxytocin Compared With Oxytocin Alone in Patients Undergoing Intrapartum Cesarean Birth: A Randomized Controlled Trial. *Obstetrics & Gynecology* 140(2):p 181-186.

Merrer J, Dreyfus C, Girault A, Goffinet F, Le Ray C. Is duration of passive second stage associated with a risk of hysterotomy extension during cesarean?. *PLoS One*. 2021;16(10):e0258049.

Miller, H. & Ansari, J. (2022). Uterine atony. *Current Opinion in Obstetrics and Gynecology, 34* (2), 82-89.

Nguyen-Lu N et al. Carbetocin at Cesarean delivery for labour arrest: a sequential allocation trial to determine the effective dose. *Can J Anaesth*. 2015;62(8):866-874.

Onwochei DN et al. Carbetocin compared with oxytocin in non-elective Cesarean delivery: a systematic review, meta-analysis, and trial sequential analysis of randomized-controlled trials. *Can J Anaesth*. 2020;67(11):1524-1534.

Reale SC, Easter SR, Xu X, Bateman BT, Farber MK. Trends in Postpartum Hemorrhage in the United States From 2010 to 2014. *Anesth Analg*. 2020;130(5):e119-e122.

11

No Solid Food in Labor!!! - Pro (Clear Liquids Allowed)

Mark Zakowski, M.D., FASA
Professor, Obstetric Anesthesiology Cedars-Sinai
Chair, ASA Committee on Obstetric Anesthesia
Past-President, Society of Obstetric Anesthesia and Perinatology
Past-President, California Society of Anesthesiologists

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SOAP 2024
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Disclosures:
No financial disclosures

2

Solids in Labor: NOT a Hard Choice

3

Learning Objectives

- Aspiration risk
- Physiology of gastric emptying
- ASA Statement on Oral Intake during Labor/ACOG/SOAP
- Risk stratification of pregnant patients for aspiration risk

4

Mendelsohn Syndrome: acid aspiration

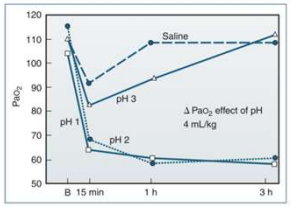


Fig. 28.5 Relationship between acidity and PaO_2. In this study, 4 mL/kg of fluid of varying pH was instilled into the tracheas of dogs. The severity of the hypoxemia correlated with the pH of the aspirate. A maximal decrease in PaO_2 occurred with aspirates with a pH of less than 2.5. *B*, baseline. (From Awe WC, Fletcher WS, Jacob SW. The pathophysiology of aspiration pneumonitis. *Surgery*. 1966;60:232–239.)

Chestnut's Obstetric Anesthesia

5

Gastric Contents: pH, Volume, Clearance

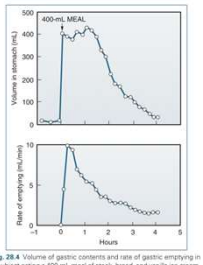


Fig. 28.4 Volume of gastric contents and rate of gastric emptying in a subject eating a 400-mL meal of steak, bread, and vanilla ice cream. (From Malagelada JR, Longstreth GF, Summerskill WHJ, et al. Measurements of gastric functions during digestion of ordinary solid meals in man. *Gastroenterology*. 1976;70:203–210.)

TABLE 28.2 Prevalence of Fasting Gastric Findings in Various Populations (%)

Population	pH < 2.5	Volume > 25 mL	pH < 2.5 and Volume > 25 mL
Pregnant[101–105]	57–80	51–54	31–43
Nonpregnant[101,106]	75–95	45–67	45–60
Postpartum[104,105,106]	54–93	61	60
Children[101]	93–100	64–78	64–77
Obese, nonpregnant[106]	88	86	75

Chestnut's Obstetric Anesthesia

6

General Anesthesia Obstetrics

- Failed intubation
  - 1/180->1/533
  - Video Laryngoscopes on L&D
  - 0 aspirations/~5,300 GA
- Desaturation O_2 faster
  - Increased oxygen consumption
  - Decreased reserve (FRC)
- Obesity
  - Mechanical difficulties
  - V/Q mismatch

-D'Angelo R. Anesthesiology 2014:120:1505

7

Incidence: ASPIRATION - ASA Closed Claims

Risk Factor	No. (%)*
Emergency procedure	52 (45)
Gastrointestinal obstruction	41 (36)
Other acute intraabdominal process†	29 (25)
Morbid obesity	25 (22)
Gastroesophageal reflux disease	22 (19)
Diabetes mellitus	18 (16)
Recent oral intake‡	17 (15)
Recent opioid administration	10 (9)
Major trauma§	9 (8)
Previous gastric bypass or sleeve	9 (8)
Neurologic disease‖	6 (5)
Pregnancy	4 (3)
Other#	2 (2)
Any risk factor present	107 (93)

Phase	No. (%)*
Preinduction	4 (3)
During regional anesthesia	4 (3)
During monitored anesthesia care	17 (15)
During induction of general anesthesia	
Before airway instrumentation	23 (20)
During airway instrumentation	11 (10)
Timing unknown	21 (18)
During maintenance of general anesthesia	12 (10)
During emergence and tracheal extubation	8 (7)
Phase 1 recovery (includes transport)	4 (3)
Postoperative	6 (5)
Unknown	5 (4)

Warner MA. Anesthesiology 2021;135:284-91

8

Incidence: ASPIRATION

- Retrospective, n=48,609 CD
- 3 aspirations
- 2 aspirations GA
  - Difficult intubation
  - Induction of anesthesia
  - Emergency cesarean
- 1 aspiration spinal
  - Deep sedation

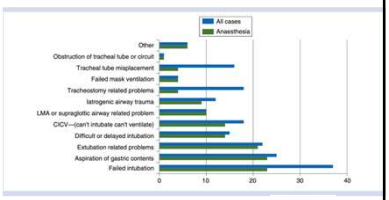
Cesarean	Risk
Aspiration all	1:16, 203
Aspiration GA	1:11,345
Aspiration NA	1:25,929

-Binyamin Y. Anaesth Crit Care Pain Med 2024:43:101347

9

Incidence: Difficult Airway NAP4

	All cases (n=184)	Anaesthesia (n=133)	
ASA			
I	26	23	
II	62	51	
III	59	40	
IV	29	13	
V	3	2	
Not recorded	5	4	
Age			
<10	10	8	
11-20	8	6	
21-40	39	26	20%
41-60	56	41	31%
61-80	60	44	
>80	10	7	
Not recorded	1	1	
Reporter provided inclusion criteria			
Death	33	14	
Brain damage	13	6	
ESA	75	54	
ICU admission*	122	100	
Sum	243	174	



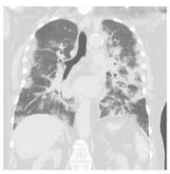
4 OB cases
2 - failed RA->GA
1 – aspiration
2 - cricothyroidotomy

Cook TM. BJA 2011:106:617-31

10

Pulmonary Aspiration Gastric Content

- Small % of cases identified
- Important identify at risk patients
- 55% elective surgical
  - **Full stomach** not appreciated
- Risk factors <u>not</u> highly represented
  - Pregnancy
  - Diabetes
  - GE Reflux
- Gastric US to identify full stomach



"…pulmonary aspiration of gastric contents continues to be a significant source of morbidity and mortality in modern anesthesiology."

Perlas A.EDITORIAL, Anesthesiology 2021:135:209-11

11

Failed Intubation Obstetric General Anesthesia

- 1970-2014, review
- Failed intubation = 2.6/1000 OB GA
  - 1/390 overall
  - 1/443 cesarean
  - **2/3 failed intubations maternal hypoxemia**
  - **1/60 failed intubations surgical airway (often late)**
- **Pulmonary aspiration 8% of failed intubations**
- **<u>Maternal mortality</u>** from failed intubation
  - 2.3/100k GA cesarean
  - **1/90 mortality from failed intubations**
  - **Deaths from aspiration or hypoxemia**

Kinsella SM. IJOA 2015:24:356-74

12

Gastric Emptying Labor: Epidural Improves

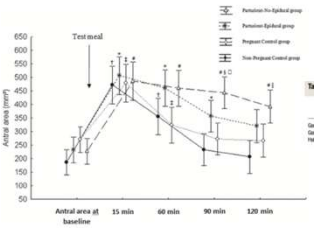


Table 2. Gastric Emptying Fractions and Half-time Gastric Emptying in Four Participant Groups

	Nonpregnant Control (n = 10)	Pregnant Control (n = 10)	Parturient–Epidural (n = 10)	Parturient–No-Epidural (n = 10)	P Value
Gastric emptying fraction at 90 min, %	52 (46–61)	45 (31–56)	31 (17–38)*	7 (5–10)†	0.0001
Gastric emptying fraction at 60 min, %	27 (15–38)	34 (22–52)	9 (2–17)*	4 (0–8)*	0.003
Half-time to gastric emptying, min	43 (32–64)	35 (22–49)	72 (54–130)*	Not applicable†	0.0006

Bouvet L. Anesthesiology 2022;136:542-50

13

Gastric Emptying Labor Editorial

- Labor no epidural - ↓90% vs. non-pregnant
- Labor epidural - ↓40% vs. non-pregnant
  ↑46% vs. labor no epidural

At **2 h**:

- Labor no epidural **90% still had solid food in stomach**
- Labor epidural **30% still had solid food in stomach**

- 'It is **probably too soon to propose liberal intake for all parturients before further large-scale studies** become available to validate the findings of Bouvet' [note - N=10 each group]

Palmer C. Anesthesiology 2022;136:528-30

14

ASA Guideline Preop Fasting: Clear Liquids

- Elective, healthy
- Clear liquids 2 h preop
  - Carbohydrate
    - Simple or complex
  - Protein containing ok
    - Insufficient evidence +/-
- Chewing gum
  - Doesn't help/hurt
    - Insufficient evidence +/-

The intended population for this update is the same as for the 2017 ASA guideline, limited to healthy patients undergoing elective procedures.[1] Healthy patients are those without coexisting diseases or conditions that may increase the risk for aspiration, including esophageal disorders such as significant uncontrolled reflux disease, hiatal hernia, Zenker's diverticulum, achalasia, stricture; previous gastric surgery (for example, gastric bypass); gastroparesis; diabetes mellitus; opioid use; gastrointestinal obstruction or acute intraabdominal processes; pregnancy; obesity; and emergency procedures.[3–4] Anesthesiologists should recognize that these conditions can increase the likelihood of regurgitation and pulmonary aspiration and should modify these guidelines based upon clinical judgment.

Joshi GP. Anesthesiology 2023;138:132-51

15

ASA Statement Oral Intake during Labor

- Pregnancy: **↑ risk pulmonary aspiration** - general anesthesia
- Gastric emptying delayed
  - Until 18 h post-delivery
  - 90% slower than non-pregnant
  - Opioids IV or higher dose neuraxial may slow further
- >50% have Gastroesophageal reflux
  - ↓LES tone until 48 h post-delivery
- **Difficult intubation (1:49)** = increased aspiration risk
- **Failed intubation (1:808)** = increased aspiration risk
- **Emergency General (SOAP COE ≤ 6% GA) =** increased aspiration risk

https://www.asahq.org/standards-and-practice-parameters/statement-on-oral-intake-during-labor
ASA, Committee on Obstetric Anesthesia , ACOG support, SOAP Oct 2022

16

ASA Statement Oral Intake during Labor

- **Solid food avoided active labor**
- Clear liquids encouraged
  - Electrolyte
  - [protein okay – see ASA preop fasting]
- **High-risk conditions may require stricter limitations**
- Pre-Labor (induction) – insufficient information
  - Pre-labor transition to labor (latent or active) subjective and ambiguous
  - Shared decision making/informed consent for Pre-Labor period (only)
- Neuraxial regardless of NPO status

https://www.asahq.org/standards-and-practice-parameters/statement-on-oral-intake-during-labor
ASA, Committee on Obstetric Anesthesia , ACOG support, SOAP Oct 2022

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ASA Statement Oral Intake during Labor:
High Risk Conditions Potentially Requiring Additional Restrictions

System	Medical Condition
GI tract	GE reflux severe, Hiatal hernia, obstruction
Gastric motility	Diabetes, gastroparesis [prior to US study]
Difficult airway	BMI≥ 40 (OR 2.7) Hx, exam suggests difficult airway
Neurologic	Decreased consciousness, moderate sedation
Obstetric	Preeclampsia, abruption, multiple gestation
Fetal	↑ Risk cesarean (e.g. macrosomia, malpresentation), non-reassuring fetal status, IUGR

https://www.asahq.org/standards-and-practice-parameters/statement-on-oral-intake-during-labor
ASA, Committee on Obstetric Anesthesia , ACOG support, SOAP Oct 2022

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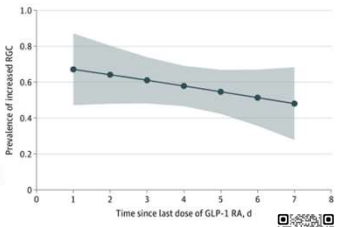
19

Gastric Volume GLP-1Agonist

- ASA Guideline followed
  - 1 week off GLP-1 agonist
- Residual gastric volume
  - Solid, thick liquid, >1.5ml/kg clear fluid
  - **Control group 19%**
  - GLP-1 agonist 56%
- May need longer NPO/stopping



Sen S. JAMA Surg 2024: Mar 6:e240111 PMID: 38446466

20

Light Diet Labor vs Water: OB Outcomes

- N=2426, RCT
- NO DIFFERENCES!!!
  - NSVD
  - Assisted delivery
  - **Cesarean rate**
    - 30% vs 30%
  - **Duration labor**
  - Vomiting
    - 35% vs 34%

Table 2 | Primary and pre-defined secondary maternal outcomes. Values are numbers (percentages) unless stated otherwise

Outcome	Eating (n=1219)	Water (n=1207	P value	Comparison (95% CI)
Normal vaginal delivery*	533 (44)	534 (44)	0.77	0.99† (0.91 to 1.09)
Instrumental delivery	324 (27)	310 (26)	0.64	1.04† (0.91 to 1.19)
Caesarean section	362 (30)	363 (30)	0.86	0.987† (0.87 to 1.12)
Vomited	430 (35)	406 (34)	0.41	1.05† (0.94 to 1.17)
Oxytocin for augmentation	647 (53)	673 (56)	0.19	0.95† (0.88 to 1.02)
Intravenous fluid >500 ml	820 (67)	838 (69)	0.25	0.969† (0.92 to 1.02)
Length of labour (min):				
Geometric mean	597	612	–	0.975‡ (0.927 to 1.025)
Median (interquartile range)	669 (437-929)	658 (432-905)	–	

*Primary outcome.
†Risk ratio.
‡Ratio of geometric means.

O'Sullivan G. BMJ 2009:338:b784. PMID 19318702

21

Carbohydrate High vs Low in Fluids RCT

N=1953, RCT, Primip

NO DIFFERENCES!!!

- **Cesarean**
  - 11.3% v 10.9%
- **Duration labor**
  - 1st stage
  - 2nd stage
  - Forceps

Differences

- Maternal hyperglycemia
  - 6.9% vs. 1.9%, P<.01
- Neonatal hyperglycemia
  - 9.2% vs. 5.8% P<.01
- Neonatal hypoglycemia
  - 1% vs. 2.3%, P=.03
- Maternal hunger
  - 3 vs. 4, P .01

Ding T. BMC Pregnancy Childbirth. 2022:22:339

22

Stats

- 32% cesarean
  - 22.5% primary cesarean low risk
- 32% induction labor
- Diabetes
  - 1.1% pre-pregnancy
  - 8.3% gestational
- BMI ≥ 30 - 42%
- Repeat cesarean 85%
  - VBAC 15%
- ~15% labor to cesarean

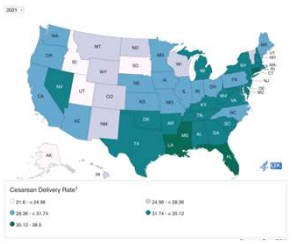
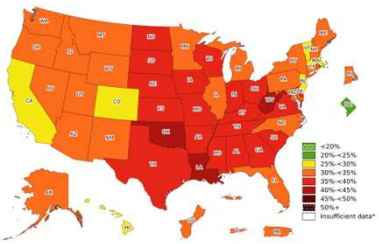


Table 13, Births Final Data 2021, NVSR 72.1 2023, March of Dimes https://www.marchofdimes.org/peristats accessed March 2024, CDC.gov/obesity/data

23

Obesity Prevalence CDC

Prevalence† of Obesity Based on Self-Reported Weight and Height Among U.S. Adults by State and Territory, BRFSS, 2022



BMI ≥ 30

https://www.cdc.gov/obesity/data/prevalence-maps.html#overall, accessed March 2024

24

OB Risk Stratification

- Category II FHR 84% at any point during labor
  - 22% over the course of labor
  - 39% in the two hours before delivery

- BMI ≥ 40, 20-39y.o.F 12.5% NHSR 2021:158
  - Black 19.1%
  - White 12 %
  - Hispanic 8.8%
  - Asian 1.1%

Jackson M. Obstet Gynecol 2011:118:803

25

Anesthesia Complications

- IV catheter 1:5000 Jenkins 2005
- IT catheter unrecognized 1:2900 Jenkins 2005
- High neuraxial block 1:4336 D'Angelo 2014
- Cardiac arrest 1.4:10000 D'Angelo 2014

26

Airway Swelling Labor

- Airway exam worsens p<.01
- 50% become Grade 3-4
  - 33% increase one grade
  - 5% increase two grades
- Oral volume decreases p<.05
- Difficult intubation
  - Grade 3 – 7.6x
  - Grade 4 – 11.3x

-Kodali BS. Anesthesiology 2008:108:357-62, Rocke DA. Anesthesiology 1992:77:67-73

27

JAMA Network

From: **Cesarean Delivery Trends Among Patients at Low Risk for Cesarean Delivery in the US, 2000-2019**

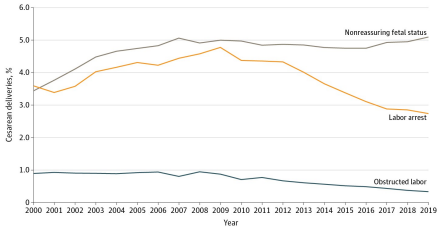


Figure Legend:

Trends in the Proportion of Cesarean Deliveries Among Low-risk Deliveries With Specific Diagnoses Graph shows the proportion of cesarean delivery hospitalizations with diagnoses of non-reassuring fetal status, labor arrest, and obstructed labor among low-risk deliveries in the National Inpatient Sample from 2000 to 2019.

JAMA Netw Open. 2023;6(3):e235428. doi:10.1001/jamanetworkopen.2023.5428

28

JAMA Network

From: **Cesarean Delivery Trends Among Patients at Low Risk for Cesarean Delivery in the US, 2000-2019**

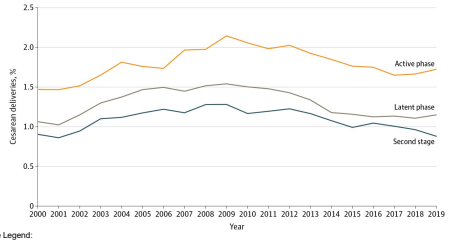


Figure Legend:

Trends in the Proportion of Cesarean Deliveries Among Low-risk Deliveries With **Labor Arrest**, by Stage of Labor Graph shows the proportion of cesarean delivery hospitalizations with second stage arrest, active phase arrest, and latent phase arrest among low-risk deliveries in the National Inpatient Sample from 2000 to 2019.

JAMA Netw Open. 2023;6(3):e235428. doi:10.1001/jamanetworkopen.2023.5428

29

Really?

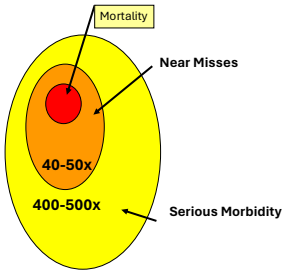
30

Maternal Mortality Aspiration

- Death by aspiration
- Likely under coding
- Near Miss/Morbidity

- No benefit in outcomes

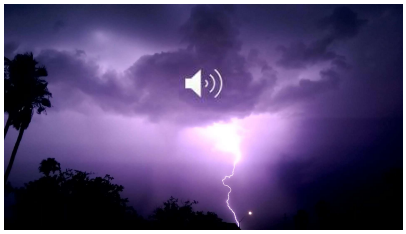
- Why Increase risks when we are trying to Decrease maternal mortality
- High risk of obesity - disparities



2007 All-California Rapid Cycle Maternal/Infant Database for CA Births: CMQCC

31

Maternal Death or Aspiration



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33

34

35

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Manny Vallejo, MD, DMD, FASA
Associate Dean and Designated Institutional Official
Professor of Medical Education, Anesthesiology, Obstetrics & Gynecology
West Virginia University

PRO/CON: Fed in Labor

Disclosure Info: NONE

1

Current Policies and Practices

- The American College of Nurse-Midwives - food and drink should not be restricted routinely in labor and healthy women experiencing normal labor determine for themselves if they wish to eat and drink
- World Health Organization (WHO) - health care providers should not interfere with a woman's desire for oral intake during labor
- Cochrane Database of Systematic Reviews
  - No benefits or harms (C/S rate, operative VD's, Apgar scores, labor augmentation & duration, emesis, narcotic pain relief and epidural analgesia)
  - No justification for the restriction of fluids and food in labor for women at low risk
  - No studies looked specifically at women at ↑ risk of complications => no evidence to support restrictions in this group
  - Conclusion => women should be free to eat and drink in labor (or not), as they wish

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2

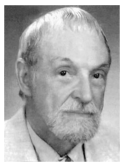
Current Policies and Practices

- America Society of Anesthesiologists (ASA)
  - Oral intake of moderate amounts of clear liquids may be allowed for uncomplicated laboring patients and patients undergoing elective surgery (e.g., scheduled cesarean delivery or postpartum tubal ligation)
  - May have moderate amounts of clear liquids up to 2 h before induction of anesthesia
  - Solid foods should be avoided in the laboring patient
- American College of Obstetricians & Gynecologists (ACOG)
  - Moderate amounts of clear liquids by women in labor who do not have complications and particulate containing fluids and solid foods should be avoided
- ASA Committee on Obstetric Anesthesia (COBA)
  - Can be offered clear liquids during labor, including isotonic sports beverages, water, ice chips, fruit juices without pulp, black coffee, and tea without milk or cream
  - Consumption of solid food during active labor should be avoided
- No real consensus guidelines regarding oral intake in labor

ACOG Committee Opinion 766 2019, ASA Practice Guidelines 2016, ACNM 2016, Cochrane Database of Systematic Reviews 2013, COBA 2022

3

Curtis Mendelson 1946



1913-2002

- 15-year experience (1932 to 1945) of 44,016 deliveries => 66 cases of aspiration of stomach contents (0.15% incidence)
- 2 cases => maternal death due to the aspiration of solid food leading to obstruction/asphyxiation and 64 cases resulted in aspiration pneumonitis with complete recovery (given liquids, not solids)
- 1940-time capsule – general anesthesia was used for vaginal deliveries for labor administered via face mask using a black rubber mask strapped to the mother's face with ether, leaving the airway unprotected
- 80% were "normal spontaneous deliveries" given by ether

Mendelson 1946

4

Mendelson 1946 – Secondary Study

- Rabbits died only when they aspirated material containing hydrochloric acid
- No deaths due to aspiration of fluids with a neutral pH
- A gastric pH of < 2.5 and/or a volume > 0.4 mL/kg (25 cc) resulted in lung injury if aspirated
- Consequently => most hospital policies do not allow eating and drinking in labor, apart from frequent sips of water

Solids = Obstruction/Asphyxiation

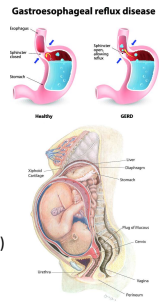
Mendelsen 1946

Liquids = Pneumonitis (Asthmatic)

5

Pregnancy Increases Aspiration Risk

- Hormonal
  - Progesterone and estrogen produced by the placenta lead to a ↓ in muscle tone of the GI tract
  - Relaxation of the Lower Esophageal Sphincter (LES) smooth muscle, ↓ the pressure barrier that normally prevents acid reflux => GERD
  - ↑ concentrations of gastrin (produced by the placenta) => ↓ pH
- Mechanical
  - Mechanical push of the gravid uterus on the stomach => delayed gastric emptying
- Physiologic changes - ↑ RR, ↑ MV, ↓ FRC => Apnea and Aspiration
- Considered "full stomachs" after eating (at least for the 4 hours)



6

Difficult and Failed Intubation in Pregnancy

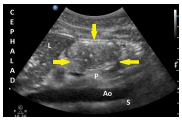
- Airway edema, breast enlargement, obesity and the high rate of emergency surgery => contribute to the risk of failed intubation
- Pregnancy carries an ↑ rate of both difficult and failed intubation
- Risk of failed intubation is 3-11 times ↑ in pregnant patients (than non-pregnant) and can be as high 1:250 (compared to 1:2,500 in non-pregnant adults)
- However, despite liberal food policies, aspiration of gastric contents in the pregnant population is exceedingly rare
- Anesthesia-related deaths occur in 1.6 per million live births => most of these reflect difficulty in intubation
- Rate of general anesthesia is very low, approximately 5% in the overall population

ESA 2011, Fiszer 2023, O'Sullivan 2003, COBA 2022, Chang 2003

7

Delayed Gastric Emptying in Labor

- Gastric emptying is delayed during active labor
- Labor pain is the most important cause of delayed gastric emptying
- Gastric volume is significantly ↑ in parturients without pain relief compared to those who receive labor analgesia
- Gastric emptying in laboring parturients is significantly delayed and can take up to 18 hours to return to normal
- Co-existing disorders such as obesity, GERD and diabetes can also ↓ gastric emptying



Arzola BJA 2014, Barboni 2016, Palmer 2022

8

Opioids and Delayed Gastric Emptying

- Labor epidural analgesia (LEA) accelerates gastric emptying compared to a laboring parturient without LEA (improves gastric emptying up to 50%)
- Narcotic administration also delays gastric emptying
- Continuous epidural infusion of low dose local anesthetic with fentanyl does not appear to delay gastric emptying until the total dose of fentanyl ≥ 100 mcg

Ciardulli 2017

9

Labor Energy Expenditure

- Labor is analogous to continuous moderate aerobic exercise => accelerated starvation
- ↑ oxygen consumption and ↑ glucose utilization
- Uterine and skeletal muscle contractions are also major stimulants for glucose utilization
- Circulating catecholamines and cortisol and sympathetic nervous system stimulation ↑ endogenous glucose production
- The liver ↑ glucose production, primarily through gluconeogenesis
- Starvation => ↑ production of ketones (ß-hydroxybutyrate and acetoacetic acid) as an alternative energy source => ↓ uterine contraction and can prolong labor
- Sports Medicine Studies => carbohydrate intake during intense, moderate, and intermittent exercise has proven to enhance the capacity to perform, slows fatigue, and ↓ lipolysis, ketosis, and protein degradation

ACNM 2016, Vallejo 2013

10

Oral Supplementation in Labor

- Labor Parturient Survey
- 28% did not receive advice on oral intake during labor
- 27% of women considered the restriction of food in labor moderately to most stressful; 57% considered the restriction of fluids to be moderately to mostly stressful (Simkin et al.)
- Most women wanted to drink but not eat in labor
- 83% strongly agreed or agreed that they felt like drinking in labor was beneficial
- 30% strongly agreed or agreed that they felt like eating food during labor was beneficial
- 61% experienced nausea and 32% had emesis
- A light diet during labor prevents ketosis, but ↑ gastric volume
- Light diet = low-residue foods such as biscuits, toast or cereals (BRAT diet)
- Isotonic "sport drinks" prevents ketosis without ↑ gastric volume

ESA 2011, McDermott ANZJOG 2022, ACNM 2016

11

Less-Restrictive Food Intake During Labor in Low-Risk Singleton Pregnancies: A Systematic Review and Meta-analysis

- Meta-analysis of 10 trials, including 3,982 laboring women
- Subgroup analyses => unrestricted food intake or a low-residue diet was NOT associated with any significant effect on labor duration
- Chance of CD in a laboring woman with a low-risk singleton pregnancy with cephalic presentation at term was approximately 25%
- Oral carbohydrate-based fluids => associated with a significant 15 min. shorter duration of labor compared with water only (Laifer et al. Anesthesiology 2000)
- Policy of less-restrictive food intake => associated with a significantly shorter duration of labor (mean difference = 16 minutes, 95% CI: 225 to 27)
- Policy of less-restrictive food intake during labor => did not influence obstetric or neonatal outcomes, nor did it increase the incidence of vomiting
- No other benefits or harms in obstetric or neonatal outcome were noticed (i.e., regurgitation during general anesthesia or Mendelson syndrome) did not occur
- CONCLUSIONS:
- Women with low-risk singleton pregnancies who were allowed to eat more freely during labor had a shorter duration of labor
- Policy of less restrictive food intake during labor did not influence other obstetric or neonatal outcomes nor did it increase the incidence of vomiting
- Operative delivery rates were similar

Ciardulli 2017

12

ASA & ESA Current Fasting Guidelines

- Adults and children should be encouraged to drink clear fluids (including water, pulp-free juice and tea or coffee without milk, carbohydrate rich drinks) up to 2 hrs. before elective surgery (including caesarean delivery)
- Milk in large quantities curdles in the stomach and acts like a solid, but smaller quantities are similar to other liquids (not as much at risk)
- Solid food should be prohibited for 6 hrs. before elective surgery in adults and children
- Drinking carbohydrate-rich fluids before elective surgery improves subjective well being, ↓ thirst and hunger and ↓ postoperative insulin resistance

ESA Guidelines 2011, ASA Guidelines 2016

13

Conclusions

- Women eating and drinking in labor is highly controversial
- Countries with more liberal policies do not have higher rates of aspiration => suggests little correlation between eating in labor and maternal aspiration-related morbidity
- Respecting patient autonomy is important
- Insufficient evidence to support starving women in labor to ↓ the risk of aspiration
- Oral supplementation provides an overall sense of Well-being, Self-control which ↑ Maternal Satisfaction
- Denial of food can be seen as Authoritarian and Intimidating => ↑ fear and apprehension

Fiszer 2023

14

Conclusions Continued

- Women not given food intake restrictions tend to follow their normal dietary pattern in early labor but reduce their food intake as labor becomes more painful
- Low risk factors for general anesthesia => women who wish to eat and drink in labor (or not) should be encouraged to do so (permitted light food)
- High risk for C/S (general anesthesia) => diet restriction to fluids (e.g., carbohydrate-rich drinks)

15

Fed in Labor Questions

• Should there be restriction of fluids and food in all laboring patients	**NO**
• Solids can be given in active labor	**NO**
• Liberalize guidelines	**NO**
• Modify NPO guidelines	**Absolutely!**
• Should Dr. Mark Zakowski liberalize his NPO guidelines	**Of Course!**

Thank You

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SOAP 2024 ANNUAL MEETING
MAY 1-5, 2024
SHERATON DENVER DOWNTOWN HOTEL
DENVER, COLORADO
SOAP

1

SOAP 2024
ANNUAL MEETING
Addressing Maternal Disparities:
3 Areas to Improve Your
Patients' Outcomes

2

SOAP
Society for Obstetric Anesthesia and Perinatology
SOAP 2024 ANNUAL MEETING
Fatoumata Kromah, MD
Virginia Commonwealth University
Sarah Nizamuddin, MD
University of Chicago Medicine
Paloma Toledo, MD, MPH
University of Miami Miller School of Medicine
Emily Naoum, MD
Massachusetts General Hospital
Harvard Medical School

3

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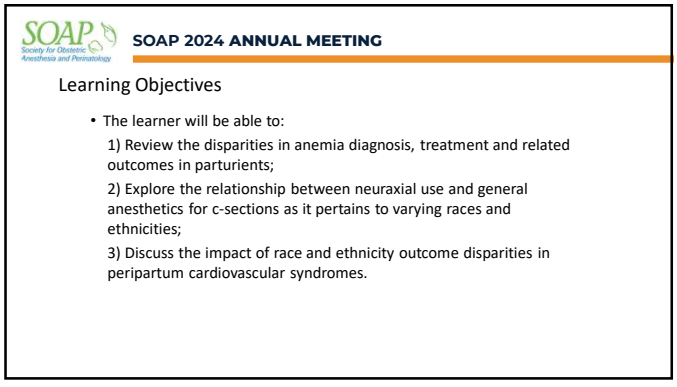
Disclosures
We have no financial interests
or conflicts to disclose.

4


SOAP
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SOAP 2024 ANNUAL MEETING
Learning Objectives
• The learner will be able to:
1) Review the disparities in anemia diagnosis, treatment and related outcomes in parturients;
2) Explore the relationship between neuraxial use and general anesthetics for c-sections as it pertains to varying races and ethnicities;
3) Discuss the impact of race and ethnicity outcome disparities in peripartum cardiovascular syndromes.

5

ANEMIA IN PREGNANCY:
IMPROVING DIAGNOSIS
AND TREATMENT IN
UNDERSERVED
POPULATIONS
Sarah Nizamuddin, MD
Associate Professor
University of Chicago Medicine

6

What is it?
Anemia in Pregnancy

- Hg< 10.5-11 g/dL (lower Hg in second trimester)
- Causes of anemia in pregnancy:
  - Iron-deficiency
  - Folate deficiency
  - B12 deficiency
  - Other underlying diseases

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7

Why does it matter?

Women with anemia experience increased rates of severe maternal morbidity

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Am J Obstet Gynecol MFM. 2021 Sep;3(5):100395.

8

Maternal consequences of anemia

- Mortality with high blood loss
- Cardiovascular strain
- Reduced peripartum blood reserves
- Increased risk for peripartum blood transfusion
- Increased risk of infection
- Reduced physical and mental performance
- Increased risk of postpartum depression
- Insufficient milk syndrome

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Breymann. Arch Gynecol Obstet. 2017 Dec;296(6):1229-1234

9

Fetal risks

- Prematurity
- Death in utero
- Infection
- Placental abruption
- Preeclampsia
- Reduced neonatal iron stores
- Intrauterine growth restriction (Hg<9 and >11 g/dL)

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10

UNDERSERVED POPULATION: LOW RESOURCE COUNTRIES, LOW SES

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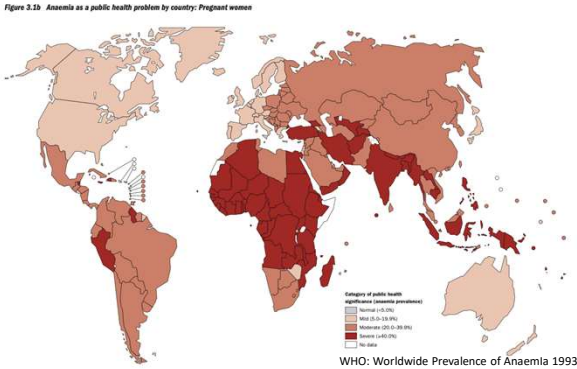
11

Worldwide prevalence of anaemia 1993–2005

Population group	Prevalence of anaemia		Population affected	
	Percent	95% CI	Number (million)	95% CI
Pregnant women	41.8	39.9–43.8	56	54–59

	Percent	95% CI	Number (million)	95% CI
Preschool-age children	47.4	45.7–49.1	293	283–303
School-age children	25.4	19.9–30.9	305	238–371
Pregnant women	41.8	39.9–43.8	56	54–59
Non-pregnant women	30.2	28.7–31.6	468	446–491
Men	12.7	8.6–16.9	260	175–345
Elderly	23.9	18.3–29.4	164	126–202
Total population	**24.8**	**22.9–26.7**	**1620**	**1500–1740**

12

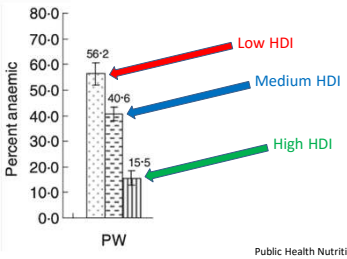


WHO: Worldwide Prevalence of Anaemia 1993–2005

13

Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993–2005

Erin McLean[1], Mary Cogswell[2], Ines Egli[3], Daniel Wojdyla[4] and Bruno de Benoist[1,*]



Public Health Nutrition:12(4), 444-454.

14

UNDERSERVED POPULATION: BLACK RACE AND MEXICAN/HISPANIC AMERICANS

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Health Services Research

Anemia in Pregnancy and Race in the United States: Blacks at Risk

Omoniyi Y. Adebisi, MD; Gregory Strayhorn, MD, PhD

- Data obtained from U.S. nationality data files (1995-2000), included 23,654,695 live births.
- Even after adjustment for risk factors, the prevalence of anemia was 2 times higher in non-Hispanic blacks than among non-Hispanic whites
- Conclusion: Black race was significantly associated with higher risk of anemia in pregnancy.

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Maternal anemia and pregnancy outcomes: a population-based study

Rachael H. Beckert[1] · Rebecca J. Baer[2,3] · James G. Anderson[1] · Laura L. Jelliffe-Pawlowski[4] · Elizabeth E. Rogers[1]

Table 1 Characteristics of women with and without anemia during pregnancy

	Anemia, *n* (%)	No anemia, *n* (%)	cRR (95% CI)
Sample	**284,780**	**2,584,635**	
Race/ethnicity			
White non-Hispanic	59,414 (20.9)	688,430 (26.6)	Reference
Hispanic	142,302 (50.0)	1,256,700 (48.6)	1.3 (1.3, 1.3)
Black	29,006 (10.2)	124,498 (4.8)	2.4 (2.3, 2.4)
Asian	30,338 (10.7)	326,953 (12.7)	1.1 (1.1, 1.1)
Other	23,720 (8.3)	188,054 (7.3)	1.4 (1.4, 1.4)

Journal of Perinatology (2019) 39:911–919.

17

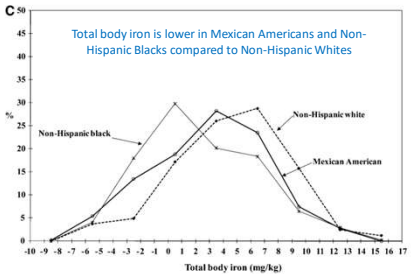
	N=5358	Non-anemic N=954 (17.8%)	Mildly anemic N=2828 (52.8%)	Moderately anemic N=1566 (29.2%)	Severely anemic N=8 (0.2%)	*P*
Race	African American N=3905 (72.9%)	583 (14.9%)	2063 (52.8%)	1251 (32.0%)	8 (0.2%)	p<0.0001
	White N=887 (16.6%)	248 (28.0%)	468 (52.8%)	171 (19.3%)	0 (0%)	
	Other* N=564 (10.5%)	123 (21.8%)	297 (52.7%)	144 (25.5%)	0 (0%)	
Ethnicity	Not Hispanic N=4813 (89.8%)	836 (17.4%)	2551 (53%)	1418 (29.5%)	8 (0.2%)	p<0.002
	Hispanic/Latino N=405 (7.6%)	92 (22.7%)	212 (52.4%)	101 (24.9%)	0 (0%)	
	Unknown N=140 (2.5%)	27 (19.3%)	66 (47.1%)	47 (33.6%)	0 (0%)	
Insurance	Government N=3413 (63.7%)	504 (14.5%)	1771 (52.0%)	1138 (33.3%)	8 (0%)	p<0.0001
	Private N=1691 (31.6%)	411 (24.3%)	909 (53.7%)	371 (22.0%)	0 (0%)	
	Other** N=195 (4.7%)	35 (18.0%)	121 (62.0%)	39 (20.0%)	0 (0%)	
Household income	Median income in USD***	37,864 (31,646-52,910) [0,134-130,756]	37,123 (31646-44,489) [0,134-61,972]	37,123 (31,646-42,864) [20,263-58,638]	38,540 (30,504-55,048) [21,103-61,857]	p<0.0001

Data expressed as n (%).
*Includes Asian Mideast Indian [n=212 (4%)], American Indian or Alaskan Native [n=5 (0.1%)], Native Hawaiian/Pacific Islander [n=4 (0.1%)], and other [(n=343 (6%)].
** Includes self-paid [n=195 (5.9%)].
*** Data expressed as median (interquartile range) and [range].

Angelidis et al. Anemia in Pregnancy and Social Determinants of Health.

18

Why the disparity?



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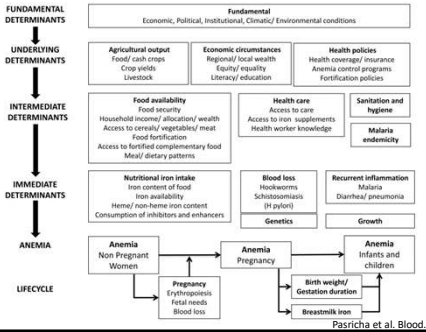
Mei et al. Am J Clin Nutri. 2011 June;93(6):1312-20.

19

Why the disparity?



Pasricha et al. Blood. 2013 Apr 4;121(14):2607-17.

20

Food insecurity and anaemia risk: a systematic review and meta-analysis

Sajjad Moradi[1,2], Hana Arghavani[3], Amos Issah[3], Hamed Mohammadi[4] and Khadijeh Mirzaei[3,*]

Association between food insecurity and anemia among women of reproductive age

Bishwajit Ghose[1], Shangfeng Tang[1], Sanni Yaya[2] and Zhanchun Feng[1]

Original Investigation | Pediatrics

Association of Family Income and Risk of Food Insecurity With Iron Status in Young Children

Imaan Bayoumi, MD, MSc; Patricia C. Parkin, MD; Catherine S. Birken, MD, MSc; Jonathon L. Maguire, MD, MSc; Cornelia M. Borkhoff, PhD; for the TARGet Kids! Collaboration

Public Health Nutr. 2018 Nov;21(16):3067-3079.
PeerJ. 2016 May 5;4:e1945.
JAMA Netw Open. 2020 Jul 1;3(7):e208603.

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What We Know:

- Anemia in pregnancy is a world-wide problem
- Black populations and lower SES are at higher risk of having anemia in pregnancy
- Anemia can increase risk of maternal and fetal complications

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How Do We Address These Disparities?

- Improve diagnosis

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How Do We Address These Disparities?

- Improve diagnosis
- Improve education

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How Do We Address These Disparities?

- Improve diagnosis
- Improve education
- Improve treatment

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Improve Diagnosis

- Clear screening guidelines and protocols
- Gold standard: serum ferritin
- Screening ferritin and Hb tests even during triage/ED visits for all pregnant women

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RESEARCH ARTICLE

Development and implementation of a quality improvement toolkit, iron deficiency in pregnancy with maternal iron optimization (IRON MOM): A before-and-after study

Jameel Abdulrehman[1], Andrea Lausman[2], Grace H. Tang[3], Rosane Nisenbaum[4,5], Jessica Petrucci[3], Katerina Pavenski[6,7], Lisa K. Hicks[4,6], Michelle Sholzberg[4,6,7]*

- Tertiary care center in Toronto, 3,000 deliveries/year
- Implementation of a novel QI toolkit to improve early detection and management of iron deficiency and IDA.
  - Clinical pathways
  - Educational resources (clinicians and patients)
  - Adjusted laboratory requisitions
  - Standardized iron prescriptions

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PLoS Med. 2019 Aug 20;16(8):e1002867.

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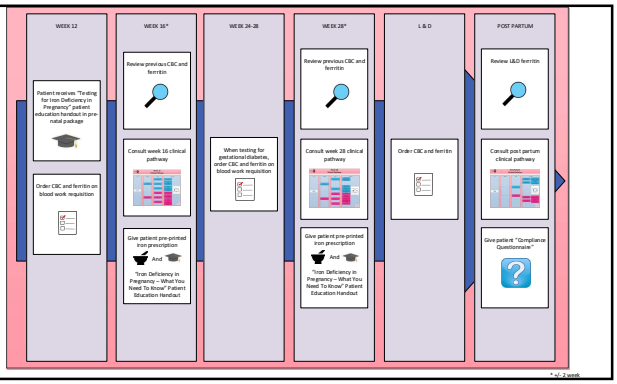

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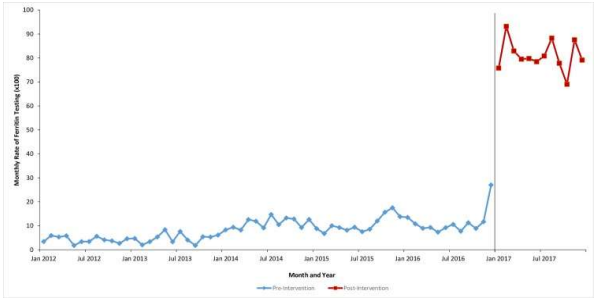

PLoS Med. 2019 Aug 20;16(8):e1002867.

29

RESEARCH ARTICLE

Development and implementation of a quality improvement toolkit, iron deficiency in pregnancy with maternal iron optimization (IRON MOM): A before-and-after study

Jameel Abdulrehman[1], Andrea Lausman[2], Grace H. Tang[3], Rosane Nisenbaum[4,5], Jessica Petrucci[3], Katerina Pavenski[6,7], Lisa K. Hicks[4,6], Michelle Sholzberg[4,6,7]*

- Pre-intervention group: 2012-2016 (chart review)
- Post-intervention group: Jan 2017- Dec 2017
- Results: Post-delivery-8 weeks postpartum:
  - Pre-intervention: 342 women out of 15,019 (2.3%) transfused
  - Post-intervention: 41 women out of 2,617 (1.6%) transfused
    - $p = 0.0214$

PLoS Med. 2019 Aug 20;16(8):e1002867.

30

Improve Education

Build trust with minority groups

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Distrust From History

- Dr. Marion Sims
- Henrietta Lacks
- Tuskegee Syphilis Study

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Distrust From Personal Experience

"Every day, Black Americans have their pain denied, their conditions misdiagnosed, and necessary treatment withheld by physicians."

Bajaj SS, Stanford FC. Beyond Tuskegee: Vaccine Distrust and Everyday Racism. N Engl J Med. 2021 Feb 4;384(5):e12.

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Improve Education

Diversify our workforce

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Improve Education

Get out into the communities

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Improve Treatment

- Iron supplementation:
  - Improves birth weight
  - Improves infant ferritin at 3 months
  - Reduces need for maternal transfusion
  - Reduces neonatal mortality

Pena-Rosas JP. Cochrane Database Syst Rev 2006;(3):CD004736
Zeng L. BMJ. 2008;337:a2001

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Oral versus IV Iron

- IV iron:
  - Higher maternal hemoglobin at delivery (weighted mean difference, 0.66 g/dL; 95% CI, 0.31-1.02 g/dL)
  - Increased hemoglobin level after 4 weeks (pooled weighted mean difference, 0.84 g/dL; 95% CI, 0.59-1.09 g/dL)
  - Fewer medication reactions (relative risk, 0.34; 95% CI, 0.20-0.57)
  - Higher hemoglobin concentrations at 6 weeks post partum (mean difference, 0.9 g/dL; 95% CI, 0.4-1.3 g/dL

Am J Obstet Gynecol. 2019 Jul;221(1):19-29.e3.
Am J Perinatol. 2019 Mar;36(4):366-376.
J Perinatol. 2019 Apr;39(4):519-532.

37

IV Iron in High-Risk Populations

Consider IV Iron as first line treatment

38

Summary

- Iron deficiency anemia is the most common anemia in parturients
- Disparities in Black populations, Mexican Americans, and lower SES
- Improving disparities requires improvements education, diagnosis and treatment in these communities
- IV iron works faster and is more effective in raising Hg levels compared to PO iron

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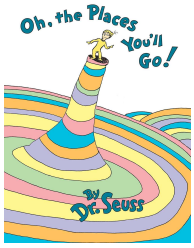
Where to go from here…

- Continue outreach into the community
- Move towards protocolizing diagnosis strategies and treatment
- Improved treatment– move to IV iron more frequently
- Diversify our work force
- Risk planning when anemic patients come to L&D



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Evaluation of The Intersection Between Disparities in the Use of General Anesthesia and Neuraxial Labor Analgesia

Paloma Toledo, MD, MPH, FASA
Professor
University of Miami
Miller School of Medicine

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Disclosures

•I have no financial interests or conflicts to disclose.

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MIAMI MILLER SCHOOL of MEDICINE

Email:
p.toledo1@Miami.edu

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Overview

- 1. Review the origins of healthcare racial and ethnic disparities
- 2. Discuss disparities in general analgesia use
- 3. Discuss disparities in neuraxial labor analgesia
- 4. Discuss the disparities in general anesthesia use and how they relate to disparities in neuraxial labor analgesia
- 5. Discuss framework to evaluate disparities

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Key Takeaways

- Racial and ethnic disparities in the use of cesarean delivery, neuraxial labor analgesia, and general anesthesia exist
- It is unclear if the disparities in general anesthesia use are preventable
- Consider implementing a quality assurance review of all general anesthetics and review, in addition to patient, provider, and systems-level factors, if race/ethnicity, language, or other social determinants contributed to the decision to proceed with general anesthesia

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Origins of Healthcare Disparities

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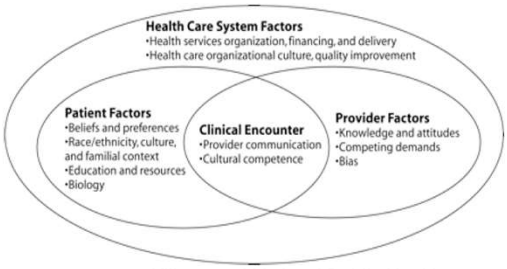
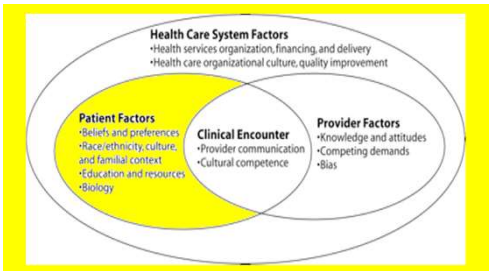
Origins of Healthcare Disparities



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

47

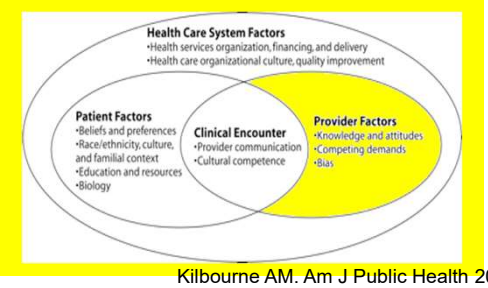
Patient-level factors



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

48

Physician-level factors



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

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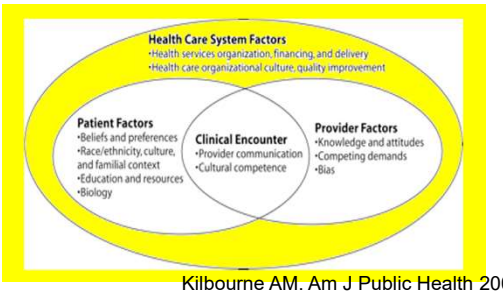
Systems-level factors



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

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Disparities in General Anesthesia Use

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Difficult and Failed Intubations in Obstetrics

PERIOPERATIVE MEDICINE

ANESTHESIOLOGY

Frequency and Risk Factors for Difficult Intubation in Women Undergoing General Anesthesia for Cesarean Delivery: A Multicenter Retrospective Cohort Analysis

Sharon C. Reale, M.D., Melissa E. Bauer, D.O., Thomas T. Klumpner, M.D., Michael F. Aziz, M.D., Kara G. Fields, M.S., Rachel Hurwitz, B.S., Manal Saad, B.S., Sachin Kheterpal, M.D., M.B.A., Brian T. Bateman, M.D., M.Sc., Multicenter Perioperative Outcomes Group Collaborators*

ANESTHESIOLOGY 2022; 136:697–708

EDITOR'S PERSPECTIVE

ABSTRACT

The difficult and failed intubation rate remains higher for pregnant than non-pregnant patients

Difficult intubation: 1 in 49

Failed intubation: 1 in 808

Reale SC. Anesthesiology 2022; 136: 697-708

52

Anesthesia-Related Maternal Mortality in the United States: 1979–2002

Joy L. Hawkins, MD, Joani Chang, MPH, Susan K. Palmer, MD, Charles P. Gibbs, MD, and William M. Callaghan, MD

- Retrospective study
- Evaluated anesthesia-related maternal deaths 1991-2002 (n=86)
  - Compared 1991-2002 to 1979-1990
- Primary outcome: Estimate trends in maternal mortality and compare the risks of neuraxial vs. general anesthesia (GA)

Hawkins JL. Obstet Gynecol 2011; 117: 69-74

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Anesthesia-Related Maternal Mortality in the United States: 1979–2002

Joy L. Hawkins, MD, Joani Chang, MPH, Susan K. Palmer, MD, Charles P. Gibbs, MD, and William M. Callaghan, MD

Table 3. Case Fatality Rates and Rate Ratios of Anesthesia-Related Deaths During Cesarean Delivery by Type of Anesthesia in the United States, 1979–2002

Year of Death	Case Fatality Rates*		Rate Ratios
	General Anesthetic	Regional Anesthetic	
1979–1984	20.0	8.6	2.3 (95% CI 1.9–2.9)
1985–1990	32.3	1.9	16.7 (95% CI 12.9–21.8)
1991–1996	16.8	2.5	6.7 (95% CI 3.0–14.9)
1997–2002	6.5	3.8	1.7 (95% CI 0.6–4.6)

CI, confidence interval.
* Deaths per million general or regional anesthetics.

Improvements in case-fatality with GA over time

GA should not be be avoided if necessary

Hawkins JL. Obstet Gynecol 2011; 117: 69-74

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PRACTICE PARAMETERS

Practice Guidelines for Obstetric Anesthesia

An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology[1]

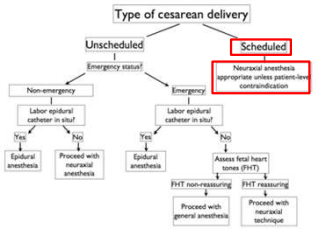
General, Epidural, Spinal, or Combined Spinal–Epidural Anesthesia

- The decision to use a particular anesthetic technique for cesarean delivery should be individualized, based on anesthetic, obstetric, or fetal risk factors (*e.g.*, elective *vs.* emergency), the preferences of the patient, and the judgment of the anesthesiologist.
- Consider selecting neuraxial techniques in preference to general anesthesia for most cesarean deliveries.
- For urgent cesarean delivery, an indwelling epidural catheter may be used as an alternative to initiation of spinal or general anesthesia.
- General anesthesia may be the most appropriate choice in some circumstances (*e.g.*, profound fetal bradycardia, ruptured uterus, severe hemorrhage, severe placental abruption, umbilical cord prolapse, and preterm footling breech).

Anesthesiology 2016; 124: 270-300

55

Anesthetic decision-making: General anesthesia



Toledo P. Clin Perinatol 2013; 40: 443-55

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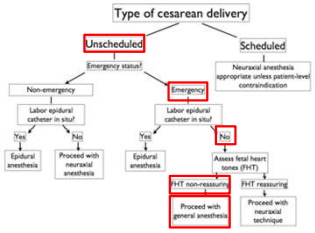
Anesthetic decision-making: General anesthesia



Toledo P. Clin Perinatol 2013; 40: 443-55

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CENTER of EXCELLENCE

The 2022 Application for the Society of Obstetric Anesthesia and Perinatology (SOAP) Center of Excellence (COE) for Anesthesia Care of Obstetric Patients Designation

7. General anesthesia rates:

What is your institution's overall general anesthesia rate for cesarean delivery? #

_____%

What is your general anesthesia rate for planned/scheduled/elective cesarean delivery

_____%

What is your general anesthesia rate for unplanned/intrapartum/urgent cesarean delivery? _____%

☐ *Do you conduct a quality assurance review of all cases requiring general anesthesia (irrespective of your institution's general anesthesia rate)? Please provide evidence of your quality assurance review process.

A quality assurance review must be established, with the aim of reducing avoidable general anesthesia. #Overall (for all indications i.e. planned/scheduled/elective and unplanned/intrapartum/urgent combined, including abnormal placentation/cesarean hysterectomy cases), general anesthesia rate for cesarean delivery should ideally be ≤5%. If >5%, the COE criteria can be met if the application review determines that all general anesthesia cases are being actively reviewed and there is clear evidence of efforts made to reduce avoidable general anesthesia.

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Disparities in General Analgesia Use

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OBSTETRICS

Mode of anaesthesia for preterm Caesarean delivery: secondary analysis from the Maternal–Fetal Medicine Units Network Caesarean Registry†,‡

A. J. Butwick[1,*], Y. Y. El-Sayed[2], Y. J. Blumenfeld[2], S. S. Osmundson[2], and C. F. Weiniger[1,3]

[1]Department of Anaesthesia, [2]Department of Obstetrics and Gynecology, Stanford University School of Medicine, Stanford, CA 94305, USA, and [3]Department of Anesthesiology and Critical Care Medicine, Hadassah Hebrew University Medical Center, Jerusalem, Israel

*Corresponding author. E-mail: ajbut@stanford.edu

Downloaded from http://bjaed.org/ at Stanford University

Butwick AJ. Br J Anaes 2015; 267-74

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Society for Obstetric Anesthesia and Perinatology

Section Editor: Cynthia A. Wong

Racial and Ethnic Disparities in Mode of Anesthesia for Cesarean Delivery

Alexander J. Butwick, MBBS, FRCA, MS,* Yair J. Blumenfeld, MD,† Kathleen F. Brookfield, MD, PhD, MPH,† Lorene M. Nelson, PhD, MS,‡ and Carolyn F. Weiniger, MBChB*§

BACKGROUND: Racial and ethnic disparities have been identified in the provision of neuraxial labor analgesia. These disparities may exist in other key aspects of obstetric anesthesia care. We sought to determine whether racial/ethnic disparities exist in mode of anesthesia for cesarean delivery (CD).

METHODS: Women who underwent CD between 1999 and 2002 at 19 different obstetric centers in the United States were identified from the Maternal-Fetal Medicine Units Network Cesarean Registry. Race/ethnicity was categorized as: Caucasian, African American, Hispanic, and Non-Hispanic Others (NHOs). Mode of anesthesia was classified as neuraxial anesthesia (spinal, epidural, or combined spinal-epidural anesthesia) or general anesthesia. To account for obstetric and non-obstetric covariates that may have influenced mode of anesthesia, multiple logistic regression analyses were performed by using sequential sets of covariates.

RESULTS: The study cohort comprised 50,974 women who underwent CD. Rates of general anesthesia among racial/ethnic groups were as follows: 5.2% for Caucasians, 11.3% for African Americans, 5.8% for Hispanics, and 6.6% for NHOs. After adjustment for obstetric and non-obstetric covariates, African Americans had the highest odds of receiving general anesthesia compared with Caucasians (adjusted odds ratio [aOR] = 1.7; 95% confidence interval [CI], 1.5–1.8; $P < 0.001$). The odds of receiving general anesthesia were also higher among Hispanics (aOR = 1.1; 95% CI, 1.0–1.3; $P = 0.02$) and NHOs (aOR = 1.2; 95% CI, 1.0–1.4; $P = 0.03$) compared with Caucasians, respectively. In our sensitivity analysis, we reconstructed the models after excluding women who underwent neuraxial anesthesia before general anesthesia. The adjusted odds of receiving general anesthesia were similar to those in the main analysis: African Americans (aOR = 1.7; 95% CI, 1.5–1.9; $P < 0.001$); Hispanics (aOR = 1.2; 95% CI, 1.1–1.4; $P = 0.006$); and NHOs (aOR = 1.2; 95% CI, 1.0–1.5; $P = 0.05$).

CONCLUSIONS: Based on data from the Cesarean Registry, African American women had the highest odds of undergoing general anesthesia for CD compared with Caucasian women. It is uncertain whether this disparity exists in current obstetric practice. (Anesth Analg 2016;122:472–9)

Butwick AJ. Anesth Analg 2016; 122: 472-9

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Original Research

Racial and Ethnic Inequities in Cesarean Birth and Maternal Morbidity in a Low-Risk, Nulliparous Cohort

Michelle P. Debbink, MD, PhD, Lynda G. Ugwu, PhD, William A. Grobman, MD, MBA, Uma M. Reddy, MD, MPH, Alan T. N. Tita, MD, PhD, Yasser Y. El-Sayed, MD, Ronald J. Wapner, MD, MBA, Dwight J. Rouse, MD, George R. Saade, MD, John M. Thorp Jr, MD, Suneet P. Chauhan, MD, Hon DSc, Maged M. Costantine, MD, Edward K. Chien, MD, Brian M. Casey, MD, Sindhu K. Srinivas, MD, MSCE, Geeta K. Swamy, MD, and Hyagriv N. Simhan, MD, for the Eunice Kennedy Shriver *National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units (MFMU) Network**

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Relationship between Disparities in General Anesthesia and Neuraxial Analgesia

63

Racial and Ethnic Disparities in Neuraxial Labor Analgesia

Paloma Toledo, MD, MPH,*† Jinglu Sun, BA,* William A. Grobman, MD, MBA,†† Cynthia A. Wong, MD,* Joe Feinglass, PhD,†§ and Romana Hasnain-Wynia, PhD†§

A qualitative analysis of parturients' perspectives on neuraxial labor analgesia

Primary Spoken Language and Neuraxial Labor Analgesia Use Among Hispanic Medicaid Recipients

Paloma Toledo, MD, MPH, Stanley T. Eosakul, MD, MS, William A. Grobman, MD, MBA, Joe Feinglass, PhD, and Romana Hasnain-Wynia, PhD

Readability, Content, and Quality Assessment of Web-Based Patient Education Materials Addressing Neuraxial Labor Analgesia

Samir K. Patel, MD,* Elisa J. Gordon, PhD, MPH,† Cynthia A. Wong, MD,* William A. Grobman, MD, MBA,‡ Haley Goucher, MD,* and Paloma Toledo, MD, MPH*†

64

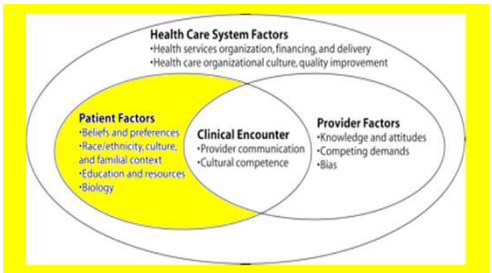
Analgesic differences

	White (n=320)	Hispanic (n=116)	African American (n=73)	*P*
Anticipated epidural use	85%	51%	67%	<0.001
Used epidural analgesia	94%	79%	84%	<0.001

Toledo P. Anesth Analg 2012; 114: 1-8

65

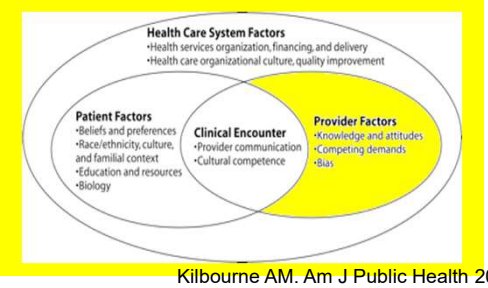
Patient-level factors?



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

66

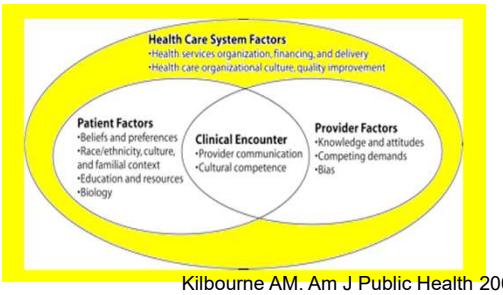
Physician-level factors?



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

67

Systems-level factors?



Kilbourne AM. Am J Public Health 2006; 96: 2113-21

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JAMA Network Open

Original Investigation | Anesthesiology

Racial and Ethnic Disparities in Receipt of General Anesthesia for Cesarean Delivery

Caroline Leigh Thomas, MD; Elizabeth M. S. Lange, MD; Jennifer M. Banayan, MD; Yinhua Zhu, BA; Chuanhong Liao, MS; Feyce M. Peralta, MD, MS; William A. Grobman, MD, MBA; Barbara M. Scavone, MD; Paloma Toledo, MD, MPH

Abstract

IMPORTANCE General anesthesia for cesarean delivery is associated with increased maternal morbidity, and Black and Hispanic pregnant patients have higher rates of general anesthesia use compared with their non-Hispanic White counterparts. It is unknown whether risk factors and indications for general anesthesia differ among patients of differing race and ethnicity.

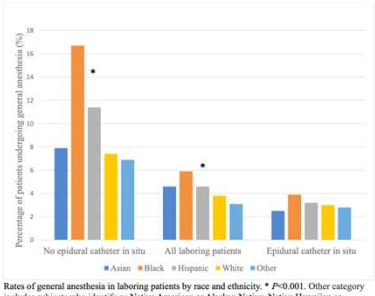
Key Points

Question Do rates of general anesthesia use for cesarean delivery differ by race or ethnicity?

Findings In this cross-sectional study

69

eFigure. Rates of General Anesthesia in Laboring Patients by Race and Ethnicity



Rates of general anesthesia in laboring patients by race and ethnicity. * $P<0.001$. Other category includes subjects who identify as Native American or Alaskan Native, Native Hawaiian or Pacific Islander), and subjects without information on race or ethnicity.

70

Potential Solutions

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Consensus Statement

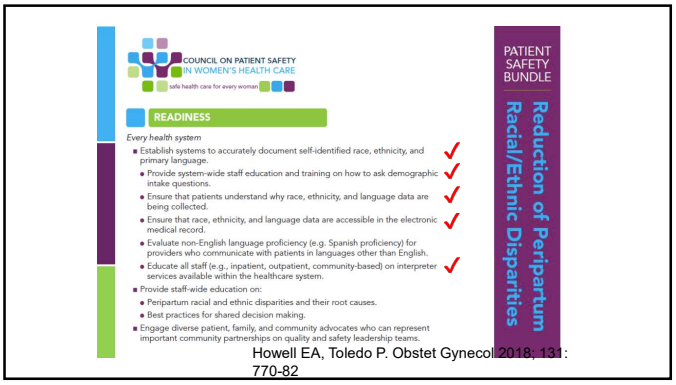
Reduction of Peripartum Racial and Ethnic Disparities

A Conceptual Framework and Maternal Safety Consensus Bundle

Elizabeth A. Howell, MD, MPP, Haywood Brown, MD, Jessica Brumley, CNM, PhD, Allison S. Bryant, MD, MPH, Aaron B. Caughey, MD, PhD, Andria M. Cornell, MSPH, Jacqueline H. Grant, MD, MPH, Kimberly D. Gregory, MD, MPH, Susan M. Gullo, RN, MS, Katy B. Kozhimannil, PhD, MPA, Jill M. Mhyre, MD, Paloma Toledo, MD, MPH, Robyn D'Oria, MA, RNC, Martha Ngoh, MPH, and William A. Grobman, MD, MBA

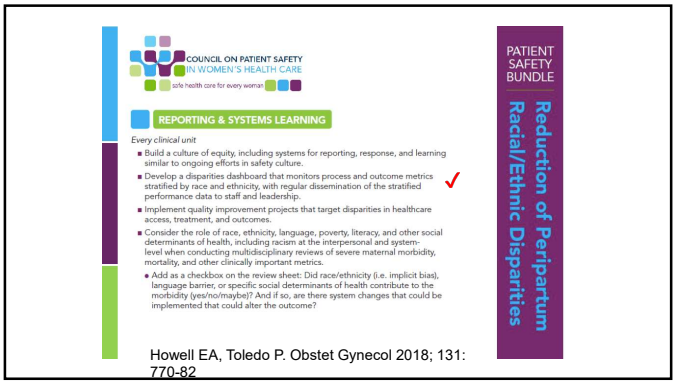
Howell EA, Toledo P. Obstet Gynecol 2018; 131: 770-82

72



Howell EA, Toledo P. Obstet Gynecol 2018; 131: 770-82

73



Howell EA, Toledo P. Obstet Gynecol 2018; 131: 770-82

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Key Takeaways

- Racial and ethnic disparities in the use of cesarean delivery, neuraxial labor analgesia, and general anesthesia exist
- It is unclear if the disparities in general anesthesia use are preventable but data suggests neuraxial labor analgesia attenuates disparities in general anesthesia use
- Consider implementing a quality assurance review of all general anesthetics and review, in addition to patient, provider, and systems-level factors, if race/ethnicity, language, or other social determinants contributed to the decision to proceed with general anesthesia

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Thank you!

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Outcome Disparities in Maternal Cardiovascular Disease

Emily Naoum, M.D.

77

Objectives

- Recognize comorbidities that are associated with adverse maternal cardiovascular outcomes
- Discuss socioeconomic and racial factors associated with disparities in maternal cardiovascular morbidity and mortality
- Identify interventions that may address and reduce preventable maternal cardiac morbidity and mortality

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ACOG Statement 2019: Pregnancy and Heart Disease

- Race/Ethnicity
  - Non-Hispanic black women have a 3.4x risk of death from CV disease compared to non-Hispanic white women
  - Structural, institutional, and systemic barriers contribute to an increased risk of comorbidities
- Hypertensive disorders of pregnancy
  - Severe, early-onset hypertension increases risk of cardiac compromise during or after delivery
  - Pregnancies with HTN have a 13x higher incidence of MI and 8x higher incidence of heart failure compared to healthy pregnancies
- Obesity
  - Increases maternal death secondary to cardiac causes especially if associated with significant OSA
- Age > 40

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Impact of race on presence of chronic cardiac conditions

- Non-Hispanic Black women have ↑ risk of HTN, metabolic disorders, DM
- Non-Hispanic Black and Non-White Hispanic women ↑ prevalence of heart failure

- ↑ prevalence of stroke compared to Non-Hispanic and Hispanic white women in the US
- ↑ risk of death from stroke compared to Non-Hispanic and Hispanic white women in the US

Brown RM et al. Curr Cardiol Rep 2022.
Virani SS et al. Circulation 2021.

80

Impact of race on presence of chronic cardiac conditions

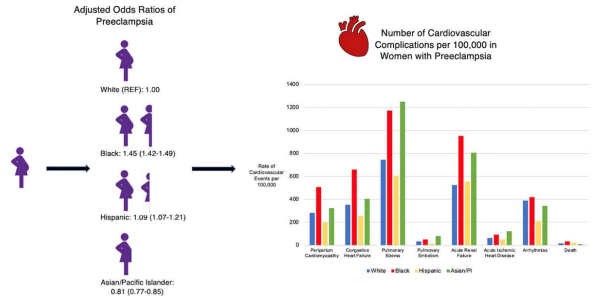
Online Table 3. Prevalence of maternal pre-pregnancy hypertension reported per 1,000 live births in the United States by race/ethnicity and urban-rural status, 2007-2018

	Year											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Non-Hispanic White	**11.07**	**11.70**	**12.17**	**12.82**	**13.52**	**13.68**	**14.23**	**14.88**	**15.11**	**16.11**	**17.53**	**19.30**
Rural	13.25	13.86	14.22	14.49	15.78	15.57	16.54	17.36	17.88	18.53	20.24	22.24
Urban	10.57	11.20	11.69	12.44	13.01	13.24	13.70	14.32	14.48	15.55	16.90	18.62
Non-Hispanic Black	**21.33**	**23.31**	**25.41**	**27.78**	**29.09**	**30.34**	**30.90**	**31.50**	**33.84**	**34.87**	**37.68**	**40.06**
Rural	26.04	28.43	30.83	32.80	35.88	39.45	38.31	40.15	42.10	41.12	44.86	49.40
Urban	20.84	22.80	24.87	27.30	28.45	29.51	30.21	30.71	33.07	34.30	37.03	39.22
Hispanic/Latina	**5.37**	**6.08**	**6.70**	**7.18**	**7.91**	**8.36**	**9.42**	**9.84**	**10.02**	**10.95**	**12.09**	**13.40**
Rural	6.64	6.98	7.11	7.26	8.78	9.00	9.32	10.21	11.14	11.42	11.97	13.51
Urban	5.28	6.01	6.67	7.18	7.84	8.31	9.42	9.81	9.93	10.91	12.10	13.39

Cameron NA et al. J Am Coll Card 2020.

81

Variable rates of hypertensive disorders of pregnancy



Minhas AS et al. Hypertension 2021.

82

Impact of race on prevalence of peripartum cardiomyopathy

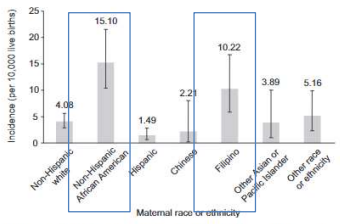


Fig. 2. Incidence of confirmed peripartum cardiomyopathy by maternal race or ethnicity, 1995–2004, Kaiser Permanente Northern California deliveries.

Gunderson EP et al. Obstet Gynecol 2011.

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Impact of race on prevalence of peripartum cardiomyopathy

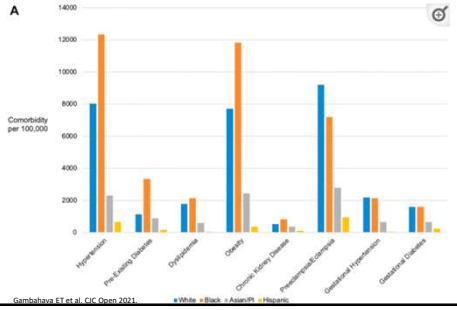
Table 2. Multivariable Maternal Independent Predictors of Developing Peripartum Cardiomyopathy Among 227,224 Pregnant Women Who Had Live Births Between 1995 and 2004 in Kaiser Permanente Northern California Hospitals

Maternal Predictor	Adjusted Odds Ratio* (95% Confidence Interval)	Trend Test *P*
Maternal age (y)		<.001
Younger than 20	1.4 (0.4–4.4)	
20–24	Reference	
25–29	2.7 (1.2–6.0)	
30–34	2.5 (1.1–5.6)	
35–39	3.0 (1.3–7.0)	
40 or older	5.7 (2.3–14.3)	
Race or ethnicity		—
Non-Hispanic white	Reference	
Non-Hispanic African American	2.9 (1.8–4.8)	
Hispanic	0.4 (0.2–0.8)	
Chinese	0.7 (0.2–2.9)	
Filipina	2.3 (1.3–4.2)	
Asian or Pacific Islander or other race or ethnicity	1.2 (0.6–2.4)	

Gunderson EP et al. Obstet Gynecol 2011.

84

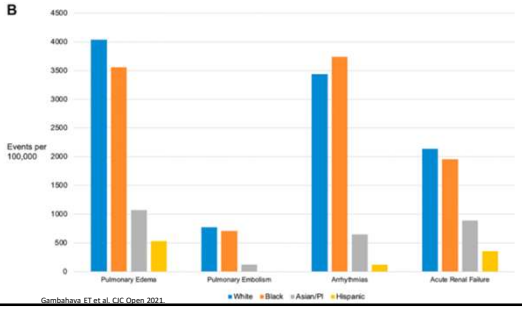
Disparities in comorbidities and peripartum cardiomyopathy



Gambahaya ET et al. CJC Open 2021.

85

Disparities in complications and peripartum cardiomyopathy



Gambahaya ET et al. CJC Open 2021.

86

Disparities in outcomes with peripartum cardiomyopathy

Table 2:

Outcomes of Women with NHLBI – Classified Peripartum Cardiomyopathy from 2000–2017

	Black n=46	White n=49	p value
Primary Outcome			
EF at diagnosis	26.8 ± 12.5	28.7 ±9.9	0.41
Secondary Outcomes			
EF < 35% at diagnosis	35 (76.1%)	34 (69.4%)	0.46
Clinical Outcomes			
Recovered EF to ≥ 55% within 12 months of diagnosis	16 (34.8%)	26 (53.1%)	0.07
ICD Placement	15 (32.6%)	7 (14.3%)	0.03

Sinkey RG et al. J Matern Fetal Neo Med 2022.

87

Impact of race on complications in patients with CHD

Table 3 Unadjusted adverse event rates stratified by race

	White	Black	Hispanic	Other	p
Cardiovascular events	24.0 (22.7–25.3)	27.0 (24.1–30.1)	23.3 (21.0–25.9)	23.3 (20.3–26.6)	0.207
Heart failure	1.7 (1.4–2.1)	3.6 (2.6–5.1)	2.2 (1.5–3.2)	2.7 (1.8–4.2)	0.001
Arrhythmia	8.9 (8.2–9.7)	11.1 (9.2–13.3)	8.7 (7.3–10.2)	8.7 (6.8–11.0)	0.152
MI	*	*	*	*	-
Thromboembolic	17.2 (16.0–18.5)	17.6 (15.1–20.4)	16.4 (14.2–18.8)	15.6 (13.0–18.5)	0.651
Obstetric events	33.3 (32.1–34.6)	44.2 (14.1–47.3)	36.7 (34.1–39.4)	34.7 (31.4–38.2)	< .001
Hypertension in pregnancy	9.6 (8.9–10.4)	14.2 (12.1–16.5)	8.7 (7.3–10.4)	7.9 (6.1–10.2)	< .001
Placenta previa	2.3 (1.9–2.7)	3.2 (2.3–4.5)	1.5 (1.0–2.2)	3.4 (2.3–4.9)	0.006
Placental abruption	1.5 (1.2–1.8)	1.8 (1.2–2.9)	1.0 (0.6–1.7)	1.6 (0.9–2.8)	0.339
Hemorrhage	5.0 (4.5–5.6)	6.4 (5.0–8.2)	6.9 (5.7–8.3)	7.2 (5.6–9.3)	0.004
Pre-eclampsia	5.9 (5.3–6.5)	12.3 (10.4–14.6)	8.0 (6.7–9.5)	7.7 (6.0–10.0)	< .001
Pre-term delivery	7.9 (7.2–8.6)	14.1 (12.0–16.4)	9.7 (8.3–11.4)	9.5 (7.5–12.0)	< .001
Prolonged pregnancy	8.6 (7.9–9.4)	6.4 (5.0–8.1)	9.0 (7.7–10.6)	7.5 (5.8–9.6)	0.065
Fetal events	28.0 (26.9–29.3)	35.7 (32.7–38.9)	29.9 (27.6–32.2)	32.9 (29.6–36.4)	< .001
Distress	9.0 (8.3–9.7)	8.7 (7.1–10.6)	8.6 (7.3–10.2)	10.9 (8.9–13.4)	0.283
Growth restriction	4.7 (4.2–5.3)	8.0 (6.5–9.9)	4.4 (3.4–5.6)	6.0 (4.5–8.0)	< .001
Malformation	18.3 (17.3–19.4)	24.5 (21.9–27.4)	20.2 (18.2–22.5)	19.9 (17.1–23.0)	< .001
Death/stillbirth	0.9 (0.7–1.2)	1.2 (0.7–2.1)	1.1 (0.7–1.8)	1.5 (0.8–2.7)	0.332

Petersen J et al. J Racial Ethn Health Disp 2024.

88

Background: Severe Maternal Morbidity

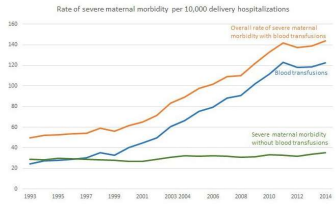
Unexpected outcomes resulting in consequence to women's health

- Cardiac
- Respiratory
- Neurologic
- Infectious
- Hematologic
- Anesthesia

Increasingly common in the last 2 decades

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Severe Maternal Morbidity, 1993–2014



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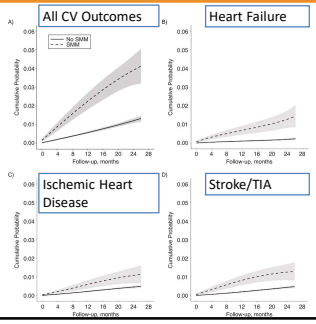
Background: Severe Maternal Morbidity and Postpartum Risk

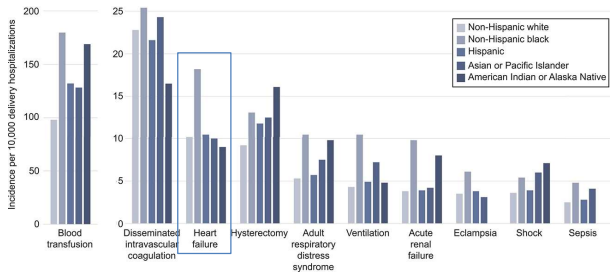
- SMM has longer term implications beyond delivery hospitalization
- These figures represent the cumulative probability of adverse CV event in deliveries with versus without SMM at 28 months follow up
- **SMM may identify women at high risk of adverse CV events after delivery**



Cartus AR et al. Am J Epidemiol 2022.

90

Disparities in maternal morbidity due to cardiovascular disease



Admon LK, et al. Obstet Gyn 2018.

91

Disparities in maternal complications due to CV disease

Table. Unadjusted Rates and Adjusted Hazard Ratios of Individual Causes of Cardiovascular Hospitalizations in Black and Hispanic Women Compared to White Women

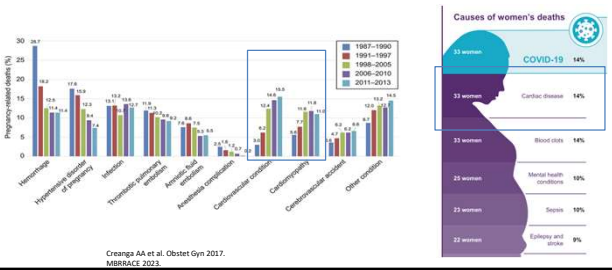
	White	Black			Hispanic		
	Unadjusted rate (%)	Unadjusted rate (%)	Adjusted hazard ratio	95% CI	Unadjusted rate (%)	Adjusted hazard ratio	95% CI
All cardiovascular hospitalizations	0.33	0.72	1.60	1.53–1.67	0.30	0.80	0.76–0.84
Acute myocardial infarction	0.01	0.02	1.31	1.02–1.66	0.01	0.62	0.46–0.85
Heart failure	0.12	0.36	1.94	1.82–2.08	0.11	0.75	0.68–0.82
Stroke	0.05	0.1	1.41	1.25–1.58	0.06	1.09	0.96–1.23
Venous thromboembolism	0.15	0.25	1.31	1.22–1.40	0.13	0.74	0.68–0.81
Arrhythmia	0.02	0.03	1.68	1.37–2.06	0.01	0.77	0.59–0.99

Mahmoud Z et al. Circ Card Qual Out 2022.

92

Background: Maternal Mortality

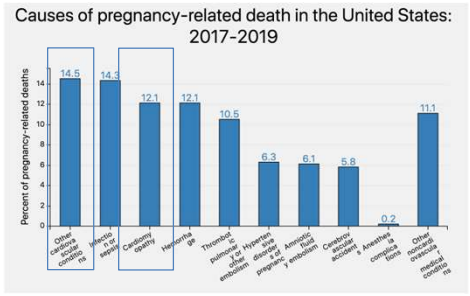
- Cardiovascular disease is one of the leading causes of maternal mortality in high income countries



Creanga AA et al. Obstet Gyn 2017.
MBRRACE 2023.

93

Background: Maternal Mortality



CDC Pregnancy Mortality Surveillance System.

94

Disparities in maternal death due to CV disease

TABLE 1— Maternal Mortality Rate Ratios (MRRs) by Race/Ethnicity: United States, 2016–2017

	Maternal,[a] MRR (95% CI)[b]		Late Maternal,[c] MRR (95% CI)[b]		Combined Maternal and Late Maternal, MRR (95% CI)[b]	
	NCHS Coded	Confirmed	NCHS Coded	Confirmed	NCHS Coded	Confirmed
Non-Hispanic Black/ Non-Hispanic White	2.46 (2.20, 2.75)	3.55 (2.94, 4.28)	2.14 (1.79, 2.57)	3.52 (2.17, 5.71)	2.37 (2.16, 2.60)	3.55 (2.98, 4.22)
Hispanic/Non-Hispanic White	0.76 (0.66, 0.88)	1.08 (0.85, 1.36)	0.87 (0.70, 1.07)	1.29 (0.72, 2.26)	0.79 (0.70, 0.89)	1.11 (0.89, 1.36)
Non-Hispanic Black/ Hispanic	3.23 (2.78, 3.75)	3.30 (2.62, 4.19)	2.47 (1.96, 3.12)	2.73 (1.56, 4.92)	2.99 (2.64, 3.39)	3.21 (2.59, 3.99)

MacDorman MF et al. Am J Public Health 2021.

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Disparities in maternal death due to CV disease

TABLE 2— Five Leading Causes of Confirmed Maternal Death by Race and Hispanic Origin: United States, 2016–2017

	Total[a]		Non-Hispanic White[b]		Non-Hispanic Black[c]		Hispanic		Non-Hispanic Black/ Non-Hispanic White, MRR (95% CI)	% Contribution to Non-Hispanic Black-Non-Hispanic White Disparity
	Rank	No. (Rate)[d]	Rank	No. (Rate)[d]	Rank	No. (Rate)[d]	Rank	No. (Rate)[d]		
All causes		615 (7.88)		230 (5.58)		232 (19.81)		109 (6.00)	3.55 (2.94, 4.28)	
Obstetric embolism (O88)	1	90 (1.26)	1	41 (0.99)	3	30 (2.56)	1	22 (1.21)	2.58 (1.55, 4.23)	11.8
Eclampsia and preeclampsia (O11, O13–O16)	1	98 (1.26)	2	32 (0.78)	1	46 (3.93)	3	13 (0.72)[e]	5.06 (3.16, 8.21)	22.1
Postpartum cardiomyopathy (O90.3)	3	86 (1.10)	4	29 (0.70)	2	40 (3.42)	5	11 (0.61)[e]	4.86 (2.93, 8.12)	19.1
Obstetric hemorrhage (O20, O43.2, O44–O46, O67, O71.0, O71.1, O71.3, O71.4, O71.7, O72)	4	82 (1.05)	3	31 (0.75)	4	20 (1.71)	2	19 (1.05)[e]	2.27 (1.22, 4.11)	6.7
Other complications of obstetric surgery and procedures (O75.4)	5	40 (0.51)	7	10 (0.24)[e]	6	14 (1.20)[e]	4	12 (0.66)[e]	4.93 (2.04, 12.4)	6.7

MacDorman MF et al. Am J Public Health 2021.

96

Disparities in maternal death due to cardiovascular disease

TABLE 2
Demographic characteristics of cardiovascular pregnancy-related deaths in California, 2002–2006

Characteristic	All CVD deaths, n (%) (n = 64)	Non-CVD deaths, n (%) (n = 193)	California birth cohort, n (%) (n = 2,741,220)
Age, y			
<20	3 (4.7)	12 (6.2)	257,301 (9.4)
20–34	46 (71.9)	115 (59.6)	2,014,092 (73.5)
≥35	15 (23.4)	66 (34.2)	469,102 (17.1)
Race/ethnicity			
White, non-Hispanic	16 (25.0)	50 (25.9)	793,780 (29.0)
Hispanic	21 (32.8)	91 (47.2)	1,391,656 (50.9)
African-American, non-Hispanic	25 (39.1)	31 (16.1)[a]	146,536 (5.4)[a]
All other/unknown or missing	2 (3.1)	19 (9.8)	401,701 (14.7)

Like previous studies, our study confirmed African-American race, obesity, and hypertensive disorders as risk factors for pregnancy-related CVD deaths.[10,21,22] Although African-American women account for approximately 5.5% of California births, they comprised more than one fifth of all pregnancy-related deaths and nearly 40% of CVD deaths. This suggests that CVD may be contributing to the persistent racial/ethnic disparity in pregnancy-related mortality. The higher incidence of CVD in the African-American population may be partially explained by the increased baseline burden of traditional CVD risk factors,[23,24] but disparities in diagnostic or therapeutic care may also contribute to higher rates of CVD pregnancy-related deaths among African-American women.

Hameed AB et al. Am J Obstet Gynecol 2015.

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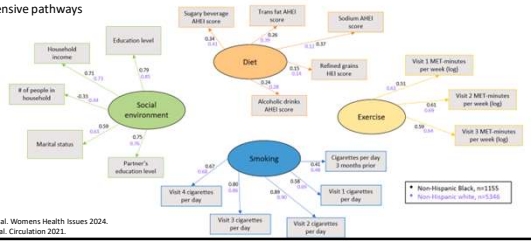
What can we do to prevent to prevent these disparities?

- Call for help from many organizations including but not limited to:
  - Council on Patient Safety in Women's Health Care and the Alliance for Innovation in Maternal Health (AIM)
  - ACOG
  - CDC
  - HHS
  - CMQCC
  - Association of Black Cardiologists
  - Black Maternal Health Caucus

98

Social drivers of disparities

- Systemic inequalities exist → social environmental stressors
  - Stronger direct effects on incidence of HDP particularly in US black women
  - Disparities in household income and educational attainment with the most significant impact on hypertensive pathways

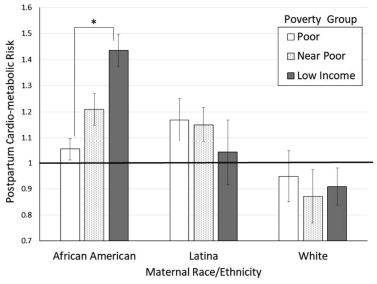


Keith MH et al. Womens Health Issues 2024.
Parikh NI et al. Circulation 2021.

99

Social drivers of disparities

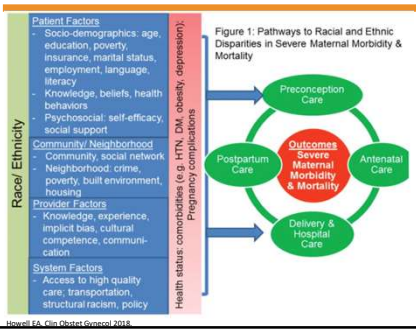
- Non-Hispanic black women were 84% more likely to have cardiometabolic disease in pregnancy
- Non-Hispanic black women with higher household income had higher cardiometabolic risk compared to lower household income



Ross KM et al. Ethnicity & Health 2020.

100

What can we do to prevent to prevent these disparities?



Howell EA. Clin Obstet Gynecol 2018.

101

Conclusions and Future Directions

- **Bundles** to reduce preventable morbidity and mortality + standardize care
- **Educational** of clinicians and staff about racial/ethnic disparities and bias

- Implementation of **disparities dashboards**
- Programs that **partner with communities** may improve quality of care

- Improved **postpartum care**
- Addressing the **fragmentation of insurance coverage** in US

Howell EA. Clin Obstet Gynecol 2018.
MA JI et al. Heart 2022.
Sacks DA et al. NEJM 2014.

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Questions?

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Addressing Maternal Disparities:
3 Areas to Improve Your Patients' Outcomes

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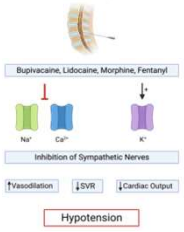
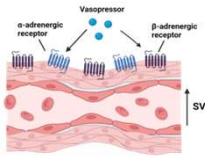
Sinai Health

The Effects of Ephedrine, Phenylephrine, and Norepinephrine on Myometrial Contractility

Wafa Bellan MD, Joseph Park BSc, Oksana Shynlova PhD, John Kingdom MD, Stephen Lye PhD, Mrinalini Balki MD
Mount Sinai Hospital, Department of Anesthesia & Pain Management, University of Toronto





- Results in vascular smooth muscle **contraction** and increase in systemic vascular resistance/blood pressure
- **Controversies** persist between the choice of vasopressor to administer: **ephedrine, phenylephrine, norepinephrine**[1]
- Currently **no** definitive guidelines exist for use in obstetrics

Heesen et al. 2015 Anaesthesia

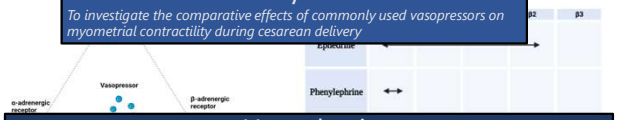
1

Sinai Health

Effect of Vasopressors on Myometrial contractility

Study Aim

To investigate the comparative effects of commonly used vasopressors on myometrial contractility during cesarean delivery



Hypothesis

Ephedrine, phenylephrine, and norepinephrine would have variable effects on the contractility of pregnant myometrium due to their variable actions on adrenergic alpha (α) and beta (β) receptors located in this tissue

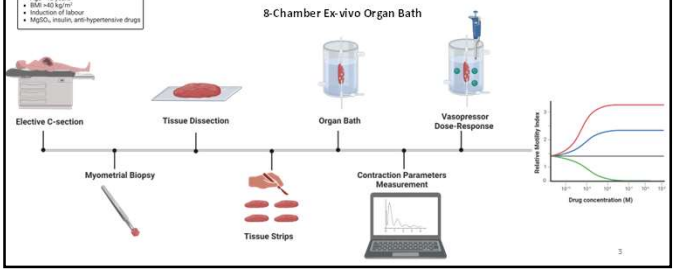
2

Sinai Health

Experimental Protocol

Inclusion Criteria
- Elective Primary or first repeat CD
- Age 19-45 years
- Non-laboring, not exposed to oxytocin
- Patients receiving spinal anesthesia

Exclusion Criteria
- Parity >2
- Age >45 years
- BMI >40 kg/m²
- Induction of labour
- $MgSO_4$, insulin, anti-hypertensive drugs



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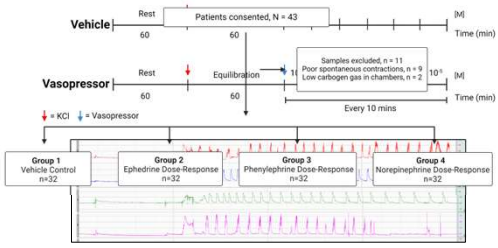
Vasopressor Dose-Response Experiment



Amplitude and Frequency

4

Sinai Health

Effect of Vasopressors on Myometrial Contractility

Primary outcome: Motility index= amplitude*frequency of contractions

- Outcome: Relative value by dividing with the baseline value during equilibration
- Statistical Analysis: Prism 9 software (GraphPad Software Inc., CA, USA) – (Wilcoxon rank sum test, the Kruskal-Wallis and Two-way ANOVA .

Plasma Level (10^{-7}M) Measured:
- IV Ephedrine 8mg/min (Kee et al. 2009)
- IV Phenylephrine 100μg/min (Kee et al. 2009)
- IV Norepinephrine 2.5μg/min (Kee et al. 2015)

5

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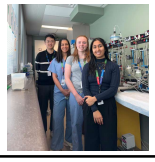
Sinai Health

Conclusions

- Vasopressor drugs **influence** myometrial contractility during cesarean section
- Ephedrine and Phenylephrine at **relevant plasma concentrations** significantly **increase** myometrial contractility
- Norepinephrine has **no effect** on myometrial contractility at **relevant plasma concentration range**



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6

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Donald Lee, MD.

OB Anesthesiology Fellow
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Readability, Quality and Accuracy of ChatGPT and Bard for Common Questions about Obstetric Anesthesia

1

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Disclosure Info

I have NO financial disclosure or conflicts of interest with the presented material in this presentation

2

Artificial Intelligence in Medicine

- Large Language Model (LLM)
  - Deep learning algorithms that can recognize, summarize, translate, predict and generate content using very large datasets
    - Chatbots: ChatGPT (Open AI's GPT), Bard (Google's LaMDA), Claude (Anthropic's Claude 3) etc.
  - Recent popularity of LLM providing answers to people's queries
    - 1.7 billion visits to ChatGPT in November 2023.
    - Over 90% of parturients have searched the internet for health information
  - We examined the readability and quality of answers to common obstetric anesthesia questions from popular answer engines ChatGPT 3.5 and Google Bard

Open AI's ChatGPT

Bard
Google Bard (Now known as Gemini)

3

Methods

- 20 questions were derived from FAQs on SOAP, ASA, ACOG, hospital and consumer websites
- ChatGPT and Google Bard were queried (November 2023)
- The derived answers were graded for accuracy and quality by the authors
- Quality was measured via Agency for Healthcare Research and Quality (AHRQ)'s Patient Education Materials Assessment Tool for Print (PEMAT)
- Readability was measured using validated readability indices:
  - FRES, FOG, FKGL, Coleman-Liau, SMOG, Linsear formulas
- Accuracy, quality and readability were compared using independent t-test, with P<.05 considered significant

4

Results

Table. Readability, accuracy and PEMAT scores of Chat GPT and BARD for common questions about obstetric anesthesia

	ChatGPT (n=20) Mean ± SD†		BARD (n=20) Mean ± SD†	P-value
Readability				
FRES	35.5 ± 9.62	<	52.15 ± 8.79	0.00001‡
FOG	16.7 ± 2.18		13.07 ± 1.93	0.00001‡
FKGL	13.53 ± 1.9	>	10.2 ± 1.73	0.00001‡
Coleman-Liau	13.37 ± 1.58		10.21 ± 1.59	0.00001‡
SMOG	12.27 ± 1.58		9.57 ± 1.39	0.00001‡
Linsear	14.92 ± 2.93		10.88 ± 2.46	0.00003‡
Accuracy	87.24 ± 14.42%	=	85.26 ± 10.24%	0.5
PEMAT				
Understandability	5.35 ± 1.04%		6.3 ± 1.97%	0.06
Actionability	9.17 ± 12.65%	<	22.5 ± 16.47%	0.0067‡

PEMAT: Patient Educational Materials Assessment Tool.

†FOG, FKGL, Coleman-Liau, SMOG and Linsear scores represent grade level. In the FRES test, higher scores indicate greater readability, corresponding to a lower grade level (e.g., 50–60 = 10th–12th grade/fairly difficult, 60–70 = 8th–9th grade/standard, 70–80 = 7th grade/fairly easy, 80–90 = 6th grade/easy).

‡P <0.05 significant.

5

Discussion

- The accuracy, quality and readability of LLM answers should meet the current standards suggested by the Agency for Healthcare Research and Quality (AHRQ)
- Google Bard gave significantly longer answers, with similar accuracy to ChatGPT 3.5
- Bard was also easier to read (high school level), but well above the AHRQ suggested 4th-6th grade reading level for patient safety materials
- Bard content was significantly more actionable which is a desired characteristic in patient educational materials
- Consumers, health care providers, hospitals and governmental agencies should be aware of the quality of information generated by LLMs

6

References

- 1. Murphy J, Vaughn J, Gelber K, Geller A, Zakowski M: Readability, content, quality and accuracy assessment of internet-based patient education materials relating to labor analgesia. Int J Obstet Anesth 2019; 39: 82-87
- 2. Duarte F: Number of ChatGPT Users (Jan 2024). https://explodingtopics.com/blog/chatgpt-users, 2024
- 3. Shoemaker MB: The Patient Education Materials Assessment Tool (PEMAT) and User's Guide. Rockville, MD, Agency for Healthcare Research and Quality, 2014
- 4. Bakerjian D: Personal Health Literacy. https://psnet.ahrq.gov/primer/personal-health-literacy, Agency for Healthcare Research and Quality, 2023

Brigham and Women's Hospital
Founding Member, Mass General Brigham

A New Machine Learning Model for the Prediction of Severe Maternal Morbidity Using a Large Retrospective Cohort

Taylor Maney, MD
Obstetric Anesthesiology Fellow

Co-Authors: Braden W. Eberhard, BS; David W. Bates, MD MSc; Kathryn J. Gray, MD PhD; Vesela P. Kovacheva, MD PhD

HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

1

Severe Maternal Morbidity

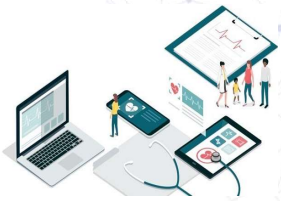
has steadily increased in the United States in recent years and is estimated to affect more than **50,000** patients annually.

Fink et al. JAMA Netw Open. 2023.
Maternal Mortality. www.cdc.gov.

2

Methods

- Retrospective cohort of deliveries across MGB between 2015 and 2023
  - 80% for model training, 20% for testing
- Admission data ingested by machine learning (ML) platform
- Outcome of SMM defined using CDC SMM indicators
- Developed new ML model and compared performance to existing tools



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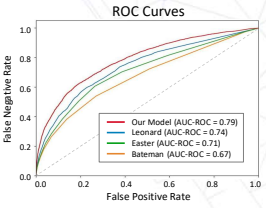
Results

- SMM identified in 6,838 (5.6%) of the 122,177 pregnancies in testing cohort
- Area under the receiver operator characteristic (ROC) curve used to measure ability of our model to predict SMM
  - AUC of 0.5 signifies no discriminating ability, while AUC of 1.0 signifies perfect discrimination
- Performance of Bateman, Easter, and Leonard indices also evaluated



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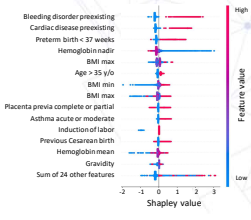
Results (continued)

- Shapley values are a way to explain the output of machine learning model
- Measure how much each variable contributes to the prediction of SMM
- Each point represents row of data from testing cohort
  - Y axis: Variables ordered by importance
  - X axis: Degree of influence
  - Color: Value of variable (low vs. high)



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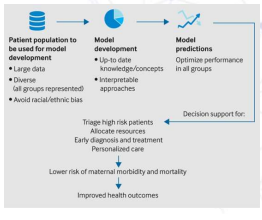
Conclusions

- New ML model outperformed previous risk prediction tools
- Early identification of at-risk patients may influence:
  - Transfer to a tertiary care facility
  - Escalation of care
  - Decision for early epidural



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1

2

3

Abstract No. 1745988

Development and validation of a **prognostic model** for maternal **cardiovascular morbidity** events in patients with **hypertensive disorders of pregnancy**

Marie-Louise Meng, MD[1]; Yuqi Li, BS[2]; Qin Weng, BS[2],Jerome J. Federspiel, MD, PhD[3,4]; Vijay Krishnamoorthy, MD, PhD[1,4,8]; Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA[1]; Matthew Engelhard, MD, PhD[2]

1. Department of Anesthesiology, Duke University School of Medicine, Durham, North Carolina
2. Department of Biostatistics and Bioinformatics, Duke University School of Medicine, Durham, North Carolina
3. Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Duke University School of Medicine, Durham, North Carolina
4. Department of Population Health Sciences, Duke University School of Medicine, Durham, North Carolina

4

Background

Hypertensive disorders of pregnancy (HDP) confer increased risk of **cardiovascular (CV) morbidity** during and after delivery.[1]

To **improve CV risk stratification** among people with HDP, we developed and internally and externally validated a **predictive model for maternal CV events following HDP**.

1. Meng. Anesth Analg 2023;136:728-37

5

Methods

Dataset: Premier Healthcare Database (October 1, 2015-December 31, 2020)

Factors for multi-label neural network model: variables from the existing OB-CMI, preeclampsia-specific factors, gestational age at delivery, medications and mode of delivery

Outcomes

- All CV events
- Organ specific events: heart failure, cerebrovascular, renal failure

Timeframe

(1) "Index Model" during delivery hospitalization

(2) "Readmission Model" during readmission within one year of delivery

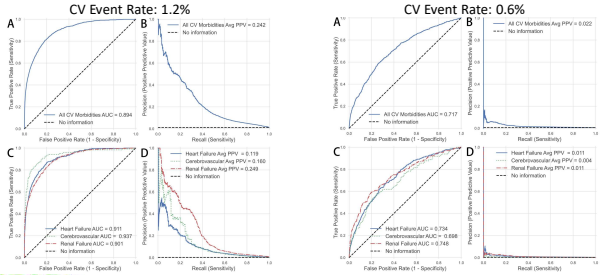
- Models were adapted to and **externally validated** in an electronic health record (EHR) cohort of patients in two neighboring health systems (2016-2020)
- **EHR events validated by chart review** and models assessed in people with validated outcomes

6

Premier Database: 553,658 deliveries in people with HDP

Index Delivery Hospitalization
CV Event Rate: 1.2%

1 Year Readmission
CV Event Rate: 0.6%



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EHR cohort n=12,259 deliveries in people with HDP

Delivery hospitalizations CV Event Rate = 1.9%

Readmission CV Event Rate = 1%

	AUROC (95% CI)	AP (95% CI)	Model specificity*
Index Model (Adapted to EHR)			
All CV events	0.922 (0.905, 0.937)	0.278 (0.226, 0.339)	75.6%
Cerebrovascular events	0.880 (0.800, 0.951)	0.062 (0.025, 0.165)	50.4%
Heart failure	0.939 (0.918, 0.957)	0.094 (0.060, 0.167)	83.2%
Renal failure	0.934 (0.915, 0.953)	0.309 (0.239, 0.395)	76.4%
Readmission Model (Adapted to EHR)			
All CV events	0.726 (0.678, 0.772)	0.030 (0.022, 0.048)	32.1%
Cerebrovascular events	0.734 (0.592, 0.859)	0.007 (0.002, 0.019)	68.1%
Heart failure	0.670 (0.598, 0.735)	0.008 (0.005, 0.014)	17.0%
Renal failure	0.835 (0.751, 0.904)	0.027 (0.015, 0.062)	28.8%

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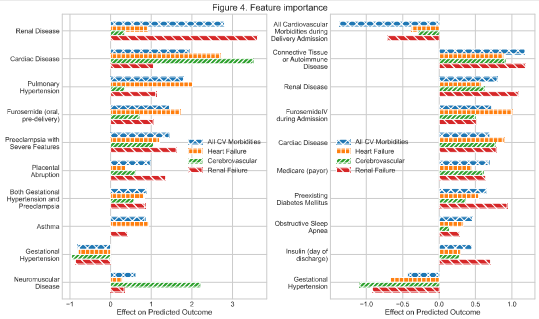
Figure 4. Feature importance



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9

Discussion

We derived and externally validated a multi-label neural network model that predicts CV events among individuals with HDP during delivery hospitalization and within one year postpartum with a high degree of performance.

While model refinement and validation in other cohorts are necessary, this is a first step toward tailoring CV care for patients with HDP.

Risk prediction models specific to HDP could help mitigate CV complications by identifying people who could benefit from enhanced CV surveillance, early treatment, specialized location of delivery, and higher level of care during and after delivery.

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MAY 1-5, 2024
SHERATON DENVER DOWNTOWN HOTEL
DENVER, COLORADO
SOAP

1

SOAP 2024
ANNUAL MEETING
Speaker: Sun-Kyung Park
Title: Noninvasive Continuous Versus Intermittent Oscillometric Arterial Pressure Monitoring And Maternal Hypotension During Cesarean Delivery: A Randomized Controlled Trial

2

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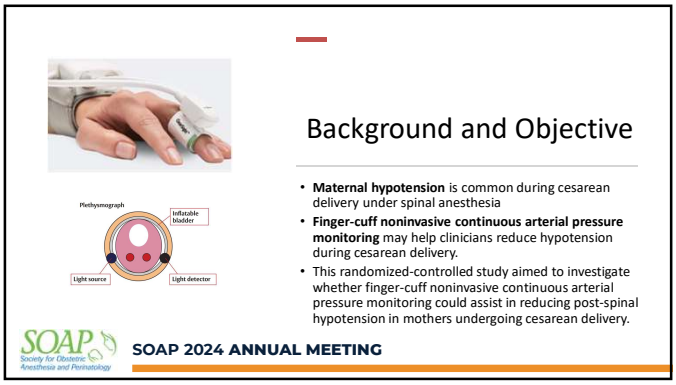
I have no financial or personal relationships, affiliations, or interests that could be seen as influencing my work.

3


Background and Objective
Plethysmograph
Inflatable bladder
Light source
Light detector
Maternal hypotension is common during cesarean delivery under spinal anesthesia
Finger-cuff noninvasive continuous arterial pressure monitoring may help clinicians reduce hypotension during cesarean delivery.
This randomized-controlled study aimed to investigate whether finger-cuff noninvasive continuous arterial pressure monitoring could assist in reducing post-spinal hypotension in mothers undergoing cesarean delivery.
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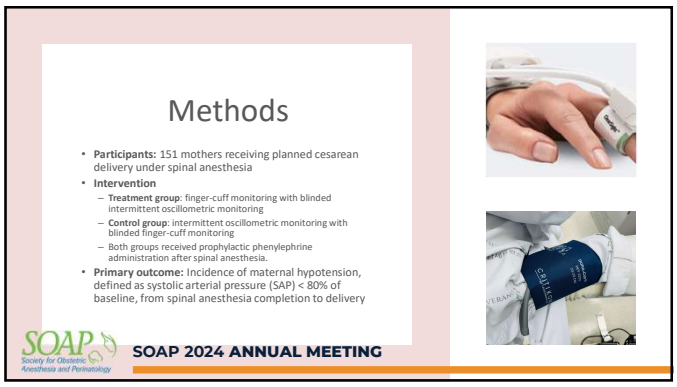
Methods
Participants: 151 mothers receiving planned cesarean delivery under spinal anesthesia
Intervention
Treatment group: finger-cuff monitoring with blinded intermittent oscillometric monitoring
Control group: intermittent oscillometric monitoring with blinded finger-cuff monitoring
Both groups received prophylactic phenylephrine administration after spinal anesthesia.
Primary outcome: Incidence of maternal hypotension, defined as systolic arterial pressure (SAP) < 80% of baseline, from spinal anesthesia completion to delivery
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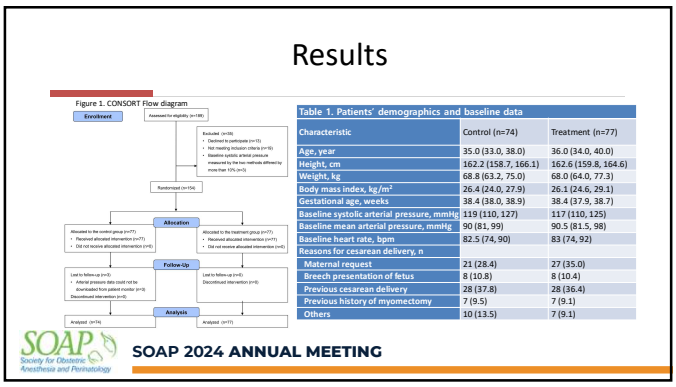
Results
Figure 1. CONSORT Flow diagram
Enrollment
Allocation
Follow-Up
Analysis
Table 1. Patients' demographics and baseline data
Characteristic | Control (n=74) | Treatment (n=77)
Age, year | 35.0 (33.0, 38.0) | 36.0 (34.0, 40.0)
Height, cm | 162.2 (158.7, 166.1) | 162.6 (159.8, 164.6)
Weight, kg | 68.8 (63.2, 75.0) | 68.0 (64.0, 77.3)
Body mass index, kg/m²| 26.4 (24.0, 27.9) | 26.1 (24.6, 29.1)
Gestational age, weeks | 38.4 (38.0, 38.9) | 38.4 (37.9, 38.7)
Baseline systolic arterial pressure, mmHg | 119 (110, 127) | 117 (110, 125)
Baseline mean arterial pressure, mmHg | 90 (81, 99) | 90.5 (81.5, 98)
Baseline heart rate, bpm | 82.5 (74, 90) | 83 (74, 92)
Reasons for cesarean delivery, n
Maternal request | 21 (28.4) | 27 (35.0)
Breech presentation of fetus | 8 (10.8) | 8 (10.4)
Previous cesarean delivery | 28 (37.8) | 28 (36.4)
Previous history of myomectomy | 7 (9.5) | 7 (9.1)
Others | 10 (13.5) | 7 (9.1)
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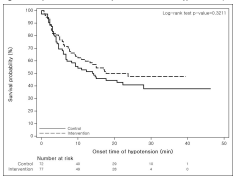
Results

Table 2. Primary and secondary outcomes of cesarean deliveries

Outcome	Control (n=74)	Treatment (n=77)	P value
Primary outcome			
Patients with ≥1 reading of hypotension (SAP<80% of baseline), n	43 (58.1)	39 (50.7)	0.358
Secondary outcomes			
Time-weighted average SAP<80% of baseline, mmHg	0.17 (0.00, 0.85)	0.19 (0.00, 0.78)	0.617
AUC SAP<80% of baseline, mmHg×min	5.24 (0.00, 24.42)	5.03 (0.00, 18.22)	0.467
Duration of SAP<80% of baseline, min	1.30 (0.00, 3.00)	1.00 (0.00, 3.00)	0.565

Figure 2. Kaplan–Meier survival plot of time to first hypotension (min)



SOAP Society for Obstetric Anesthesia and Perinatology **SOAP 2024 ANNUAL MEETING**

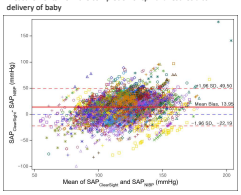
7

Results

Table 3. Maternal and neonatal outcomes

Outcome	Control (n=74)	Treatment (n=77)	P value
Nausea, n	9 (12.2)	8 (10.4)	0.731
Vomiting, n	1 (1.4)	0	0.490
Dizziness, n	2 (2.7)	4 (5.2)	0.682
Breathlessness, n	4 (5.4)	2 (2.6)	0.436
Bradycardia, n	6 (8.1)	11 (14.3)	0.230
Phenylephrine consumption, µg	720.0 (500.0, 900.0)	675.0 (400.0, 925.0)	0.455
Duration of surgery, min	60.0 (55.0, 70.0)	60.0 (50.0, 70.0)	0.609
Spinal anesthesia to delivery, min	26.0 (22.0, 31.0)	25.0 (21.3, 27.2)	0.051
Total fluids during surgery, ml	700.0 (550.0, 800.0)	650.0 (600.0, 750.0)	0.760
Umbilical arterial pH	7.34 (0.04)	7.34 (0.03)	0.704
Apgar score at 1 min	8 (7, 8)	8 (8, 8)	0.563
Apgar score at 5 min	9 (9, 9)	9 (9, 9)	0.572

Figure 3. Bland–Altman plot for assessing the agreement between SAP measured with ClearSight and intermittent oscillometer for all measurements from the completion of spinal anesthesia to delivery of baby



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Conclusions

- In this randomized controlled trial involving mothers undergoing cesarean delivery, finger-cuff noninvasive continuous arterial pressure monitoring did not reduce the incidence of maternal hypotension compared to standard intermittent oscillometric monitoring, in the context of prophylactic phenylephrine administration.
- Our data do not support the use of finger-cuff monitoring for this purpose during cesarean delivery.

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Erector Spinae Plane Block with Liposomal Bupivacaine for Post Cesarean Delivery Analgesia: A Pilot Study

Sara Feldman, MD; Romel J. Holmes Jr., MS; Matthew Fuller, MS; Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA

Duke Anesthesiology
Duke University School of Medicine

Background

- Truncal blocks are recommended for post cesarean delivery (CD) analgesia when intrathecal morphine (ITM) is not used. However, evidence does not support an additional benefit from truncal blocks when neuraxial morphine is used.
- Extending the duration of the block beyond the duration of action of ITM might provide benefit.
- There are limited data about the efficacy of erector spinae plane blocks (ESPB) for post-CD analgesia.

Study Aim:

- To assess the analgesic efficacy of ESPB with liposomal bupivacaine in patients undergoing CD.

Hypothesis:

ESPB with liposomal bupivacaine would be associated with reduced opioid consumption compared to a historical cohort of patients receiving the same multimodal analgesic regimen including ITM but without truncal block.

Disclosures: This study was supported by Pacira Habib, AS– research support Pacira and Haisco-USA, advisory board member for Merck and Heron Therapeutics

1

Methods

Study Design

- Single center case control study of ASA II or III patients undergoing elective CD under spinal or CSE anesthesia.
- All received analgesic regimen of 100 mcg ITM, scheduled acetaminophen and NSAIDS, and PRN oxycodone for breakthrough pain.
- Following surgery, a bilateral ESPB was performed using 133 mg liposomal bupivacaine and 20 ml 0.25% bupivacaine per side.
- Cases matched 1:4 by age, race, history of prior CD, and insurance status with historical controls receiving same analgesic regimen but no truncal blocks.

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Methods

Primary Outcome

Postoperative oxycodone consumption 0- 48 h after CD

Secondary Outcomes

- Total postsurgical opioid consumption through 24 hours
- Time to first postsurgical opioid rescue medication
- Area under the curve (AUC) of visual analog scale (VAS) pain intensity scores through 48 hours (AUC 0–48)
- Need for rescue antiemetics and antipruritics

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	ESP Block Patients (n=30)	Matched Controls (n=120)
Age (years)*	33 [29, 36]	33 [30, 36]
Race*		
2 or more races	1 (3.3%)	4 (3.3%)
Black or African American	4 (13.3%)	16 (13.3%)
Caucasian/White	23 (76.7%)	92 (76.7%)
Other	2 (6.7%)	8 (6.7%)
History of Cesarean Delivery*	17 (56.7%)	68 (56.7%)
Insurance Status*		
Private/managed care	26 (86.7%)	104 (86.7%)
Medicaid	2 (6.7%)	8 (6.7%)
Other public insurance	2 (6.7%)	8 (6.7%)
Height (cm)	165 [160, 170]	163 [157, 170]
Weight (kg)	89 [81, 93]	83 [75, 93]
BMI (kg/m²)	33.6 [29.2, 35.2]	31.5 [28.6, 35.4]
ASA Score		
I	0	3 (2.5%)
II	24 (80.0%)	97 (80.8%)
III	6 (20.0%)	20 (16.7%)
Gravidity	3 [2, 3]	3 [2, 3]
Parity	1 [1, 1]	2 [2, 3]
Gestational Age (weeks)	39 [37, 39]	39 [38, 39]

Table 1
Demographics; * = Patients matched 1:4 for these characteristics; Data are represented as median [IQR] or number (%)

	ESP Block Patients (n=30)	Matched Controls (n=120)	Effect Size (95% CI)	p-value
Primary Outcome				
Oxycodone use through 48h (mg)	12.5 [5.0, 40.0]	25.0 [3.8, 50.0]	0.81 (0.51, 1.29)	0.380
Secondary Outcomes				
Postsurgical opioid consumption through 24h (OME)	7.5 [0, 22.5]	15.0 [0, 30.0]	0.66 (0.32, 1.36)	0.267
Time to first postsurgical opioid rescue medication (hours)	12.2 [4.7, 30.2]	3.2 [1.7, 13.1]	0.78 (0.50, 1.28)	0.282
Pain AUC through 48h (cm*hours)	115 [26, 151]	140 [86, 180]	-38.1 (-65.3, -10.9)	0.007
Use of antiemetics through 48h	8 (26.7%)	48 (40.0%)	0.67 (0.35, 1.25)	0.255
Use of antipruritics through 48h	5 (16.7%)	30 (25.0%)	0.67 (0.28, 1.57)	0.469
Use of opioids through 48h	24 (80.0%)	93 (77.5%)	1.03 (0.84, 1.26)	0.961

Table 2.
Outcomes; OME= Oral Morphine Equivalents, AUC = Area Under the Curve; Data are represented as median [IQR] or number (%)

Results

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ESP Block Patients (n=30)	
Satisfaction with pain relief	
24h postop	9 [8, 10]
48h postop	9 [8, 10]
Pain compared to prior cesarean	
Worse	1 (3.3%)
Same	2 (6.7%)
Better	4 (13.3%)
Much better	8 (26.7%)
Can't remember	2 (6.7%)
N/A	13 (43.3%)
QoR Score	
24h postop	84 [77, 92]
48h postop	88 [81, 93]

Table 3
Additional measures in ESPB population; Data are represented as median [IQR] or number (%)

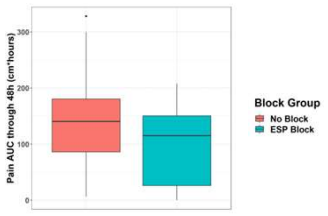

Figure 1
Pain AUC through 48h (cm*hours) in block group as compared to matched controls

Results

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Discussion

- There were no significant differences between the groups in the primary outcome of oxycodone consumption at 48 h.
- Of the 17 patients who had a repeat CD, 12 thought that compared to their prior CD, analgesia was better or much better.
- **ESPB with liposomal bupivacaine was associated with lower pain scores compared to historical controls** not receiving a truncal block.
- **Future studies with a larger sample size are needed to further assess whether ESPB provides clinically significant benefit** to patients undergoing CD and receiving a multimodal analgesic regimen incorporating ITM.

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Dr. Shobana Murugan
Local Anesthetic Systemic
Toxicity in Pregnancy: A
Retrospective Cohort Analysis

1

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Local Anesthetic Systemic
Toxicity in Pregnancy: A
Retrospective Cohort Analysis
Micah de Valle, Michael Adkison, Ruhi
Maredia , & Shobana Murugan
The University of Texas Medical
Branch, Galveston, TX

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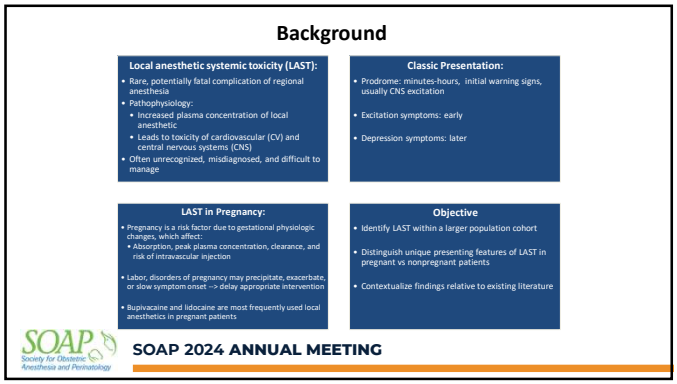
Background
Local anesthetic systemic toxicity (LAST):
• Rare, potentially fatal complication of regional anesthesia
• Pathophysiology:
• Increased plasma concentration of local anesthetic
• Leads to toxicity of cardiovascular (CV) and central nervous systems (CNS)
• Often unrecognized, misdiagnosed, and difficult to manage
Classic Presentation:
• Prodrome: minutes-hours, initial warning signs, usually CNS excitation
• Excitation symptoms: early
• Depression symptoms: later
LAST in Pregnancy:
• Pregnancy is a risk factor due to gestational physiologic changes, which affect:
• Absorption, peak plasma concentration, clearance, and risk of intravascular injection
• Labor, disorders of pregnancy may precipitate, exacerbate, or slow symptom onset --> delay appropriate intervention
• Bupivacaine and lidocaine are most frequently used local anesthetics in pregnant patients
Objective
• Identify LAST within a larger population cohort
• Distinguish unique presenting features of LAST in pregnant vs nonpregnant patients
• Contextualize findings relative to existing literature
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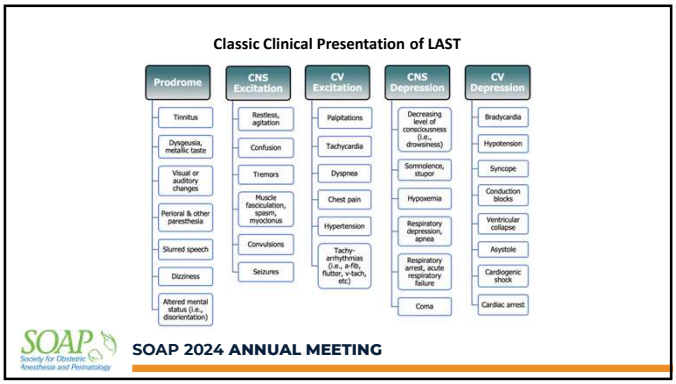
Classic Clinical Presentation of LAST
Prodrome
Tinnitus
Dysgeusia, metallic taste
Visual or auditory changes
Perioral & other paresthesia
Slurred speech
Dizziness
Altered mental status (i.e., disorientation)
CNS Excitation
Restless, agitation
Confusion
Tremors
Muscle fasciculation, spasm, myoclonus
Convulsions
Seizures
CV Excitation
Palpitations
Tachycardia
Dyspnea
Chest pain
Hypertension
Tachy-arrhythmias (i.e., a-fib, flutter, v-tach, etc)
CNS Depression
Decreasing level of consciousness (i.e., drowsiness)
Somnolence, stupor
Hypoxemia
Respiratory depression, apnea
Respiratory arrest, acute respiratory failure
Coma
CV Depression
Bradycardia
Hypotension
Syncope
Conduction blocks
Ventricular collapse
Asystole
Cardiogenic shock
Cardiac arrest
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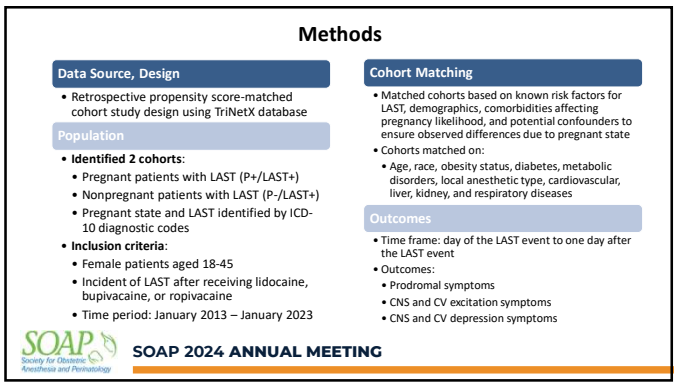
Methods
Data Source, Design
• Retrospective propensity score-matched cohort study design using TriNetX database
Population
• Identified 2 cohorts:
• Pregnant patients with LAST (P+/LAST+)
• Nonpregnant patients with LAST (P-/LAST+)
• Pregnant state and LAST identified by ICD-10 diagnostic codes
• Inclusion criteria:
• Female patients aged 18-45
• Incident of LAST after receiving lidocaine, bupivacaine, or ropivacaine
• Time period: January 2013 – January 2023
Cohort Matching
• Matched cohorts based on known risk factors for LAST, demographics, comorbidities affecting pregnancy likelihood, and potential confounders to ensure observed differences due to pregnant state
• Cohorts matched on:
• Age, race, obesity status, diabetes, metabolic disorders, local anesthetic type, cardiovascular, liver, kidney, and respiratory diseases
Outcomes
• Time frame: day of the LAST event to one day after the LAST event
• Outcomes:
• Prodromal symptoms
• CNS and CV excitation symptoms
• CNS and CV depression symptoms
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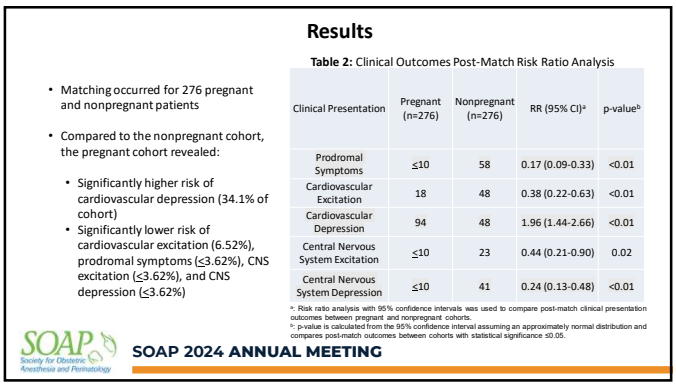
Results
• Matching occurred for 276 pregnant and nonpregnant patients
• Compared to the nonpregnant cohort, the pregnant cohort revealed:
• Significantly higher risk of cardiovascular depression (34.1% of cohort)
• Significantly lower risk of cardiovascular excitation (6.52%), prodromal symptoms (≤3.62%), CNS excitation (≤3.62%), and CNS depression (≤3.62%)
Table 2: Clinical Outcomes Post-Match Risk Ratio Analysis
Clinical Presentation | Pregnant (n=276) | Nonpregnant (n=276) | RR (95% CI)[a] | p-value[b]
Prodromal Symptoms | ≤10 | 58 | 0.17 (0.09-0.33) | <0.01
Cardiovascular Excitation | 18 | 48 | 0.38 (0.22-0.63) | <0.01
Cardiovascular Depression | 94 | 48 | 1.96 (1.44-2.66) | <0.01
Central Nervous System Excitation | ≤10 | 23 | 0.44 (0.21-0.90) | 0.02
Central Nervous System Depression | ≤10 | 41 | 0.24 (0.13-0.48) | <0.01
[a]- Risk ratio analysis with 95% confidence intervals was used to compare post-match clinical presentation outcomes between pregnant and nonpregnant cohorts.
[b]- p-value is calculated from the 95% confidence interval assuming an approximately normal distribution and compares post-match outcomes between cohorts with statistical significance ≤0.05.
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Discussion

Primary Findings

- Both cohorts exhibited conventional manifestations of LAST; with varying severity, distribution
- Physiologic changes of pregnancy can exacerbate local anesthetic effects; may explain these differences

Lower Risk of Prodromal, CNS Symptoms in Pregnancy

- ≤ 3.52% in pregnant vs. 21% in nonpregnant cohort:
  - Consistent with previous literature reports in pregnancy vs analyses estimating prodromal symptoms in general population
  - Increased progesterone is neuroprotective to mother and fetus
  - Labor and pregnancy-related conditions can mask, mimic, or slow symptom onset

Evidence of Absent / Mildly Presenting Prodromes

- 48.6% or less of the pregnant cohort had LAST diagnosis + no identified symptoms, compared to 21% or less of nonpregnant cohort
- May be due to frequent misdiagnosis and underreporting of LAST in pregnant patients
- Or difficulty distinguishing LAST presentations from other processes in pregnancy
- Takeaway: Compared to nonpregnant patients and classic presentation, LAST may present unconventionally in pregnancy, which may impede diagnosis

Cardiovascular Depression: Early, Sensitive Marker of LAST in Pregnancy?

- 34.1% pregnant cohort had CV depression, mainly medication-induced hypotension:
  - The emergence of CV depression following local anesthetic administration may serve as a sensitive marker of LAST in pregnant patients
- May aid clinicians in promptly differentiating and identifying LAST

Evidence of Severe Complications in Pregnancy

- Syncope and collapse, cardiac arrest, respiratory arrest, acute respiratory failure, somnolence/stupor/coma each observed in ≤ 3.52% of the pregnant cohort
- Affects a marginal percentage, but awareness of subtle symptom changes and projected clinical sequelae may help clinicians identify cases of rapid deterioration and reduce fatal outcomes
- Literature evidence that severe LAST presentations in the general population (i.e., cardiac arrest) may be preceded by more mild CV depression (i.e., hypotension, bradycardia)

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Conclusions

This study:

- Is the first of its kind to examine LAST in a large cohort of pregnant patients
- Highlights the variable nature of LAST, particularly in pregnant patients
- Demonstrates how pregnancy may influence clinical presentation of LAST

Pregnant patients with LAST:

- More likely to exhibit CV depression
- Less likely to manifest prodromal, CV excitation, CNS excitation, and CNS depression symptoms
- May present differently due to physiologic changes of pregnancy

Heightened awareness, and vigilance of subtle clinical indications may:

- Assist clinicians in prompt and accurate LAST diagnosis
- Allow more timely intervention
- Minimize potentially fatal outcomes during local anesthetic administration in pregnant patients

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SOAP 2024 ANNUAL MEETING

Emily Stockert, MD, MBA (*she/her*)
May 5, 2023

Trends in neuraxial labor analgesia utilization by race and ethnicity among nulliparous individuals undergoing spontaneous vaginal delivery, United States, 2007-2022

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Stephanie A. Leonard, PhD, MS

Stanford MEDICINE

1

BACKGROUND

- Neuraxial labor analgesia in the United States is **highly prevalent**: 73% in 2015[1]
- Utilization of neuraxial labor analgesia in the U.S. has been reported to be ***highest*** among non-Hispanic **White** individuals and ***lower*** among **American Indian-Alaska Native** (AIAN), **Native Hawaiian or Other Pacific Islander** (NHOPI), **Black** and **Hispanic** individuals[2-4]
- Limited population-level data have described the presence and extent of racial-ethnic disparities in the U.S., and **how they have changed over time**.
- References:

1. *JNO. 2018;1(8):e186567*
2. *NVSS. 2011;59(5)*
3. *JACS. 2015;221(4):p e27*
4. *Anesthesiology. 2007;106:19–25*

2

METHODS

- **Study Design:** Retrospective, population-based study
- **Data Source:** US Birth Certificate Data - Natality Public Use File
- **Study Cohort:** Nulliparous individuals with in-hospital spontaneous livebirth vaginal deliveries; 2007 to 2022
- **Sample Size:** N = 13,227,536 individuals
- **Primary Exposure:** race and ethnicity
- **Primary Outcome:** Neuraxial labor analgesia
- **Statistical Analyses:** Cochran-Armitage Test for Trend – change in annual frequency of neuraxial analgesia by race and ethnicity

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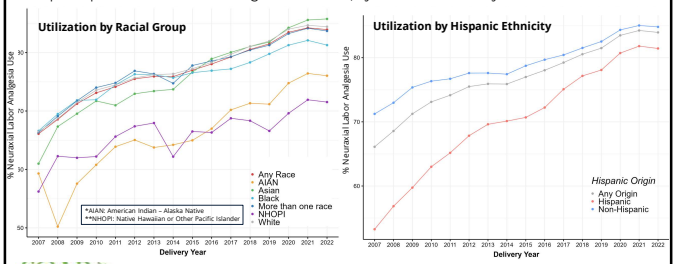
RESULTS:

Percentage Neuraxial Labor Analgesia Utilization among Nulliparous Individuals with In-Hospital Spontaneous Livebirth Vaginal Deliveries; by Race and Ethnicity Over Time: 2007 – 2022



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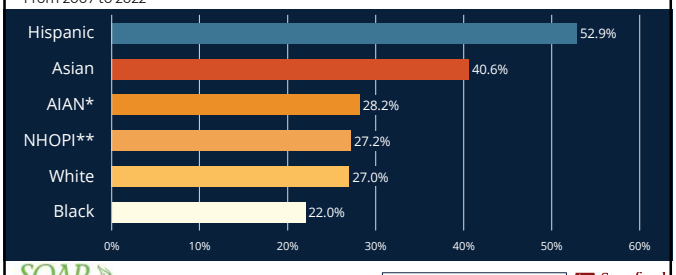
RESULTS:

Percentage Increase in Neuraxial Labor Analgesia Utilization by Race and Ethnicity; From 2007 to 2022



*AIAN: American Indian - Alaska Native
**NHOPI: Native Hawaiian or Other Pacific Islander

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DISCUSSION

- Annual rates of neuraxial labor analgesia utilization among nulliparous individuals undergoing spontaneous vaginal delivery **increased across all racial** and **ethnic groups** from 2007-2022.
- **Disparities** among racial-ethnic groups likewise **evolved over time:**
  - *Highest* increase in utilization: **Hispanic** (52.9%) and **Asian** (40.6%) individuals
  - *Lowest* increase in utilization: **Black** (22.0%) individuals
  - *Highest* 2022 frequency of use: **White** (84.4%) and **Asian** (85.8%) individuals
  - *Lowest* 2022 frequency of use: **AIAN** (76.0%) and **NHOPI** (71.5%) individuals
- These data suggest a **narrowing gap** between Hispanic and non-Hispanic individuals; perhaps due to **better access** to language concordant care.
- **Persistent disparities** among **Black, AIAN** and **NHOPI** individuals may reflect structural racism, reduced access to anesthesia services, and/or patient distrust.

6

Abstract #: SUN – OP 2 – 01

Effect of Ephedrine, Phenylephrine, and Norepinephrine on Myometrial Contractility

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Co-Authors: John Kingdom, MD - University of Toronto
Stephen Lye, Phd - University of Toronto
Joseph Park, HBSc - University of Toronto
Oksana Shynlova, Phd - University of Toronto

Abstract: Wafaa Bellan[1], Joseph Park[1,2,3], Oksana Shynlova[2,3] John Kingdom[1,2,3], Stephen Lye[2,3], Mrinalini Balki[1,2,3]
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Departments of Anesthesia, Physiology and Ob/Gyn, University of Toronto, Toronto, ON, Canada[3]

Introduction: To mitigate the risk of hypotension during caesarean delivery (CD), vasopressors such as ephedrine, phenylephrine and norepinephrine are administered during CD. These drugs act by binding to adrenergic receptors (ARα and ARβ) on blood vessels, inducing vasoconstriction and elevating blood pressure.[1] Importantly, ARs are also present on the smooth muscle cells of the myometrium, thus vasopressors can impact uterine contractility during CD causing uterine atony, which is a major contributor to postpartum hemorrhage (PPH).[2] The aim of this study was to assess the ex-vivo effect of ephedrine, phenylephrine, and norepinephrine on myometrial contractility with and without oxytocin.

Methods: Myometrial biopsies were acquired from pregnant non-laboring women undergoing elective CD. Tissues were dissected into strips and the ex-vivo contractions generated by increasing concentrations of vasopressors ephedrine, phenylephrine, and norepinephrine (10^{-10} to 10^{-5} M) with/out oxytocin (20 nM) were recorded using an organ bath apparatus. The primary outcome was the motility index (amplitude*frequency of contractions). Secondary outcomes included amplitude, frequency, and area under the curve (AUC) for myometrial contractions generated in each dose-response window. A sample size of 32 strips per study group was calculated to obtain 80% power to detect significant differences between groups. Statistical analysis was conducted using two-way ANOVA followed by Dunnett's multiple comparisons test (GraphPad Prism).

Results: A total of 43 patients were recruited for this study (32 strips/group). When compared to vehicle control, the relative motility index of myometrial contractility increased significantly with ephedrine (200%, $p< 0.001$) and with phenylephrine (152%, $p< 0.05$) at 10^{-7} M. Similar effects were observed in the presence of oxytocin (Fig 1). The

frequency and AUC increased significantly with ephedrine (261%, 245%) and phenylephrine (203%, 207%) at 10^{-7} M ($p < 0.001$), whereas there was no effect on contraction amplitude. Interestingly, norepinephrine displayed no significant effect on primary and secondary outcomes.

Conclusions: Our results indicate that ephedrine and phenylephrine should be preferred over norepinephrine to increase myometrial contractility in patients at risk of PPH at elective CD.

References:

1. Kinsella S. M. *et al.* International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia. *Anaesthesia* **73**, 71–92 (2018).
2. Balki M & Wong CA. Refractory uterine atony: still a problem after all these years. *Int J Obstet Anesth* **48**, 103207 (2021).

Vassopressores effect on Motility Index with and without oxytocin.pdf

Abstract #: SUN – OP 2 – 02

Readability, Quality and Accuracy of ChatGPT And BARD For Common Questions About Obstetric Anesthesia

Presenting Author: Donald Lee, MD
Presenting Author's Institution: Cedars Sinai Medical Center
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Co-Authors: Melissa Brown, MD - Cedars Sinai Medical Center
James Hammond, MD - Cedars Sinai Medical Center

Abstract:
Introduction: Over 90% of parturients have searched the internet for health information.[1] The recent rise and popularity of large language models (LLM) are providing answers to people's queries, with 1.7 billion visits to ChatGPT in November 2023.[2] We examined the readability and quality of answers to common obstetric anesthesia questions from popular answer engines ChatGPT 3.5 and Google BARD.

Methods: This study is IRB exempted. We developed 20 questions for LLM query derived from FAQs on SOAP, ASA, ACOG, hospital and consumer websites. The LLMs ChatGPT 3.5 and Google Bard were each queried and answers obtained in November 2023, serving as Patient Education Materials (PEMs). The answers were graded for accuracy and quality by the authors. Quality was measured via Agency for Healthcare Research and Quality (AHRQ)'s Patient Education Materials Assessment Tool for Print (PEMAT).[1,3] Readability was measured using validated readability indices.[1] Accuracy, quality and readability were compared using independent t-test, with P >.05 considered significant.

Results: The mean readability scores for BARD (high school level) were significantly easier than ChatGPT 3.5 (college level or graduate) by all scoring metrics, P< .001.(see Table). BARD produced significantly longer answers P< .001, however the accuracy of BARD (85%±10) and ChatGPT (87%±14) were similar, P=0.5, and reasonably good. The understandability by PEMAT for BARD was higher (39% vs 33%), but not statistically significant at P=.06. The Actionability by PEMAT for BARD was significantly higher (22% vs 9%), p=.007.

Discussion: As people turn to LLM queries for answers to commonly asked questions about obstetric anesthesia, the accuracy, quality and readability should meet the current standards suggested by the Agency for Healthcare Research and Quality (AHRQ). Google BARD gave significantly longer answers, with similar accuracy to ChatGPT 3.5. BARD was also easier to read (high school level), but well above the AHRQ suggested 4^{th}-6^{th} grade reading level for patient safety materials.[4] BARD content was significantly more actionable, also a desired characteristic in patient educational materials. Consumers, health care providers, hospitals and governmental agencies should be aware of the quality of information generated by LLMs.

References:
1. Murphy J, Vaughn J, Gelber K, Geller A, Zakowski M: Readability, content, quality and accuracy assessment of internet-based patient education materials relating to labor analgesia. Int J Obstet Anesth 2019; 39: 82-87
2. Duarte F: Number of ChatGPT Users (Jan 2024). https://explodingtopics.com/blog/chatgpt-users, 2024
3. Shoemaker MB: The Patient Education Materials Assessment Tool (PEMAT) and User's Guide. Rockville, MD, Agency for Healthcare Research and Quality, 2014
4. Bakerjian D: Personal Health Literacy. https://psnet.ahrq.gov/primer/personal-health-literacy, Agency for Healthcare Research and Quality, 2023

Table. Readability, accuracy and PEMAT scores of Chat GPT and BARD for common questions about obstetric anesthesia

	ChatGPT (n=20) Mean ± SD†	BARD (n=20) Mean ± SD†	P-value
Readability			
FRES	35.5 ± 9.62	52.15 ± 8.79	0.00001‡
FOG	16.7 ± 2.18	13.07 ± 1.93	0.00001‡
FKGL	13.53 ± 1.9	10.2 ± 1.73	0.00001‡
Coleman-Liau	13.37 ± 1.58	10.21 ± 1.59	0.00001‡
SMOG	12.27 ± 1.58	9.57 ± 1.39	0.00001‡
Linsear	14.92 ± 2.93	10.88 ± 2.46	0.00003‡
Accuracy	87.24 ± 14.42%	85.26 ± 10.24%	0.5
PEMAT			
Understandability	5.35 ± 1.04%	6.3 ± 1.97%	0.06
Actionability	9.17 ± 12.65%	22.5 ± 16.47%	0.0067‡

PEMAT: Patient Educational Materials Assessment Tool.

†FOG, FKGL, Coleman-Liau, SMOG and Linsear scores represent grade level. In the FRES test, higher scores indicate greater readability, corresponding to a lower grade level (i.e. 30-50 college level- difficult to read, 50–60 = 10th–12th grade/fairly difficult).

‡P <0.05 significant.

Abstract #: SUN – OP 2 – 03

A New Machine Learning Model for the Prediction of Severe Maternal Morbidity Using a Large Retrospective Cohort

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Kathryn J. Gray, MD, PhD - University of Washington

Abstract:
Introduction: Every year in the United States, more than 50,000 women experience severe maternal morbidity (SMM) (1). SMM is defined as labor and delivery outcomes with significant consequences to a woman's health (2). Risk prediction tools exist (3-5) which identify high-risk individuals based on comorbidity burden. As demographics, vital signs, and laboratory results can also contribute to risk in a complex, non-linear fashion, we sought to develop a new machine learning model for the prediction of SMM using electronic medical record data.

Methods: We created a retrospective cohort of all deliveries across a large healthcare system between 2015 and 2023. Demographics, comorbidities, vital signs, laboratory results, and other data collected on admission for delivery was ingested and processed using our machine learning platform. The outcome of SMM was defined using the CDC SMM Index indicators along with corresponding ICD disease codes (2). Our cohort was split 80% for model training and 20% for model testing. We developed a new xgboost model and compared its performance in predicting SMM to existing tools (3-5) using the area under the curve (AUC). We additionally investigated the top predictors using the SHapley Additive exPlanations method.

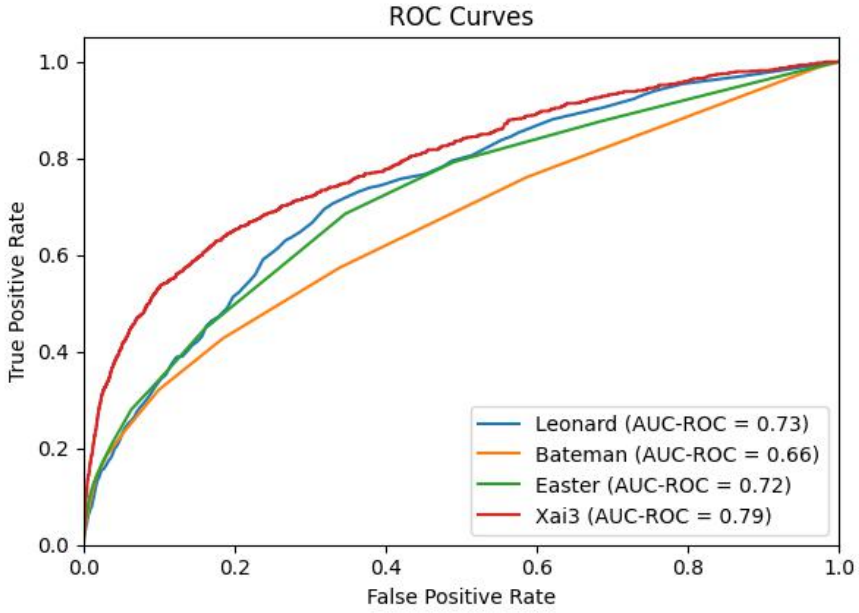
Results: We identified 122,177 pregnancies in our cohort, and the incidence of SMM was 6,838 (5.6%). We found that existing comorbidity scores performed well in predicting SMM with an AUC of 0.66-0.73. The novel xgboost model, Xai3, had slightly improved performance with an AUC of 0.79. The top predictors were a history of coagulation disorder, cardiac disease, and prior preterm birth.

Conclusion: Risk prediction tools are useful in identifying patients at risk for SMM. We developed and validated a new machine learning model that outperformed existing tools (3-5). Future work will focus on further validation and on implementation of a dynamic dashboard to notify clinical teams of high-risk patients. Early recognition, appropriate

triaging, and escalation to a higher level of care when indicated may lead to improved long-term maternal outcomes.

Figure 1.
Area under the receiver operating characteristic curves (AUC ROC) for prediction of SMM by Leonard, Bateman, and Easter tools, as well as by the novel xgboost model, Xai3.

References: 1. Hoyert et al. *Natl Vital Stat Rep*. 2018.
2. How Does CDC Identify Severe Maternal Morbidity? www.cdc.gov.
3. Bateman et al. *Obstet Gynecol*. 2013.
4. Easter et al. *Am J Obstet Gynecol*. 2019.
5. Leonard et al. *Obstet Gynecol*. 2020.



Abstract #: SUN – OP 2 – 04

Development and Validation of a Prognostic Model for Maternal Cardiovascular Morbidity Events in Patients with Hypertensive Disorders Of Pregnancy

Presenting Author: Marie-Louise Meng, MD
Presenting Author's Institution: Duke University Medical Center - Durham, North Carolina
Senior Author: Matthew Engelhard, MD PhD - Duke University Medical Center**Co-Authors:**
Jerome Federspiel, MD PhD - Duke University Medical Center
Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA - Duke University Department of Anesthesiology
Vijay Krishnamorthy, MD PhD - Duke University Medical Center
Yuki Li, BS - Duke University Medical Center
Qin Weng, BS - Duke University Medical Center

Abstract:
Introduction: Hypertensive disorders of pregnancy (HDP) confer increased risk of cardiovascular (CV) morbidity during delivery and the subsequent year.[1] To improve risk stratification among people with HDP, we developed and both internally and externally validated a predictive model for maternal CV events following HDP. Risk prediction models specific to HDP could help mitigate CV complications by identifying people who could benefit from enhanced CV surveillance, early treatment, specialized location of delivery, and higher level of care during and after delivery.

Methods: Models were created using delivery hospitalizations in the Premier Healthcare Database (October 1, 2015-December 31, 2020). A multi-label neural network model was used to derive predictive models of all CV events and individual organ specific events (heart failure, cerebrovascular, renal failure) during delivery hospitalization ("Index Model") and during readmission within one year of delivery ("Readmission Model"). The models were adapted to and externally validated in an electronic health record (EHR) cohort of patients with HDP who delivered from 2016-2020 in two neighboring health systems. In a subset of patients, events were validated by chart review and models assessed in people with validated outcomes.

Results: The Premier Database had 553,658 deliveries in people with HDP. A CV event occurred in 1.2% of delivery hospitalizations. Model performance is summarized in the table. The Index Model had a high performance for all CV events (Area under the receiver operating curve [AUROC] 0.89 and average precision [AP] 0.24) and for individual CV events. With a positivity threshold set at ≥90% sensitivity, model specificity was 68.5% for predicting all CV events. Readmission CV events occurred in 0.6% of patients. The Readmission Model had a moderate performance for predicting all CV events (AUROC 0.72 and AP 0.02) and individual CV events.
The EHR cohort had 12,259 deliveries in people with HDP. A CV event occurred in 1.9% of the delivery hospitalizations. The Index Model Adapted to the EHR dataset predicted CV

events with high model performance (AUROC 0.92 and AP 0.28, a 15-fold enhancement over the event rate), and performed well for individual CV events. At ≥90% specificity, model specificity was 75.6%. Readmission CV events occurred in 1% individuals. The Readmission Model Adapted to the EHR dataset had moderate performance for all CV events (AUROC 0.73) and individual CV events. The models performed similarly in the subset of people with validated events.

Discussion: We derived and externally validated a multi-label neural network model that predicts CV events among individuals with HDP during delivery hospitalization and within one year postpartum with a high degree of performance. While model refinement and validation in other cohorts are necessary, this is a first step toward tailoring CV care for patients with HDP.

References: **1. Meng. Anesth Analg 2023;**136:728-37

FAER SOAP abstract_TABLE.pdf

Abstract #: SUN – OP 2 – 05

Noninvasive Continuous Versus Intermittent Oscillometric Arterial Pressure Monitoring and Maternal Hypotension During Cesarean Delivery: A Randomized Controlled Trial

Presenting Author: Sun-Kyung Park, MD,PhD
Presenting Author's Institution: Department of Anesthesiology and Pain Medicine Yonsei University College of Medicine - Seoul, Seoul-t'ukpyolsi
Co-Authors: Youngwon Kim, MD - Department of Anesthesiology and Pain Medicine Yonsei University College of Medicine

Abstract:
Background: Maternal hypotension is common during cesarean delivery under spinal anesthesia. This randomized-controlled study aimed to investigate whether finger-cuff noninvasive continuous arterial pressure monitoring could assist in reducing post-spinal hypotension in mothers undergoing cesarean delivery.

Methods: A total of 151 mothers receiving planned cesarean delivery under spinal anesthesia were randomly assigned to the treatment group (finger-cuff monitoring with blinded intermittent oscillometric monitoring) or the control group (intermittent oscillometric monitoring with blinded finger-cuff monitoring). Both groups received prophylactic phenylephrine administration after spinal anesthesia. The primary outcome was the incidence of maternal hypotension, defined as systolic arterial pressure (SAP) < 80% of baseline, from spinal anesthesia completion to delivery. Secondary outcome included area under SAP < 80% of baseline, time-weighted average SAP < 80% of baseline, and cumulative duration of SAP < 80% of baseline. Similar measures were analyzed with mean arterial pressure (MAP) thresholds of < 65, 60, and 55mmHg. Nausea, vomiting, phenylephrine consumption, and neonatal outcomes were also assessed.

Results: The incidence of maternal hypotension did not significantly differ between the groups (50.7% in treatment group vs. 58.1% in control group; *P*=0.358). Median (interquartile range) area under SAP of 80% of baseline was 5.03 (0–18.22) mmHg × min in treatment group versus 5.24 (0–24.42) mmHg × min in control group (*P*=0.467). Median (interquartile range) time-weighted average SAP< 80% of baseline was 0.19 (0.00–0.78) mmHg in treatment group versus 0.17 (0.00–0.85) mmHg in control group (*P*=0.617). No significant differences were observed in the secondary outcomes.

Conclusion: In this randomized controlled trial involving mothers undergoing cesarean delivery, finger-cuff noninvasive continuous arterial pressure monitoring did not reduce the incidence of maternal hypotension compared to standard intermittent oscillometric monitoring, in the context of prophylactic phenylephrine administration. Our data do not support the use of finger-cuff monitoring for this purpose during cesarean delivery.

Trial Registration: ClinicalTrials.gov (identifier: NCT04752904)

References: 1. Kouz K, Weidemann F, Naebian A, Lohr A, Bergholz A, Thomsen KK, Krause L, Petzoldt M, Moll-Khosrawi P, Sessler DI, Flick M, Saugel B: Continuous Finger-cuff versus Intermittent Oscillometric Arterial Pressure Monitoring and Hypotension during Induction of Anesthesia and Noncardiac Surgery: The DETECT Randomized Trial. Anesthesiology 2023; 139: 298-308

2. Maheshwari K, Khanna S, Bajracharya GR, Makarova N, Riter Q, Raza S, Cywinski JB, Argalious M, Kurz A, Sessler DI: A Randomized Trial of Continuous Noninvasive Blood Pressure Monitoring During Noncardiac Surgery. Anesth Analg 2018; 127: 424-431

Figure 1 CONSORT Diagram ver 2.0.pdf

Abstract #: SUN – OP 2 – 06

Erector Spinae Plane Block with Liposomal Bupivacaine for Post Cesarean Delivery Analgesia: A Pilot Study

Presenting Author: Sara Feldman, MD
Presenting Author's Institution: Department of Anesthesiology, Duke University, Durham, NC - Durham, North Carolina
Senior Author: Ashraf Habib MBBCh, MSc, MHSc, FRCA - Duke University Department of Anesthesiology
Co-Authors: Matthew Fuller, MS - Department of Anesthesiology, Duke University, Durham, NC
Romel J. Holmes, Jr., MS - Department of Anesthesiology, Duke University, Durham, NC

Abstract:
Introduction: There are limited data about the efficacy of erector spinae plane blocks (ESPB) for post-cesarean delivery (CD) analgesia, with no prior studies investigating the use of liposomal bupivacaine (LB) for ESPB. We performed a case control study to assess the analgesic efficacy of ESPB with LB in patients undergoing CD. We hypothesized that ESPB with LB would be associated with reduced opioid consumption compared to a historical cohort of patients receiving the same multimodal analgesic regimen including intrathecal morphine (ITM) but without a truncal block.

Methods: We performed a single center case control study of patients undergoing elective CD under spinal or combined spinal epidural anesthesia with 12 mg hyperbaric bupivacaine, 15 mcg fentanyl and 100 mcg ITM. Prospectively enrolled patients received the standard of care analgesic regimen used at our center which includes scheduled NSAIDs and acetaminophen, and PRN oxycodone. Following surgery, a bilateral ESPB was performed at T10 under ultrasound guidance using 133 mg LB and 20 ml 0.25% bupivacaine per side. Cases were matched in a 1:4 ratio by age, race, history of prior CD, and insurance status with historical controls who received the same multimodal analgesic regimen but no truncal blocks. The primary outcome was postoperative oxycodone consumption 0-48 h after CD. Secondary outcomes included: total postsurgical opioid consumption through 24 hours, time to first postsurgical opioid rescue medication, area under the curve (AUC) of visual analog scale pain intensity scores through 48 hours and need for rescue antiemetics and antipruritics. At 48 h, patients who had a repeat CD were asked about how analgesia for this delivery compared with the prior CD. The primary outcome was compared between groups using a log-linear regression model and the effect size is reported as a geometric mean ratio. Secondary outcomes were compared using chi-squared tests or log-linear regression, as appropriate.

Results: Thirty prospectively enrolled patients were matched with 120 historical controls. Outcomes are summarized in the table. There were no significant differences between the groups in the primary outcome of oxycodone consumption at 48 h. There were also no

significant differences between the groups in any of the secondary outcomes, but the AUC for pain scores 0-48 h was significantly lower in the block group compared to the historical controls (p=.007). Of the 17 patients who had a repeat CD, 12 thought that, compared to their prior CD, analgesia was better or much better, 2 thought it was similar, 1 thought it was worse and 2 could not remember.

Conclusion: In this pilot study, ESPB with LB was associated with lower pain scores compared to historical controls not receiving a truncal block. Future studies with a larger sample size are needed to further assess whether ESPB with LB provides clinically significant benefit to patients receiving a multimodal analgesic regimen incorporating ITM.

Table 1.pdf

Abstract #: SUN – OP 2 – 07

Local Anesthetic Systemic Toxicity in Pregnancy: A Retrospective Cohort Analysis

Presenting Author: Shobana Murugan, MD
Presenting Author's Institution: University of Texas Medical Branch John Sealy School of Medicine - Galveston, Texas
Co-Authors: Michael Adkison, BS - University of Texas Medical Branch John Sealy School of Medicine
Cooper Stevenson, MS - University of Texas Medical Branch John Sealy School of Medicine
Sanjna Tripathy, BS - University of Texas McGovern Medical School

Abstract:
Introduction: Local Anesthetic Systemic Toxicity (LAST) is a rare complication of regional anesthesia1. Pregnancy is a risk factor that may precipitate or exacerbate LAST due to gestational physiologic changes[2,3]. Labor and related disorders of pregnancy can mask or delay symptoms of LAST, inhibiting accurate recognition and slowing appropriate intervention[1,2]. This study seeks to identify LAST within a larger population cohort, distinguish unique features of LAST in pregnant patients versus their nonpregnant counterparts, and contextualize our findings relative to existing literature.

Methods: The TriNetX database was used to compare pregnant and nonpregnant patients with LAST from 2013 to 2023. Cohorts were matched on age, race, obesity status, diabetes, metabolic disorders, local anesthetic type, and cardiovascular, liver, kidney, and respiratory disease. Outcomes included prodromal symptoms of LAST and symptoms of cardiac and central nervous system excitation and depression.

Results: Matching occurred for 276 pregnant and 276 nonpregnant patients. Pregnant cohorts had a significantly higher risk of cardiac depression (RR, 1.96 [95% CI 1.44 - 2.66], $p< 0.01$) and significantly lower risk of cardiac excitation (RR, 0.38 [95% CI 0.22-0.63], $p< 0.01$), prodromal symptoms (RR, 0.17 [95% CI 0.09 - 0.33], $p< 0.01$), central nervous system excitation (RR, 0.44 [95% CI 0.21-0.90], $p=0.02$), and central nervous system depression
(RR, 0.24 [95% CI 0.13-0.48], $p< 0.01$) than nonpregnant cohorts.

Conclusion: Pregnant patients with LAST were more likely to exhibit cardiac depression and less likely to manifest prodromal symptoms, cardiac excitation, and central nervous system excitation and depression than nonpregnant patients. Physiological changes during pregnancy and prompt detection and treatment may explain these differences. These findings highlight the variable nature of LAST and demonstrate how pregnancy may influence its clinical presentation.

References:

1. Macfarlane AJR, Gitman M, Bornstein KJ, El-Boghdadly K, Weinberg G. Updates in our understanding of local anaesthetic systemic toxicity: a narrative review. Anaesthesia. 2021;76(S1):27-39. doi:10.1111/anae.15282

2. Mock ND, Griggs KM, Mileto LA. Local Anesthetic Systemic Toxicity during Labor, Birth, and Immediate Postpartum. MCN: The American Journal of Maternal/Child Nursing. 2021;46(6):330-338. doi:10.1097/NMC.0000000000000765

3. Neal JM, Barrington MJ, Fettiplace MR, et al. The Third American Society of Regional Anesthesia and Pain Medicine Practice Advisory on Local Anesthetic Systemic Toxicity. Reg Anesth Pain Med. 2018;43(2):113-123.

Local Anesthetic Systemic Toxicity in Pregnancy: A Retrospective Cohort Analysis_RESULTS TABLE.pdf

Abstract #: SUN – OP 2 – 08

Trends in Neuraxial Labor Analgesia Utilization by Race and Ethnicity Among Nulliparous Individuals Undergoing Spontaneous Vaginal Delivery, United States, 2007-2022

Presenting Author: Emily Stockert, MD, MBA
Presenting Author's Institution: Stanford University - Palo Alto, California
Senior Author: Stephanie Leonard, PhD, MS - Stanford University
Co-Authors: Brian Bateman, MD, MSc - Stanford University
Alexander J. Butwick, MD - Stanford University
Eva Martinez, MD - Stanford University
Sara Siadat, MS - Stanford University

Abstract:
Introduction: Disparities in the use of neuraxial labor analgesia use are well-documented in the United States (U.S.), with the highest use among non-Hispanic White individuals, and the lowest use among American Indian-Alaska Native (AIAN), Hispanic, and Native Hawaiian or Other Pacific Islander (NHOPI) individuals[1-5]. However, it is unclear whether these disparities have changed over time. Our objective was to evaluate temporal trends in neuraxial labor analgesia use among racial and ethnic groups in the U.S.

Methods: We conducted a retrospective, population-based study using U.S. national vital statistics data from 2007 to 2022. Our study cohort comprised nulliparous individuals with singleton pregnancies who had an in-hospital spontaneous livebirth vaginal delivery in the U.S. Neuraxial labor analgesia was defined as the use of epidural or spinal anesthesia during labor. Parents report their ethnicity and one or more races on the birth certificate worksheet. The CDC categorizes responses into racial-ethnic groups and imputes maternal race for approximately 6-7% of births. We calculated the annual frequency of neuraxial labor analgesia use in each racial and ethnic group, assessing changes over time using the Cochran-Armitage test for trend.

Results: Our study cohort comprised 13,227,536 individuals. Annual frequencies for neuraxial labor analgesia use by race and ethnicity are presented in Figure 1. Between 2007 and 2022, the annual neuraxial analgesia rate increased across all racial and ethnic groups, with the highest and lowest percent change in Asian individuals (61.0% in 2007; 85.8% in 2022; 40.6% increase) and Black individuals (66.6% in 2007; 81.3% in 2022; 22.0% increase), respectively. By comparison, utilization by White individuals increased 27.0% (66.5% in 2007; 84.4% in 2022). Hispanic individuals had a substantially higher percent increase (53.3% in 2007; 81.4% in 2022; 52.9% increase) compared to non-Hispanic individuals (71.2% in 2007; 84.8% in 2022; 19.0% increase). In 2022, neuraxial labor analgesia use was lowest among AIAN (76.0%) and NHOPI (71.5%) individuals and highest among Asian (85.8%) and White (84.4%) individuals.

Discussion: Annual rates of neuraxial analgesia use increased across all racial and ethnic groups between 2007 and 2022, yet significant variations in percent change differences were observed. Notably, Hispanic and Asian individuals experienced the highest increases. Although these data suggest a narrowing gap between Hispanic and non-Hispanic individuals, disparities persist, especially for AIAN and NHOPI individuals with the lowest current utilization, and for Black individuals with lowest rate of growth in utilization. Further research is needed to explore the reasons for differential neuraxial labor analgesia utilization across racial and ethnic groups.

References:

1. NVSS. 2011;59(5)
2. Anesthesiology. 2019;131:840–849
3. JACS. 2015;221(4):e27
4. Anesth Analg. 2012;114(1):172-8
5. Anesthesiology. 2007;106:19–25

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Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 01

Abnormal Echocardiogram Findings in Morbidly Obese Pregnant Patients and the Association with Obstetric Outcomes

Presenting Author: Gurbani Singh, BS, BA
Presenting Author's Institution: University of Maryland School of Medicine
Co-Authors: Maxwell Emmanuel, BS - University of Maryland School of Medicine
Miranda Gibbons, BS - University of Maryland School of Medicine

Abstract:
The incidence of maternal obesity in the United States has significantly increased, with rates up to 29%[1]. The superimposed physiological changes of obesity and pregnancy are associated with cardiovascular and respiratory complications during both gestation and delivery[2]. Consequently, all morbidly obese pregnant patients at the University of Maryland Medical Center (UMMC) routinely undergo screening echocardiograms during pregnancy. The results are thought to enhance management guidelines for these patients; however, the diagnostic yield of these screenings is not well studied.
We conducted a retrospective chart review of morbidly obese pregnant patients who delivered at UMMC from 11/01/2015 to 5/20/2023. We used chi-squared tests to compare patients with normal and abnormal echocardiograms.
Among 506 patients identified, 157 had normal echocardiograms and 195 had abnormal echocardiograms. 154 did not receive an echocardiogram and were excluded. Patients largely identified as African-American/Black (67%) and had a mean BMI of 57.6. There were no significant differences in age, BMI, and race between the two patient cohorts. Abnormal echocardiogram results were not significantly associated with the following pre-pregnancy comorbidities: diabetes mellitus, hypertension, congenital heart disease, asthma, chronic obstructive pulmonary disease, and smoking, as well as the following gestational conditions: gestational diabetes, preeclampsia, gestational hypertension, and obstructive sleep apnea. Regarding adverse delivery complications, abnormal echocardiogram results were not associated with a need for ICU admission, blood transfusion, or adjunctive interventions (arterial line, central line, epinephrine, norepinephrine, dobutamine, milrinone). Patients with abnormal echocardiogram results were significantly more likely to receive a cardiology consult during pregnancy (p=0.008) and were more likely to receive neuraxial anesthesia (p=0.008); there was no significant association between echocardiogram result and type of delivery method performed.
Our findings suggest that morbidly obese pregnant patients with abnormal echocardiogram findings are more likely to require a cardiology consultation and use neuraxial anesthesia during delivery; however, they are at no higher likelihood of certain pre-pregnancy comorbidities, gestational comorbidities, and additional obstetric outcomes. Further analysis with this subset of pregnant patients must be conducted to assess the utility of echocardiograms as a screening tool.

References:

1. Driscoll AK, Gregory ECW. Increases in prepregnancy obesity: United States, 2016–2019. NCHS Data Brief, no 392. Hyattsville, MD: National Center for Health Statistics. 2020.

2. Matuszak, Oskar, et al. “The Long-Term Effect of Maternal Obesity on the Cardiovascular Health of the Offspring–Systematic Review.” Current Problems in Cardiology, vol. 49, no. 1, 1 Jan. 2024, pp. 102062–102062, https://doi.org/10.1016/j.cpcardiol.2023.102062.

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 02

Implementation of a Standardized Epidural Top-Up Algorithm

Presenting Author: Zeitz Jack, BS
Presenting Author's Institution: Texas A&M Health Sciences Center - Austin, Texas
Co-Authors: Dylan Grote, BS - Texas A&M Health Sciences Center
Sloan Long, BS - Texas A&M Health Sciences Center
Courtney Shaver, MS - Baylor Scott & White Research Institute
Cole Sorrels, BS - Texas A&M Health Sciences Center
Anne Waddle, BS - Texas A&M Health Sciences Center

Abstract:
Background: We introduced a labor epidural troubleshooting algorithm published by Ende, et al.[1] in August 2023 at our hospital. We hypothesized that patients who received labor epidural analgesia after implementation of the algorithm would have a higher catheter replacement rate compared to those receiving labor epidural analgesia prior to our change in practice.

Methods: We searched our electronic medical record for patients who received a labor epidural catheter from August 1, 2022 to December 31, 2022 and for patients who received a labor epidural catheter from August 1, 2023 to December 31, 2023. Study investigators entered data from the electronic medical record into REDCap.

Results: 665 and 788 patients received a labor epidural catheter before and after implementation of the algorithm, respectively. Demographic, physical, and clinical characteristics for the cohorts are presented in Table 1. Patients who received labor epidural analgesia after implementation of the protocol had an absolute increase of 1.2% in the catheter replacement rate that was not statistically significant (P=0.288). Additionally, patients who received labor epidural analgesia after implementation of the protocol were more likely to receive one or more physician administered rescue boluses of epidural analgesia (odds ratio 1.351; 95% CI 1.062-1.719; P=0.014).

Conclusion: A potentially clinically significant but statistically non-significant increase in labor epidural catheter replacement was detected after implementation of a standardized algorithm. Limitations of our study were that patients who received labor epidural analgesia after implementation of the algorithm were less likely to have a labor analgesic technique that punctured the dura and the training level of the operators who performed the neuraxial analgesic techniques differed between the two cohorts as well.

References: 1. Ende HB, et al. Standardization of epidural top-ups for breakthrough labor pain results in a higher proportion of catheter replacements within 30 min of the first bolus dose. Int J Obstet Anesth 2021 Aug;47:103161

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 03

Failure Rates of Single Injection Spinal and Combined Spinal Epidural Anesthesia for Postpartum Tubal Ligation: A Single Center Retrospective Study

Presenting Author: Megan Foster, BS
Presenting Author's Institution: Texas A&M Health Sciences Center
Co-Authors: Kelsey Hudson, PhD - Texas A&M Health Sciences Center
Ehrig Jessica, MD - Baylor Scott & White Medical Center-Temple
Emily E. Sharpe, MD - Mayo Clinic
Courtney Shaver, MS - Baylor Scott & White Research Institute

Abstract:
Introduction: Postpartum tubal ligations (PPTL) have been performed with the utilization of neuraxial anesthesia, although the optimal anesthetic technique is unknown. Ansari, et al. reported a 15% failure rate for de novo spinal anesthesia for PPTL.[1] The primary aim of our study was to identify the failure rate of de novo single injection spinal (SIS) and combined spinal epidural (CSE) anesthesia for PPTL at our hospital along with variables that predict failure.

Methods: After obtaining IRB approval, we conducted a retrospective study of patients that underwent a PPTL with SIS or CSE anesthesia from January 1, 2020 to December 31, 2022. We defined failure as conversion to general anesthesia (GA) that used an endotracheal tube or supraglottic airway, administration of intravenous (IV) propofol in doses greater than 10 mg, IV fentanyl greater than 100 mcg, and inhaled nitrous oxide. A study investigator manually inspected each medical record and recorded demographic, physical, and clinical data.

Results: During the study period, 233 patients had PPTL and 26 (11.2%) met our definition of failure. Demographic, physical, and clinical characteristics of patients who did and did not have failure of neuraxial anesthesia (NA) are presented in Table 1. The median (interquartile range) surgical duration was 36 (24-43) and 29 (23-37) minutes (P=0.016) in patients who did and did not have NA failure. Of the patients who had NA failure, 11 required conversion to GA prior to skin incision, four required conversion to GA after skin incision, nine received propofol doses greater than 10 mg, and two patients had inhaled nitrous oxide. Four of 47 (8.5%) of patients who received CSE had NA failure compared to 22 of 186 (11.8%) who had SIS, a difference that was not statistically significant (P=0.614). Of the 47 patients who had a CSE technique, 16 had local anesthetic administered through the epidural catheter and four of these resulted in NA failure.

Discussion: Patients who underwent PPTL under SIS or CSE NA had a combined failure rate of 11.2%. This rate was lower than the 15% rate reported by Ansari, et al.[1] We attribute this difference to a combination of a higher dose of hyperbaric bupivacaine and the use of CSE which allowed for administration of additional local anesthetic through the epidural catheter. The NA failure cohort had a seven minute increase in time from incision to wound closure and

and we believe that this increased time is a surrogate marker for surgical complexity rather than the spinal anesthetic dissipating. A limitation of our study was pain was not measured and documented during the PPTL procedure and patients may have experienced pain during the procedure who did not meet the definition of NA failure.

References: 1. Ansari J, et al. A retrospective cohort study of the anesthetic management of postpartum tubal ligation, International Journal of Obstetric Anesthesia (2023), doi: https://doi.org/10.1016/j.ijoa.2023.103974

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 04

Urine Drug Screening During Pregnancy Stratified by Race: Preliminary Results of a Single Center Retrospective Study

Presenting Author: Ivie Izekor, BS
Presenting Author's Institution: Texas A&M Health Sciences Center College of Medicine
Co-Authors: Ehrig Jessica, MD - Baylor Scott & White Medical Center-Temple
Steven Lindheim, MD - Baylor Scott & White Medical Center-Temple
Chandni Raiyani, MS - Baylor Scott & White Research Institute
Robert S. White, MD, MS - Weill Cornell Medicine Department of Anesthesiology

Abstract:
Objective: Despite similar rates of substance use during pregnancy across races, limited reports suggest that minority women appear to be more likely to be screened for substance use without consent.[1] We hypothesized that patients who identified as Hispanic or Black or African American only would have higher rates of urine drug screening (UDS) with similar rates of positive screens.

Methods: Our institutional review board approved this study. This was a retrospective analysis of patients who delivered between December 1, 2020 to May 31, 2021 and December 1, 2022 to May 31, 2023. We defined Hispanic as any patient who identified as Hispanic, Black or African American as patients who identified as only Black or African American, and White or Caucasian as patients who identified as only White or Caucasian. We collected ethnic and racial data for each patient but only collected detailed data on UDS for patients who comprised the Black or African American, Hispanic, and White or Caucasian cohorts. The primary outcome was performance of a UDS and secondary outcome was the results of the UDS. Our hospital had a policy of not obtaining informed consent for UDS during our study period.

Results: 1286 patients delivered at our hospital from December 1, 2020 to May 31, 2021. Of the Black or African American (n=226), Hispanic (n=369), and White or Caucasian (n=628) patients, the UDS rates for both Black (36.3%) and Hispanic (29.5%) patients were significantly higher than White or Caucasian patients (21.1%; $p< 0.01$). The UDS positivity rates were similar between patients who identified as Black or African American (24.4%) and White or Caucasian (23.3%; $p=0.856$), but Hispanic patients (14.5%) had a lower positivity rate compared to White or Caucasian patients that did not meet statistical significance ($p=0.09$).

Conclusion: While similar positive UDS were noted among cohorts stratified by race and ethnicity, Black or African American and Hispanic parturients were more likely to undergo UDS compared to White or Caucasian parturients. Our study demonstrates that racial differences in UDS exist at our hospital and that addressing these disparities is warranted.

References: 1. Winchester ML, et al. Racial and Ethnic Differences in Urine Drug Screening on Labor and Delivery. Matern Child Health J 2022;26:124-130

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 05

Design and Production of a Custom Skin Marking Needle Guide for Ultrasound-Guided Neuraxial Anesthesia Using a 3D Printer

Presenting Author: Isabella (Ella) F. Taylor, Student
Presenting Author's Institution: Duke University
Co-Authors: Sachin H. Mehta, MD - University of Virginia Dept. of Anesthesiology
Rebecca Simmons, PhD - Duke University Department of Mechanical Engineering

Abstract:
Pre-procedural ultrasound guided neuraxial assessment is an essential skill in obstetric anesthesiology, particularly when the procedure is anticipated to be difficult. Large curvilinear probes such as the Sonosite C5-1 are ubiquitous on labor and delivery units, and provide ideal depth and resolution for neuraxial block assessment. Unfortunately, compatible skin marking guides are not commercially available. Instead, providers are left to use unwieldy tools such as marking pens, which compromise accuracy and can fade with skin prep (1).
We aimed to increase efficiency and comfort by creating a needle guide that fits over the curvilinear probe during scouting, and facilitates marking the needle entry point when the optimal interspace is located. Design goals included accuracy, compatibility with the C5-1, patient comfort, ease of use, and durable skin marking. Comparable products include the Rivanna Accuro Locator and the Sonosite Infiniti Plus Needle Guide, but the Accuro is not designed for large curvilinear probes, and the Infiniti requires the more painful paramedian technique with prohibitively long needles.
We created our guide with computer-aided design by modeling around an open access ultrasound transducer file, and adjusting to the C5-1 dimensions. Key features were the base, handles, and markers. Iterations of the base evolved to taper inward for a secure fit and a shorter height to ensure the markers would not block scanning. Handles varied in location on the base, angling, length, and thickness. Markers included rectangular slits, circular pegs, and blunt plus-signs. Prototypes of needle guides were created from PLA filament using an Ultimaker S3 at Duke University, and evaluated on patients at UVA Medical Center. Ultimately, FormLabs BioMed Clear Resin was selected due to its medical grade certification, durability, autoclavability, and clear coloration that helped visualize the C5-1 underneath. The final design included a rectangular base with a cut out slot for the side button of the C5-1, thumb indents for improved grip, two angled handles, and four plus-shaped pegs (Fig 1).
In vivo testing revealed that our device helped achieve neuraxial anesthesia on first pass with minimal discomfort, particularly in patients with prior difficult epidural placements, pre-existing back pain, and high anxiety. We hope this device will help improve the anesthesiologist and patient experience during ultrasound assisted neuraxial procedures, particularly in lower resource settings where the larger curvilinear probes are the only ones available. We plan to open-source our 3D printer g-code for others to use freely.

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Fig 1. Needle Guide

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 06

Curvilinear Versus Phased Array Transducers for Peripartum Focused Cardiac Ultrasound: A Non-Inferiority Comparative Cross Over Study

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Abstract:
Introduction: Focused cardiac ultrasound (FCU) performed by practitioners with limited echocardiography training has been shown to be an effective diagnostic tool to assess obstetric patients (1,2). However, the ability to perform FCU is limited by phased array (PA) transducer availability, compared with a curvilinear (CL) transducer that is widely available on obstetric units. We aimed to assess FCU image acquisition using CL versus PA probes. We hypothesized that clinically usable image acquisition of CL views would be non-inferior to PA views.

Methods: In this prospective, comparative, cross over study, parturients were recruited to undergo an FCU performed by novices (trainees with standardized but limited FCU experience). Trainees obtained parasternal long (PLA) and short (PSA) axis, apical and subcostal 4 chamber, and inferior vena cava (IVC) views using a CL and PA transducer, randomized to initial transducer. Views were graded by two blinded experts on a scale of 1 to 5, with ≥3 sufficient quality for clinical decisions (defined as allowing for measurements of ventricular dimensions and systolic function). The primary outcome was the proportion of patients with at least two views with image grading ≥3 (clinically useful). We also compared the proportion of sufficient quality images at each view and the variability between expert and novice self-grading. The non-inferiority margin was established if the lower limit of 90% confidence interval was greater than -15%. Cohen's Kappa with quadratic weight was used to assess interrater reliability of novice and expert ratings.

Results: 72 parturients were recruited and 70 scanned. Using the CL transducer, 91.4% of patients had ≥2 useful FCU images which was non inferior when compared to 95.7% when a PA transducer was used (difference: -4.3%, 90% CI: -11.9%, 3.3%). Overall, 63.7% of CL and 73.4% of PA views were deemed sufficient quality (difference: -9.7%, 90% CI: -14.1%, -5.4%). The feasibility of obtaining individual views is represented in Table 1. Novices were more likely to rate their images of insufficient quality (59.7% versus 68.6% for expert reviewer rating) and these image gradings showed high inter-rater reliability (Kappa 0.61, 90% CI: 0.56,0.66).

Discussion: Our study demonstrates that CL transducers can be used for FCU in parturients and are non-inferior compared to PA transducers for obtaining images of sufficient quality for patient management. In particular, PLA and PSA views, which are easily accessible in both vaginal and cesarean deliveries, were non-inferior with CL compared to PA transducer (2,3). In contrast to previous studies, we also obtained usable subcostal views in some parturients. Taken together, we hope these novel findings will lower barriers to peripartum FCU use on obstetric units.

References:

1. PMID 21315578
2. PMID 28832901
3. PMID 38127663

Squires, Curvilinear versus Phased Array Ultrasound Transducers for Peripartum Focused Cardiac Ultrasound.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 07

Intra- And Interrater Reliability of Quantitative Ultrasound Assessment of Gastric Content in Term Parturients Before Elective Cesarean Delivery

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Naveed T. Siddiqui, Associate Professor, Director Peri-operative Research Unit - Mount Sinai Hospital and University of Toronto

Abstract:
Background. Gastric ultrasound provides information about content and volume of the stomach, helping to determine the aspiration risk at the bedside. We aimed to assess the intra and interrater reliability of the antral cross-sectional area (CSA) measurements, performed by anesthesiologists of different expertise levels in term pregnant patients before elective cesarean delivery.

Methods. We conducted a prospective study after obtaining REB approval and written informed consent. Included subjects: non-laboring term pregnant women; ≥37 weeks gestational age; scheduled for elective cesarean delivery under neuraxial anesthesia; and following ERAS institutional fasting guidelines. The raters were four anesthesiologists in two levels of expertise (two experienced and two novice). Subjects were assessed in a random order and blinded by two raters, one of each level. Using a low-frequency curved-array transducer, three measurements were performed in each position (supine and right lateral decubitus [RLD]) by each rater. The primary outcome was the antral CSA to calculate the intra- and inter-rater reliability between the two level of expertise. Secondary outcomes included the qualitative inter-rater reliability of the antral grade (0-1-2), and volume estimation of the stomach (mL) by two different models.

Results. We enrolled 30 subjects; 2 women were excluded. The overall intra-rater reliability was good to excellent with an intraclass correlation coefficient (ICC) from 0.879 to 0.932, irrespective of the level of expertise and examination position. Between the two levels of expertise, the inter-rater reliability was moderate in supine (ICC=0.519), while in RLD was poor (ICC=0.474). Median antral CSA was 4.71 and 8.39 in supine and RLD, respectively. The volume estimation was similar between levels of expertise in both models (novice and experienced: Perlas et al. 107 and 113 ml; Roukhomovsky et al. 146 and 153 ml, respectively)

Conclusions. Experienced and novice anesthesiologists in bedside gastric ultrasound demonstrated good to excellent consistency within their own measurements (intra-rater reliability) regardless of the examination position. However, when comparing the measurements between the two levels of expertise the consistency was lower (moderate to poor inter-rater reliability). Similarly, the inter-rate reliability for the antral grade was only moderate. Nevertheless, the volume estimation of the stomach rendered similar results between experienced and novice, irrespective of the model utilized and compatible with a fasted state. Despite the performance of the novice level of expertise in gastric ultrasound compared to the experienced, still the relevant outcome of volume estimation remains equivalent for clinical purposes. This study underscores the feasibility of knowledge transfer for bedside gastric ultrasound, emphasizing its clinical utility in medical decision-making.

Fig 1. comparison novice expert image.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 08

The Effect of a Head Elevating Positioning Device on The Position, Depth and Height of the Cricothyroid Membrane in Patients with Obesity Class 3 In Their Third Trimester of Pregnancy

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Fabrizio Zasso, Toronto University - Mount Sinai Hospital

Abstract:
Introduction: Cricothyroid membrane (CTM) identification facilitates rescue oxygenation in the event of a "can't intubate, can't ventilate scenario".[1] Obesity is a risk factor for difficult airway in obstetrics. The localization of the CTM by palpation is unreliable and ultrasound improves its identification in patients with obesity.[2] The use of a positioning device to ensure optimum head and neck position for airway management is considered standard practice in obstetric anesthesia.[3,4] How it effects CTM has not been studied. This study aims to determine changes in the mid-point, depth and height of the CTM when patients with obesity class 3 in their third trimester of pregnancy are positioned on a head elevating positioning device compared to neutral positioning.

Methods: This was a prospective, single-centre study, approved by the Hospital Research Ethics Board. Patients in their third trimester of pregnancy with BMI≥40kg/m^2 were included. Patients underwent an ultrasound assessment of CTM in the supine position (Control) and with the head elevating device (Intervention). For each position, the following measurements were assessed: i) distance from the CTM mid-point to the sternal notch, ii) depth of the CTM, iii) height of the CTM. Demographic and additional data (neck circumference, sternomental distance, presence of skin folds, difficult imaging, and ease of CTM identification) were recorded. The primary outcome was the change in distance from the sternal notch to the CTM mid-point between positions. The secondary outcomes were the change in depth and height of the CTM between positions. The primary and secondary outcomes were examined using paired t test. The association between the outcomes and the patients characteristics were examined using linear regression models. A two-sided p value of < 0.05 was considered statistically significant.

Results: 30 patients were included. There was a statistically significant change in the distance from the sternal notch to the CTM mid-point between Intervention [Mean (SD) 45.40 mm (8.97)] and Control [Mean (SD) 41.07 mm (8.35)] groups [Diff 95%CI 4.33 mm (3.06, 5.61), $p < 0.0001$]. No change was observed on the depth of the CTM between Intervention [Mean (SD)

12.34 mm (3.15)] and Control [Mean (SD) 12.50 mm (3.04)] groups, p = 0.66]. Moreover, no change was observed on the height of the CTM between Intervention [Mean (SD) 9.25 mm (1.93)] and Control [Mean (SD) 8.91 mm (2.04)] groups, p = 0.20]. No association between the outcomes and patients' characteristics was observed.

Conclusion: Our study shows that the use of a head elevating positioning device compared to neutral positioning in patients with obesity class 3 in their third trimester of pregnancy increases the distance from the CTM mid-point to the sternal notch, but do not change the CTM depth or height.

References: 1) Br J Anaesth. 2015;115:827-48; 2) Anaesthesia. 2015;70:1230-4; 3) Obes Surg. 2004;14:1171-5; 4) Anesth Analg. 2011;113:1098-102.

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 09

Focused Cardiac Ultrasound in the Peripartum Environment: A Case Series of the Echocardiographic Assessment Using Subcostal-Only (EASy) View in the Obstetric Population

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Co-Authors: Nibras Bughrara, MD - Albany Medical Center
Andreana Prifti - Albany Medical Center

Abstract:
Point of care ultrasound (POCUS) in the peripartum setting has grown to be a useful tool in rapidly and non-invasively assessing cardiopulmonary function. The increase in maternal cardiac disease and morbid obesity has led to an increased need for formal, POCUS training by obstetric anesthesiologists. Thus, the development of institution-specific POCUS exams has become valuable to assess distinct obstetric pathologies[1,2]. Transthoracic scanning protocols in the OB anesthesia field primarily rely on parasternal long/short axis and apical 4-chamber views to assess cardiac function and volume status, as it is largely believed subcostal views are difficult to obtain. Anecdotally, fundal height and difficulty with positioning are listed as reasons why the subcostal view is only useful in post-partum patients[3,4].
In this case series, we demonstrate the feasibility of echocardiographic assessment using subcostal-only (EASy) view in obstetric patients during the peripartum period. Our scanning protocol focuses on the subcostal cardiac window and the IVC. In addition, we incorporate bilateral upper lung views and basal lung views. This EASy-OB scanning protocol evaluates volume status and structural information to help guide resuscitation, assess cardiac contractility, identify pericardial effusions or pulmonary edema. Images were acquired by anesthesiology residents, fellows and attendings, who all received formal training in the EASy exam in non-OB patients (ie. formal 4-day FOCUS course described in methods section). Image quality was determined by an independent, FOCUS-credentialed anesthesiologist (using a predetermined grading system). Data was collected on 32 parturients. Image quality was deemed “good” in 22 cases and “adequate” in 5 cases. This pilot study indicates 26/32 (**81%)** of images were of diagnostic quality [confidence interval (CI) of a proportion 0.646 to 0.911; **Figure 1A**), gathered over an average of 5.75 minutes for each exam. Additionally, we evaluated the image quality based on body habitus and weeks gestational age (WGA). Interestingly, the acquisition of diagnostic quality subcostal views was not statistically different across BMI range and WGA of the parturient (**Figure 1 B,C**). In the obstetric population, where time constraints and labor progress prohibit a full, comprehensive cardiac exam the EASy-OB protocol may serve as a time-saving and feasible tool.

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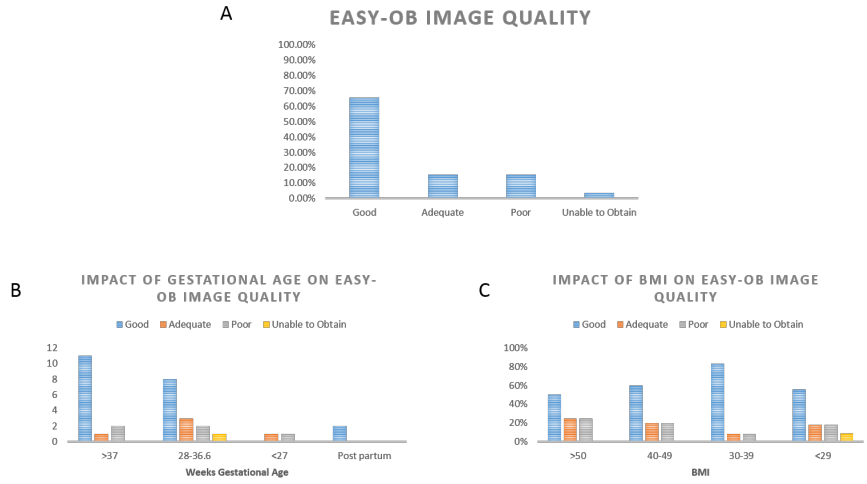

Figure 1. EASy-OB Image Quality. A) A total of 32 images were graded “Good,” “Adequate,” “Poor,” and “Unable to Obtain.” B,C) Fisher’s exact test was used to assess the impact of gestational age and BMI on image quality. No significant difference was found

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 10

Rescue Transesophageal Echocardiography (TEE) in a Case of Peripartum Maternal

Presenting Author: Divleen Malhi, MD
Presenting Author's Institution: University of Ottawa
Co-Authors: Elio Barbosa Raimondi Belfiore, MD; MHSc(c) - University of Ottawa

Introduction: Accounting for 8.5in100,000 hospitalizations,MCA is a challenging presentation for Birth Units worldwide,with survival rate of 58.9%.1The potential underlying causes of MCA can include a wide range of diagnosis; the most common are hemorrhage, cardiomyopathy, amniotic fluid embolism(AFE),and thromboembolism(TE).Among these potential causes, AFE occurs in an estimated 2-6in100,000 pregnancies with typically severe cardiovascular collapse.2Given the acuity of presentation and paucity of direct diagnostic markers, echocardiography can help in identifying the cause, and managing MCA,according to the I-AIM framework.3Prior reported cases of AFE,were presenting mainly with pulmonary hypertension and right ventricle(RV) failure in the initial stage of AFE followed by Left Ventricle(LV) collapse in a biphasic ventricle failure model.2

Case One: Granted consent, we present a 32-year-old female known for delta thalassemia,previous cesarean(CS), and stated childhood viral myocarditis. She underwent elective repeat CS for an uncomplicated pregnancy at term. The patient was prepared for surgery with standard ASA monitors.She received spinal anesthesia with Bupivacaine 0.75%9.75mg and intrathecal opioids.Initial vital signs after spinal were stable with normal sinus rhythm and phenylephrine infusion to maintain hemodynamic stability. Following delivery,Carbetocin 100mcg was administered IV. Immediately after, she complained of headache, chest pain followed by MCA.The initial rhythm presented was supraventricular tachycardia then ventricular fibrillation(VF).Maternal ACLS resuscitation was started with intubation during closure of the surgical site. Intermittent return of spontaneous circulation(ROSC) and VF occurred until stable ROSC was achieved after approximately 15 minutes. Rescue TEE was performed immediately following ROSC showing normal RV size and function, severely dilated LV with severe reduction in systolic function with apical sparing. Diagnosis of tamponade, aortic dissection, hypovolemia, anaphylaxis, and TE were excluded with possible cause of MCA being either atypical Takotsubo4or AFE. Patient was then started on epinephrine infusion to improve myocardial contractility and admitted to ICU for further management.Patient’s myocardial function improved after to be discharged home later.

Discussion: In this case of MCA,TEE was key to guiding clinical decision-making.

References: 1. Mhyre JM, et al. Cardiac arrest during hospitalization for delivery in the United States, 1998-2011. Anesthesiology. 2014;120(4):810-8 2. Kanayama N, Tamura N. Amniotic fluid embolism: pathophysiology and new strategies for management. Journal of Obstetrics and Gynaecology Research. 2014;40(6):1507-17 3. Bahner DP, Hughes D, Royall NA: I-AIM: A novel model for teaching and performing focused sonography. J Ultrasound Med

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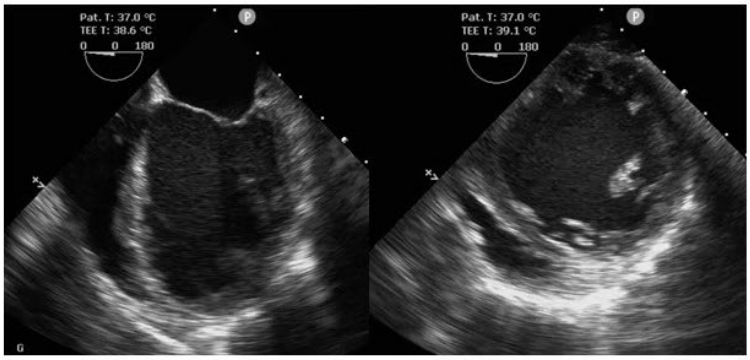
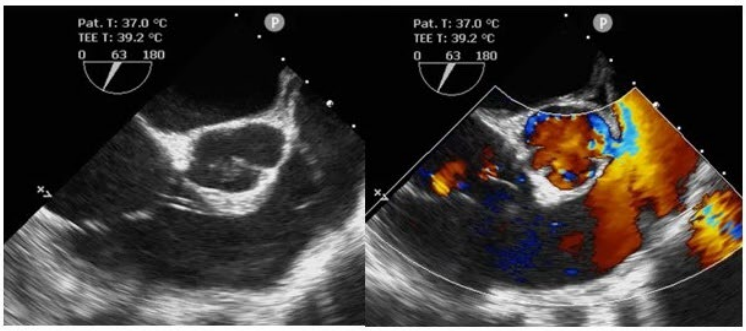
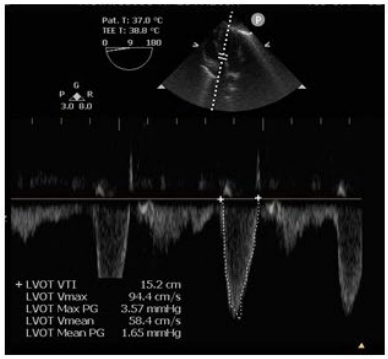


TEE images (mid-esophageal 4 chamber view and trans-gastric midpap. View) showing severely dilated LV with severe reduction in LV systolic function and normal sized RV, other causes; pericardial tamponade, hypovolemia can be excluded as well.



TEE images (RV inflow and outflow view) can be seen with normal sized RV, mild TR and no thrombus can be detected even with the use of color flow maping



TEE can be used to assess cardiac output by measuring LVOT VTI which has shown to have a better correlation with outcomes in cases of advanced HF.

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 11

Evaluating the Feasibility of Measuring VTI as a Surrogate for Cardiac Output in Pregnancy

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Abstract:
Introduction: In developed countries, although cardiovascular diseases are infrequent, they are the leading cause of maternal mortality which has been increasing in the last 30 years from 3% to 15%.[1] In routine practice, heart rate (HR) and blood pressure (BP) are used as surrogate markers for measurement of cardiac output (CO) and placental perfusion. However, there is poor correlation between CO and both BP and HR. For example, preeclampsia is associated with reduced stroke volume (SV) in the setting of normotension.[2] Transthoracic echocardiography (TTE) is a widely accepted technique for CO measurement due to its non-invasive nature and absence of ionizing radiation. It has become more widely accepted for calculation of the SV, and CO by multiplying the velocity-time integral (VTI) of the left ventricular outflow tract (LVOT) by the LVOT area.[3] VTI is obtained through pulsed wave doppler interrogation at the LVOT in an apical 5-chamber view.[4] The LVOT diameter is almost constant, therefore LVOT area is rarely taken into account for tracking the SV or CO, and any change in the SV should be due to changes in LVOT VTI.[5] The primary objective of our study is to evaluate the feasibility of obtaining VTI measurements in parturients.

Methods: 55 Full term parturients with a singleton pregnancy were recruited. Two LVOT VTI measurements were obtained for each parturient and the intra-rater reliability was assessed. Our primary outcome of interest was the percentage of images rated as a 2 or 1 on the 3-Point Likert Scale for Imaging Quality. Our secondary outcome of interest was the average time to obtain an image.

Results: We were able to measure the LVOT VTI in all our patients on both attempts with good image quality (either score 2 or 1 on a 3-Point Likert Scale for Imaging Quality) which allowed us to measure the LVOT VTI. None of our patients had a score of 0. The intraclass correlation coefficient between both measurements (V1/V2) was 0.79 (95% CI 0.78 to 0.80)

showing strong intra-patient reliability. The average time needed to get the VTI measurements was 63.65±26.59 seconds on the 1st attempt and 44.22±20.5 seconds on the 2nd attempt.

Conclusions: This study demonstrates that VTI measurements in partuerients were obtained rapidly and with good intraclass correlation making it a feasible method to estimate SV.

References:

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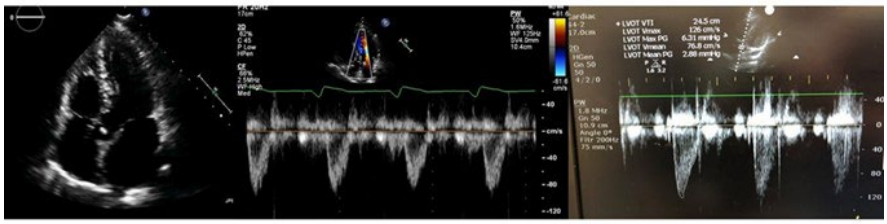

5-chamber view pulsed wave doppler at the LVOT Tracing the envelope of the LVOT flow

Abstract #: SUN – RA & CR – BS 4 – BR 1 – POCUS & Failures – 12

Neuraxial Analgesia/Anesthesia in Super and Super- Super Morbid Obese Pregnant Women. Have We Gotten Better? What is the Status?

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Peter Rock, MD, MBA - University of Maryland School of Medicine

Abstract: Morbid obesity in pregnant women continues to rise. There is an increasing trend of super (BMI ≥ 50) and super-super (BMI ≥60) morbid obese parturients presenting for delivery. The epidural catheter replacement rate decreased from 42% in 1993 to 17% in 2014 in morbidly obese parturient.[1,2] In this retrospective cohort study, we analyze performance and success of neuraxial analgesia in pregnant subjects with BMI > 50 and BMI > 60 as compared to parturients with lower BMI.

Methods: The data from anesthesia records for pregnant subjects receiving either neuraxial labor analgesia or anesthesia for vaginal or cesarean delivery from 2016 to 2023 were extracted from the IRB-approved anesthesiology perioperative data warehouse. Cases were excluded for missing BMI, and dilatation evacuation procedures. The data included demographic data (e.g., age, BMI, gravida, parity), neuraxial anesthesia type details and their success, number of attempts, outcome of replacement of failed neuraxial analgesia/anesthesia, conversion to general anesthesia due to failure of regional anesthesia. T-tests were used to analyze the relationship between BMI and regional anesthesia failure. Logistic regression and Poisson regression analysis were used to evaluate the effect of BMI on regional anesthesia failure and number of epidural attempts.

Results: There were 13620 deliveries and 10792 received anesthesia. After exclusion criteria, the distribution of 10483 deliveries is shown in the table. The mean (SD) BMI was 34.3 (8.4) kg/m^2, range 15.9 – 83.6. Morbid obesity (≥40) was present in 20.5%, super morbidity 5.3%, and super-super morbid obesity 1.3% of the sample. Overall replacement rate of epidural catheters was 3% (2.9% in BMI < 50, super obese 5.3%, super-super obese 4.5%). Failed regional requiring conversion to GA varied from 1.2 to 2.2%. Mean BMI differed significantly between patients with success or failure of regional anesthesia. For every 1-unit increase in BMI, the likelihood of regional anesthesia failure increases by 2% (Odds Ratio 1.0195, 95% confidence interval 1.009 – 1.030). However, there is no statistically significant difference in conversion to GA between the groups of BMI < 40, BMI 40-49.9, and BMI ≥ 50. But, replaced catheters are more likely to fail in BMI ≥ 50 (7.7% v 3.7% BMI < 50). Furthermore, patients with BMI ≥ 50 are more likely to have a greater number of epidural attempts with an

incidence rate ratio of 1.20 (95% CI 1.12, 1.30; p-value < 0.001, compared to those with BMI ≤ 40 (Poisson regression).

Conclusion: Super and super-super morbidly obese pregnant women require a greater number of attempts for successful neuraxial outcome compared to those of normal BMI. Conversion to GA for failed neuraxial anesthesia is 5.2% in BMI ≥ 70, but still within the SOAP Center of Excellence Criteria. However, replaced catheters are more likely to fail If BMI ≥ 50.

References:
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Morbidobesity table.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 01

Euglycemic Diabetic Ketoacidosis in a Parturient Leading to Maternal Cardiac Arrest

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Catherine Cha, MD - University of California Los Angeles (UCLA) Department of Anesthesiology
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Jonathan Dahan, MD - University of California Los Angeles (UCLA) Department of Anesthesiology

Introduction: Diabetic ketoacidosis (DKA) poses significant morbidity and mortality risk to the diabetic parturient. Complications include metabolic derangements that increase risk for fetal demise and in some cases, maternal cardiovascular collapse. DKA typically presents with a triad of profound hyperglycemia, ketosis, and anion gap metabolic acidosis in patients with type 1, type 2, or gestational diabetes. It often occurs in states of euglycemia in pregnant patients, which may delay diagnosis and management.

Case One: 36 y.o. G2P0 at 34w1d with insulin-dependent type 2 diabetes presented after 15 hours of diarrhea and abdominal pain thought to be due to gastroenteritis. Initial labs showed Na 128, Glu 124, HCO3 10, AG 20, VBG pH 7.28, and UA with 3+ ketones. Volume resuscitation was started as well as insulin gtt. The patient deteriorated clinically with increased work of breathing and was transferred to MICU for higher level of care. Fetal heart tracing revealed prolonged decelerations and bradycardia to 50s without return to baseline, prompting emergent cesarean section under GETA. The procedure was complicated by placental abruption and significant uterine atony. VBG showed worsening acidosis, pH 6.86/HCO3 4.8/BE -26 and Hgb 6.2. Patient became hypotensive without significant response to vasopressors and entered PEA arrest. After coding the patient for 26 minutes, she was initiated on VA-ECMO. TEE noted global hypokinesis. Labs were significant for plt 13, INR 2.8, fibrinogen 72. The patient was stabilized on ECMO and transferred to CTICU. She was suspected to have intraoperative amniotic fluid embolism (AFE) given rapid cardiovascular collapse, DIC, and placental abruption.

Discussion: Changes in maternal physiology such as accelerated starvation, increased glomerular filtration rate, and dilutional effects on maternal plasma volume can make diagnosing euglycemic DKA in pregnancy challenging. In this case, the patient suffered several complications following DKA diagnosis including worsening acidosis, fetal cardiovascular distress, high suspicion for AFE, and ultimately maternal cardiac arrest. It is possible that the patient's worsening metabolic status contributed to weakened maternal-fetal circulatory interface and potentiated AFE. This case highlights the importance of early diagnosis and

treatment of euglycemic DKA to mitigate further complications to mother and fetus. Management of the critically ill parturient is enhanced by close collaboration with an OB anesthesiologist who can obtain access and guide volume resuscitation, electrolyte repletion, and glucose management.

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Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 02

Amniotic Fluid Embolus

Presenting Author: O. Morgan Hall, MD
Presenting Author's Institution: LSUHSC New Orleans Department of Anesthesiology
Co-Authors: Corinne Weinstein, MD - LSU Anesthesiology

Introduction: Amniotic Fluid Embolus (AFE) is a rare but potentially catastrophic complication of labor and delivery. Characterized by cardiopulmonary arrest, PE, DIC, and uterine atony; it is estimated to occur in approximately 1:20,000-80,000 deliveries and carries a mortality rate of up to 80%. The exact pathophysiology remains unclear, however it is thought that introduction of amniotic fluid or fetal components into the maternal circulation is the trigger. 1

Case One: We present a 36 yo G2P1 at 39w1d with PMH of asthma presenting for elective IOL. Epidural labor analgesia was requested and placed without complication. On hospital day 1, the patient developed a non-reassuring fetal heart tracing. Shortly thereafter, the patient became unresponsive and was taken for emergent cesarean delivery. Her airway was secured, and she continued to require escalating hemodynamic support and massive blood product administration. Intraoperative TTE noted RV enlargement. After delivery of the fetus, the patient had surgical findings concerning for development of DIC secondary to a suspected AFE. A hysterectomy was performed. General surgery was consulted intraoperatively to assist with hemostasis, which was ultimately unsuccessful. The patient was transferred hemodynamically stable to the ICU intubated and sedated with an open abdomen. On POD#1, the patient was taken to the operating room for closure of her abdomen and afterwards extubated and continued to improve. She was discharged on POD#5.

Discussion: In the unresponsive obstetric patient, AFE diagnosis requires a high index of suspicion. Treatment must consist of emergent cesarean delivery to remove aortocaval compression, securement of the airway, and rapid correction of maternal hemodynamic instability. Protocolized resuscitation, treatments and laboratory monitoring should be implemented. Ultimately rapid recognition and response are vital to improving outcomes in AFE.

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AFE SOAP 2024 Abstract_Hall.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 03

Safe Removal of Epidural Catheter in the Setting of AFE Requiring VA ECMO

Presenting Author: Lindsay Tremper, MD
Presenting Author's Institution: Northwestern

Introduction: Amniotic fluid embolism (AFE) is a devastating complication of pregnancy caused by entrance of amniotic fluid/fetal material into the maternal circulation, causing massive inflammatory and coagulopathic response, potentially leading to cardiovascular collapse and disseminated intravascular coagulation (DIC)1. Once the underlying cause of DIC has been corrected (delivery of fetus/placenta), the coagulopathy should be corrected with factor replacement2 and hemodynamics with supportive care1 which increasingly includes extracorporeal membrane oxygenation (ECMO) to save the mother's life. Timing of safe removal of an epidural catheter during ECMO becomes challenging in this situation.

Case One: 28 yo G3P1011 at 38 weeks, BMI 40 kg/m2 presented to outside hospital with abdominal pain and elevated blood pressures. She was admitted to labor and delivery and epidural analgesia was initiated. A few hours later, patient became less responsive. Cervix was at complete dilation. Rapidly, she became unresponsive and pulseless. An emergency cesarean delivery was performed with estimated blood loss of 3.5L, requiring 20units packed red blood cells, 2 platelets, 2 fresh frozen plasma, and 1 cryoprecipitate. Bedside echo showed a severely dilated right ventricle with poor bi-ventricular systolic function. Decision made to cannulate for VA ECMO. Despite ECMO initiation, she remained in max pressor shock and was transferred to our medical center. Upon arrival, exam with epidural catheter still in place at 13cm at the skin. Given continued ECMO and transfusion requirements, there was a question of when to safely remove catheter. After discussion with obstetric anesthesiology, and review of literature2, it was decided that the catheter would be removed at INR < 1.3, platelets >70,000 and within 5 days of placement, due to concern for infection. Removal should also occur if it was noted to be 5cm or less at the skin. On POD 4, INR was 1.2 and platelets 87,000, and the catheter was removed without complication.

Discussion: AFE is a rare cause of DIC in pregnancy with often devastating effects on maternal health, including the need for ECMO. Given the rapid coagulopathy, it can be challenging to identify a safe time for epidural removal. Risk of infection increases over time, which must be balanced with the risk of epidural hematoma formation with removal in the setting of coagulopathy. Furthermore, there are no current guidelines in place regarding the safety of indwelling epidural catheters while on ECMO or the timing of their removal to aid in this decision. We hope that this case report serves to guide other clinicians caring for patients in this unfortunate situation more safely.

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Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 04

Perimortem Cesarean Delivery and Refractory Cardiogenic Shock after Atypical HELLP Syndrome vs Acute Fatty Liver of Pregnancy vs Amniotic Fluid Embolism

Presenting Author: Kelechi B. Anyaehie, MD, MPH
Presenting Author's Institution: University of Texas Southwestern Medical Center
Co-Authors: Jacqueline M. Galvan, MD - University of Texas Southwestern Medical Center

Introduction: The incidence of HELLP syndrome in pregnancy is 0.5-0.9%, however, incidence of atypical subtypes is unknown and likely underdiagnosed (1). In atypical HELLP syndrome, hypertension or proteinuria are absent in 10-20% of patients and lab abnormalities can be variable (1). Clinical syndromes of HELLP have been associated with a 15% risk of DIC and high morbidity, thus anesthesiologists must remain vigilant for these conditions (2).

Case One: A 19-year-old G1 at 37w2d presented to her MFM appointment with worsening nausea, jaundice, and icterus. Workup a month prior, at symptom onset was notable for mild transaminitis, positive EBV IgG with elevated viral load, managed with supportive care. The patient was afebrile with blood pressure of 108/69. Labs revealed normal glucose, mild transaminitis, elevated total bilirubin, elevated alkaline phosphatase and coagulopathy as evidenced by an INR of 1.7, PTT 43.9, PLT 147,000 with no clear etiology. Fibrinogen was low at 233 mg/dL with undetectable Haptoglobin, suggesting hemolysis. Urinalysis was negative for proteinuria. Given coagulopathy, the patient was admitted for IOL. 2 FFP and TXA were given, following ROTEM evidence of a slightly prolonged clotting time. Dural puncture epidural was placed uneventfully. Intrapartum, development of non-reassuring fetal heart tracings with seizure activity was noted. Lorazepam and magnesium were given for presumed eclampsia treatment. The patient was transported to the OR for stat cesarean delivery (CD), where she suffered cardiac arrest. She was intubated and perimortem CD was performed with ongoing resuscitation efforts. ROSC was achieved after ten minutes. CD was complicated by uterine atony/PPH with QBL 2L. MTP with appropriate uterotonics were given. Post op day 0, Chest CTA revealed a right lower lobe segmental PE with right ventricular strain. Echocardiography showed a dilated RV with large mobile thrombus and globally depressed biventricular function. MRI showed multiple ischemic cortical strokes. On post op day 1, she had refractory cardiogenic shock requiring VA ECMO cannulation x 72 hours as a bridge to ventricular function recovery.

Discussion: Undetectable haptoglobin levels, transaminitis, thrombocytopenia, and seizure in absence of hallmark preeclampsia features suggest atypical HELLP syndrome. Resultant DIC (evidenced by hypofibrinogenemia and worsening coagulopathy) promoted multifocal thrombi and massive PPH. Alternative diagnoses include AFLP and amniotic fluid embolism. Timely recognition and delivery with preparation for potential adverse sequelae is paramount.

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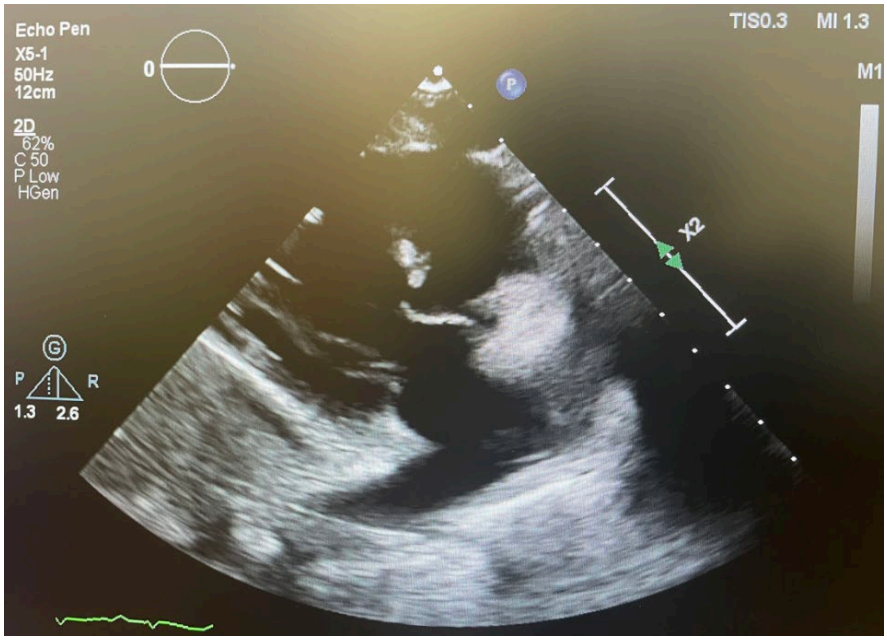

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 05

Amniotic Fluid Embolism: Early Recognition and Intervention

Presenting Author: Kunal Sampat, D.O.
Presenting Author's Institution: Tufts Medical Center, Department of Anesthesiology and Perioperative Medicine

Introduction: Amniotic fluid embolism (AFE) is an extremely rare (5.5 per 100,000 pregnancies) but devastating complication (mortality 24.8%) of pregnancy (1). Risk factors include advanced maternal age, cesarean delivery, placenta previa, and induction of labor (2). The major challenges include initial diagnosis, rapidly starting chest compressions to obtain early return of spontaneous circulation, and management of bleeding from disseminated intravascular coagulation (DIC) (1). We present the case of a patient who had AFE during cesarean delivery and had a very favorable outcome.

Case One: The case was a 32-year-old female G2P0010 who presented at 33 weeks gestation with type II vasa previa, bilobed placenta, and polyhydramnios. Her hospital course was complicated by multiple episodes of vaginal bleeding, which eventually resulted in urgent cesarean delivery under spinal anesthesia. Immediately following delivery, the patient exhibited seizure-like movements, became unresponsive, and was found to be in pulseless electrical activity arrest. She was immediately intubated, chest compressions were initiated, and phenylephrine and ephedrine were given. Within two minutes, she had return of spontaneous circulation. Central venous access and an arterial line were established with subsequent oozing noted around the arterial line and increased uterine bleeding consistent with DIC. The presumptive diagnosis at this point was AFE. The patient received uterotonics, antifibrinolytics, fibrinogen concentrate, packed red blood cells, fresh frozen plasma, cryoprecipitate, and had a Bakri balloon placed with hemostasis ultimately achieved. She went to the surgical intensive care unit and was subsequently extubated on post-op day 1, and was found to be fully neurologically intact without any sequelae from the event. She was discharged from the hospital with a healthy baby.

Discussion: This case highlights the impact that early recognition and intervention can have when treating AFE. Key factors that allowed for a positive outcome were immediately securing an airway, calling for help early, quickly recognizing cardiac arrest, starting high quality compressions, establishing prompt vascular access and monitoring, and clinically recognizing DIC early and starting aggressive resuscitation. While AFE remains rare, given the severe outcomes associated it is important to always keep this diagnosis on the differential and quickly intervene if needed.

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Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 06

Navigating Splenic Hemorrhage in Pregnancy: A Multidisciplinary Case Report

Presenting Author: Danran Zhou, RN, BS
Presenting Author's Institution: Brigham and Women's Hispital

Introduction: The management of splenic hemorrhage during pregnancy requires urgent, multidisciplinary care due to the increased risk. Diagnostic challenges and the need for swift intervention to ensure the safety of both mother and child are paramount. This case report illustrates a rare but critical instance of splenic hemorrhage in a pregnant patient, emphasizing the vital role of collaborative medical expertise in guiding successful outcomes.

Case One: Clinical History: A 27-year-old female, 33 weeks pregnant, presented with atraumatic left low back pain. Diagnostic radiology revealed a sizable left upper quadrant splenic hematoma, necessitating the formation of a comprehensive multi-disciplinary team. This team, comprising experts from various specialties, including Maternal fetal medicine, Anesthesiology, Interventional radiology, Trauma surgery, Nursing and Intensive Care, was pivotal in planning and executing the patient's management. The patient was urgently taken from obstetric triage directly to the operating room, received blood transfusion before been induced for emergency surgery due to her unstable condition. Exploratory laparotomy was performed under intravenous general anesthesia, with continuous fetal monitoring. The surgery involved hematoma evacuation, managing hemorrhagic ascites, performing a splenectomy. The team eventually elected for a cesarean section given the unclear source of bleeding and pending re-exam of the open abdomen. Postoperative pain was managed with transversus abdominis plane catheters and hydromorphone patient-controlled analgesia, transitioning later to oral analgesics. The patient’s recovery was marked by closure of abdominal incision.

Discussion: Discussion: This case is a prime example of the vital role of preoperative assessment and the necessity for prompt, coordinated responses in managing complex medical situations such as in this case a splenic hemorrhage. The collaborative approach, integrating the skills of various medical disciplines, was crucial in optimizing patient care and outcomes. Anesthetic management with proper access and volume resuscitation to maintain hemodynamic stability is crucial in the successful management of the case. The effective management of pain was pivotal in ensuring the patient's recovery and the overall success of the surgical interventions. In conclusion, this case illustrates the critical importance of a multidisciplinary approach in the management of pregnancy-related splenic hemorrhage. Timely intervention, along with precise and patient-specific management strategies, were key to ensuring the well-being of both the mother and the newborn. This case study serves as a testament to the necessity of such an integrated approach, highlighting the challenges and successful strategies in managing complex medical scenarios during pregnancy.

References: Aung et al. Int J Gynecol Obstet 2022

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 07

Peripartum Hyponatremia

Presenting Author: Nitisha Lotun, MD
Presenting Author's Institution: University of Chicago
Co-Authors: Sarah Nizamuddin, MD - University of Chicago

Introduction: A decreased serum sodium is part of the physiologic changes of pregnancy. It occurs within the first two months, with an average reduction of 5 mEq/L from baseline and typically stabilizes until delivery. The increase in beta-hCG "resets" the threshold for ADH release, leading to an increase in water retention. However, serum sodium of < 130 mEq/L is atypical and warrants further investigation due to the potentially fatal consequences on both the parturient and fetus3.

Case One: A 39 YO G4P0030 at 39wd4 was admitted for IOL for pre-eclampsia with severe features. Her pregnancy had otherwise been uncomplicated. She was induced and was started on oxytocin. She had an epidural catheter placed 12 hours after initiating oxytocin. Thirty-six hours post induction, she became acutely hyponatremic to 129 mEq/L (Cr also increased to 0.88 mg/dL). Her sodium nadired at 123 (Cr peaked at 1.5), despite a fluid bolus. Oxytocin infusion was stopped. She underwent a Caesarean delivery for arrest of dilation 48 hours after induction, which was complicated by hemorrhage (QBL of 1.8 L). Given the concerns of hyponatremia, high-dose oxytocin administration was avoided intraoperatively. Her hyponatremia and creatinine also normalized following hypertonic saline administration postoperatively.

Discussion: Oxytocin differs from ADH by 2 amino acids and exerts its anti-diuretic effects by binding to the renal vasopressin receptors. Oxytocin infusions have been shown to induce a dose-dependent decrease in urine flow, with an infusion rate of 50 milliunits/min reducing the urine flow by 90%.1. However, lower doses of < 20 mU, used for the augmentation of labor, only causes a slight reduction in urine flow that is unlikely to lead to significant hyponatremia. Higher doses and infusions in D5W are risk factors for the development of drug-induced hyponatremia from oxytocin. There have been no studies that found a relationship between the duration of oxytocin infusion and the risk of hyponatremia. Hyponatremia caused by pre-eclampsia is poorly understood and currently a diagnosis of exclusion. Severe hyponatremia attributed to pre-eclampsia is still constrained to case reports, with a lack of published guidelines on the matter. Proposed mechanisms include increased vasopressin sensitivity, placental overproduction of vasopressin or decrease in placental vasopressinase. In these case reports, hyponatremia was often refractory to fluid restriction/ isotonic fluid administration and resolved only after delivery.

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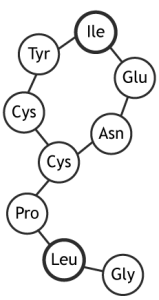
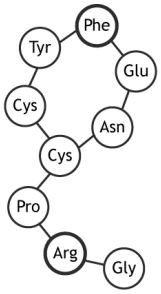


Oxytocin



Vasopressin

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 08

Accelerated Idioventricular Rhythm Diagnosed Intra-Operatively in Pre-Eclamptic Parturient without Peripartum Cardiomyopathy: A Case Report

Presenting Author: Daniel Tobes, DO
Presenting Author's Institution: University of Chicago Department of Anesthesia

Introduction: In the United States, cardiovascular disease affects 1-4% of pregnancies annually (1). Cardiac arrhythmias pose significant concerns for maternal and fetal well-being (2). Ventricular arrhythmias are commonly associated with underlying structural heart disease, and thus warrant further workup (3). We present the case of a 24-year-old woman (G3P2), without prior cardiovascular history, who presented with a new wide-complex arrhythmia during surgery.

Case One: A 24-year-old G3P2 parturient presented at 39 weeks gestation for a trial of labor after cesarean section. Her pregnancy was complicated by polyhydramnios, pre-eclampsia (without severe features), gestational diabetes, and an active RSV infection at the time of induction. After a failed induction of labor she underwent a cesarean section with successful conversion of her labor epidural. Intraoperatively she intermittently experienced a wide-complex ventricular arrhythmia, but remained asymptomatic and otherwise hemodynamically stable. Post-operative correction of her hypomagnesemia (0.7mg/dL) did not resolve the arrhythmia. Transthoracic echocardiogram on postoperative day 1 revealed mild systolic dysfunction with abnormal septal motion. Electrocardiogram demonstrated an accelerated idioventricular rhythm, which converted to normal sinus rhythm by postoperative day 2. Cardiology considered the findings unrelated to peripartum cardiomyopathy, favoring transient structural changes linked to pre-eclampsia and surgery. Her subsequent Holter monitoring post-discharge confirmed sustained normal sinus rhythm.

Discussion: During pregnancy, hormonal, hemodynamic, and autonomic shifts may heighten the risk of cardiac arrhythmias (4). Limited literature on accelerated idioventricular rhythms during labor exists, likely due to infrequent telemetry monitoring, typically reserved for operating rooms or patients with pre-existing cardiovascular conditions. Existing case reports lack associations with structural changes, as in our case (5, 6). Following discussions with cardiology, we hypothesize that the arrhythmia trigger may be linked to acute stress induced by pre-eclampsia, labor, and cesarean section, potentially exacerbated by the patient's hypomagnesemia.

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Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 09

A Parturient with a Lung Arteriovenous Malformation and a New Diagnosis of Hereditary Hemorrhagic Telangiectasia

Presenting Author: Amanda Rodriguez, MD
Presenting Author's Institution: UThealth Houston - Houston, Texas
Co-Authors: Kendra Brown, MD - The University of Texas Health Science Center in Houston

Introduction: Hereditary Hemorrhagic Telangiectasia (HHT) is a genetic disorder affecting multiple organs and characterized by arteriovenous malformations (AVM) including in the lungs (Pulmonary AVM), epistaxis, and cutaneous telangiectasia. Pregnancy can influence their growth with potentially worsening symptoms or increasing risk of complications secondary to AVM rupture. [1-2]

Case One: A 36-year-old G11P3073 at 37w1d presented to an outside hospital with worsening dyspnea and orthopnea. CTA chest with contrast showed ovoid and serpentine densities in the right lower lobe consistent with PAVM. The patient was transferred to our institution for a higher level of care. A multidisciplinary team including pulmonary critical care medicine, maternal fetal medicine, interventional radiology, anesthesiology, and acute heart failure convened to formulate a comprehensive care. For our anesthetic plan, we considered the risks-benefits of general anesthesia compared to neuraxial anesthesia. For neuraxial, our primary concern was infirming vascular malformations in the spine, but we had no imaging. For general anesthesia, our concerns were sympathetic stimulation from laryngoscopy and intubation during rapid sequence induction, leading to potential PAVM rupture. Also, the use of positive pressure ventilation with increase in intrathoracic pressure could also compromise the PAVM. MFM wanted to proceed with Cesarean Delivery (CD) due to concern for her respiratory symptoms including tachypnea and desaturation from 92-94% in room air. However, after expressing our concerns and since the patient was stable, decision was made to proceed with further testing to better classify the extent of her disease and to determine if neuraxial would be feasible. The patient underwent MRI of the lumbar spine as well as the abdomen and pelvis which ruled out vascular malformations. She was scheduled for CD under spinal anesthesia with plan for ICU admission for hemodynamic monitoring. 2 large bore peripheral IV’s and an arterial line were placed. ECMO was on standby during the CD. She had PAVM embolization in the immediate postpartum period.

Discussion: Treatment for PAVM in pregnancy is typically reserved to the second trimester. Embolization prior to delivery was considered but decision was made to wait after the CD. This case highlights the importance of multidisciplinary approach and highlights the change of plan motivated by our anesthesia team to offer the safest option possible for this patient’s anesthesia management.

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Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 10

Management of a Parturient with Poorly Controlled Chronic-Phase Chronic Myeloid Leukemia

Presenting Author: Amy Zheng, MD
Presenting Author's Institution: University of Maryland School of Medicine - Baltimore, Maryland
Co-Authors: Shobhana Bharadwaj, MD - University of Maryland School of Medicine
Bhavani S. Kodali, MD - University of Maryland School of Medicine
Andrea Lorico, MD - University of Maryland School of Medicine

Introduction: A 23yo G1P0 at 30w5d presented for anesthesiology consult for poorly controlled Chronic Meyloid Leukema (CML). CML was diagnosed two years prior and she was treated with dasatinib with excellent response. She self-discontinued treatment after a year and her WBC count at her first prenatal visit was 105 × 109/L. Oncology care was reinstated and pegylated interferon was started due to concerns about the teratogenicity of tyrosine kinase inhibitors. Leukopheresis at 17 weeks gestation was unsuccessful. Her CML did not respond to pegylated interferon and given concerns that she would decompensate into accelerated phase or blast crisis, a decision was made to deliver at 37w and resume dasatinib immediately postpartum.

Case One: Out of an abundance of caution, we discussed with the patient that neuraxial techniques could potentially carry high risk of epidural hematoma or seeding the central nervous system and that harm may outweigh the benefits. She was educated that the alternative labor analgesia options include nitrous oxide or intravenous patient-controlled analgesia (IV-PCA). Alternatively, she could undergo scheduled cesarean delivery under general anesthesia. She elected for induction of labor with nitrous oxide in early labor and a Fentany IV-PCA in active labor. She had an uncomplicated vaginal delivery of a healthy neonate with APGARS 9 and 9 at 1 and 5 minutes and was resumed on dasatinib postpartum day (PPD) 1 before she was discharged PPD2. On outpatient follow up labs two weeks later, her WBC count had dramatically improved to 4.3 × 109/L.

Discussion: There is limited data regarding anesthesia for parturients with CML. In most case reports of parturients with CML, the patients ultimately underwent cesarean delivery under general anesthesia. One concern of neuraxial techniques in patients with CML is the risk of inadvertently seeding the CNS with blast cells and leading to a CNS blast crisis, which has a very high mortality rate and reported median life expectancy of three months. Though not in a parturient, there have also been case reports of spontaneous epidural hematoma in patients with CML due to thrombocytopathy. This case highlights important obstetric and anesthetic considerations for parturients with oncologic diagnoses. Multidisciplinary care and patient education are paramount.

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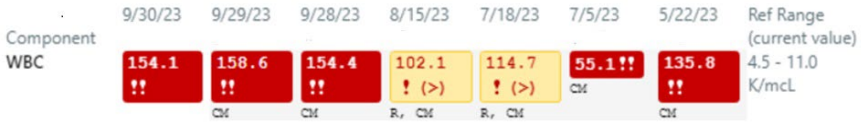

Component	9/30/23	9/29/23	9/28/23	8/15/23	7/18/23	7/5/23	5/22/23	Ref Range (current value)
WBC	154.1 !!	158.6 !! CM	154.4 !! CM	102.1 ! (>) R, CM	114.7 ! (>) R, CM	55.1 !! CM	135.8 !! CM	4.5 - 11.0 K/mcL

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 11

Anesthetic Management of a Parturient with Metastatic B-Cell Lymphoma

Presenting Author: Rechna Korula, MD, MS
Presenting Author's Institution: Northwestern Memorial Hospital
Co-Authors: Andrew Hallmark, M.D. - McGaw Medical Center of Northwestern University

Introduction: A 33yo G2P1 at 32w2d with a history of BCL s/p cycle 4/6 of R-CHOP, preeclampsia without severe features, diet-controlled gestational diabetes, and a prior Cesarean delivery, was admitted for severe-range blood pressures.

Case One: An MRI prior to her initial cycle of chemotherapy revealed multiple thoracic and lumbar metastases with mass effect on the L1–L4 nerve roots. The patient's primary symptoms of groin and pelvic pain resolved after her first round of chemotherapy, implying a reduced tumor burden. Additionally, a repeat MRI following her fourth cycle showed a significantly reduced L1-L3 tumor burden. A TTE performed prior to chemotherapy was significant for mild-to-moderate MR/TR, and RA/LA dilation. Ultimately, the patient had to be delivered at 33w3d for worsening preeclampsia. A repeat LTCS was performed under a single-shot spinal. The procedure was uncomplicated and the patient was discharged POD5 with plans in place for her next chemotherapy cycle.

Discussion: Neuraxial procedures in a cancer setting have two primary theoretical risks: neuraxial seeding of neoplastic cells via dural puncture, and infection (1). Both of these were areas of concern when considering neuraxial anesthesia in this patient, however there have been no case reports of patients experiencing CNS cancer seeding after a lumbar puncture was performed (2). The patient's oncologist also confirmed that patients with lymphoma routinely undergo lumbar taps during treatment. Nevertheless, there is a scarcity of data on neuraxial anesthesia in parturients with BCL. Bleeding risk was another concern given the possibility of accidental needle puncture of nearby metastases during neuraxial placement. The patient's repeat MRI showing a decreased tumor burden relative to possible neuraxial routes was reassuring. Areas of lesser concern included possible cardiomyopathy given that the patient was on cycle 4/6 of R-CHOP. A repeat echo was conducted on admission and was notable only for grade 1 diastolic dysfunction. Studies also show the incidence of early-onset chronic doxorubicin cardiotoxicity, which presents within a year of treatment, is less than 2% (3). Overall, in order to manage these and similar concerns in other parturients, ongoing conversations should occur with hematology and MFM, with emphasis placed on patients' fluctuating clinical status. Ultimately, the patients' own preferences must also be taken into account while advising them on the safety of different anesthetic options.

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Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 12

Mediastinal Mass Pregnancy: Perioperative Management of a Parturient with a Large Mediastinal Mass

Presenting Author: Nicholas Cardillo, MD
Presenting Author's Institution: University of Michigan Department of Anesthesiology

Introduction: Large mediastinal masses are rare and encompass a wide variety of diseases. Regardless of their etiology, these masses present a unique set of challenges for the anesthesiologist because they can cause compression or invasion of vital structures resulting in respiratory insufficiency or hemodynamic decompensation. Detailed preoperative planning with a multidisciplinary team is critical for favorable outcomes.1

Case One: A 30-year-old G5P4 presented at 36 weeks and 2 days with a large mediastinal mass for induction of labor. At 30 weeks, the patient decided to transfer her care to our institution after a CT scan demonstrated a 10 x 9.4 x 10 cm mediastinal mass with thoracic tracheal compression to 4 mm and extension into the right pleural cavity. On initial presentation to our hospital, the patient noted moderate dyspnea on exertion with stridor and hoarseness. Otolaryngology performed a flexible bronchoscopy, which demonstrated proximal narrowing of the airway prior to branching into the mainstem bronchi. Additionally, the patient's case was presented at a multidisciplinary conference including anesthesia, thoracic surgery, radiology, and interventional pulmonology. It was noted during the conference that the patient could likely be intubated, but an AFOI should be attempted if the circumstances allowed. The decision was also made to induce labor in the OR and consent the patient for VV ECMO in the event of an emergent situation. Induction was started in the OR at 36 weeks and 2 days. The patient had a dural puncture epidural placed for labor analgesia in addition to two large bore IVs and an arterial line. Overall, induction was unremarkable, and the patient had a successful vaginal delivery in the OR without complication.

Discussion: The initial concern was regarding emergent delivery in the setting of a STAT C-section and our ability to intubate the patient. Due to these concerns, our initial recommendation was for a scheduled C-section with an AFOI. Given the patient's desire for vaginal delivery, we believed that a controlled induction in the OR with the availability of all relevant specialists would be the safest possible option. In case of inability to progress, a contingency plan with elective conversion to C-section would be considered. Our anesthetic plan involved epidural labor analgesia with tight titration to avoid respiratory compromise. Hourly checks were performed to assess for level and catheter migration. Neuraxial for C-section was to be considered if the patient's respiratory status would permit lying flat. GA was our backup plan with preferred AFOI. In an emergent situation, the plan was for IV induction with video laryngoscopy and subsequent bronchoscopy to confirm airway patency and ETT position.

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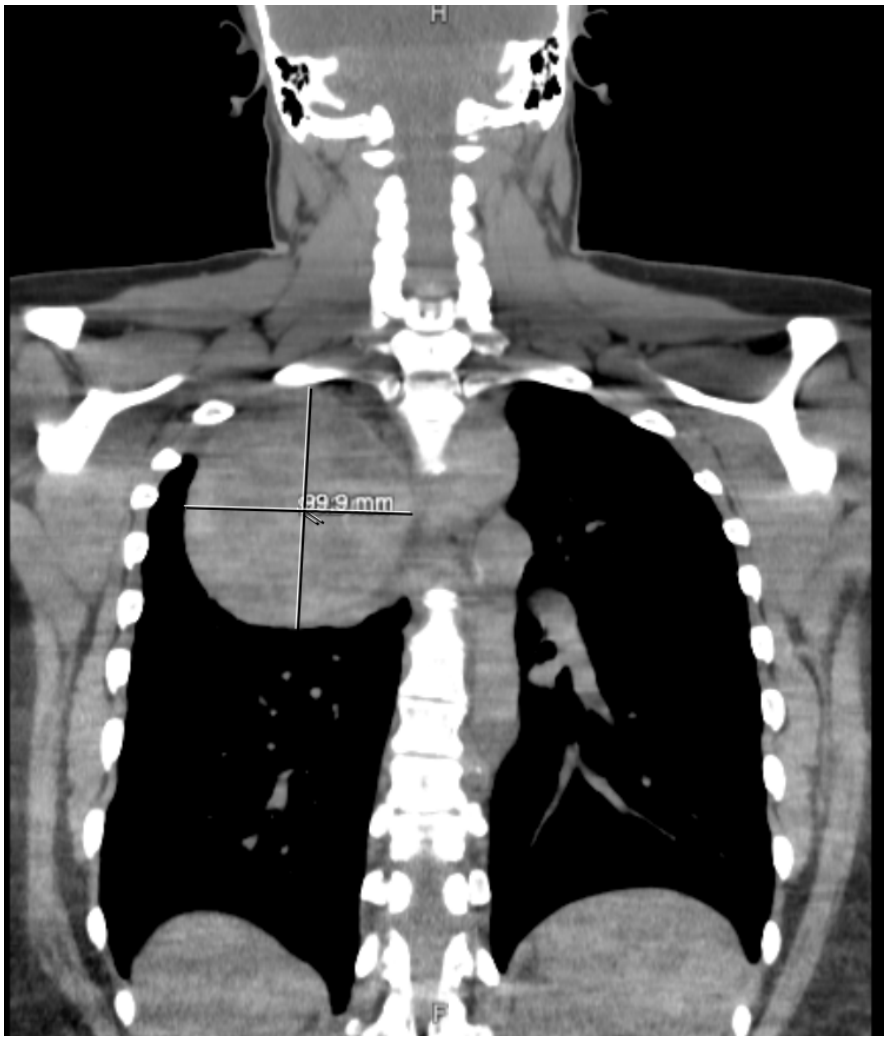

Abstract #: SUN – RA & CR – BS 4 – BR 2 – AFE and emergencies - Case Reports – 01

Cesarean Delivery of Twins at 26-weeks in a Woman with Recurrent Metastatic Osteosarcoma and Mediastinal Mass

Presenting Author: Dayley Keil, MD
Presenting Author's Institution: University of California San Diego - San Diego, California
Co-Authors: Kelsey Pinson, MD - University of California San Diego
Reema Sanghvi, MD - University of California San Diego

Introduction: Metastatic osteosarcoma has a very poor prognosis with < 30% 5-year survival rate.1 We present a cesarean delivery (CD) of premature twins in the setting of acute recurrence of metastatic osteosarcoma.

Case One: A 27 yo G3P1 female with recurrent metastatic osteosarcoma presented at 25w with dichorionic diamniotic twins and acute chest pain, hypoxia, and hypotension. CTA chest showed significant increase in pulmonary metastases and enlargement of an anterior mediastinal mass (7x7 cm) abutting the left pulmonary artery (PA) and left ventricle (LV) with possible myocardial invasion. A multidisciplinary team met for delivery planning, including maternal fetal medicine, oncology, NICU, anesthesia, and cardiothoracic surgery. The mediastinal tumor was inoperable, and her best treatment option was palliative radiation. ECMO was not an option due to terminal cancer. Goals of care included maternal comfort, positive delivery experience, fetal maturity, initiation of maternal palliative radiation, and avoiding an emergent or perimortem CD. Since she was at high-risk for a catastrophic cardiopulmonary event, the team agreed that a planned CD at 26w best balanced maternal-fetal goals. Access for CD included an arterial line, 8.5 Fr Cordis, and two 18G peripheral lines. A low-dose combined spinal-epidural with 0.6 mL 0.75% hyperbaric bupivacaine, 15 mcg fentanyl, and 250 mcg morphine was placed. The patient was positioned with left uterine displacement and elevated head of bed. The patient had a T12 sensory level from low-dose spinal in the semi-recumbent position. A total of 15 mL of 2% lidocaine with bicarbonate and epinephrine was titrated over 20 minutes to achieve T6 sensory level while maintaining hemodynamics with norepinephrine infusion. Delivery of the twins was uncomplicated. Prophylactic 3u oxytocin bolus was administered at cord clamp, followed by a 5 unit/hr infusion with adequate uterine tone. Quantitative blood loss was 750 mL. The patient received 1200 mL crystalloid and 1 RBC. Norepinephrine was discontinued and she was transferred to recovery in stable condition.

Discussion: This case demonstrates patient-centered management of a unique combination of clinical factors to maximize maternal and fetal wellbeing. Delivery planning aimed to optimize fetal condition while providing a positive birth experience that allowed the patient additional time with her children. Anesthetic management was based on the large mediastinal mass with LV/PA compression. Key points included invasive hemodynamic monitoring, slow titration of neuraxial anesthetic, and norepinephrine for maintenance of SVR with inotropic support. Semi-recumbent positioning with left tilt was key to prevent mediastinal mass effect. This

patient had a good outcome and is receiving palliative radiation and visiting her babies in the NICU at 6 weeks postpartum.

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SOAP Osteosarcoma image.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 2 – AFE and emergencies – Case Reports – 14

Peripartum Anesthetic Considerations in a Patient with Fontan Physiology and Placenta Accreta Spectrum

Presenting Author: Braydon Bak, MB, BCh ,BAO
Presenting Author's Institution: Mayo Clinic
Co-Authors: Katherine W. Arendt, M.D. - Mayo Clinic
Marissa L. Kauss, MD - Mayo Clinic
Emily E. Sharpe, MD - Mayo Clinic

Introduction: We present a patient with Fontan physiology and placenta accreta spectrum (PAS) undergoing cesarean delivery (CD) and hysterectomy.

Case One: A 34-year-old G3P2002 with a history of congenitally corrected transposition of great arteries status post Fontan procedure with normal ejection fraction, atrioventricular block and pacemaker dependent, thrombocytopenia, liver fibrosis, and PAS diagnosed by ultrasound and MRI imaging presented for a planned cesarean hysterectomy at 37 weeks in the cardiac operating room. She had two prior CDs with sequential combined spinal epidural (CSE) that were well tolerated. Pacemaker was initially set to asynchronous mode at 100bpm with pacing pads in place. Placement of a right internal jugular central venous catheter and radial arterial line occurred prior to neuraxial anesthesia. Sequential CSE was placed (intrathecal 0.7 mL of 0.75% hyperbaric bupivacaine, 15 mcg fentanyl, and 150 mcg morphine) with epidural titration (3 mL of 1.5% lidocaine prior to midline incision and 50 mL of 2% lidocaine was administered in 3-9 mL aliquots throughout the case). Phenylephrine infusion was initiated with spinal placement and norepinephrine / epinephrine were in line. Nitric oxide was available, 2 units of red blood cells were in the room, and interventional radiology was on standby. The patient experienced 2.3 L of blood loss, received 1 unit of red blood cells, 5 L of plasmalyte, and did not require uterotonic medications. She tolerated the procedure well and remained awake under neuraxial anesthesia. She was transferred to the cardiac care unit (CCU) on room air, requiring low dose phenylephrine, and was discharged from the CCU on postpartum day 2.

Discussion: Peripartum care for women with Fontan physiology and PAS present a unique set of challenges to anesthesiologists. In our case, invasive blood pressure monitoring was performed to help meet hemodynamic goals (decreased pulmonary vascular resistance (PVR) and maintained preload, myocardial contractility, and cardiac output). A sequential CSE with epidural titration was performed to optimize passive preload and cardiovascular hemodynamics. Due to concern for significant postpartum hemorrhage in the setting of congestive hepatopathy and PAS, adequate vascular access was obtained. Management of postpartum uterine atony with Fontan physiology risk hemodynamic compromise with boluses of oxytocin or administration of carboprost, and methylergonovine. The combination of Fontan physiology with physiologic changes in pregnancy in the setting of PAS places these patients at high risk for multiorgan system complications and mortality. Anesthesiologists

must be well-versed in the unique physiology and comorbidities of this patient population.

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Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 01

Management of a Parturient with Elevated Mitral Valve Gradient and Suspected Prosthetic Mitral Valve Thrombus

Presenting Author: Amy Zheng, MD
Presenting Author's Institution: University of Maryland School of Medicine - Baltimore, Maryland
Co-Authors: Shobhana Bharadwaj, MD - University of Maryland School of Medicine
Ashanpreet Grewal, MD - University of Maryland School of Medicine
Andrea Lorico, MD - University of Maryland School of Medicine

Introduction: We present a 22yo G1P0 at 30w1d with a history of a mitral valve replacement who presented with concern for prosthetic valve thrombus. The patient had a history of mitral valve regurgitation s/p mechanical mitral valve replacement at 5yo. She was on warfarin therapy pre-pregnancy and enoxaparin during pregnancy and was followed with weekly anti-Xa levels, though they were frequently subtherapeutic. She underwent routine echocardiogram, with her baseline demonstrating normal biventricular function, mean mitral gradient 6.1 mmHg, and RVSP 40. At 30w1d she had an interval echo that showed an increased mean mitral gradient to 22 mmHg and a possible clot underlying the mechanical valve. She admitted for management of a potential mitral valve thrombus.

Case One: Repeat echo on admission showed further worsening of mitral gradient to 44 mmHg, RVSP 65, severe tricuspid regurgitation, and hepatic vein flow reversal. Transesophageal echo was recommended by cardiology to further evaluate for a thrombus; however, the patient refused due to concerns about general anesthesia. Given that she was subtherapeutic on enoxaparin, she was transitioned to a heparin infusion. After a joint discussion with Maternal Fetal Medicine, cardiology, critical care, and obstetric anesthesiology, the decision was made to have her remain inpatient on a heparin infusion and monitor with weekly echo until delivery at 37 weeks given her failed outpatient anticoagulation and high risk for decompensation. She had steady improvement in her mitral gradients on therapeutic heparin and at 37w0d the patient elected for primary cesarean delivery with neuraxial anesthesia. Arterial line was placed for closer monitoring, and she received a sequential CSE to maintain hemodynamic stability with attention on limiting tachycardia, hypotension, and hypervolemia. Her delivery was uncomplicated, and she remained stable throughout. Postop she was given furosemide for diuresis and was resumed on heparin six hours post-delivery. Warfarin was started POD1 with plans to bridge with heparin until therapeutic. Unfortunately, on POD4 she left against medical advice despite counseling that she was not yet therapeutic on warfarin. She was given enoxaparin to bridge and scheduled for close outpatient follow-up.

Discussion: Maternal cardiac disease is a leading cause of maternal morbidity and mortality as physiologic changes interplay with disease physiology. Mitral valve disease is the most common valvular disease seen in pregnancy and mitral stenosis is often poorly tolerated due

to the elevated heart rate and increased intravascular volume that occurs with pregnancy. Patients with mechanical valve replacements pose a particular challenge given their need for anticoagulation. Multidisciplinary management can optimize the care of these patients.

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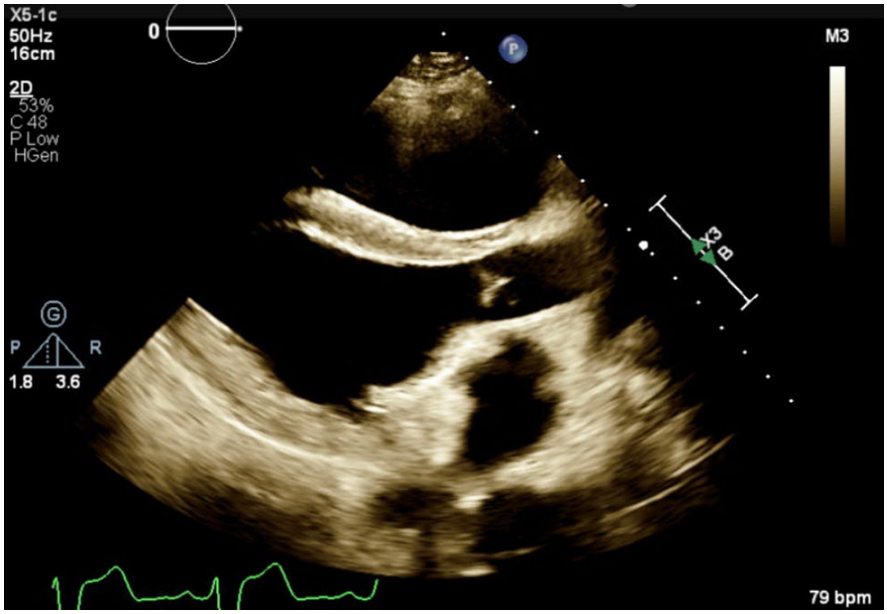

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 02

Management of a Parturient with Severe Mitral Stenosis and Atrial Fibrillation with Rapid Ventricular Rate

Presenting Author: Amy Zheng, MD
Presenting Author's Institution: University of Maryland School of Medicine - Baltimore, Maryland
Co-Authors: Yusuf Ali, MD - University of Maryland School of Medicine
Shobhana Bharadwaj, MD - University of Maryland School of Medicine
John Pallan, MD - University of Maryland School of Medicine

Introduction: We present a 32yo G4P2012 at 32w5d with a history of mitral stenosis (MS) secondary to rheumatic heart disease s/p percutaneous balloon mitral valvuloplasty (PBMV) who was admitted with new onset atrial fibrillation with rapid ventricular rate (RVR) and recurrent severe MS.

Case One: She initially presented to another hospital with pyelonephritis but was tachycardic to 140's with EKG demonstrating atrial fibrillation with RVR. She was started on a diltiazem infusion and transferred to our institution. Diltiazem caused hypotension so she was transitioned to amiodarone. Her blood pressure improved and she converted to normal sinus rhythm. Due to safety concerns of amiodarone in pregnancy, she was transitioned to metoprolol for rate control. Transthoracic echo was obtained and showed now severe mitral stenosis compared to moderate one month prior. She remained otherwise asymptomatic and was euvolemic on exam. Given worsening MS, she was evaluated by cardiac surgery for possible repeat PBMV vs valve replacement. After multidisciplinary discussion between the Maternal-Fetal Medicine, cardiac surgery, cardiology, and obstetric anesthesiology, the decision was made to defer intervention until post-delivery given that she had good functional status and was thought to be able to tolerate labor with early epidural placement and possible assisted second stage. She remained in sinus rhythm for the remainder of her hospital course and at 37w0d she underwent induction of labor. An epidural was placed prior to induction and an arterial line was placed for hemodynamic monitoring. She was monitored on telemetry during labor until 24 hours postdelivery. Her epidural placement and induction were uneventful, and she spontaneously delivered a healthy neonate with APGARs 9 and 9 at 1 and 5 minutes. Enoxaparin was resumed postpartum day (PPD) 1 and she was discharged PPD1 with cardiac surgery follow up set up to plan for valve replacement.

Discussion: Mitral stenosis and atrial fibrillation pose significant risk to the mother and fetus during pregnancy. Mitral stenosis is poorly tolerated as the increased cardiac output and heart rate of pregnancy can result in increased left atrial and pulmonary pressures due to restricted left ventricular inflow. Hemodynamic instability from atrial fibrillation with RVR can result in compromise that affects the fetus. Rapid correction of this arrhythmia is critical; however, careful drug selection is warranted as many rate and rhythm control medications are associated with adverse fetal effects. Unresponsive RVR may even require synchronized

cardioversion to avoid hemodynamic decompensation.

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Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 03

Pregnancy and Cardiac Disease: Two Case Reports

Presenting Author: Anuj Bapodra, MD
Presenting Author's Institution: Maimonides Medical Center
Co-Authors: Raymond Powers, DO - Maimonides Medical Center

Introduction: Cardiovascular disease is the leading cause of maternal mortality in the United States, accounting for >25% of all deaths. Many of these deaths occur in the immediate peripartum period and heart disease in pregnancy is of special importance to obstetric anesthesiologists. Judicious use of appropriate anesthesia and analgesia techniques can contribute to the decreased maternal and neonatal mortality and morbidity.

Case One: 37 years old parturient, history of previous c/s, s/p mechanical mitral valve replacement, complete heart block requiring pacemaker, and bioprosthetic tricuspid valve, on therapeutic doses of low-molecular weight heparin. Recommendations for optimal care for this patient were made during multidisciplinary meeting. TTE demonstrated LVEF 56 - 60%, and normally functioning mitral and tricuspid valves. Patient presented to L&D with premature rupture of membranes at 36 weeks. C-section was performed under general anesthesia (TIVA) with RSI and intubation. Perioperative course was uneventful.

Case Two: 30 year old parturient at 29+ weeks with hx of chronic hypertension, CAD s/p PCI x2 in 2018, uncontrolled Type 2 DM presented with elevated blood pressures. She was previously on clopidogrel and now on aspirin, nifedipine and metoprolol. Transthoracic echo demonstrated EF 51-55%, no A/V dysfunction, no valvular pathology. Stress Test during pregnancy was negative. ECG showed normal sinus rhythm. Anesthesia care team discussed with the patient, the advantages of epidural analgesia inclusive of heart rate and blood pressure control. Patient adamantly declined. Patient had an uneventful vaginal delivery without complications.

Discussion: Cardiovascular disease is the leading cause of maternal mortality in the United States. Due to the vast diversity in pathophysiology and anatomy and the evolving physiologic changes with the pregnancy, it is vital to have ongoing evaluation, appropriate work ups and a comprehensive management plan involving multidisciplinary team discussions to have favorable outcomes. It is also crucial to involve the patient, early on, in the discussions regarding management plan and address her concerns. Planned cesarean delivery may be advantageous in the higher risk patients. For all cardiac pregnant patients in labor, appropriate monitoring and early epidural analgesia is of crucial importance. The postpartum period has some of the highest risk for cardiac complications because of maternal hemodynamics changes inclusive of “autotransfusion” and fluid shifts. These hemodynamic changes can cause worsening cardiovascular function and continued vigilance is essential.

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Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 04

Coagulopathy in a Parturient with Aortic Stenosis Presenting for Cesarean Section

Presenting Author: Kyle Wong, MD
Presenting Author's Institution: UIC

Introduction: Aortic stenosis is the most common cause of left ventricular outflow obstruction in both children and adults. In addition to the hemodynamic changes associated with aortic stenosis, patients can present with bleeding diathesis, a phenomenon known as Heyde's syndrome. In a study of 42 patients with aortic stenosis undergoing aortic valve replacement surgery, a strong association was demonstrated between vWF defects and severity of aortic stenosis with resolution of defects shortly after surgery (Vincentelli et al.). Heyde's syndrome is now thought to be a result of an acquired vWF deficiency caused by cleavage in response to high shear forces from aortic stenosis. We present a case of a parturient with congenital aortic stenosis and potential acquired vWD who was brought to the OR for an emergent cesarean section.

Case One: A 35-year-old, G4P1102 parturient at 35w5d with a history of severe congenital aortic stenosis and prior cesarean section presented to the OB ED for multiple episodes of epistaxis. She had bleeding from the left nostril and subsequently vomited 300mL blood-stained bile. There were prolonged, recurrent late decelerations, and the decision was made to undergo an emergent cesarean under general anesthesia. After induction, hemodynamics were soft requiring minimal vasopressor. An arterial line was placed, and massive transfusion protocol was initiated for continued bleeding from mucosal surfaces and intraoperative hemoglobin of 5.9. Tranexamic acid and carboprost were also administered. While labs were pending, a whole blood clotting test was performed and failed to demonstrate clotting after 20 minutes. The patient received 3u pRBC, 4u FFP, 2u platelets, and 2u cryoprecipitate, which resulted in the cessation of bleeding and no vasopressor needs. The patient was kept intubated and taken to the cardiac ICU. PT, PTT, INR, and fibrinogen drawn prior to transfusing were all within the normal range. TEG, vWF, and Factor 8 activity were only drawn after all products were transfused and also did not show any abnormalities. The following day, ENT performed a right sphenopalatine artery ligation without complications. The patient was extubated on postpartum day 2 and was discharged on postpartum day 4 without further issues.

Discussion: This case report describes an unusual case of continued bleeding in a patient with severe congenital aortic stenosis. The most likely diagnosis was acquired vWD, as the labs drawn do not implicate DIC. This case illustrates the need to consider acquired vWF in aortic stenosis patients, as timely intervention can prevent continued bleeding.

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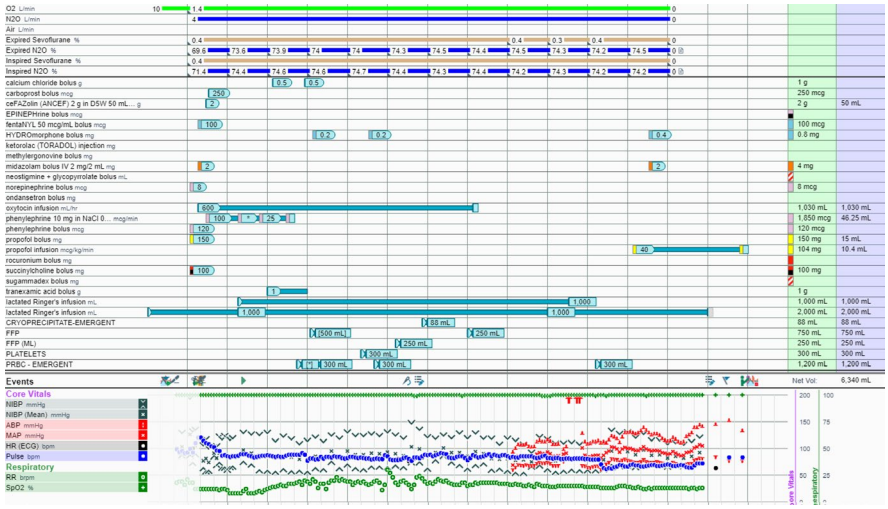

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 05

Point-Of-Care Ultrasound (POCUS) in Diagnosis of Sudden Onset Peripartum Cardiomyopathy Case Report and Anesthesia Management

Presenting Author: Juan Pablo Ghiringhelli, MD
Presenting Author's Institution: Department of Anesthesia and Pain Medicine, Mount Sinai Hospital, University of Toronto
Co-Authors: Cristian Arzola, MD, MSc - Mount Sinai Hospital
Fabrizio Zasso, Toronto University - Mount Sinai Hospital

Introduction: Dyspnea, a common symptom in pregnant women, can pose a diagnostic challenge. While it may often be attributed to physiological changes it can also be a presenting sign of underlying serious pathologies. Peripartum cardiomyopathy (PPCM) is a rare disease that can have devastating effects on both the mother and the fetus. It is crucial to promptly recognize and properly treat it. Point-of-care ultrasound (POCUS) is a rapid method of assessment that can be performed at the bedside. It can be used as an alternative or alongside traditional formal ultrasound conducted by a cardiology service.

Case One: We present an intriguing case involving a sudden onset of pulmonary edema and loss of consciousness in a 48-year-old patient who underwent a category one cesarean section under general anesthesia. A presumptive diagnosis of PPCM was made, and POCUS helped suspect this rare pathology, providing also swift guidance for intraoperative fluid management. Despite these complications, the patient had a favourable outcome and was extubated after four days in ICU.

Discussion: The overall presentation featured a fulminant disease marked by pulmonary edema and an unstable condition, necessitating intubation prior to emergent cesarean section. If diagnosis of PPCM is delayed and the disorder is not recognized, could have devastating consequences. Therefore, is crucial a prompt diagnoses and POCUS plays a key role in achieving this, identifying severe decreased global systolic function, confirming pulmonary edema with the presence of B-Kerley lines and excluding other causes of pathological dyspnea.

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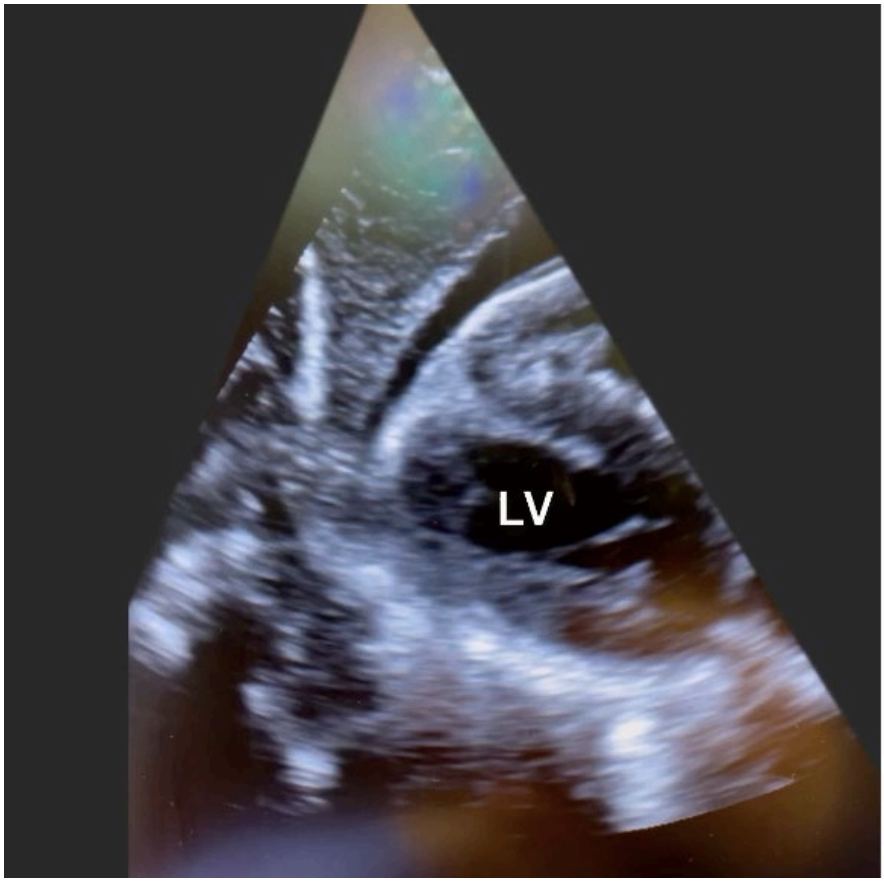

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 06

Shone's Complex Pregnancy: Perioperative Management of a Parturient with Congenital Cardiac Malformation

Presenting Author: Ralph Lamonge, MD
Presenting Author's Institution: University of Michigan
Co-Authors: Nicholas Cardillo, MD - University of Michigan Department of Anesthesiology
Monika Toton, MD - University of Michigan

Introduction: A 20 year old G1P0 at 30w5d with Shone's complex with situs inversus, subaortic stenosis, ventricular septal defect, aortic coarctation with arch hypoplasia, bicuspid aortic valve and mitral stenosis status post end-to-end coarctation repair with VSD closure was admitted for worsening dyspnea in the setting of fetal growth restriction.

Case One: Two months prior to admission, cardiac catheterization demonstrated elevated ventricular filling pressures, PA pressure, cardiac index and low PVR, consistent with Group 2 and Group 5 PH. At admission she reported heart failure symptoms and was volume overloaded. She was aggressively diuresed but remained symptomatic with a rising pro-BNP. A multidisciplinary meeting with MFM, cardiac surgery, congenital cardiology, and cardiac/OB anesthesia resulted in a recommendation for Cesarean delivery in the setting of increased maternal risk with continuing the pregnancy. Our anesthetic plan included joint staffing by cardiac and OB anesthesia, a slowly titrated DPE, arterial blood pressure monitoring, and central venous access. HFNC, vasopressors, and inotropes were immediately available; cardiac surgery was available with ECMO standby. She was hemodynamically stable during the delivery. She recovered in the cardiac critical care unit through POD 1 and was discharged on POD 4. Following delivery, the patient was increasingly responsive to diuretics (20 kg weight decrease in 3 weeks) with improved heart failure symptoms.

Discussion: Shone's complex is a rare congenital cardiac malformation characterized by obstructive left sided cardiac anomalies including a supravalvar mitral ring, parachute mitral valve, subaortic stenosis and aortic coarctation. Shone's complex accounts for 0.6% of all congenital cardiac malformations. The syndrome includes at least one left ventricular inflow tract lesion and one left ventricular obstructive lesion. Together, these structural malformations result in diastolic dysfunction and poor cardiac output eventually leading to pulmonary artery/right ventricular hypertension. Complete Shone's complex often presents as decompensated congestive heart failure early in life. Those with a milder variant display congestive heart failure, poor nutritional intake, and dyspnea in early childhood. Surgical correction of valvular lesions delays the development of pulmonary hypertension and right sided heart failure. The literature is scarce regarding pregnancy and peripartum management of women with Shone's complex. Pregnancy in this population is WHO class 3-4 depending on the severity and is associated with a severe risk of complication and morbidity. The complex nature of their cardiac disease requires close multidisciplinary coordination. Our case demonstrates safe cesarean delivery in a high risk patient with Shone's complex.

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Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 07

Spontaneous Coronary Artery Dissection

Presenting Author: Tyler J. Guidugli, DO
Presenting Author's Institution: University of Kentucky - Lexington, Kentucky
Co-Authors: Jasveen K. Chadha, MBBS - University of Kentucky
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Introduction: Spontaneous Coronary Artery Dissection (SCAD) is a leading cause of myocardial infarction in pregnant women (3). Acute SCAD can lead to MI, arrhythmia, and even sudden cardiac death. Women affected by SCAD rarely have classical risk factors for coronary disease; however, there has been a link to connective tissue disorders (2). Understanding the risk factors, treatments, and outcomes is imperative to reducing morbidity and mortality related to SCAD.

Case One: A 33-year-old female at 36 weeks gestation presented as a transfer for elevated troponins. Her past medical history was notable for congenital pulmonic stenosis s/p failed percutaneous valvuloplasty complicated by RV perforation requiring surgical repair, subsequent surgical PVR with homograft, and bacterial endocarditis as a child. The day before arrival, she developed a severe, aching pain between her scapulae that radiated to the left chest. She was given famotidine and noted improvement in her symptoms. Her work up revealed a normal VQ scan, LVEF 45%, mild pulmonic stenosis, an ECG with no abnormal findings, and consistently up-trending troponins. A heparin infusion was initiated prior to transfer to our facility. On arrival, a multidisciplinary plan was developed between cardiology, MFM, anesthesia, and nursing. Her leading diagnosis was MINOCA with SCAD, however the differential included coronary vasospasm, post-viral myocarditis, and peri-partum myocarditis as potential etiologies. Her chest pain resolved and troponins stabilized. Heparin was discontinued, metoprolol and aspirin were started. Her delivery was planned at 37 weeks and included continuous telemetry, assisted second stage of labor, arterial line, epidural analgesia, postpartum MRI, and postpartum telemetry for five days. At 37 weeks the patient had an uneventful, forceps assisted, vaginal delivery of a healthy neonate. On postpartum day four a cardiac MRI revealed left circumflex territory infarction consistent with SCAD. She was discharged home on post-partum day five. After discharge, she was continued on metoprolol indefinitely and aspirin for one year. Work-up for fibromuscular dysplasia was negative and she was referred to cardiac rehab.

Discussion: SCAD is rare, with an incidence of 0.1%- 1.1% (1). Although rare, it is associated with substantial morbidity. Most cases occur in late gestation and in the postpartum period. Treatment varies depending on the vessels affected but can include PCI, CABG, and conservative management. Current recommendations are that women avoid pregnancy after SCAD due to increased risk of MACE. Obstetric anesthesiologists should be involved in the care of SCAD patients and should be aware of anticoagulants administered peripartum.

References: 1. PMID: 22919449 2. PMID: 35546090 3. 2020;3(9):e2018170. doi:10.1001

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 08

Management of Cesarean Delivery in Fontan Physiology

Presenting Author: Tyler J. Guidugli, DO
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Regina Fragneto, MD - University of Kentucky Department of Anesthesiology
Dien Vu, MD - University of Kentucky

Introduction: The Fontan procedure provides palliation for patients with single ventricle physiology. Pregnancy in women with Fontan physiology puts the patient at an increased risk of multiple complications, such as cardiovascular and thromboembolic events (1). We present a case of a patient for urgent cesarean delivery with prior Fontan palliation.

Case One: A 28-year-old G3P1 at 31 weeks gestation presented for urgent delivery. Her past medical history included debilitating anxiety, severe scoliosis, seizures, chronic HTN, sinus node dysfunction, pacemaker, double inlet left ventricle status post Fontan repair. She developed superimposed preeclampsia during the antepartum period, requiring continued inpatient management until delivery. In the days leading up to delivery she began to have consistent severe range blood pressures and refused anti-hypertensives. Due to continued severe HTN, she was taken for urgent cesarean delivery. In the operating room, she required midazolam and dexmedetomidine while a pre-procedure arterial line was placed. Due to her significant scoliosis and anxiety, epidural placement was extremely difficult and required ultrasound guidance. She received low dose propofol and remifentanil infusions throughout the epidural procedure to manage anxiety. Intrathecal morphine was given, and the epidural was dosed with 2% lidocaine with epinephrine. At delivery, milrinone was started as well as an oxytocin infusion. Nitric Oxide was administered via nasal cannula intermittently throughout the procedure. At the conclusion of the case, the patient was transferred to the ICU in stable condition. APGAR scores were 8 and 9.

Discussion: Outcomes for women with congenital heart disease are improving, and more of these patients reach childbearing age. The obstetric anesthesiologist must be familiar with these lesions as the overall number of Fontan patients is expected to double over the next 20 years (1). Pillars of Fontan physiology management are to avoid increases in pulmonary vascular resistance (PVR), maintain high preload, minimize decreases in hemoglobin and support the systemic ventricle. When caring for a parturient with Fontan physiology consider choice of anesthetic (due to systemic anticoagulation), strategies to treat post-partum hemorrhage (common therapies increase PVR) and level of care needed in the immediate postpartum period. Embolic events such as PE or AFE can be potentially devastating to these patients and need to be considered when developing a plan with a multidisciplinary team. Maternal mortality in these patients is rare which is likely due to the multidisciplinary care they receive (2).

References: 1. PMID: 35953405 2. PMID: 29752389

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 09

Successful Cesarean in Non-Operative Triple Valve Endocarditis

Presenting Author: Madison J. Kohl, DO
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Introduction: Given the ongoing opioid epidemic, increasing cases of infective endocarditis have been reported in pregnant women (2,7). An estimated 0.006% of pregnancies are complicated by IE with maternal morbidity and mortality of 33%, mainly due to thromboembolic events and heart failure, as blood volume increases through pregnancy (10,12). Treatment of these patients requires multidisciplinary management (7,8) for addiction control, cardiovascular support, bacterial clearance, and surgical intervention if needed (5,6). Surgical timing must weigh gestational age (4), ability to be anticoagulated and maternal cardiac status (2,9).

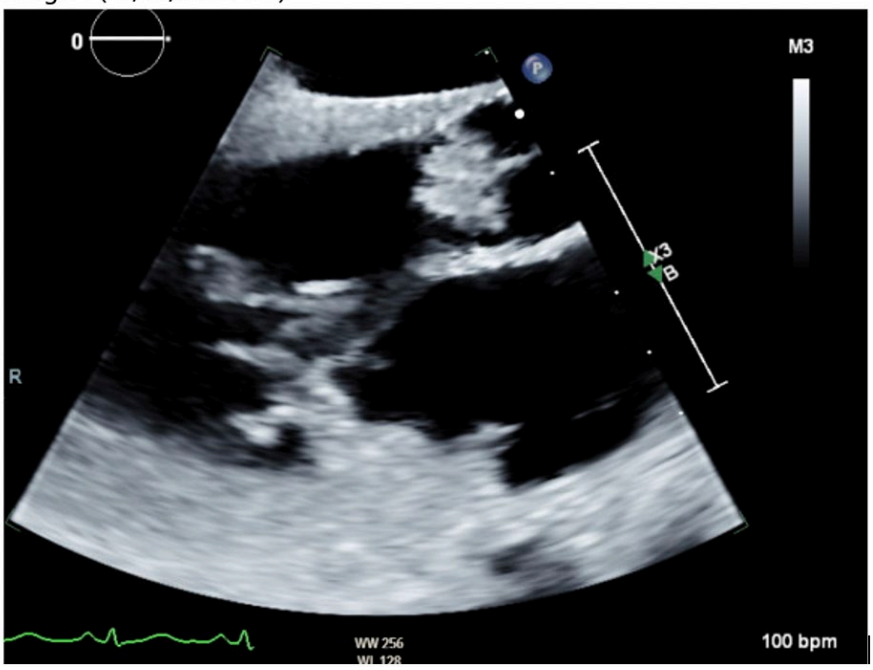
Case One: This case is a 32y.o. G6P4 at 29w4d with IVDU complicated by recent incarceration, Hep C, scoliosis, previous C/S x3, and S. mitis/oralis bacteremia resulting in IE (1). TTE (Image 1) showed vegetations on MV/TV/AV causing severe MR/TR/AI with MV perforation and severe AI preventing use of ECMO if needed. Further sequelae included embolic L PCA stroke resulting in right hemiplegia, severe pulmonary HTN, and heart failure requiring furosemide and supplemental O2. She was deemed a non-surgical candidate for repair or transplant given ongoing daily drug abuse on methadone. After a second embolic stroke causing facial numbness, patient was posted for C/S earlier than planned in the main OR with cardiac and OB anesthesia after multidisciplinary discussion. Patient refused neuraxial block despite being aware of risks, so after preinduction arterial line, GA was initiated with RSI and etomidate. In the OR we had TEE, central line, PRBCs, inotropes and vasopressor drips available. GA was maintained using TIVA to avoid uterine relaxation from inhalational agents, since nitrous oxide was avoided due to PHTN. After delivery, concentrated Pitocin was given to minimize fluid overload, boluses of Vasopressin were given for hypotension to avoid increasing PVR. She was given multimodal analgesia with ketamine, hydromorphone and TAP blocks, then extubated and transferred to CT ICU during the auto-transfusion period (10). She was transferred to the floor on POD2 and discharged on POD10 after antibiotic completion, but unfortunately declined contraception and continued IVDU.

Discussion: In summary, this is an interesting case of a patient with known triple valve IE (6,11), non-surgical candidacy and continued drug use who had a C/S under GA. Anesthetic considerations in this case were focused on hemodynamic stability (3) and managing a difficult patient with ongoing drug use, refusal of neuraxial and no emergent surgical options. Given her lack of surgical candidacy, a careful GA with adequate preparation was performed

with CT anesthesia involvement for TEE and inotropic support as needed and careful uterotonic, pain and fluid management.

References: 1. PMID: 27512463 2. PMID: 37241171 3. PMID: 32448305 4. PMID: 19918528 5. PMID: 34317284 6. PMID: 24997091 7. PMID: 35237434 8. PMID: 34993404 9. PMID: 37213793 10. PMID: 21873418 11. PMID: 33274121 12. PMID: 29660361

Image 1 (10/23/2023 TTE)



Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 10

Management of Labor in a Parturient with Double Inlet Left Ventricle S/P Fontan Procedure

Presenting Author: David A. Gutman, MD, MBA
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Co-Authors: Andra Oprisan, MD - Medical University of South Carolina
Lauren Yacobucci, MD - Medical University of South Carolina

Introduction: With the advances in medical technology over the past few decades, the field of obstetrics is beginning to see more parturients with single ventricle heart defects that have been repaired and result in Fontan circulation. Given the cardiovascular and respiratory changes of pregnancy, the unique physiology of Fontan circulation requires special considerations for both labor and cesarean delivery. We describe the pregnancy and anesthetic management of a patient with a history of double inlet left ventricle status post Fontan procedure.

Case One: Patient was a 22-year-old G1 with a double inlet left ventricle who underwent a staged surgical repair that included the Norwood procedure, followed by the bidirectional Glenn operation in infancy followed by the Fontan procedure at age 4. This was followed by two additional operations for closure of the residual extra-cardiac fenestration. The most recent cardiac cath, two years prior to pregnancy, showed reassuring hemodynamics and normal LV function. Prenatal care was managed by Maternal Fetal Medicine and Cardiology. Echocardiograms performed each trimester showed normal ventricular function. A multidisciplinary meeting was held to formulate delivery recommendations. At 35 weeks, she presented with preterm premature rupture of membranes and was admitted to the cardiac ICU for close monitoring in labor. She underwent an uncomplicated epidural, radial arterial, and right-sided IJ central venous line placement with Swan-Ganz for continuous pulmonary artery pressure monitoring. She had an uncomplicated unassisted vaginal delivery. However, immediately after delivery of the placenta, she developed severe hypotension, tachycardia, shortness of breath, and pallor, thought to be due to acute sensitivity to blood loss versus autotransfusion with significant peripheral vasodilation. She was started on epinephrine and phenylephrine infusions and received two units of packed red blood cells with rapid improvement in her hemodynamics. Inotropic and vasopressor support was weaned without incident. She was monitored in the ICU for 24 hours and discharged home on day 3.

Discussion: Successful anesthetic management of a parturient with Fontan circulation requires detailed, multidisciplinary delivery planning with focus on preventing situations in which there is a significant increase in Pulmonary Vascular Resistance as this can lead to a marked decrease in pulmonary blood flow.1 Because of this, a slowly titrated lumbar epidural is the preferred option for labor analgesia2, and continuous cardiac monitoring is prudent.

References: 1 - Cohen AM, Mulvein J. Obstetric anaesthetic management in a patient with the

Fontan circulation. Br J Anaesth. 1994 Aug;73(2):252-5. doi: 10.1093/bja/73.2.252. PMID: 7917748. 2 - Moroney E, Posma E, Dennis A, d'Udekem Y, Cordina R, Zentner D. Pregnancy in a woman with a Fontan circulation: A review. Obstet Med. 2018 Mar;11(1):6-11. doi: 10.1177/1753495X17737680. Epub 2017 Nov 22. PMID: 29636807; PMCID: PMC5888845.

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 11

A Multidisciplinary Approach for Managing Incidental Finding of Left Atrial Myxoma during Pregnancy

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Co-Authors: Dina Aboutouk, MD, FRCPC - Department of Anesthesiology and Pain Management, The Ottawa Hospital, Ottawa, Ontario, Canada
George Dumitrascu, MD, FRCPC - Department of Anesthesiology and Pain Management, The Ottawa Hospital, Ottawa, Ontario, Canada.
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Elizabeth Miller, MD, FRCPC - Department of Anesthesiology and Pain Management, The Ottawa Hospital, Ottawa, Ontario, Canada
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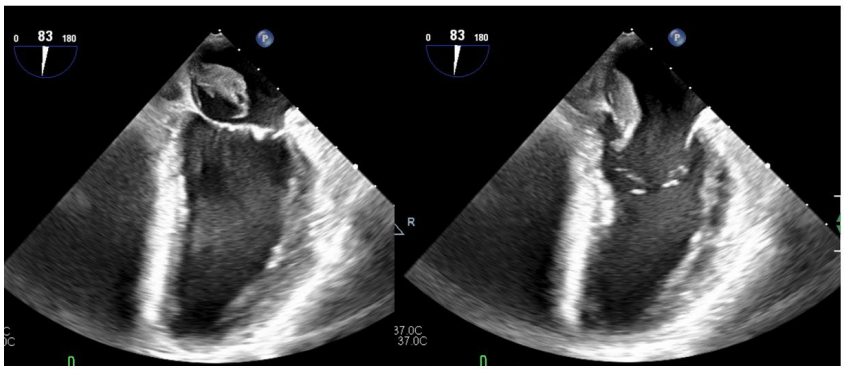

Mid esophageal commissural view, showing pedunculated left atrial myxoma attached to left atrial wall, and protruding into the left ventricle during diastole through the posterior commissure of Mitral valve.

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 12

Management of a Parturient with Newly Diagnosed Vascular Ehlers-Danlos

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Co-Authors: Riley Landreth, DO - University of North Carolina at Chapel Hill

Introduction: Ehlers-Danlos syndrome (EDS) comprises connective tissue disorders linked to collagen mutations. Vascular EDS (vEDS) is the most perilous subtype, with complications including arterial, uterine, and intestinal rupture(1). vEDS has an estimated 5% maternal mortality and a high rate of obstetric complications(2). Despite the complexity, there are no societal guidelines to aid in anesthetic management, especially during pregnancy, when vEDS poses a high risk. This case supports the safety of neuraxial and highlights other considerations for management of this rare disease in pregnancy.

Case One: A 24-year-old G4P0211 with bilateral club feet had an obstetric history notable for placental abruption requiring classical cesarean section (CS) at 25 weeks (G1), and 33-week uterine rupture (G2). Fetal club foot on 16-week ultrasound (US) prompted genetic testing leading to maternal diagnosis of vEDS at 24 weeks. She was admitted for antepartum monitoring. Echocardiogram was unremarkable. Non-contrast full-body MRA had no evidence of aneurysm. After multidisciplinary planning, she underwent repeat CS at 28w1d given her prior complications and concern for focal placenta accreta on second trimester US. Management included two large-bore IVs and arterial line placed under US guidance, a combined spinal-epidural, and prophylactic tranexamic acid. Four units each of red blood cells and plasma were cross-matched, and cell-saver was available. The case was uneventful without need for hysterectomy, transfusion, or general anesthesia. Quantified blood loss was 525 mL and postoperative pain was managed with a 24-hour epidural infusion. She was discharged home on postoperative day 7.

Discussion: Anesthetic management of parturients with vEDS is complex. Key components of this case included anesthetic type, placement of arterial line, and transfusion preparations. Theoretical concern for neuraxial bleeding from platelet dysfunction seen in vEDS has led to recommendations against neuraxial(3). However, neuraxial in this case enabled avoidance of general anesthesia with excellent postoperative pain control and minimized opioid use, which decreases risk of ileus and potential bowel rupture. Aneurysm formation or vessel rupture after peripheral arterial cannulation is theoretically possible due to tissue fragility, so some recommend avoidance of invasive lines and monitors(3). We felt this was too conservative of a recommendation when blood pressure control is paramount, especially with careful placement via US guidance. In the absence of strong guidelines for anesthetic management, clinical decisions should weigh the relative risks and benefits for each vEDS patient.

References: 1. Kang et al. EJOG 2020;255:118-123 2. Murray et al. Genet Med 2014;16(12):874-80 3. Wiesmann et al. Orphanet J. Rare Dis 9, 2014;109

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 13

Epidural Placement in A Patient with Ehlers-Danlos Syndrome

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Co-Authors: Allie Kerby, BS - University of Mississippi Medical Center
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John W. Robison - University of Mississippi Medical Center

Introduction: Ehlers-Danlos Syndrome (EDS) is a genetic connective tissue disorder with varying inheritance pattern based on subtype. There are six major types of EDS, with the most common subtype being hypermobile, or type III. Common manifestations of hypermobile EDS include joint hypermobility, musculoskeletal discomfort, and mild cutaneous involvement. Vascular EDS carries the highest morbidity and mortality risk due to increased vascular fragility. For all subtypes of EDS, epidural and spinal anesthesia poses the risk of epidural hematoma due to tissue fragility. Though there are no clear guidelines, anesthesia references generally recommend avoiding neuraxial blockade in vascular-subtype EDS patients and using I.V. opioids as an alternative to labor analgesia. In EDS patients without genetic confirmation of vascular EDS or phenotypic evidence of vascular fragility, it is clinically appropriate to administer neuraxial anesthesia, if preoperative laboratory evaluation doesn't reveal any abnormalities. We present the case of a 23-year-old G2P1011 with hypermobile EDS who successfully underwent epidural anesthesia placement without complications.

Case One: Laboratory evaluation of this patient revealed no abnormal hematologic lab values, and focused history revealed no major bleeding episode in her past. An epidural catheter was placed with no complications. The patient was monitored throughout her labor course for any signs or symptoms of epidural hematoma formation. The epidural was removed 5 hours after placement following spontaneous vaginal delivery. There was no sign of hematoma at the insertion site immediately after removal and the patient was clinically stable. The patient was further monitored on the postpartum floor with no evidence of epidural hematoma before being discharged home with appropriate follow-up.

Discussion: This case demonstrates that obstetric patients with EDS can successfully undergo epidural anesthesia without complications commonly seen in EDS patients such as epidural hematoma. Paying careful attention to the subtype of EDS is important when treating patients undergoing obstetric anesthesia as complications vary based on the subtype1. A risk-benefit assessment should be done for each EDS patient prior to administering anesthesia. Vigilant monitoring with administration of neuraxial anesthesia in patients with EDS is critical for successful outcomes.

References: 1. Wiesmann T, Castori M, Malfait F, Wulf H. Recommendations for anesthesia

and perioperative management in patients with Ehlers-Danlos syndrome(s). Orphanet J Rare Dis. 2014 Jul 23;9:109. doi: 10.1186/s13023-014-0109-5. PMID: 25053156; PMCID: PMC4223622. 2. Tinkle B, Castori M, Berglund B, Cohen H, Grahame R, Kazkaz H, Levy H. Hypermobile Ehlers-Danlos syndrome (a.k.a. Ehlers-Danlos syndrome Type III and Ehlers-Danlos syndrome hypermobility type): Clinical description and natural history. Am J Med Genet C Semin Med Genet. 2017 Mar;175(1):48-69. doi: 10.1002/ajmg.c.31538. Epub 2017 Feb 1. PMID: 28145611.

Abstract #: SUN – RA & CR – BS 4 – BR 3 – Cardiovascular – Case Reports – 14

Mission Impenetrable: Failed Dural Puncture in a Parturient with Hypermobile Ehlers-Danlos Syndrome

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Co-Authors: Jessica Nieto, MD - Naval Medical Center San Diego
Edgar Zamora, MD - Naval Medical Center San Diego

Introduction: Rare conditions may bring unique challenges in achieving neuraxial anesthesia or labor analgesia. Here we describe a patient with hypermobile Ehlers-Danlos Syndrome (hEDS) in whom a dural puncture (DP) was unable to be completed due to suspected abnormal dural tissue, but an effective continuous labor epidural (CLE) was placed without difficulty.

Case One: A 21-year-old parturient with hypermobile Ehlers-Danlos Syndrome (hEDS) presented in labor at term. She was diagnosed at age 10 with isolated connective tissue manifestations. She desired a CLE for labor analgesia. Her initial epidural catheter was placed easily, with appropriate loss of resistance and threading. After three hours, examination revealed a unilateral block. The catheter was removed with the plan to place a new one with a DP. A fellowship-trained obstetric anesthesiologist oversaw a senior resident for the procedure. They appreciated a definitive loss of resistance with a Tuohy needle and saline-filled glass syringe. During advancement of a 24-gauge pencil-point needle, they met resistance consistent with dura mater. Attempts at DP with both slow and quick advancement of the needle led to more than a centimeter of dural tenting without puncturing the tissue. The DP was aborted, and an epidural catheter was threaded without difficulty. Bilateral analgesia was obtained shortly afterward.

Discussion: All 14 known EDS variants affect connective tissue, but each has unique phenotypic characteristics. Hypermobile EDS is the most common, making up one third of all diagnoses. Diagnosis is clinical, requiring generalized joint hypermobility not due to other rheumatologic conditions, along with other specifications of the 2017 International Criteria. In patients with hEDS, the dura mater and spinal ligaments are more elastic, which is exacerbated by the relaxin hormone in pregnancy. As a result, providers may not feel the classic pop of a DP. The ligaments may also buckle, which can be interpreted as a bounce without a definitive give. It is well-described in neurosurgical literature that redundant dural pouches called Tarlov cysts may exist in the lumbar spine, which can confuse the tactile feedback of DP. Despite these challenges, loss of resistance with syringe will occur as usual in the epidural space, facilitating reliable CLE placement.

References: Beatrice, D., Titi, L., Tarsitano, M., & Borgia, M. (2014). Anesthetic management of a parturient with Ehlers-Danlos syndrome posted for elective cesarean section. Journal of Obstetric Anaesthesia and Critical Care, 4(1), 35. https://doi.org/10.4103/2249-4472.132822

Karthikeyan, A., & Venkat-Raman, N. (2018). Hypermobile Ehlers–Danlos syndrome and pregnancy. Obstetric Medicine, 11(3), 104–109. https://doi.org/10.1177/1753495x18754577
Wiesmann, T., Castori, M., Malfait, F., & Wulf, H. (2014). Recommendations for anesthesia and perioperative management in patients with Ehlers-Danlos syndrome(s). Orphanet Journal of Rare Diseases, 9(1). https://doi.org/10.1186/s13023-014-0109-5

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 01
Intraoperative Ketorolac Dosing for Analgesia Following Cesarean Delivery

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Co-Authors: Dani Lavage, MA - UPMC
C. Tyler Smith, MD - University of Pittsburgh

Abstract:
Introduction: Consensus guidelines recommend a dose range of 15 to 30mg of intraoperative ketorolac for cesarean delivery, with the ultimate dose left to provider discretion.[1] This study aims to compare analgesic efficacy between 15 and 30mg doses of ketorolac in patients undergoing cesarean delivery under neuraxial anesthesia.

Methods: This retrospective observational study was conducted at a large tertiary care center with approval from the institutional review board. Patients receiving ketorolac during cesarean delivery under neuraxial anesthesia in 2022 were included. Patients receiving an additional dose of ketorolac within 2 hours postoperatively were excluded. Perioperative pain management was provided using a standardized clinical protocol including intraoperative neuraxial morphine and postoperative scheduled acetaminophen, scheduled non-steroidal anti-inflammatory drug, and oxycodone 5mg and 10mg as needed for moderate and severe pain, respectively.
The primary outcome was total opioid consumption at 24 hours postoperatively, calculated in morphine milligram equivalents (MME). Secondary outcomes included average and maximum pain scores using the 0-10 numeric rating scale. Logistic regression models were fit to assess associations between those who received zero MME by ketorolac group. Linear regression models were fit to test differences between ketorolac groups for average and max pain scores at 24 hours. A *P*-value of 0.05 was used to define statistical significance.

Results: There were 1,544 patients included in the final analysis (15mg n=900; 30mg n=644). A total of 37 patients received an additional dose of ketorolac within 2 hours postoperatively and were excluded. Opioid consumption (MME) was zero in 47% of the total cohort. Baseline differences in groups were notable for body mass index (higher in 30mg group, *P*=0.02) and intraoperative high-dose morphine receipt (9.5% in 15mg vs 13.8% in 30mg, *P*=0.01). (Table 1) There was no significant difference between 15 and 30mg groups for the primary outcome of total opioid consumption at 24 hours (mean MME 12.9 vs 12.8, *P*=0.94). Logistic regression for prediction of zero opioid consumption showed no difference between ketorolac groups (aOR 0.87, CI [0.68, 1.12], *P*=0.28). There was no significant difference between groups for 24 hour average pain score (4.2 vs 4.2, *P*=0.58) or maximum pain score (6.0 vs 6.0, *P*=0.97) (Table 1).

Discussion: The key finding of this study is that there is no difference between 15 versus 30mg of intraoperative ketorolac for post-cesarean pain intensity or opioid consumption in patients receiving neuraxial anesthesia. Although these findings suggest that 15- and 30-mg doses yield

comparable analgesic benefits, they do not preclude potential superior analgesic effects of doses greater than 30mg.

References: 1. Bollag L. Anesth Analg. 2021 May 1;132(5):1362-1377.

SOAP_table1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 02

Patient and Provider Perspectives on Pain and Other Dimensions of Cesarean Delivery Experience (PARTNER Study Part 1)

Presenting Author: Yunseo Linda Park, BS
Presenting Author's Institution: University of Pittsburgh School of Medicine
Co-Authors: Rida Ashraf - University of Pittsburgh
Briana Clifton, BA - University of Minnesota Medical School
Emily Miller, MD MPH - Brown University, Women and Infant's Hospital
Mark Neuman, MD, MSc - University of Pennsylvania Perelman School of Medicine

Abstract:
Introduction: We currently lack insights on patient perspectives of pain and other aspects of clinical care in cesarean delivery as well as how these perspectives compare with provider perceptions.[1] The purpose of this study was to discover patient priorities for cesarean delivery anesthesia experience, to compare patient and provider perspectives, and to explore attitudes on shared decision-making around anesthesia choices for cesarean delivery. We hypothesized that patient priorities would differ from provider perspectives.

Methods: A prospective qualitative cohort study was conducted after IRB approval (STUDY23060017). Patients who recently experienced cesarean deliveries and clinical care providers for patients receiving cesarean delivery were enrolled using a purposive sampling strategy. Semi-structured interviews were conducted using an interview guide. Interview transcripts were independently coded by three coders and qualitatively analyzed for major themes. Participants were recruited and interviews continued until thematic saturation was achieved.

Results: 42 participants (20 patients and 22 providers) completed interviews. Five major themes emerged reflecting patient attitudes and beliefs toward cesarean delivery experience (**Table 1**): (1) effective communication, education, and respect; (2) emotional support by care team to build trust; (3) intra-operative pain or discomfort; (4) contrasting acceptability around therapies for pain or discomfort; (5) stigma surrounding having a cesarean delivery. Five major themes emerged reflecting provider attitudes and beliefs toward cesarean delivery priorities: (1) complexity of pain responses and expressions; (2) multiple strategies for pain control; (3) effective communication and education surrounding an emergency cesarean delivery; (4) patient psychological well-being during cesarean delivery; (5) barriers to accommodating individualized birth plans.

Conclusion: Patients and providers alike prioritize pain management, psychological well-being, and effective communication during cesarean delivery experiences. Patients emphasize relationships and trust as influential in their cesarean experience, while clinicians emphasize clinical complexities and physical treatments. Key patient-centered priorities for cesarean

anesthesia care were identified and can inform future patient-centered outcomes research on cesarean delivery experience.

References:

1 Mazzoni A. BJOG. 2011;118(4):391-9.

PARTNER SOAP Table v3.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 03

Quantitative Evaluation of Patient and Provider Priorities for Cesarean Delivery Anesthesia Experience (PARTNER Study Part 2)

Presenting Author: Briana Clifton, BA
Presenting Author's Institution: University of Minnesota Medical School - Falcon Heights, Minnesota
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Andrea Gomez-Sanchez, MD - University of Pittsburgh
Mark Neuman, MD, MSc - University of Pennsylvania Perelman School of Medicine
Linda Park, BA - University of Pittsburgh

Abstract:
Introduction: Patient-centered priorities for anesthesia during a cesarean delivery are not well defined. Previous studies have explored patient preferences for cesarean delivery anesthesia 1 but have not evaluated patient-driven endpoints unrelated to physical experience and known to be important to patients' birth experiences, such as being treated with respect, communication, and emotional support. 2 The purpose of this study was to compare patient and provider priorities for patient-centered priorities for cesarean delivery anesthesia care.

Methods: This IRB-approved prospective quantitative survey study included patients with recent cesarean deliveries and clinical providers who provide clinical care for cesarean deliveries. Eleven patient-centered factors of importance for cesarean delivery anesthesia experience were first identified by qualitative semi-structured interview (PARTNER Part 1). Participants then completed a forced ranking survey for these 11 items, ranked in order from most important to least important aspect of cesarean anesthesia care. They also ranked most desired to least desired anesthesia side effects (e.g., pain). For items ranked highest and lowest, participants rated the degree (valence) of importance on a 0-10 numeric rating scale where 0 was not important at all and 10 was the most important factor imaginable. Responses from patient and provider groups were compared using the Wilcoxon rank sum test. A $P< 0.05$ was considered statistically significant.

Results: There were 118 patients and 17 providers with complete data. Patients ranked "physical safety of baby during cesarean delivery" as the most important factor (median 1, interquartile range [1-3]) while providers ranked this factor lower (median 5[2-6], $P< 0.001$) (Table 1). Patients and providers also differed with respect to how important (valence) this item was (patient median valence 10 (9-10) vs. no provider rated this item of highest importance). Providers and patients similarly and highly ranked "physical safety of myself/mother during cesarean delivery" (patient median 3[2-6] vs. provider median 1[1-7], $P=0.19$). Other areas of discordance between patient and provider rankings included healthcare team communication (patient median 8[6-9] vs. provider median 6[5-7], $P=0.02$), and pain or discomfort during surgery as an anesthesia side effect (patient median 9[5-11] vs.

provider median 11[9-11], P=0.04).

Discussion:
Patients and providers mostly agree on cesarean delivery anesthesia patient-centered priorities, but differ in priorities for physical safety of baby, team communication, and pain or discomfort during surgery. Patients ranked pain or discomfort as similarly important as other anesthesia effects. These data challenge previous concepts suggesting that patients consider pain during cesarean delivery to be the most important factor for their anesthesia experience.

References: 1 Carvalho B. Anesth Analg. 2005;101:1182
2 Brown S. Birth. 1994;21:4-13

SOAP PARTNER Phase 2 Abstract_GL-Table_v2.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 04

Comparison of Remimazolam and Midazolam for Intraoperative Sedation During Cesarean Section Under Spinal Anesthesia: A Prospective Randomized Trial

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Abstract: Comparison of Remimazolam and Midazolam for Intraoperative Sedation During Cesarean Section Under Spinal Anesthesia: A Prospective Randomized Trial

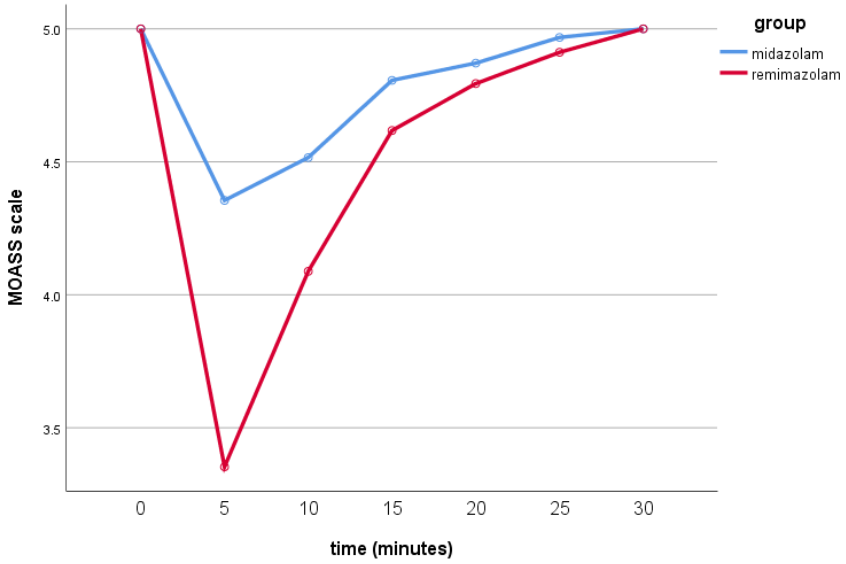
Background: This study aimed to compare the effect of midazolam and remimazolam after the delivery of babies in elective cesarean section under spinal anesthesia.

Methods: A total of 80 pregnant women undergoing cesarean section were randomly assigned to either midazolam group (n=40) or remimazolam group (n=40). Twelve mg of 0.5% bupivacaine was used for spinal anesthesia. After the delivery of babies, 2 mg of midazolam was given by bolus in the midazolam group, and 5 mg of remimazolam was infused over 1 minute in the remimazolam group. Modified Observer's Assessment of Alertness/Sedation scale, blood pressure, heart rate, nausea and vomiting, and shivering were evaluated at 5, 10, 15, 20, 25, 30, and 60 minutes after commencement of sedation, and at the postanesthesia care unit. One mg of midazolam or 2.5 mg of remimazolam were administered in each group as for the patients' request. The primary outcome was the incidence of intraoperative nausea and vomiting. The secondary outcomes were blood pressure, heart rate, Modified Observer's Assessment of Alertness/Sedation scale, intraoperative phenylephrine use, need for rescue sedative use, shivering, and postoperative satisfaction score.

Results: The incidence of intraoperative nausea and vomiting was comparable between the two groups. The level of intraoperative sedation was deeper ($P_{Group \times Time} < 0.01$, Figure 1) and the incidence of postoperative shivering was higher (6/40 (15.0%) vs. 14/40 (35.0%), P = 0.039) in the remimazolam group compared with midazolam group. Other outcomes including intraoperative phenylephrine use, the need for rescue sedative use, and postoperative satisfaction score were not different between the two groups.

Conclusion: Sedation with remimazolam could achieve deeper level of sedation, however the postoperative shivering occurred more frequently compared to sedation with midazolam.

Figure 1. Intraoperative changes in Modified Observer's Assessment of Alertness/Sedation (MOAAS) scale evaluated at 5-minutes intervals



Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 05

Association Between Preoperative Pain Phenotype and Postoperative Opioid Use after Scheduled Cesarean Delivery

Presenting Author: Amelie Pham, MD
Presenting Author's Institution: Vanderbilt University Medical Center - Nashville, Tennessee
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Alex Pedowitz, BS - University of Miami Leonard M. Miller School of Medicine
Laura L. Sorabella, MD - Vanderbilt University Medical Center

Abstract:
Objective: Prior retrospective studies suggest that pain-related and psychosocial factors influence opioid use following non-obstetric surgical procedures. In the obstetric literature, known predictors, including tobacco use, quantity of opioid prescribed, and level of depression and anxiety, account for approximately 80% of the variation in opioid use after cesarean delivery. Using prospectively collected data, we sought to determine whether a *preoperative* patient phenotype reflecting elevated pain intensity, negative affect, and decreased physical function is associated with increased postoperative opioid use after scheduled cesarean delivery.

Methods: This is a secondary analysis of a prospective cohort study examining associations between endogenous opioids and postoperative opioid use after scheduled cesarean delivery. Patients without chronic pain or regular opioid use were enrolled prior to scheduled cesarean and completed validated pain and psychosocial measures. At 48 hours postpartum, participants completed a measure of positive subjective responses to early postoperative inpatient opioid use (e.g., feeling euphoric, happy, comfortable). The primary outcome was total amount of opioids used in MMEs (inpatient and outpatient). Secondary outcomes were total duration of outpatient opioid use, number of tablets used, and using all prescribed opioids. We examined associations between preoperative phenotype measures and postoperative opioid outcomes using linear regression for continuous outcomes and logistic regression for binary outcomes (i.e., using all prescribed opioids). Analyses were adjusted for potential confounding factors, including maternal age, delivery body mass index (BMI), and self-reported maternal race and ethnicity.

Results: Complete follow up data were available for 136 patients, with mean maternal age of 31.1 years (SD 5.3), mean BMI of 34.4 kg/m2 (SD 8.6), 27.1% publicly insured, and 77.6% non-Hispanic white. Results (Table 1) indicated that patients with a preoperative phenotype characterized by greater pain intensity, pain-related life interference, and negative affect (pain catastrophizing, anxiety, and depression) used more opioids postpartum. Similar associations were observed for secondary outcomes. More positive subjective opioid analgesic responses at 48 hours were associated with greater opioid use.

Conclusion: A preoperative maternal phenotype reflecting elevated pain intensity, negative affect, and decreased physical function was associated with increased opioid use after scheduled cesarean delivery. Findings regarding positive subjective opioid responses in the early postoperative period as driving later opioid use outcomes support the role of reinforcement mechanisms as a contributor to outpatient opioid use.

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 06

Intraoperative Pain During Cesarean Delivery - Quality Improvement Project Part II: Trainee Baseline Educational Gap Assessment

Presenting Author: Bryan Wakefield, MD
Presenting Author's Institution: Vanderbilt University Medical Center
Co-Authors: Anne Chen, BA - Vanderbilt University School of Medicine
Holly Ende, MD, MS - Vanderbilt University Medical Center
Leslie Fowler, EdD, M.Ed. - Vanderbilt University Medical Center
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Britany L. Raymond, MD - Vanderbilt University Medical Center

Abstract:
Introduction: Neuraxial anesthesia is the optimal choice for cesarean delivery .[1] Unfortunately, women may experience pain during cesarean delivery leading to poor satisfaction or postpartum depression.[2] Intraoperative pain during CD has been reported to be as high as 10%,[3] but initial data from our institution indicate a much lower incidence of 2.5%. Given this limited clinical exposure, we sought to better understand our trainees' baseline knowledge of how to treat intraoperative pain. We surveyed our trainees' clinical management of intraoperative pain and compared it to a treatment algorithm proposed by OB anesthesiologists.

Methods: This QI project was started with an MMI Grand Rounds on intraoperative pain during CD. After multiple iterations, the OB Anesthesia Division developed a clinical treatment algorithm to address this clinical scenario in standardized fashion. The four initial steps in the algorithm include: 1) communication with surgeon to stop/pause 2) communication with anesthesiologist to inform 3) communication with patient to listen/validate and 4) give fast-acting intravenous opioid. Trainees were not yet shown or trained on the algorithm but had rotated on the obstetric anesthesia service for 4-8 weeks. We developed a short survey to query trainees about their clinical approach to treatment of intraoperative pain. The survey was distributed via RedCap to student nurse anesthetists and residents rotating through OB anesthesiology within the last 6 and 12 months, respectively. Follow-up reminder emails were sent on days 3 and 6, and the survey was closed after 14 days of availability. Primary outcome was the % of trainees who could name 3 of 4 initial steps in the algorithm. Secondary outcomes included naming any of the initial steps. Qualitative analysis on free text comments was then performed by two authors independently followed by consensus agreement.

Results: 45 surveys were sent with 28 (62%) trainee responses. Most trainees surveyed overestimated our institution's incidence of intraoperative pain. Most trainees reported receiving previous training on treatment of intraoperative pain by an attending/fellow and believed having an algorithm would be helpful. Few trainees could list 3 initial steps that aligned with the treatment algorithm. Most trainees listed, as an initial step, to give an

intravenous fast-acting opioid. However, communication with the patient or surgeon was mentioned by less than a third of the trainees. (Table 1)

Conclusions: While most trainees endorsed treating intraoperative pain immediately with an intravenous fast-acting opioid, the majority failed to identify the importance of communication with healthcare team members or the patient. Future directions for this quality improvement project include developing a comprehensive educational plan to teach trainees how to address intraoperative pain under neuraxial anesthesia.

References:

1) PMID 30985305
2) PMID 27163790
3) PMID 37865217

Intraoperative Pain During Cesarean Delivery - QI Project II Table (1).pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 07

Estimating the 95% Effective Duration of Music for Anxiety Reduction Before Elective Cesarean Delivery

Presenting Author: Tristan Fong, BS
Presenting Author's Institution: Tufts University School of Medicine - Hope, Maine

Abstract:
Background: Music is often used in the perioperative period as a non-pharmacological intervention to reduce anxiety (1, 3). Despite multiple studies demonstrating the effects of music, no study to date has described the minimum duration of music required for effective anxiolysis. Therefore, the goal of this study was to determine the 95% effective duration (ED_{95}) of music (pre-selected Mozart vs. patient preference) for the reduction of anxiety in parturients awaiting elective cesarean delivery. Our hypothesis was that the overall ED_{95} would be less than 15 minutes and would be similar between music groups.

Methods: After IRB approval, a prospective, randomized, biased coin study was conducted at a major academic institution. From 8/7/2023 to 12/13/2023, parturients on a labor and delivery unit were approached and consented before undergoing elective cesarean delivery. Subjects were randomly assigned to one of two music groups (pre-selected Mozart sonatas or patient preference). Music duration began at 4 minutes and either increased (in case of failure) or decreased (in case of success) by 1 minute based on the previous subject's response or remained unchanged when dictated by the biased coin methodology. Anxiety (on a numeric rating scale of 0-10) and vital signs were compared pre-and post-intervention. Successful intervention was defined as a decrease in anxiety by at least 1 point. ED_{95} estimates were calculated from simple means, turning point means, and centered isotonic regressions. Means were compared with Student's t-test.

Results: Forty parturients with a mean age of 33 (standard deviation, s.d. 5.1) years were recruited and randomized to listen to Mozart or personal preference music. Mean immediate post-intervention anxiety reduction with Mozart music was 1.7 (s.d. 1.4) and with personal preference was 2.6 (s.d. 2.0). ED_{95} was 5.4 (95% CI, 4.9 to 5.8) minutes (Mozart) and 5.7 (95% CI, 5.2 to 6.2) minutes (personal preference) (mean difference 0.3, 95% CI, -1.1 to 0.4, P = 0.325). ED_{95} estimated from simple means for any music type was 5.5 (95% CI, 5.2 to 5.9) minutes.

Conclusion: Listening to music for less than 6 minutes was found to effectively produce a clinically meaningful decrease in anxiety, regardless of music subtype, in an estimated 95% of parturients awaiting elective cesarean delivery. The results suggest that music can be quickly administered and result in anxiolysis in patients who cannot otherwise receive pharmacological intervention.

References:

1. Bradt J, et al. Music interventions for preoperative anxiety. *Cochrane Database Syst Rev*. 2013;2013(6):CD006908. Published 2013 Jun 6.
2. Drzymalski DM, et al. A Randomized Controlled Trial of Music Use During Epidural Catheter Placement on Laboring Parturient Anxiety, Pain, and Satisfaction. *Anesth Analg*. 2017;124(2):542-547.
3. Weingarten SJ, et al. The effect of music on anxiety in women undergoing cesarean delivery: a systematic review and meta-analysis. *Am J Obstet Gynecol MFM*. 2021;3(5):100435.

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 08

Anesthesia Practice during Elective Cesarean Delivery Under Spinal Anesthesia: A Prospective Observational Study

Presenting Author: Juliana Barrera, MD, MSc, FRCPC
Presenting Author's Institution: Department of Anesthesia, BC Women's Hospital, Vancouver, BC, Canada - Vancouver, British Columbia
Co-Authors: Simon Massey, MBBCh MRCP FRCA FRCPC - Department of Anesthesia, BC Women's Hospital and Health Centre, Vancouver, BC, Canada
Aislynn Sharrock, BA - Department of Anesthesia, BC Women's Hospital and Health Centre, Vancouver, BC, Canada

Abstract:
Introduction: The incidence of intraoperative pain in women undergoing elective cesarean delivery (CD) under neuraxial anesthesia is reported as high as 22.7%[1]. This is associated with poor patient outcomes and adverse psychological sequelae[2]. The 2022 Obstetric Anaesthetists' Association (OAA) guidelines provide recommendations for best clinical practice, specifically targeting prevention and management of intraoperative pain during CD[2]. The purpose of this observational study was to assess current clinical practice during elective CD under spinal anesthesia with respect to OAA guidelines, at a tertiary obstetric hospital.

Methods: After REB review ethics approval was waived. This prospective observational study evaluated anesthesia consultants during elective CDs under spinal anesthesia in healthy pregnant patients. Consultants were encouraged to follow their usual clinical practice. Data was collected by a single assessor. Primary areas evaluated included requirement for additional intravenous (IV) analgesia, spinal sensory block assessment modality and technique, target sensory block level, and identification of T5 dermatome on a standardized diagram. Group performance is presented as frequencies and percentages.

Results: A total of 14 consultants were evaluated. No patients required additional IV analgesia. Spinal block assessment was performed using a combination of modalities including light touch, pinprick and ice 1/14 (7%), light touch and ice 5/14 (36%), pinprick and ice 7/14 (50%), and ice only 1/14 (7%). Among consultants employing light touch, 3/6 (50%) used a cotton ball, 2/6 (33%) used gauze, 1/6 (17%) used a Neurotip. When inquired about target sensory level before surgery initiation, 2/6 (33%) aimed for T5 to light touch, 3/6 (50%) aimed for T6 to light touch and 1/6 (17%) aimed for T4 to ice without using light touch as target modality. T5 dermatome was correctly identified by 4/14 (29%) consultants (Figure 1). None of the consultants using light touch and targeting T5 level was able to correctly mark T5 dermatome on a standardized diagram.

Discussion: Considerable differences were found between our clinical practice and OAA guidelines. Furthermore, we observed significant practice variability among consultants. OAA guidelines recommend light touch to at least T5 as the primary sensory modality to minimize

the risk of intraoperative pain[2]. Less than half of consultants used light touch with another modality. Only two consultants targeted T5 prior to incision, however, both misidentified T5 by one dermatome on a standardized diagram. Overall, less than a third of consultants marked T5 dermatome correctly. The results of this study identified areas and opportunities to standardize our anesthesia practice in alignment with OAA guidelines.

References:

1. Patel, et al. (2022). Anaesthesia. 77(5), 598-604.
2. Plaat, et al. (2022). Anaesthesia, 77: 588–597.

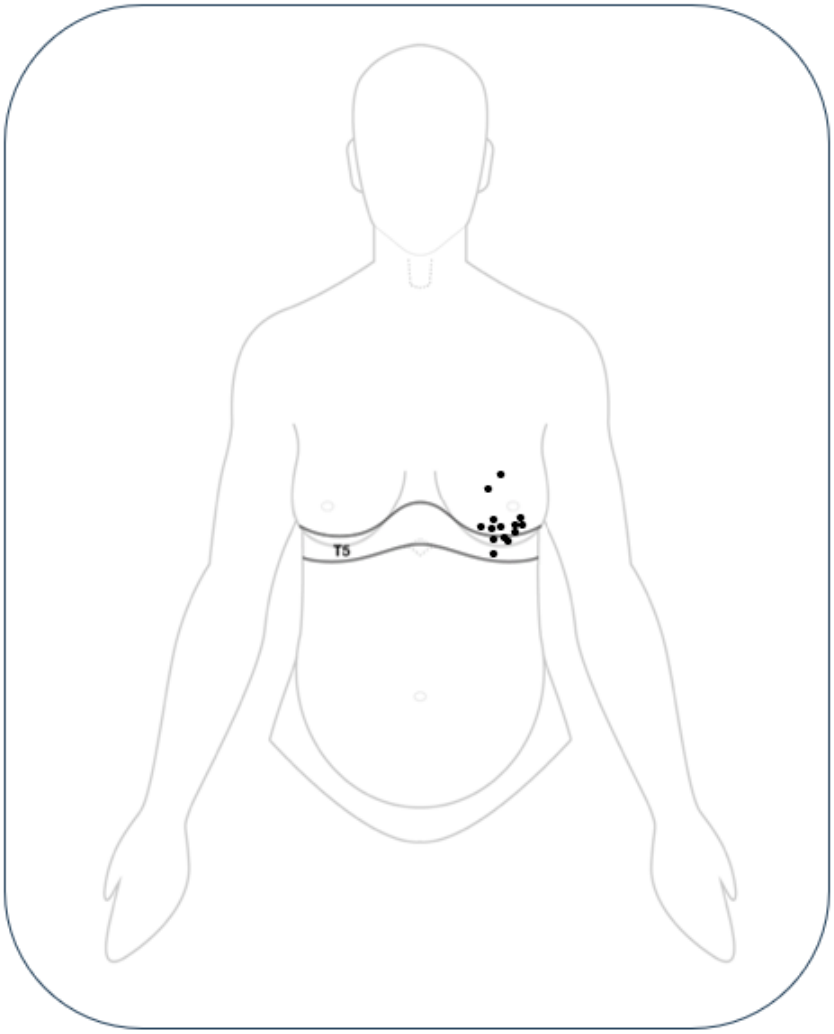

Figure 1. Standardized upper female torso diagram. (•) represents individual consultant T5 dermatome identification (n=14). Actual sensory T5 dermatome outlined. Based on the original Cleveland Clinic 2022 Dermatome Diagram.

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 09

Efficacy of Various Loco-Regional Techniques and Intrathecal Morphine for Analgesia After Cesarean Delivery: Systematic Review and Component Network Meta-Analysis of Randomized Controlled Trials

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Naveed T. Siddiqui, Associate Professor, Director Peri-operative Research Unit - Mount Sinai Hospital and University of Toronto

Abstract:
Objective: Intrathecal morphine (ITM) is the gold standard for providing analgesia after cesarean delivery (CD). Local anesthetic infiltration and regional blockade for post-CD pain have also become more popular.[1] The relative analgesic efficacy of various loco-regional modalities in isolation and combination with ITM has still been debated. This systematic review and component network meta-analysis (CNMA) was conducted to accumulate data on relative analgesic outcomes of ITM and various loco-regional blocks in patients undergoing CD.

Methods: A systematic literature search was performed using MEDLINE, Embase, Scopus, and Web of Science for eligible RCTs from inception until October 2023. We included randomized, controlled trials involving adult patients undergoing CD. We pooled trials comparing analgesic interventions and additive CNMA methodology was used for the analysis. Surface under the cumulative ranking curve (SUCRA) to establish the probability of an intervention ranking highest. The primary outcome was opioid consumption (intravenous morphine equivalents) in the first 24 hours of the postoperative period. Secondary outcomes included pain scores at various intervals, time to first analgesic request, block-related complications, opioid-related side effects, patient satisfaction scores, and the incidence of chronic pain.

Results: A total of 155 trials comprising 13049 participants were included in the final analysis. Network meta-analysis results showed that adding ITM to most regional blocks significantly improves their opioid-sparing effect. On further exploration with additive CNMA, ITM had a significant parenteral morphine-sparing effect with a mean difference of 19.73 mg [95% CrI 15.98; 23.48] in the first 24 hours. Overall, as compared to the control, the ilioinguinal, erector spinae, and ilioinguinal-iliohypogastric block were associated with a significant reduction in 24-hour opioid consumption. There is a possibility that ITM alone or as a part of the combination as compared to other loco-regional techniques was associated with a higher incidence of opioid-related adverse effects like pruritus, and nausea and vomiting.

Conclusions: ITM has a significant opioid-sparing effect and it can be combined with regional block to enhance the analgesic potential for post-CD analgesia, however; with the potential increased incidence of associated adverse effects.

References:

Singh NP, Monks D, Makkar JK, Palanisamy A, Sultan P, Singh PM. Efficacy of regional blocks or local anaesthetic infiltration for analgesia after caesarean delivery: a network meta-analysis of randomised controlled trials. Anaesthesia 2022; 77:463-474.

network.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 10

Incidence of Dyspnea During Neuraxial Anesthesia for Cesarean Delivery: A Single Center Retrospective Study

Presenting Author: Aakshi Sanchorawala, MPH
Presenting Author's Institution: Texas A&M College of Medicine - Sugar Land, Texas
Co-Authors: Ehrig Jessica, MD - Baylor Scott & White Medical Center-Temple
Chandni Raiyani, MS - Baylor Scott & White Research Institute
Emily E. Sharpe, MD - Mayo Clinic

Abstract:
Introduction: The definition of "high spinal" can include dyspnea, hypotension, and bradycardia and varies from one expert to another. The primary aim of this study was to quantify the incidence of documented dyspnea associated with neuraxial anesthesia techniques for cesarean delivery at our hospital.

Methods: Our institutional review board approved this study. We examined every cesarean delivery (CD) at our hospital from January 1, 2020 to December 31, 2022. Patients who had de novo combined spinal epidural (CSE) or single injection spinal (SIS), removal of an indwelling labor epidural catheter followed by CSE or SIS, or activation of an indwelling labor epidural catheter as the initial anesthetic technique and did not have a planned hysterectomy or another abdominal surgical procedure at the time of CD were included in the final analysis.

Results: There were 2510 CDs during the study period. 1603 CDs had CSE or SIS, 266 had removal of an indwelling labor epidural catheter followed by CSE or SIS, and 264 CDs had activation of an indwelling labor epidural catheter. There were four patients with documented dyspnea and subsequent endotracheal intubation. Data describing the dyspnea events are presented in Table 1. The dyspnea rates for de novo CSE or SIS, removal of an indwelling labor epidural followed by CSE or SIS, and activation of an indwelling labor epidural catheter were 1:1603 (95% CI 1:288-1:63,315), 1:133 (95% CI 1:37-1:1098), and 1:264 (1:47-1:10,427), respectively.

Discussion: Removal of an indwelling labor epidural catheter followed by CSE or SIS was associated with the highest rate of dyspnea in our study. D'Angelo, et al. reported a 1:4336 (95% CI 1:3356-1:5587) high neuraxial block rate in a multicenter registry study of approximately 257,000 patients but did not stratify this rate among neuraxial techniques.[1] Shepherd, et al. reported lower rates of systemic anesthetic adjuvant medication administration and conversion to general anesthesia for patients who had removal of an indwelling labor epidural catheter followed by a CSE or SIS technique compared to patients who had activation of an indwelling labor epidural catheter.[2] A limitation of our study was that we reported unedited entries from the medical record that may contain inaccuracies. The risks of high neuraxial blockade including dyspnea and hemodynamic derangements should be

weighed against the benefits of improved anesthesia when deciding on a neuraxial anesthetic technique for cesarean delivery.

References:

1. D'Angelo R, et al. Serious complications related to obstetric anesthesia: the serious complication repository project of the Society for Obstetric Anesthesia and Perinatology. *Anesthesiology* 2014;120:1505-12
2. Shepherd B, et al. A comparison of anesthetic outcomes between activation and removal of epidural catheters for patients who underwent unscheduled intrapartum cesarean delivery. *Proc (Bayl Univ Med Cent)* 2023;36:473-477

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 11

Predictors of Pain During Cesarean Delivery: Preliminary Results of a Prospective Observational Study Using Two Validated Psychometric Surveys

Presenting Author: Rachel Bates, BS
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Emily E. Sharpe, MD - Mayo Clinic

Abstract:
Introduction: A prospective observational survey-based study reported a 11.5% incidence of pain during cesarean delivery (CD).[1] The contribution of pre-existing anxiety and catastrophizing to the experience of pain during CD is unknown. We hypothesized that patients who endorsed pain during cesarean delivery would have higher levels of anxiety and catastrophizing measured by validated surveys.

Methods: Our institutional review board approved this study. We used a convenience sample of patients who had CD from December 1, 2023 to March 31, 2024 and met inclusion criteria were approached by a study investigator. After obtaining informed consent, patients competed the STAI-6 anxiety survey,[2] a 13-item catastrophizing survey,[3] a question about how the pain they experienced compared to their expected pain, and asked to indicate their level of pain on a 100 mm visual analog scale (VAS). Demographic, physical, and clinical data from the electronic medical record was recorded. We defined pain as a VAS score of 30 mm or greater.

Results: As of January 17, 2024, 54 patients completed our study and are included in our preliminary results. Patients who endorsed pain had higher levels of anxiety and catastrophizing compared to patients who did not endorse pain, but these differences were not statistically significant. Seven (35%) patients who endorsed pain during CD received systemic anesthetic adjuvant medication or conversion to general anesthesia compared to two (6%) patients who did not endorse pain, a difference that was not statistically significant (p=0.075). Demographic, physical, and clinical data are presented in Table 1.

Discussion: Patients who endorsed pain during cesarean delivery had higher levels of anxiety and catastrophizing as measured by validated surveys without differences in the initial anesthetic technique. Patients who endorsed pain were more likely to have had systemic anesthetic adjuvant medication or conversion to general anesthesia compared to patients who did not endorse pain but this difference was not statistically significant. The propensity to catastrophize and whether the patient received systemic anesthetic adjuvant medications or conversion to general anesthesia may be predictors of the experience of pain during cesarean

delivery.

References: 1. Sanchez J, et al. Pain during cesarean delivery: A patient-related prospective observational study assessing the incidence and risk factors for intraoperative pain and intravenous medication administration. Anaesth Crit Care Pain Med 2023;43:101310
2. Marteau TM, et al. The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). Br J Clin Psychol 1992;31:301-306
3. Sullivan MJ, et al. The Pain Catastrophizing Scale: Development and Validation. Psychological Assessment 1995;7:524-532

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 12

Predictors of Pain During Intrauterine Device Placement: Preliminary Results of a Prospective Observational Study Using a Validated Catastrophizing Survey

Presenting Author: Micah Clay, MD
Presenting Author's Institution: Baylor Scott & White Medical Center-Temple
Co-Authors: Krystal Fett, DO - Baylor Scott & White Medical Center-Temple
Michael P. Hofkamp, MD - Baylor Scott & White Medical Center-Temple
Joyce Ku, BS - Texas A&M Health Sciences Center
Chandni Raiyani, MS - Baylor Scott & White Research Institute

Abstract:
Introduction: Most patients will tolerate placement of an intrauterine device (IUD), but in some patients the anxiety of a pelvic exam coupled with the anticipated pain of insertion may steer them away from this reliable form of contraception. We sought to quantify pain during IUD insertions at our institution and hypothesized that patients who endorsed pain during IUD insertion would have higher catastrophizing scores compared to patients who did not endorse pain.

Methods: This study was approved by our institution's institutional review board. A convenience sample was used and patients were enrolled between April 1, 2023 and March 31, 2024. Qualifying patients (age 14-48, no history of vaginal delivery >14 weeks GA, no current cervicitis, no current pregnancy, and requesting a Mirena, Liletta, or Paragard IUD) were identified, and informed consent was obtained in the clinic on the day of insertion. The Pain Catastrophizing Scale survey[1] was administered prior to the procedure, and patients were asked about their pain experience following insertion, recording a score on a Visual Analog Scale (VAS), a 10 cm line representing a continuum between "no pain" and "worst possible pain." Pain was defined as a rating of 30 mm or greater on the VAS. The results of the survey and data from the patients' medical records were recorded by the study investigator for analysis.

Results: As of January 15, 2024, 32 patients provided informed consent and 31 patients completed all questions on the survey. 16 and 16 patients reported pain 30 mm or greater and less than 30 mm on the VAS, respectively. Demographic, physical, and clinical characteristics of patients who did and did not endorse pain are presented in Table 1. Patients who endorsed pain had higher catastrophizing scores, which was not statistically significant (P=0.06). 2, 18, 8, 2, and 1 patient rated pain during IUD insertion as none, not as bad as expected pain, just as bad as expected pain, worse than expected pain, and much worse than expected pain, respectively. The patient who endorsed much worse than expected pain had the highest catastrophizing score in the study.

Discussion: In this study, catastrophizing scores were worse in patients who had pain, but this did not reach statistical significance. Only one out of 32 patients stated the pain was "much

worse than the expected pain" and this patient had a high catastrophizing score. Most patients tolerated IUD placement well and we attribute this finding to our practice of using cervical blocks for most IUD insertions. This study was limited by a low sample size and incomplete data collection at the time of data analysis and abstract submission. There are potential opportunities to identify patients at risk of experiencing pain during IUD placement by evaluating their propensity to catastrophize.

References: 1. Sullivan MJ, et al. The Pain Catastrophizing Scale: Development and Validation. Psychological Assessment 1995;7:524-532

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 4 – CS Pain – 13

Comparison of Postoperative Opioid Consumption Between Cohorts Who Received Two Different Doses of Intrathecal Morphine: Preliminary Results of a Single Center Study

Presenting Author: Shahbaz Saad, BS
Presenting Author's Institution: Texas A&M Health Sciences Center
Co-Authors: Kendall Hammonds, MS - Baylor Scott & White Research Institute
Joanna Stacey, MD - Baylor Scott & White Medical Center-Temple
Madeline Vacula - Centenary College

Abstract:
Introduction: Intrathecal morphine (ITM) is used in single injection spinal (SIS) and combined spinal epidural (CSE) anesthesia for cesarean delivery to facilitate postoperative analgesia. The optimum dose of ITM is not known. Our hospital changed our ITM dose from 0.2 mg to 0.15 mg on February 15, 2023. We hypothesized that patients who received a lower dose of ITM would have higher postoperative opioid consumption. We also hypothesized that patients who received a lower dose of ITM would have a lower incidence of diphenhydramine and hydroxyzine consumption.

Methods: Our institutional review board approved this study. We examined patients who had cesarean deliveries from February 15, 2022 through February 14, 2024 with SIS or CSE anesthesia who did not have labor epidural anesthesia. The 24 hour postoperative period began with the documented date and time of wound closure. We used morphine milligram equivalent conversions as described by Nielsen, et al.[1] A study investigator recorded demographic, physical, and clinical data from the electronic medical record.

Results: Our preliminary results are inclusive of patients who had cesarean deliveries from February 15, 2022 to May 15, 2022 and Feburary 15, 2023 to May 15, 2023. 130 and 100 patients received 0.2 mg and 0.15 mg of ITM, respectively. The 24 opioid consumption was similar between the two cohorts along with diphenhydramine and hydroxyzine consumption. Patients who received 0.15 mg ITM were more likely to have received preoperative acetaminophen.

Discussion: 24 hour opioid consumption was similar between patients who received 0.2 mg and 0.15 mg. We used diphenhydramine and hydroxyzine administration as a surrogate marker for pruritus and the cohorts had similar administration of these drugs. Preliminary results from our study demonstrated similar analgesic effects between 0.15 mg and 0.2 mg ITM with potential increased safety from using a lower dose of ITM.

References: 1. Nielsen S, et al. A synthesis of oral morphine equivalents (OME) for opioid utilisation studies. Pharmacoepidemiol Drug Saf 2016;25:733-737

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 01

Postdural Puncture Headache: The Sphenopalatine Ganglion Nerve Block in Obstetrics (SNOB) Study

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Presenting Author's Institution: Department of Anesthesiology, Critical Care and Pain Medicine Hadassah Hebrew University Medical Center, Jerusalem, Israel, Yerushalayim
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Abstract:
Background: Accidental dural puncture (ADP) is an important complication after epidural labor analgesia, occurring in 0.5-2% of cases. Post dural puncture headache (PDPH) typically occurs in 70-80% of cases of ADP. Non-invasive therapies (caffeine, cosyntropin) have been reported to reduce symptoms, but the most effective therapy is epidural blood patch (EBP). However, EBP has complications including repeat ADP. Sphenopalatine ganglion nerve block (SPGNB) is a noninvasive therapy first described in 1902 to treat headache, which causes cerebral vasoconstriction, and has been proposed as a less invasive treatment for PDPH with success of approximately 30%. The primary aim of this study is to assess whether SPGNB is an effective treatment for PDPH and to assess a dose-response curve.

Methods: We conducted a prospective, randomized, double-blind, placebo-controlled, cross-over study at Hadassah Medical Center. We enrolled forty parturients after ADP with an 18G Touhy needle with PDPH (as defined by the ICHD-II); all were candidates for EBP. Women were allocated to three successive doses of 3-mL (total 9-mL) 4% lidocaine and three successive doses of 3-mL saline; the order (saline-lidocaine) was randomized. Drugs were prepared by a non-blinded investigator; patient and investigator were blinded. Drugs were administered drop-wise from a 5-mL syringe at the nares bilaterally in moderate next extension. Primary outcome was headache (VAS 0-10) in upright posture; secondary outcomes were time to headache onset (secs), and subsequent use of EBP (%). Descriptive outcomes were headache location and presence of other symptoms (tinnitus, diplopia, photophobia). All women had assessments at baseline and 15 minutes after each successive dose (total 7 assessment time points).

Results: 40 patients were enrolled from 8/1/2020 to 1/1/2023. 20/40 (50%) patients decided

that the treatment was a success, and 26/40 (65%) did not require or receive an EBP at any stage (including subsequent admissions). 18/40 (45%) completed the treatment but decided the treatment was a failure and 2/40 (5%) could not tolerate treatment and discontinued after the first dose (with no benefit). There was a dose-response effect of increasing lidocaine dose (repeated measures ANOVA $p < 0.01$) for both reducing VAS pain score and increasing the headache onset time; a significant advantage for the highest doses (9mL) – see figure. In subjects receiving lidocaine first there was some improvement after the first saline dose (most likely due to increased time from last lidocaine dose); there was no other effect of saline.

Conclusion: We demonstrated higher success rates than other studies of SPGNB. We demonstrated a clear advantage for higher SPGNB doses than previously described. SPGBB is non-invasive and has no significant side effects. In patients with successful SPGNB, we taught the partner to perform it and gave them a spare vial to take home if needed.

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Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 02

To Puncture or Not to Puncture: Neuraxial Considerations in a Pregnant Patient with Chronic Orthostatic Headaches

Presenting Author: Claudia L. Sotillo, MD
Presenting Author's Institution: Stanford Medicine Department of Anesthesiology, Perioperative and Pain Medicine - Palo Alto, California
Co-Authors: Cedar J. Fowler, MD MPH PhD - Stanford University School of Medicine
Eva Martinez, MD - Stanford University

Introduction: Neuraxial (NA) techniques continue to be the gold standard for the anesthetic management of cesarean deliveries (CDs) in the United States. In this case report, we examine the anesthetic management of a parturient with baseline intractable orthostatic and migraine headaches who presented for elective CD.

Case One: A 42-year-old G1P0 woman at 38+1 weeks was referred for obstetric anesthesiology evaluation given her past medical history of suspected chronic idiopathic cerebrospinal fluid (CSF) leak with a history of incomplete relief from a combined 11 epidural blood (EBP) and fibrin glue patch procedures. The patient also had a history of chronic daily migraine headaches beginning at the age of 33, intermittently associated with orthostatic intolerance, and worsening in intensity and duration in the last month of her pregnancy. Her symptoms were also associated with loss of motor function, nausea, and autonomic symptoms. A pre-pregnancy CT myelogram showed no obvious source for CSF leak but was notable for mild multilevel disc osteophyte complexes in the cervical and mid to lower thoracic spine. Additional comorbidities included Chiari malformation type II, Rathke cleft cyst, central hypothyroidism, parathyroid adenoma with prior left inferior parathyroidectomy, chronic back pain, joint hypermobility, and orthostatic hypotension. She was under active evaluation for CSF venous fistula. After careful consideration of the patient's medical history in a multidisciplinary discussion, the patient was deemed to be a poor candidate for NA anesthesia and labor. Ultimately an elective CD was successfully managed with TIVA general anesthesia and multimodal pain management, including wound catheter.

Discussion: Compared to NA anesthesia, general anesthesia is used in 6% of CDs, and favored in emergent situations where the time required for NA placement increases morbidity and mortality for the parturient and fetus.1 In turn, spontaneous CSF leaks are rare and account for < 4% of all CSF leaks.3 Reported cases occur primarily in adult women at an average age of 33 to 52.4 years, and at the thoracic spine level.2,3 Given the rarity of CSF leaks in pregnancy, the ideal choice for delivery and anesthetic management is unknown. Case reports suggest that pregnancy exacerbates spontaneous intracranial hypotension. Management focuses on symptom control with bed rest, hydration, and oral analgesics; NA anesthesia for vaginal or CD; and EBPs.4-6 This case is unique in bypassing NA anesthesia altogether in a patient with multiple risk factors for headache and a baseline complex neurological picture with known failed response to EBPs.

References: 1. Anesthesiology. 2019 Jun;130(6):912-922. 2. J Neurol Neurosurg Psychiatry. 1968 Jun;31(3):214-25. 3. N Engl J Med. 2021 Dec 2;385(23):2173-2178. 4. Radiol Case Rep. 2022 Aug 5;17(10):3763-3766. 5. BMC Pregnancy Childbirth. 2023 Mar 8;23(1):154. 6. Headache. 2020 Sep;60(8):1777-1787.

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 03

Patient, Temporal and Provider Factors Associated with Unintended Dural Puncture in Obstetrics

Presenting Author: Gregory Galanti, MD
Presenting Author's Institution: Brigham and Women's Hospital and Harvard Medical School
Co-Authors: Ayumi Maeda, MD, MD - Brigham and Women's Hospital
Gavin G. Ovsak, MD MBA - Brigham and Women's Hospital

Abstract:
Introduction: Unintended dural puncture (UDP) is a known complication of epidural analgesia with the debilitating side effect of postdural puncture headache (PDPH). Previous studies have identified scoliosis and obesity as risks for UDP;[1] no recent studies have assessed additional contributing provider factors. The aims of this study were to determine patient, temporal and provider factors associated with obstetric UDP.

Methods: We performed a retrospective cohort study at our large academic institution to identify all patients receiving epidural, dural puncture epidural (DPE), or combined spinal epidural (CSE) analgesia from 2018-2023. Based on our internal neuraxial complication follow-up list and a list of patients receiving epidural blood patches, we manually verified all UDP patients. We assessed possible risk factors for UDP, including age, BMI, time of placement, week of month (based on month-long resident rotations), and provider level of training. We calculated frequencies and adjusted odds ratios between possible risk factors and UDP.

Results: There were 29,577 patients who received neuraxial analgesia during the study period. We identified 218 patients with a known UDP during labor epidural placement. The mean BMI of patients with known UDP was 32. Frank wet taps occurred in 65% of patients; intrathecal catheters occurred in 16%. 77% of patients with a known UDP developed a PDPH; 52% required an epidural blood patch and 7% required a second.
Associations between patient, provider, and temporal factors and the risk of UDP are seen in the table. Factors most strongly associated with an increased risk of UDP were CA1 year (OR 2.87, 95% CI [1.58-5.2] compared to attending), CA2 year (OR 5.17 [3.07-8.68] compared to attending), 2nd week of the month (OR 1.52 [1.05-2.21] compared to the 4th week), scoliosis or back surgery (OR 3.71 [2.17-6.36], and BMI (OR 1.04 [1.02-1.06] per 1 kg/m^2 increase in BMI).

Conclusion: We have identified several notable factors associated with UDP, including junior trainee level, week of the month, scoliosis/back surgery, and BMI. Precautionary measures and increased vigilance in this population are needed to decrease the risk of UDP and PDPH.

References: Orbach-Zinger A&A 2016

UDP table.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 04

Inadvertent Dural Puncture Leading to Subdural Hematomas and Persistent Headaches

Presenting Author: Jessica Nieto, MD
Presenting Author's Institution: Naval Medical Center San Diego
Co-Authors: Zachary Meade, MD - Naval Medical Center San Diego

Introduction: Epidurals are commonly performed for labor analgesia. Inadvertent dural puncture (IDP) and resulting post-dural puncture headache (PDPH) is a well-known complication. PDPH is often managed conservatively or with an epidural blood patch (EBP) and rarely leads to more serious complications. We report a case of a 25-year-old parturient who developed bilateral subdural hematomas (SDH) requiring neurosurgical intervention in the setting of persistent PDPH after known IDP.

Case One: A 25-year-old healthy female underwent attempted epidural placement, leading to an IDP. The catheter was intentionally placed intrathecally for labor analgesia. After catheter removal, classic PDPH symptoms developed. The patient opted for conservative management after a thorough discussion of the risks and benefits. She initially responded well to caffeine and oral medications. Her pain persisted and increased in severity, leading to multiple emergency department (ED) visits. Despite repeated discussions with on-call anesthesia providers, she continued to decline EBP. Twenty days after IDP, she presented to the ED with severe postural head and neck pain. Head imaging revealed bilateral SDH with midline shift. She developed bradycardia and hypertension. Decompressive craniostomy was performed, followed by a short, uncomplicated hospital stay. Her pain was no longer positional, but severe headaches persisted, suggesting ongoing complications. She is followed by pain management for ongoing headaches and neck tension that is resistant to trigger point injections and botulinum toxin injections.

Discussion: Epidurals are vital for peripartum anesthesia, but IDP can rarely lead to serious complications like SDH. The risk-benefit ratio of preventing SDH and persistent headaches with EBP has not been fully defined, and management recommendations and identification of patients at risk for SDH is still needed. Additional risk of utilizing an intrathecal catheter with an IDP has yet to be fully elucidated and remains controversial. A multidisciplinary approach, including anesthesiologists, neurologists, and neurosurgeons is crucial for effective management.

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(2020). Intrathecal catheterisation after observed accidental dural puncture in labouring women: Update of a meta-analysis and a trial-sequential analysis. International Journal of Obstetric Anesthesia, 41, 71–82. https://doi.org/10.1016/j.ijoa.2019.08.001

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 05

Subdural Hematomas after Accidental Dural Puncture Requiring Surgical Interventions

Presenting Author: Yujing Zhao, M.D.
Presenting Author's Institution: MetroHealth Medical Center

Introduction: Post dural puncture headache (PDPH) is a well-known potential complication of neuraxial procedures. Subdural hematoma (SDH) formation secondary to breaking of the bridging veins in the setting of intracranial hypotension, however, can present similarly but is a much more serious complication of accidental dural puncture. Here we present a case of bilateral SDH after an accidental dural puncture requiring neurosurgical interventions to remind practitioners to remain vigilant about this potentially lethal complication from neuraxial anesthesia.

Case One: A 28-year-old G6P3023 woman with history of obesity (BMI 37), mild anemia and sickle cell trait presented for elective induction of labor at 39 weeks and 1 day. She had 3 previous full-term vaginal deliveries and received a non-complicated epidural analgesia for one of them. An accidental dural puncture occurred during epidural placement and an intra-thecal catheter was inserted to provide labor analgesia. On postpartum day (PPD) 1 after a vacuum-assisted vaginal delivery, the patient reported positional headache which was managed conservatively with fluids, ibuprofen and caffeine. Pt returned on PPD 8 for recurring and worsening positional headache without other associated neurological symptoms. An epidural blood patch (EBP) was offered but she declined due to the previous unpleasant epidural experience. Her headache again improved but reappeared on PPD 23, however, she did not present to another hospital with a severe headache until PPD 37. A CT scan without IV contrast showed a 9mm right SDH and a 10mm left SDH, with generalized effacement of sulci. Pt was initially managed with an EBP under fluoroscopic guidance, but had worsening of the right hematoma 10 days later requiring a right burr hole craniotomy. She then received another blood patch and a separate left mini craniotomy to alleviate headache and nausea symptoms. Pt was eventually discharged without neurological sequelae and had subsequent births without neuraxial anesthesia (by choice).

Discussion: 72% of PDPH resolve within 1 week.1 When the headache is prolonged or has worsened after improvement, such as in the case here, other causes of headache should be ruled out. It is difficult to determine if the SDH has already occurred on PPD 8, however, her sudden worsening of headache a month later seemed to suggest the SDH occurred then. Would a blood patch at PPD 8 have prevented the SDH? Even though early blood patching may prevent SDH by decreasing CSF losses, there are also reports of SDH developing despite early EBP.2 A thorough discussion with the patient regarding the risks and benefits of an EBP, the expected course of PDPH and possible other causes of headache is essential in the shared decision-making process of managing postpartum headache.

References: 1. Vandam LD (1956). J Am Med Assoc. 161(7):586-91. 2. Cuypers V (2016), Int J Obstet Anesth. 25:58-65.

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 06

Post-Dural Puncture Headache Incidence in Dural Puncture Epidurals/Combined Spinal Epidurals Versus Conventional Epidural Blocks for Labor: A Systematic Review and Meta-Analysis

Presenting Author: Kumiko Chino, MD
Presenting Author's Institution: UPMC Magee-Womens Hospital
Co-Authors: Nathan Pace, MD, MStat - University of Utah
Emily E. Sharpe, MD - Mayo Clinic
Patrice Vinsard, MD - University of Minnesota
Emily Walsh, MD - Mayo Clinic Rochester
Christine Warrick, MD - University of Utah

Abstract:
Background: The dural puncture epidural (DPE) and combined-spinal epidural (CSE) intentionally perforate the dura which could increase the incidence of post-dural puncture headache (PDPH). However, a prior meta-analysis did not identify any difference in PDPH rates between CSEs and epidurals used for labor analgesia [1]. Yet, most of the included studies used narrower (27 gauge) spinal needles. Because the minimum of a 25 gauge spinal needle is required for a DPE technique to improve block efficacy [2], this prior finding may not be applicable to current DPE/CSE techniques where a 25 gauge or greater spinal needle is employed. We conducted a meta-analysis of RCTs comparing DPE or CSE labor analgesia techniques (using 24- or 25- gauge spinal needles) with epidurals, to evaluate risk of PDPH.

Methods: Following registration on PROSPERO (CRD42022298624), Medline, Embase, Cochrane Central Register of Controlled Trials, Database of Abstracts of Reviews of Effects, Scopus, and Web of Science Core Collection databases were searched initially May 4, 2022 and updated April 11, 2023. All randomized controlled trials (RCT) comparing epidural labor analgesia to or DPE or CSE techniques using 24 gauge or 25 gauge spinal needles were included. The Revised Cochrane risk-of-bias tool for randomized trials was applied. Our primary outcome was postpartum headache.

Results: The literature search yielded 10,652 studies. Full text manuscripts were obtained for 130, of which 12 RCTs (total epidural group, n=1259, total DPE/CSE group, n=964) met inclusion criteria. Of the 12 studies, 8 studies reported zero headaches in either group (n=763, 34% of total) and were not reflected in the summary odds ratio (OR). Meta-analysis revealed no difference in the headache rate between the two groups (Odds ratio 1.65; 95% CI: 0.57 to 4.78, $I^2 = 0.0$, $P = 1.00$) (Figure).

Discussion: Our analysis suggests when 24- or 25-gauge spinal needles are used as part of a DPE or CSE technique, there is no difference in the risk of PDPH compared to a traditional epidural technique. Our results offer reassurance PDPH rates are not increased with use of CSE or DPE labor analgesia. When interpreting this meta-analysis, it is important

to consider the total sample size as over one-third of all subjects were part of studies with zero events. Although these subjects were not included in the odds ratio calculation, their null result supports no difference between groups. While the sample sizes across both groups were relatively balanced, suggesting comparable effects, the follow-up period in some studies included only the in-hospital period and may have been insufficient to detect all PDPH. A future large sample size RCT is needed to more definitively assess PDPH risk with CSE and DPE labor analgesia.

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2. Chau. Best Pract Res Clin Anaesthesiol. 2022 May;36(1):3-15.

Figure.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 07

Interventions to Prevent Postpartum Depression: A Systematic Review of the Literature and Network Meta-Analysis

Presenting Author: Heather E. Acuff, MD, PhD
Presenting Author's Institution: Washington University in Saint Louis - St. Louis, Missouri
Co-Authors: Debashis Das, TBD - TBD
Shannon Lenze, PhD - Washington University in Saint Louis
Preet M. Singh, MD - Washington University in Saint Louis

Abstract:
Background: Postpartum depression (PPD) has devastating consequences for the mother, baby, and society. Numerous pharmacological and non-pharmacological interventions are available to prevent PPD. To date, no attempt has been made to synthesize evidence from comparisons of interventions across these categories.
Objective: Conduct a systematic review and network meta-analysis (NMA) of interventions to prevent PPD.

Data Sources: MEDLINE, Embase, Scopus, Cochrane Central Register of Controlled Trials, and ClinicalTrials.gov databases from inception to May 2023.

Eligibility Criteria: Randomized control trials of pregnant women that assess interventions initiated during pregnancy or within 1 year of delivery.

Methods: We performed a systematic review and an NMA in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.[1] Risk of bias was assessed independently by two review authors using the RoB 2.[2] Our outcome of interest was the antidepressant efficacy of the interventions in preventing PPD. For each intervention, mean and standard deviation values for depression criteria methods were extracted and converted to standardized depression z-scores. Surface Under the Cumulative Ranking Curve (SUCRA) scores were obtained for each intervention.[3] Standardized mean differences in standardized depression scores (MD) with 95% confidence intervals (CI) were calculated comparing each intervention to controls.

Results: We identified 4,448 references and reviewed 895 full-text manuscripts. Data collection is still ongoing (18% complete, estimated completion in March). So far, evidence has been synthesized from 36 trials reporting 4,345 patients. The following interventions were identified and analyzed: expressive writing (SUCRA 0.7, MD -0.15, CI [-0.44; 0.14]), vitamins (SUCRA 0.7, MD -0.13, CI [-0.31; 0.05]), essential oils (SUCRA 0.67, MD -0.12, CI [-0.25; 0.01]), non-cognitive behavioral therapy (SUCRA 0.63, MD -0.08, CI [-0.20; 0.03]), education (SUCRA 0.61, MD -0.08, CI [-0.15, -0.00]), supplements (SUCRA 0.58, MD -0.09, CI [-0.29; 0.11]), ketamine (SUCRA 0.51, MD -0.05, CI [-0.14; 0.04]), non-cognitive behavioral therapy + education (SUCRA 0.5, MD -0.16, CI [-0.29; -0.03]), social support (SUCRA 0.45, MD -0.03, CI [-

0.13; 0.07]), cognitive behavioral therapy (SUCRA 0.38, MD -0.02, CI [-0.09; 0.05]), exercise (SUCRA 0.37, MD 0.01, CI [-0.21; 0.23]), control (SUCRA 0.28 [reference]), and hormonal (SUCRA 0.12, MD 0.15, CI [-0.11; 0.40]).

Conclusion: The preliminary analysis has already identified twelve interventions and, once complete, this NMA will compile a comprehensive list of available interventions to prevent PPD and incorporate all comparative data to provide the relative efficacies of these interventions to inform clinical decisions regarding the most appropriate choice for individual patients.

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2. Sterne JAC, et al. BMJ. 2019.
3. Salanti G, et al. J Clin Epidemiol. 2011.

Acuff_Interventions_to_Prevent_Postpartum_Depression_A_Systematic_Review_of_the_Literature_and_Network_Meta_Analysis.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 08

Development of a Psychological Birth Trauma Screening and In-Hospital Psychosocial Support Protocol

Presenting Author: Katherine M. Seligman, MD FRCPC D.ABA
Presenting Author's Institution: University of British Columbia
Co-Authors: Laura Folino, RN - Provincial Health Services Authority
Thomas Yang, BMBS FANZCA - University of British Columbia

Abstract:
Background: Research suggests that approximately 25-34% of women experience their birth as traumatic or highly stressful. The reported prevalence rates vary widely depending on the study and the definition of birth trauma used. Patients who experience distressing deliveries, severe maternal morbidity, or near misses, are at increased risk of post-traumatic stress disorder (PTSD), post-partum depression, post-partum anxiety, as well as difficulty with breast feeding and infant bonding. Despite the substantial impact on maternal mental health, there is a notable absence of a standardized protocol for screening and intervention in current obstetric practices related to psychological birth trauma.

Methods: Recognizing the need for improved support following major in-hospital events, we conducted a comprehensive review of our services at the largest birthing hospital in British Columbia (delivery volume 7,200). The absence of standardized screening and support mechanisms led us to explore evidence-based tools suitable for postpartum populations. We opted for the Peritraumatic Distress Inventory (PDI), administered within 24 hours postpartum, to identify individuals at an increased risk of PTSD and psychological birth trauma (P-BT). Patients scoring ≥15 were offered psychosocial support through social work consultation and referral to inpatient trauma counselors. (1) The primary delivering physician or midwife received notification of the patient's score, along with the provision of patient-facing resources on psychological birth trauma.

Implementation: Rollout of this pilot project occurred in the high acuity unit on labor and delivery. Patients with live born babies admitted to the unit were eligible for screening. Bedside nurses were enlisted to administer the PDI screening tool and place indicated consults. Collaborating with clinical counselors and social workers, we established a network for trauma debriefings and immediate postpartum support.

Conclusion: We outline the pioneering development of a psychological birth trauma screening protocol for postpartum patients, utilizing a multidisciplinary approach. Our initiative marks the first screening protocol of its kind in any birthing hospital in British Columbia and, to our knowledge, in Canada. Continuous improvement through Plan-Do-Study-Act (PDSA) cycles remains integral to refining the protocol and expanding available resources for vulnerable patients during this critical postpartum period. This innovative approach aims to significantly enhance the care and support provided to individuals experiencing psychological birth

trauma, ultimately contributing to improved maternal mental health outcomes.

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Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 09

The Role of Neuroimaging for Seizure Management in Pregnancy: A Case Series

Presenting Author: Nicholas Ledlie, MSc, BMBS, MRCP, FRCA
Presenting Author's Institution: BC Women's Hospital
Co-Authors: Ellen Miles - BC Women's Hospital
William Shippam, MBChB, FRCA, FRCPC - Department of Anesthesia, BC Women's Hospital and Health Centre, Vancouver, BC, Canada

Abstract:
Introduction: Seizures in pregnancy pose unique clinical challenges with risks to both the mother and fetus, including hypoxia, stillbirth and maternal death. [1] Epilepsy and eclampsia are the most common causes of seizures during pregnancy. Other conditions may present with seizures and their management is distinct according to the underlying cause. Eclampsia is associated with abnormalities on neuroimaging including cerebral oedema, cerebral infarction and intraparenchymal haemorrhage, with MRI evidence of cerebral infarction in up to 22%.[2,3] Despite these abnormalities, which can persist for weeks, neuroimaging is not always considered necessary. [4]
The obstetric perioperative anesthesiologist plays a significant role in the management of seizures and facilitating ongoing care. To ensure safe management, the anesthesiologist needs to recognize potential causes, the role of neuroimaging and the implications of anesthetic interventions.
The objectives of this study were to evaluate the demographic profile, etiology and neuroimaging findings of patients presenting with a seizure at a tertiary obstetric center over a 10-year period.

Methods: Ethics committee approval was granted. Retrospective database analysis of seizures in pregnancy (requiring an obstetric internal medicine consult) was performed. Medical chart review obtained demographic information, diagnosis, imaging findings and management.

Results: 36 cases of seizures were identified between 2013 to 2023. The mean age was 30.9 years with no difference in parity. Seizure etiologies are shown in Table 1. Neuroimaging was performed in 30 (83.3%) cases; 28 CT and 14 MRI scans. Abnormal neuroimaging was found in 11/30 (36.7%) cases where a scan was performed. There were 10 cases of eclampsia; 8 (80%) had abnormal neuroimaging findings including edema, hemorrhage and infarction. Neuroimaging was not performed in 6 (16.7%) cases; 4 epilepsy and 2 psychogenic non-epileptic seizures.

Discussion: We identified a wide range of seizure etiologies in pregnancy, highlighting the importance of a correct diagnosis to ensure appropriate management. Overall, 36.7% of patients scanned had abnormal neuroimaging, with critical findings in 80% of eclamptic cases. The likelihood of intracranial abnormalities in this group emphasizes the high-risk nature of these patients and the potential for dire consequences. We propose that all patients

with new seizures in pregnancy should receive neuroimaging as part of their initial investigations to aid diagnosis and identify crucial pathology. This information allows anesthesiologists to provide appropriate and safe anesthesia and perioperative care.

References:

References

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Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 10

Relationship Between Duration of Oxytocin Cessation and Estimated Blood Loss During Cesarean Delivery

Presenting Author: Breta Osei-Bonsu, MD
Presenting Author's Institution: Mount Sinai West/Morningside
Co-Authors: Ghislaine C. Echevarria, MD - Mount Sinai West/Morningside
Bryan Mahoney, MD - Mount Sinai West/Morningside

Abstract:
Introduction: Oxytocin is a uterotonic that is frequently used to induce labor and augment contractions. Its use is also critical during the management of the third stage of labor to enhance uterine contraction and prevent postpartum hemorrhage (PPH).[1] Patients who have a protracted labor course may be exposed to exogenous oxytocin for a significant amount of time. Prolonged oxytocin exposure is a risk factor for uterine atony and PPH.[2] Studies have demonstrated that prolonged oxytocin exposure can cause uterine myocyte desensitization and thus decrease its effectiveness when administered during the third stage of labor.[3] Yet, there is limited data to support the duration of time needed for cessation to decrease the risk of PPH. We present a retrospective review to determine the correlation between the duration of oxytocin cessation to the amount of estimated blood loss (EBL) during delivery in patients undergoing intrapartum cesarean delivery.

Methods: A retrospective chart review was performed for all labor encounters who underwent intrapartum cesarean delivery between 2019 and 2023 at our academic medical center. A custom search query was used to identify those who received an oxytocin infusion during their labor. Basic obstetric information including age, BMI, and comorbidities associated with increased risk for PPH was noted. These records were further reviewed to obtain the start and stop times of oxytocin administration, the time of delivery, and total EBL.

Results: A total of 2,411 subjects were identified. The median duration of oxytocin cessation to delivery was 124 minutes, the median total duration of oxytocin infusion was 810 minutes, and the median EBL for all cases was 722 mL. Table 1 depicts the frequency of PPH risk factors identified. When adjusting for confounding PPH risk factors, no significant relationship was found between the duration of time of stopping intrapartum oxytocin to the EBL (95% CI -0.12 to 0.56 p= 0.211).

Discussion: Our retrospective review did not demonstrate a correlation between the duration of time from stopping intrapartum oxytocin and the total EBL during cesarean delivery. Our results are surprising given that prior studies have proposed that resensitization of the oxytocin receptor can occur following oxytocin discontinuation.[4] A limitation to our study is that the administration of additional uterotonics following delivery was not analyzed which may impact a subject's total EBL. Ultimately, more studies are needed to determine optimal intrapartum oxytocin cessation management during failed labor and its impact on postpartum

hemorrhage.

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2. Hernandez-Martinez A *et al*. *Women and Birth*. 2019;32(2):112-118

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Relationship Between Duration of Oxytocin Cessation and Estimated Blood Loss During Cesarean Delivery.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 11

Methylergonovine + Oxytocin Vs. Oxytocin Alone in Non-Elective Cesarean Sections, A Retrospective Cohort Study

Presenting Author: Jordan Abrams, MD
Presenting Author's Institution: Mount Sinai West/Morningside
Co-Authors: Michael Balot, DO - Mount Sinai West/Morningside

Abstract:
Introduction: The burden of postpartum hemorrhage (PPH), can be substantially reduced through the use of prophylactic uterotonics during the third stage of labor. Currently, the World Health Organization recommends prophylactic oxytocin immediately after delivery to prevent PPH.[1] The prophylactic use of dual uterotonic agents is controversial due to the potential increase in side effects such as nausea and vomiting.[2] However, some studies have demonstrated positive outcomes with a reduced need for additional uterotonics and lower transfusion rates.[3] The aim of this retrospective study was to determine if the earlier administration of both methylergonovine and oxytocin vs. oxytocin alone in parturients undergoing non-elective cesarean delivery led to any significant difference in estimated blood loss (EBL).

Methods: A retrospective chart review was performed on all patients who underwent an intrapartum cesarean delivery at our medical center from 2019 to 2023. Through custom search queries, we identified patients who received oxytocin, methylergonovine, or both during their delivery. Subjects were grouped into two cohorts: one group that received only oxytocin and a second group that received both oxytocin and methylergonovine. The time of uterotonic administration, time of childbirth, and total EBL was retrieved. The time from childbirth to administration of methylergonovine was calculated. Obstetric data including PPH risk factors were accounted for and statistical analysis was performed to compare EBL between the two cohorts.

Results: A total of 2,509 subjects were identified. 2,087 parturients received only oxytocin following delivery and 422 received both oxytocin and methylergonovine. The mean EBL was 1056.7 mL for those who received only oxytocin and 1235.9 mL for those who received both agents. Within the group that received both uterotonic agents, the mean EBL when methylergonovine was given within 5 minutes of delivery was 1006.4 mL (n=174). Comparatively, the mean EBL when methylergonovine was administered greater than 5 minutes after delivery was 1408.8 mL (n=231). After adjusting for independent PPH risk confounders, delaying administering methylergonovine was associated with an increase in EBL by 41.9 mL every minute (95% CI 32.9, 50.9, p=0.003).

Conclusion: Our retrospective review demonstrated that delaying the use of methylergonovine after 5 minutes of delivery was associated with an increase in EBL by the minute. These results are supported by a recent randomized controlled trial where

prophylactic administration of methylergonovine led to a lower incidence of PPH and total EBL.[4] Given these findings, practitioners should consider the early administration of methylergonovine to prevent PPH.

References:

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2. McDonald S *et al. Cochrane Database Syst Rev*. 2004;2004(1)
3. Gallos ID *et al*. *Cochrane Database Syst Rev*. 2018;12(12)
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Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 12

Association of an Oxytocin Bolus Protocol on Use of Secondary Uterotonic Agents during Cesarean Delivery

Presenting Author: Brittany McCune, MD
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Abstract:
Introduction: At our hospital, patients used to receive an infusion of 40 units oxytocin mixed with one-liter Lactated Ringer's solution delivered by gravity after delivery of the placenta. In August 2022, we implemented a new protocol where patients received a series of three-unit boluses of intravenous oxytocin followed by an infusion that was modeled on the protocol published by Kovacheva, et al.[1] We hypothesized that patients who received oxytocin boluses followed by an infusion would have a lower incidence of secondary uterotonic administration compared to patients who had an oxytocin infusion without boluses.

Methods: We used an observational study design. We retrospectively collected data for patients who had cesarean deliveries with an oxytocin infusion without boluses from September 1, 2021 through December 31, 2021 and prospectively collected data for patients who had oxytocin boluses followed by an infusion from September 1, 2022 through December 31, 2022. We allowed for a one-month washout period for staff to become familiar with the new oxytocin bolus protocol prior to data collection. Intrauterine oxytocin, intramuscular methylergonovine, intramuscular carboprost tromethamine, and sublingual misoprostol were defined as secondary uterotonics.

Results: 268 and 283 patients comprised the oxytocin bolus and oxytocin infusion without bolus cohorts, respectively. Demographic and clinical data for the cohorts are presented in the table. The odds ratio for patients in the oxytocin bolus cohort receiving a secondary uterotonic was 0.261 (95% CI 0.163-0.418; $p< 0.001$). Patients in the oxytocin infusion without boluses cohort had a statistically significant higher rate of intrauterine oxytocin administration.

Discussion: Patients in the oxytocin bolus cohort were approximately 74% less likely to receive a secondary uterotonic agent compared to patients in the oxytocin infusion without bolus cohort. A limitation of this study was that we defined intrauterine administration of oxytocin as a secondary uterotonic and our results may not be generalizable to hospitals that do not use intrauterine oxytocin.

References: 1. Kovacheva VP, Soens MA, Tsen LC. A Randomized, Double-blinded Trial of a "Rule of Threes" Algorithm versus Continuous Infusion of Oxytocin during Elective Cesarean Delivery. Anesthesiology 2015;123:92-100

Table 1.pdf

Abstract #: SUN – RA & CR – BS 4 – BR 5 - PDPH Depression & … Oxytocin – 13

Identifying Severe Maternal Morbidity (SMM): A Challenge in and of Itself

Presenting Author: Kyle Sullivan, MD
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Co-Authors: Joe Bryant-Huppert, MD - New York Presbyterian- Weill Cornell
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Sarah Weingarten, MD - New York Presbyterian- Weill Cornell

Abstract:
Background: A review process for severe maternal morbidity (SMM) allows hospitals to identify systems, provider, and patient issues that may have a deleterious impact on patient outcomes, including mental health status. However, accurate capture of SMM cases can be challenging. To better understand SMM and its impact on patients, we must first be able to accurately identify true SMM events within our patient population. The CDC has defined 21 indicators of SMM.[1]

Purpose: SMM has been identified as a risk factor for maternal mental health complications, including Post-Traumatic Stress Disorder (PTSD).[2,3] In the context of an IRB-approved study to determine what delivery characteristics are associated with new-onset PTSD following delivery in patients with SMM, we set out to determine the ideal method of capturing SMM events at a single high-volume center.

Methods: We used three systems to gather SMM data for the 680 deliveries performed in October 2023: 1) automated reports from Epic, our Electronic Health Record (EHR), based on diagnostic and procedural codes for SMM indicators, 2) manual chart reviews by the investigators of all deliveries performed at our hospital, and 3) a summary of adverse event reports submitted by providers.

Findings: The automated EHR report found 60 cases with indicators of SMM, with the top 3 being transfusion of blood products (35), post-partum anemia (3), and coagulation defects (9). During a review of the 60 cases, performed to validate the indicators, we found that transfusion was based on blood having been issued by the blood bank, and that in 18 of these cases, the products were not administered. It was noted that post-partum anemia and coagulation defect are not by themselves items on the list of the CDC's 21 indicators. The EHR report also missed 3 anesthesia complications. Manual chart review found 35 cases qualifying for SMM. The top 3 indicators were transfusions of blood products (24), post-delivery ventilatory support (4), and anesthesia complications (4). The latter included post-dural puncture headache requiring blood patch (3) and infection (1). The adverse event summary had only 3 cases, with the reported complications being transfusion of blood products, emergent post-partum hysterectomy, and sepsis.

Conclusion: Based on these findings, we conclude that trained clinician chart review is the most reliable method for accurately identifying SMM cases, although there are opportunities to refine the automated EHR report. This is an important first step in identifying the patients who will be enrolled in our study of what delivery characteristics are associated with new-onset PTSD following delivery in patients with SMM.

References:

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Sullivan SMM graph.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 01

When does Labor Pain Become Front of Mind: Timeline of Antenatal Care Concerns from Patients' Perspectives

Presenting Author: Abigail Wong-Rolle
Presenting Author's Institution: University of California, San Francisco, CA
Co-Authors: Christine Blauvelt, MD - University of California, San Francisco, CA
Jo Anne Gras, MD - University of California, San Francisco, CA
Pamela Huang, MD - University of California, San Francisco
Gabriel Salazar, BS - University of California, San Francisco

Abstract:
Background: Labor pain management is a crucial aspect of antenatal care, influencing the birthing experience and patient satisfaction.[1,2] Shared decision making between healthcare providers and patients is vital for informed choices that align with patient values.[3,4] Although previous studies have reported varying degrees of counseling on options for labor pain during antenatal care,[5] the optimal timing for discussions on labor pain management during antenatal care remains unclear. This study aims to explore patients' concerns at various time points throughout pregnancy, particularly when labor pain becomes a prominent consideration.

Methods: This mixed-methods study involves an initial qualitative phase, where pregnancy related concerns were gathered from 1st, 2nd, and 3rd trimester patients through semi-structured interviews. Thematic analysis identified 13 discrete themes, including labor pain, which were used to create a ranking survey for the ongoing quantitative phase. Participants are surveyed at 20, 24, 28, 32, and 36 weeks of gestation, ranking 7 of the 13 themes based on their level of concern, with their greatest concern scored as 7 and each lesser concern scored in descending order to a score of 1. All remaining themes are given a concern score of 0. Data analysis includes Wilcoxon signed-rank tests and two-sample z tests of proportions.
Results: Of the total 55 participants, 19 have completed all surveys. Preliminary findings indicate a significant difference in labor pain concern scores between 20 and 28 weeks ($z=-2.388$, $p=0.017$). The comparison of scored versus unscored labor pain concern also reveals a significant difference between 20 and 28 weeks ($z=-1.99$, $p=0.023$), approaching significance between 20 and 24 weeks ($z=-1.56$, $p=0.059$). Data collection is ongoing, with completion projected in June 2024.

Discussion: Preliminary results suggest that there is notable concern over labor pain management even early in pregnancy with an uptick around 28 weeks. These findings suggest a potential window for early educational interventions and discussions to enhance shared decision making and patient-centered care. Addressing patient concerns at their peak interest during pregnancy could improve satisfaction, encourage dialogue, and foster better patient care during labor and delivery. Early interventions may positively impact the birthing experience and overall antenatal care.

References:

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Wong-Rolle_SOAPAbstract_Figure.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 02

Interprofessional Simulation-Based Team Training Using Relational Coordination Theory on the L&D Unit – A Pilot Study

Presenting Author: Katherine Bartz, MD
Presenting Author's Institution: UCSF
Co-Authors: Christy Boscardin, PhD - UCSF
Kelly Brandon, MSN, RNC, CNS IBCLC - ZSFG
Mara Fox, CNM, NP, RN - ZSFG

Abstract:

Introduction:

L&D units are vulnerable to breakdowns in teamwork due to complex dynamics between different disciplines.[1] This can lead to silo mentality, power differentials and conflict.[1,2] Interprofessional simulation-based team training (ISBTT) is a vital L&D teamwork improvement tool. ISBTT debriefing often focuses on correct execution of hierarchical protocols and rarely addresses team behavior interdependency.[3]

Relational Coordination (RC) theory quantifies social processes and human interactions.[4] The seven RC domains include three relational aspects (shared knowledge, shared goals, mutual respect) and four communication aspects (frequency, accuracy, timeliness, problem solving). RC has been used to improve interdisciplinary teamwork, but ample literature on L&D unit RC-informed ISBTT is lacking.[5,6]

Hypothesis:

L&D unit team dynamics can be evaluated through RC-informed ISBTT.

Methods:

IRB exemption was obtained (#22-36662). A baseline validated RC survey was distributed to L&D team members. Data were analyzed using RC Survey™. Using these data and the seven RC domains, a standardized ISBTT debrief guide was created.

ISBTTs are held monthly on the L&D unit. Sessions include two 15-min cases on leading causes of maternal mortality reported by the CMQCC, followed by 30-min debriefs. Debrief audio recordings are thematically coded to the seven RC domains via Dedoose™.

Results:

The baseline RC survey response rate was 27% (68/255). Results showed an RC index of 3.76/5 indicating moderate RC among all L&D team members.

Six ISBTT sessions were held from Aug 2023-Jan 2024 with 72 nursing, midwifery, OB and anesthesia staff and trainees. Participants' evaluations on debrief effectiveness in addressing team dynamics and communication showed a mean rating of 4.74/5 (SD 0.83, Likert scale).

Interim data analysis of 167 min of debrief recordings revealed 382 thematically coded excerpts—fig 1. RC domains with the highest prevalence were shared knowledge (26%), mutual respect (15%), timely communication (14%) and accurate communication (11%). RC domains with less prevalence were shared goals (9%), problem solving communication (7%)

and frequent communication (2%). Other thematic codes occurred with 16% frequency.

Discussion:
Interim analysis suggests RC theory can be effectively applied to L&D ISBTT. Shared knowledge (perspective taking and understanding team roles) was most commonly addressed (26%). Frequent communication was least addressed (2%), possibly due to 15-min case time constraints. These findings aid in assessing team dynamics and may promote culture change, but data collection is ongoing.

Conclusion:
L&D unit team dynamics can be evaluated through RC-informed ISBTT. This allows the quantification of complex team interactions and may promote culture change.

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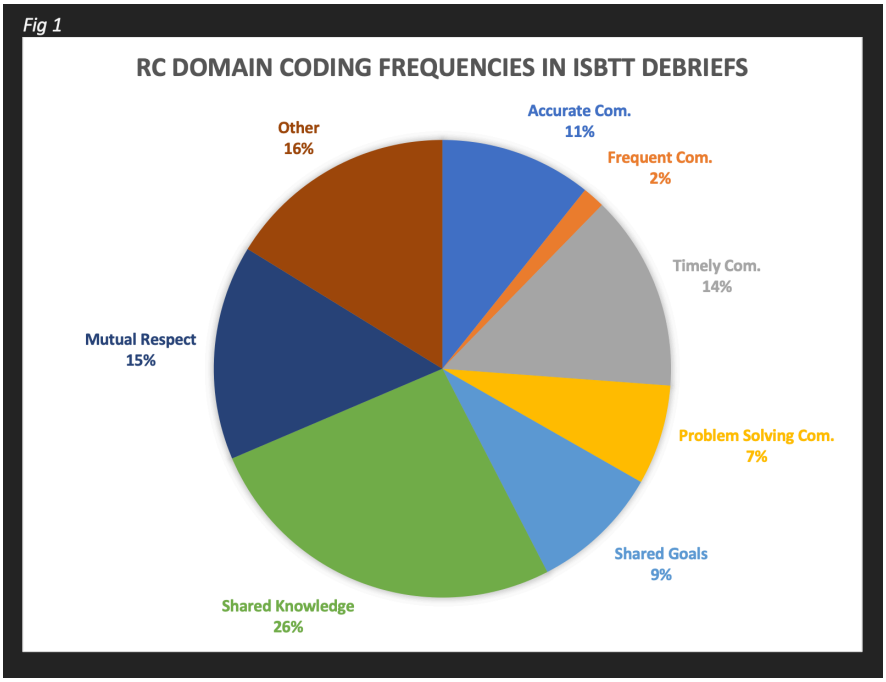
Fig 1



Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 03

Strengths and Barriers to an Effective Multidisciplinary Safety Rounds: A Qualitative Analysis of Obstetric, Midwifery, Anesthesia, and Nursing Provider Input

Presenting Author: Bryan Wakefield, MD
Presenting Author's Institution: Vanderbilt University Medical Center
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Neva P. Lemoine, MD - Vanderbilt University Medical Center
J Newton, MD, PhD - Vanderbilt University Medical Center
Britany L. Raymond, MD - Vanderbilt University Medical Center
Laura L. Sorabella, MD - Vanderbilt University Medical Center

Abstract:
Introduction: Multidisciplinary labor and delivery safety rounds are widely regarded as important contributors to communication, teamwork, and ultimately maternal wellbeing.[1] In 2023, our labor unit noted decreased frequency of safety rounds occurring every shift. We aimed to better understand perceptions of safety rounds and to elicit perceived barriers to their occurrence via survey of anesthesia, obstetric, midwife, and nursing providers.

Methods: This quality improvement project used SmartSheets to distribute a 9-question electronic survey to labor and delivery providers between September 18, 2023, and October 6, 2023. The survey included 3 yes/no questions asking if safety rounds were perceived as (1) important and (2) effective and (3) if there were barriers to completing. Follow-up open-ended questions allowed participants to expand on why they chose yes/no answers and also solicited additional input on how efficiency, effectiveness, and barriers could be improved. Authors performed deductive qualitative analysis of survey comments to identify recurrent themes.

Results: Surveys were distributed to 174 participants, with 14/29 (48%) anesthesia, 13/25 (52%) nurse/technician, and 20/120 (17%) obstetric/midwife providers completing the survey. Of 48 responses, 40 (83%) believed that safety rounds were an important component of providing quality care, 20 (42%) believed the current version of safety rounds was effective in improving safety, and 38 (79%) perceived barriers to safety rounds occurring. Analysis of 152 comments revealed themes and sub-themes as outlined in Table 1. Based upon the topical format of our survey outline, we categorized our schematic coding into an analytic framework of 1)purpose, 2)structure, 3)barriers, and 4)optimization. In addition to the explicit purpose of promoting patient safety, many providers identified the fostering of multidisciplinary collaboration and teamwork as a purpose of safety rounds. Regarding structure, standardization was a major recurrent theme for both presentation content and timing of rounds. The overall clinical busyness of the floor and rounds being a distraction from clinical care were by far the largest identified barriers. Other barriers included inconvenient timing, which led to a lack of all teams' presence. Themes for optimization focused on a unit prioritization of safety rounds and holding the rounds in a more ergonomic environment.

Conclusions: Based on qualitative assessment of survey response themes, our multidisciplinary task force prioritized safety rounds at a set time and place for day and night shifts and promoted a nurse-led standardized presentation model. Following restructuring, safety rounds occurred more frequently (72% of shifts in 8 weeks postimplementation vs. 52% of shifts in 8 weeks preimplementation). Future surveys will be needed to identify provider's perceptions of the changes and ongoing opportunities for improvement.

References:
1)PMID 28244949
2)PMID 17176309

QI for Saftey Rounds Table Final.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 04

Increasing the Percentage of First Case on-time starts in the Labor & Delivery Operating Rooms

Presenting Author: Paloma Toledo, MD, MPH, FASA
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Michelle Fletcher, MD - University of Miami
Eva Hoffman, MD - University of Miami
Michelande Ridore, MS - Holtz Women's Hospital
Colleen Virgins, RN - Holtz Women's Hospital

Abstract:
Background: Delays in first case on-time case starts (FCOTS) can result in operating room (OR) inefficiency, dissatisfaction, for patients, their providers, and OR staff, and greater facility costs. Though standards for increasing main OR efficiency have been described in the literature, little research has been conducted in labor and delivery (L&D) units. The L&D setting poses additional challenges to on-time starts given the unpredictable nature of add-on cesarean deliveries. The average percentage of FCOTS at our Women's Hospital was 12% over the past year with some months having a zero percentage of on-time first case starts. The objectives of this project were to describe the barriers to on-time case starts in L&D operating rooms and develop interventions to reduce case delays. Our aim was to increase our percentage of on-time first cases in the L&D ORs from 12% to 75% within one year of the project initiation.

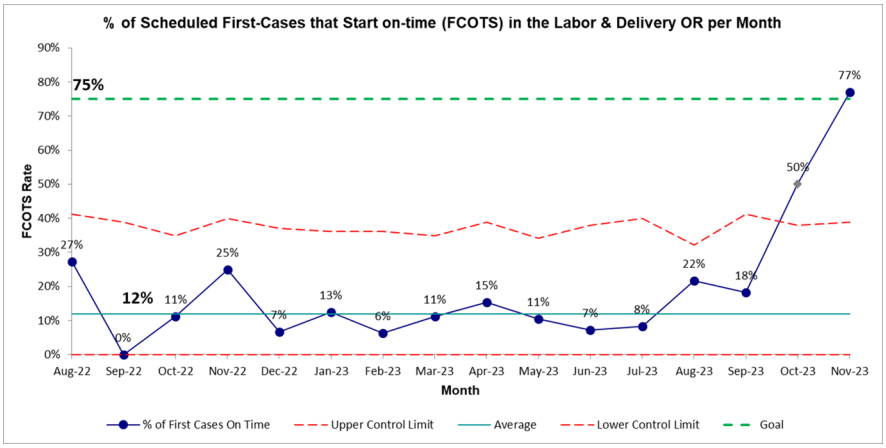
Methods: A multidisciplinary team was established with representation from quality, obstetrics, anesthesiology, nursing, scheduling, and operating room staff in November 2022. The operational definition of first case on-time start was any case in which the patient was in the OR at the time of scheduled surgery. All L&D procedures are included in the primary outcome measure. Failure modes effect analyses, process mapping, and interventions were developed using the IHI Model for Improvement to test via rapid Plan-Do Study cycles. Montgomery rules via statistical process control charts were used to measure statistically significant changes in the outcome and process measures.

Results: Patient-, provider-, and systems-level contributors to the delays were identified. Patient-level factors included patients not arriving on-time, not having the appropriate bloodwork performed prior to surgery, and not being appropriately fasted for surgery. Provider-level factors included lack of staff due to care of another patient, or changes in the order of scheduled cases on the day of surgery. Systems-level factors included the lack of a clean/available OR, or issues related to the admission order set. Structure, process, team member and patient engagement interventions were identified, and changes implemented included standardizing patient instructions, standardizing order sets, and accessing a back-up OR which can be used in the event of an unscheduled "crash" cesarean delivery. Since the

inception of the project, there have been no months with 0% on-time starts and we surpassed our target of 75% at the end of the project period (Figure 1).

Conclusions: A multidisciplinary team identified several barriers to on-time case starts and using QI methodology we were able to surpass our goal of 75% at our safety net hospital. The team continues to track the percentage of FCOTS, as well as reasons for the delays on a daily basis. This quality improvement team is using the framework used to improve FCOTS for improving other maternal outcomes.

References:



Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 05

Decreasing the Unnecessary Wait Time for Scheduled Cesarean Section

Presenting Author: Bhakti Chourasia, MD
Presenting Author's Institution: Oregon Health and Science University (OHSU), Portland Oregon - Portland, Oregon
Co-Authors: Steven A. Godwin, MD - University of Florida College of Medicine Jacksonville

Abstract: Title: Decreasing the Unnecessary Wait Time for Scheduled Cesarean Section. Authors: *Bhakti Chourasia MD, **Steven A. Godwin MD.

Problem Statement: Post-Partum Hemorrhage (PPH) is the most common cause of morbidity and mortality in pregnant patient. Depending upon risk factors and history, patients might require blood products prior to cesarean section (CS). Our data from March 2022 to October 2022 shows that 23% of CS cases required blood products causing unnecessary delay due to lack of availability of blood products at the L&D OR. On an average, it takes up to 192 minutes to start a planned CS after arrival of the patient to the hospital; therefore, any delay is negatively impactful to patient care and experience.
Goal: The aim of this study was to find methods to decrease the delay time from 192 minutes to 25 minutes due to inaccessible blood products for CS by 12/31/2023.
Background: PPH is the leading cause of pregnancy-related mortality in the United States. PPH alone causes 25% of women's death. More than 90% of the preventable morbidity and mortality due to hemorrhage is secondary to delay in treatment and/or lack of blood availability for C.S. All high-risk cases require blood products in OR prior to start the procedure.

Methods: We prospectively identified patients scheduled for CS. We collected data of the number of patients required blood products in OR with the number of units sent and transfused. By using DMAIC (Define, Measure, Analyze, Improve and Control) methodology, we performed Gemba Walk, Process and Value Stream Map, Stakeholder Analysis, Communication Plan, Root Cause Analysis with 5 Why's and Fishbone Diagram to find the cause and possible solutions.

Results: By the DMAIC methods, we identified two factors to reduce delay in start of CSs. First was to receive prenatal type and screen samples (T&S) in our blood bank, and we implemented this process starting October 2023. Second, having a refrigerator to store blood products outside OR would further decrease delay. We have got the refrigerator for our L&D OR for emergency access of blood products to reduce the unnecessary delay because of wait time for arrival of blood.

Conclusion: Receiving prenatal T&S samples and having a refrigerator to store blood products at the OR will decrease the unnecessary wait time for CS.

References: 1.Tiruneh B, Fooladi E, McLelland G, Plummer V. Incidence, mortality, and factors associated with primary postpartum haemorrhage following in-hospital births in northwest Ethiopia. PLoS One. 2022 Apr 6;17(4):e0266345. doi: 10.1371/journal.pone

Final Flow Chart Process for Blood in LnD OR.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 06

Expanding Multidisciplinary Simulation-Based Training to Medical Students: A Novel Simulation for Anesthesia and Obstetric Emergencies

Presenting Author: Virginia Berry, MD
Presenting Author's Institution: University of Virginia
Co-Authors: Vaia Abatzis, M.D. - University of Virginia
Brian Florenzo, Medical Student - University of Virginia
Katherine Latimer, M.D. - University of Virginia
Caleigh Smith - University of Virginia

Abstract:
Purpose: This study was undertaken to assess the efficacy of a novel multidisciplinary simulation (SIM) about obstetric emergencies in improving medical student comfort with interprofessional collaboration.

Background: There is evidence for team-based simulation improving teamwork and patient safety. While interdisciplinary simulations are increasingly implemented at resident and attending levels, few have been incorporated or studied among medical students(1). There is a need for such data given this key trainee demographic and the importance of multidisciplinary collaboration as a crucial physician competency. This simulation was designed by faculty members from OB/GYN and Anesthesiology to present students with situations requiring them to collaborate and draw on knowledge and experience from both key specialties.

Methods: The simulation, administered to medical students during their third-year clinical rotation, included management of a severe obstetric postpartum hemorrhage leading to a post-operative code in small groups of 4 or 5 students. The simulation was facilitated and debriefed by both an anesthesiologist and an obstetrician acting in their respective roles. Efficacy was assessed through brief pre- and post-surveys shortened and adapted from the National Interprofessional Collaborative Competencies Attainment Survey. Qualitative feedback was also collected. The simulation was performed and surveys were obtained from medical students at two large academic training centers.

Results: 36 students completed the pre-SIM survey and 43 completed the post-SIM survey. We observed an increase in total score and average comfort score across all seven questions on the post-survey compared with pre-survey. Average increase in comfort score by question was 0.9/7 (range 0.25 to 1.23), with the greatest increase in “comfort seeking team members from other service lines to address issues”. Average pre-SIM total score was 35.1/49 compared with post-SIM score of 41.8/49, representing an 14.5% increase. All respondents agreed that engaging in more simulations like this would be beneficial to their education, and all agreed that this experience will affect their patient care. Results by individual question are shown in Table 1.

Discussion: This multisite study demonstrates the efficacy and acceptability of a multidisciplinary simulation exercise about obstetric emergencies in promoting collaborative competencies at the medical student level. Our data suggests the multidisciplinary simulation increased comfort with interactions across service lines and educational benefit to students during their obstetrics clerkship. We are hopeful that demonstrating and practicing these multidisciplinary interactions during the medical school clerkship will ultimately lead to a positive impact on patient care.

References: (1) Stroud, J, et al. (2017). Putting the pieces together: The role of multidisciplinary simulation in medical education. *Int Journal of Acad Med*, *3*, 104–109.

Table 1.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 07

Cesarean Section Classification System: Improving Apgars through Expedited Communication

Presenting Author: Matthew Sikora, DO
Presenting Author's Institution: Metrohealth Medical Center - West Hollywood, California
Co-Authors: Marcos A. Izquierdo, MD - Metrohealth Medical Center
Clodagh Mullen, MD - MetroHealth Medical Center
Henna Patel, MD - MetroHealth Medical Center

Abstract:
Background: Clear communication between healthcare providers allows for more efficient care in emergencies. This is especially important on L&D where urgent/emergent situations for both mom and baby can occur at any moment. At our institution, we had a particular case where poor communication between nursing, obstetrics, and anesthesia contributed to a poor outcome in an emergency c-section. From this, a multidisciplinary team was assembled to review our communication and language for c-sections. This team worked to develop a shared language on L&D like our main ORs which most of our providers are familiar. The idea was to establish shared language tied to specific expectations for L&D staff to decrease communication errors and improve neonatal and maternal outcomes.

Methods: A multidisciplinary committee including OB, anesthesia, and nursing developed a classification system of five C-section categories (Figure 1). When a c-section was called, the OB team communicated the classification to anesthesia and nursing. The C-sections for non-reassuring fetal status were evaluated looking at neonatal APGARS and cord gases.

Results: We analyzed five months of data before the intervention and five months after institution of the classification system. The rate of general anesthesia was unchanged at 16% in both groups. We then analyzed the Apgar scores and cord gases for category A and B c-sections. The APGAR scores in the pre and post classification group were similar at 1 minute. However, we found APGAR scores at 5 minutes were higher in the post classification group compared to the prior classification group (p= 0.039). No difference was observed with cord gases in both groups.

Discussion: Streamlined communication on L&D can facilitate improved teamwork. Establishing a shared language for urgency of cesarean deliveries efficiently sets expectations across teams that should translate to improved neonatal outcomes. Regarding the higher APGAR scores, there a several factors that could have contributed to this. Utilizing the c-section timelines, our goal was to improve the “decision to incision” time. By minimizing communication errors, we were able to make decisions faster and expedite care in the OR. Also, this shared language and understanding of the timeframe allows anesthesia to quickly prepare general versus epidural dosing with chloroprocaine on the way to the OR for a “Class A". This classification system was also shared with the NICU, and the c-section category is now communicated to NICU when they are needed. This played a role in improved NICU and nursing communication when nursing calls to mobilize NICU. Prior to this study, we were not

recording “decision to incision” time however we plan to use this as a data point to track our urgent/emergent c-sections for quality improvement projects in the future. We will also utilize the "decision to incision" note completed by OB for case reviews and joint M&M conferences.

MetroHealth C-Section Classification System.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 08

Identification of Potential Barriers to Providing Equitable Care on the Obstetric Unit: A Multidisciplinary Survey on Care Providers at Riverside Community Hospital

Presenting Author: Morgan Currie, DO
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Co-Authors: Rita Derderian - University of Irvine School of Medicine
Shruthi Krishnamurthy, MD - HCA/Riverside Community Hospital
Mary Robichaux, MD - HCA/Riverside Community Hospital
Marwa Sidani, MD - HCA/Riverside Community Hospital
Amanda Sniadach, DO - Riverside Community Hospital

Abstract:
Introduction: Disparities in maternal morbidity and mortality rates persist among African American and Hispanic women compared to non-Hispanic white women. Previous studies highlight the positive impact of increased awareness through education in addressing racial and ethnic disparities within obstetric departments [1,2]. This survey study aims to evaluate the awareness of obstetric providers at Riverside Community Hospital regarding existing disparities and investigate the role of personal biases in patient care. Additionally, the study explores availability of resources to combat inequalities.

Method: A Google Survey with 21 questions inquiring about the general characteristics of medical providers and questions related to obstetric situations linked to race and ethnicity disparities was distributed to 167 obstetric care providers at Riverside Community Hospital.

Results: Out of 47 responses, a majority of providers disagreed that personal biases influence patient care. Most, 55%, believe that all patients on the Labor and Delivery unit receive equitable care, and a majority, 62%, expressed willingness to learn more about disparities. While resources such as virtual interpreters and cultural sensitivity training were acknowledged, there is a lack of language proficiency and culturally tailored instructions for patients.

Discussion: Obstetric providers at Riverside Community Hospital recognize the existing disparities in morbidity and mortality among different racial populations. Although many providers believe personal biases do not impact patient care, there is a positive disposition towards learning more about disparities. The study identifies available resources but highlights the need for enhanced language proficiency and culturally sensitive instructions to address disparities effectively. These findings underscore the importance of continuous education and resource development to improve equity in obstetric care.

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Currie Figure 1.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 09

Preoperative Pregnancy Screening with PREG (the Pregnancy Reasonably Excluded Guide) In a High-Volume Hospital System Reduces Testing Burden

Presenting Author: Katherine W. Arendt, MD
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Co-Authors: Megan E. Branda, MS - Mayo Clinic
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Abstract:
Introduction: For female patients of childbearing age undergoing surgery, the American Society of Anesthesiologists recommends offering pregnancy testing to patients for whom the results would alter management.[1] In 2018, the Mayo Clinic surgical practice adopted PREG (Pregnancy Reasonably Excluded Guide), a novel, evidence-based checklist to focus day-of-surgery pregnancy testing on those with a higher potential of pregnancy. PREG assesses menstrual status, surgical history, contraceptive use, and coitus along with a patient's request for testing. Minors, vulnerable adults and non-English speakers get pregnancy testing. Reponses are confirmed by the preoperative nurse, entered into the electronic medical record, and a urine pregnancy test is automatically ordered as indicated by PREG.

Methods: A retrospective cohort study deemed exempt by IRB included females age 18-50 years old undergoing surgery between August 1, 2018 and December 31, 2020 at Mayo Clinic. Emergency and pregnancy-related surgeries were excluded. The medical records were searched for PREG assessment and pregnancy test results.

Results: Of 26,442 females (mean age 37.3 years, SD 9.1) listed for 33,713 surgeries, PREG assessment was documented for 93% of cases. Known pregnancy was documented in 206. Based on the PREG checklist, 89.9% (28,208 of 31,360) were reasonably determined not to be pregnant without a lab test. Testing was indicated and completed in 2335 with 11 (0.47%) positive results and 611 refusing testing. Of those assessed with PREG, 0.04% were pregnant. No false positive pregnancy tests were identified. There were no reports of pregnancies missed by PREG.

Conclusion: PREG is a consistent, efficient method of evaluating for pregnancy on the day of surgery that, in comparison to testing all patients, reduces testing burden. Continued study is required to more rigorously document the sensitivity of the PREG assessment.

References: 1. American Society of Anesthesiologists Statement on Pregnancy Testing Prior to Anesthesia and Surgery. https://www.asahq.org/standards-and-practice-parameters/statement-on-pregnancy-testing-prior-to-anesthesia-and-surgery. Accessed 1/31/2024

Outcome of PREG Assessment.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 10

Evaluation of Artificial Intelligence-Created Personal Statements Compared to Applicant-Written Personal Statements for Obstetric Anesthesiology Fellowship Application

Presenting Author: Amanda Ruiz, MD
Presenting Author's Institution: Mayo Clinic
Co-Authors: Katherine W. Arendt, MD - Mayo Clinic
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Abstract:
Introduction: A personal statement (PS) is required when applying to every stage of medical training, from medical school admissions to residency applications and applying for fellowship. Hired help services for PS are available online, ranging from proofreading to full ghostwriting. The advancement in artificial intelligence (AI), such as ChatGPT, raises concern for applicants utilizing these generators for creating PS. The primary aim of our study was to survey Obstetric Anesthesiology (OBA) Fellowship Program Directors (PD) to see if they can determine the difference between real and ChatGPT-created personal statements. The second aim of our study was to survey the PDs about the importance of PS and their concerns about the applicant if they suspect a PS is written using AI.

Methods: We created 2 personal statements using ChatGPT and utilized 2 personal statements previously used by anonymous volunteers practicing Obstetric Anesthesiology. We sent a survey to 45 OBA Fellowship PDs at US programs on 1/5/2024 with two reminder emails and asked them to evaluate the statements' readability, originality, perceived authenticity, and interview eligibility. They were also asked about the importance of personal statements, opinions on applicants using AI, and demographics.

Results: Seventeen program directors completed the survey providing a 38% response rate. Using a 5-point Likert scale, 67.6% of respondents rated the real personal statements as easy to read or somewhat easy to read, whereas 85.3% of respondents rated the ChatGPT-created personal statements as easy to read or somewhat easy to read. Using a 5-point Likert scale, 35.3% of respondents rated the real personal statements as unique or somewhat unique, whereas 61.8% of respondents rated the ChatGPT-created personal statements as unique or somewhat unique. Using a 5-point Likert scale, 50.0% of respondents rated the real personal statements as written by the applicant or possibly written by the applicant, whereas 70.6% of respondents rated the ChatGPT-created personal statements as written by the applicant or possibly written by the applicant. Program director's perceptions regarding applicants who use ChatGPT are shown in Figure 1. Of the respondents, 58.8% think that using ChatGPT to write a personal statement is unethical.

Discussion: These results support that OBA Fellowship PDs are unable to distinguish between applicant-created and AI-created Personal Statements. A higher percentage of surveyed program directors rated the AI-created personal statements as higher in uniqueness and

readability. We anticipate that as more applicants utilize artificial intelligence, PDs would benefit from increasing their comfort and knowledge of AI software.

Figure 1.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 11

Demographics and Motivations of Current United States Obstetric Anesthesia Fellows: A Survey Based Study

Presenting Author: Christopher Mukasa, MD
Presenting Author's Institution: Brigham and Women's Hospital/Harvard Medical School
Co-Authors: Emily Dinges, MD - University of Washington Medical Center
Michaela K. Farber, MD, MS - Brigham & Women's Hospital

Abstract:
Title: Demographics and Motivations of Current US Obstetric Anesthesia Fellows:
A Survey Based Study
Presenting Author: Christopher Mukasa, MD–Brigham & Women's Hospital/Harvard Medical School
Co-Authors: Michaela Farber, MD, MS–Brigham & Women's Hospital/Harvard Medical School
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Introduction: There is significant demand for fellowship-trained obstetric anesthesiologists in the US to optimize maternal care and outcomes. Demand exceeds supply, and there is poor understanding of who chooses to pursue the fellowship, and why.[1] We aimed to define the demographics of 2023-2024 obstetric anesthesia fellows, understand factors that drew them to the subspecialty, and identify barriers faced in pursuing fellowship.

Methods: After IRB approval, we emailed our survey to all ACGME-accredited obstetric anesthesia fellowship program directors with a request to distribute to their fellows. All responses were recorded anonymously.

Results: We received 30 responses (53.6% response rate, given 56 ACGME fellows). Our sample was 70% female (n=21). Most fellows (n=20, 66.7%) were white, 4 (13.3%) were Asian/Pacific Islander, 3 (10%) were Hispanic/Latino, and 1 (3.3%) was Black. One (3.3%) respondent identified as lesbian, gay, or bisexual. Seven (23.3%) will be trained in more than one subspecialty, including critical care (3), pediatric anesthesia (1), regional anesthesia/acute pain (1), and cardiac anesthesia (1). Fellows cited multiple reasons for choosing obstetric anesthesia, with a majority saying they want to continue to care for high-risk parturients (93.3%) and to stay in academic practice (73.3%). Two (6.7%) elected to pursue further training because they felt that their residencies did not sufficiently prepare them to manage high-risk parturients.
Many fellows noted barriers to pursuing more training in obstetric anesthesia, namely concerns about a lost year of attending salary and perception that fellowship is unnecessary. Twenty-eight (93.3%) fellows were happy with their choice to pursue obstetric anesthesia fellowship, with only 2 (6.7%) wishing they had pursued a different fellowship and 4 (13.3%) wishing they had not pursued fellowship.

Discussion: Notable findings from our survey are that the current class is whiter (66.7% vs 49.3%) and more female (70% vs 35.3%) than anesthesia trainees overall.[2] Overall satisfaction with the choice to pursue obstetric anesthesia fellowship was very high, as was the rate of dual-specialty training. Many fellows pursued training despite discouragement while in residency. Of note, our survey cannot capture those who opted out of fellowship due to such discouragement, underscoring the importance of addressing this challenge. Our data provide meaningful preliminary insight toward improving recruitment in our subspecialty.

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2. Brotherton SE, et al. *JAMA* 2023.

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 12

The Obstetric Anesthesia Workforce Survey: 40-Year Update

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Abstract:
Introduction: Obstetric (OB) Anesthesia Workforce Surveys have been used each decade for 40 years to assess trends in OB anesthesia practice. Anesthesia providers from United States (US) hospitals were invited to complete a 5th survey in 2022-23 about practices used in their hospitals in 2021. Our primary hypothesis was that provision of OB anesthesia services has changed.

Methods: A 32-question survey expanded on previous workforce surveys. A stratified random sample of 1193 US hospitals was selected from the 2020 AHA guide based on geographic location and number of annual deliveries. If name and email address of Chief of Anesthesiology (COA) was available, a unique link to a REDCap survey was emailed directly. If they could not be identified, a letter was mailed to the COA at the selected hospital with a unique QR code, followed by paper surveys with self-addressed stamped envelopes for return. Results were analyzed using the R statistical package. Inferential statistics were performed at a significance level of 0.05.

Results: The number of hospitals providing OB care continues to decline.
Many respondents (62%) worked in private practices without residents. Most staffing models were care-team models, with MD anesthesiologist supervision in 48% of practices and MD-only care in 21%. Certified nurse anesthetist staffing without physician supervision occurred in 74% of practices with < 500 deliveries per year. Across strata, the MD anesthesiologist usually had other responsibilities besides L&D, even in 21% of hospitals with >4500 deliveries per year.
Labor analgesia was mostly provided by epidural with smaller numbers of patients receiving other techniques. 10% of parturients received no labor analgesia. Nitrous oxide was mainly used in larger hospitals and not commonly available (8%). Elective cesarean deliveries (CD) were primarily done with single-injection spinal (90%). For urgent CD, 35% received a spinal, 14% received general anesthesia but 53% would use a pre-existing epidural if present. ERAS protocols were used in 50% of responding hospitals. Most responding hospitals provided postpartum tubal ligation (PPTL) during delivery hospitalization, although 24% did not. Anesthesia provided for PPTL was 45% spinal, 36% using an existing labor epidural, and 39% general anesthesia.

Patient safety initiative questions showed 77% of respondents can provide consultation for high-risk L&D patients. 90% of hospitals reported having a massive transfusion protocol and 80% had a rapid-response team. Only 60% of hospitals reported that L&D nurses are ACLS certified, but 24% of respondents did not know whether L&D nurses were certified.

Conclusion: Obstetric anesthesia workforce surveys continue to provide information about changes in OB anesthesia practice and differences between large and small delivery services.

References: Anesthesiology 1986; 65:298–306
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Anesth Analg 2016;122:1939-46

Table 1 SOAP Abstract.pdf

Abstract #: SUN – RA & CS – BS 4 – BR 6 – Communication OR Efficiency Education SIM – 13

Evaluating Obstetric Anesthesia-Related Content on Instagram

Presenting Author: Ogechukwu Anwaegbu, BS
Presenting Author's Institution: University of Texas Medical Branch
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Deniz Isikkent - OB Anesthesia Fellow at UTMB at Galveston
Gengi Kleto, BS - University of Texas Medical Branch
Michael Okafor, BS - Morehouse School of Medicine

Abstract:
Introduction: Social media platforms, such as Instagram, are increasingly utilized by patients for health-related reasons[1]. Pregnant and new parents often use these platforms for interaction and gaining information to navigate their new experiences[2-4]. In recent times, healthcare providers have leveraged Instagram to share insights into their medical specialties[5-6], providing educational content to the public in a format distinct from traditional medical norms. However, the medical domain on Instagram lacks the same level of regulation, potentially resulting in the dissemination of inaccurate information[7], impacting patient experiences and health outcomes. Our study aims to quantify and evaluate obstetric anesthesia-related content on Instagram, with the goal of enhancing patient outcomes by assessing the quality and accuracy of this information.

Methods: A systematic search of the top Instagram posts for hashtags #Epidural, #ObAnesthesiology, #EpiduralAnalgesia, #ObAnesthesiologist, #LaborAnesthesia, #OBGYNAnesthesia, and #ObstetricAnesthesia was conducted. Engagement metrics, including likes, comments, shares, and views, were used to quantify post content reach. Video post lengths were recorded, and medical education videos were assessed for accuracy using the Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT A/V) to evaluate understandability and actionability.

Results: A total of 80 Instagram posts were analyzed, revealing a predominant focus on Medical Education (46%), followed by Provider Lifestyle (21%), Advertisement (16%), Research Articles (8%), Patient Experience (5%), and Medical Illustration (3%). Picture posts received an average of 6157 likes and 127 comments, while video posts garnered an average of 3347 likes and 186 comments, with an average video length of 38 seconds.
In the evaluation of medical education content accuracy within video posts, 50% presented accurate information, 42% contained partially accurate or incomplete information, and 7% were entirely inaccurate. The average understandability was 73%, while actionability was notably low at 38%.

Conclusion: Our analysis illustrates diverse obstetric anesthesia-related content on Instagram, with moderate user engagement. The predominance of medical education content suggests

healthcare providers are leveraging social media for educational purposes. However, varying accuracy levels in video posts highlight the need for careful evaluation of medical educational information on social media. Future research should assess accuracy variations among different obstetric healthcare provider types on social media and provide strategies for healthcare providers to improve engagement, maintain accuracy, and navigate time constraints when sharing medical information.

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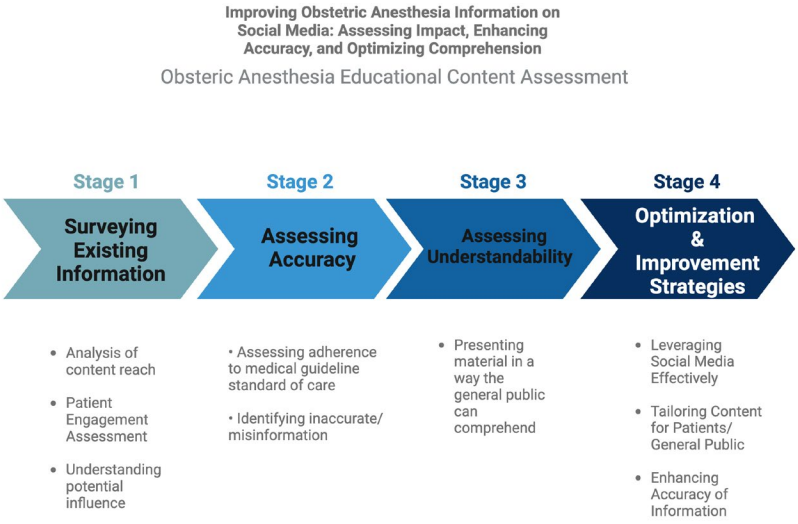

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