

# The Role of Social, Economic, and Religious Factors in the Availability of Neuraxial Labor Analgesia Worldwide

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**Abstract** The suffering of labor pain has been described for millennia. The first widely publicized use of labor analgesia was reported in medical journals in 1853, when Queen Victoria received chloroform as analgesia for her seventh labor and vaginal delivery at Buckingham Palace. In the 1930s, caudal techniques in the United States provided labor analgesia to thousands of laboring women, and favorable results were described in the *Journal of American Medical Association*. Presently, epidural labor analgesia is a mature technique, as appropriate doses, tools and protocols have been developed to minimize risk and optimize benefits to the patient and her fetus. However, the great majority of women, both in developed and less developed nations, are not offered this efficacious and safe labor analgesia choice. Recent literature has shown that epidural rates in labor are very high once the technique is available and laboring women are presented with the free choice to adopt it. It is important to develop a future strategy to offer labor epidural analgesia to a much larger group of women globally.

**Keywords** Neuraxial labor analgesia · Obstetric anesthesia · History of obstetric anesthesia · Epidural analgesia · Caudal analgesia

## Introduction

Epidural labor analgesia adoption rates are variable across nations and hospital facilities. Religious, social and cost factors are often presented as important limitations to the use of this neuraxial technique. As a consequence, only a selected minority of laboring women are presently offered the choice of labor epidural analgesia. Although the debate about the merits of labor analgesia started shortly after the celebrated success with ether in 1846, the opinion of the obstetric medical community in North America has required over a century to accept labor analgesia as one of the important ingredients of modern medical care of laboring women. Access to epidural labor analgesia is likely the most important factor in the adoption of this efficacious and safe technique by more women globally, with incalculable benefits to alleviate the associated suffering.

## A National Debate on Analgesia for Labor

Controversy was immediately evident and extensively reported when analgesia was delivered to Queen Victoria in the Buckingham's Palace bedroom for her seventh labor and vaginal delivery, on April 7, 1853. The *Case Book of Dr. John Snow* precisely records: "The first stage of labour was nearly over when the chloroform was commenced. Her Majesty expressed great relief from the application [...]. The effect of the chloroform was not at any time carried to the extent of quite removing consciousness. Dr. Locock thought that the chloroform prolonged the intervals between the pains, and retarded the labour somewhat. The infant was born at 13 min past one by the clock in the room (which was 3 min before the right time); consequently the

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chloroform was inhaled for 53 min. The placenta was expelled in a very few minutes, and the Queen appeared very cheerful and well, expressing herself much gratified with the effect of the chloroform” [1].

The recorded opinion of the Royal Accoucheur, the obstetrician Dr. Charles Locock, is important because it is indicative of the origins of controversy between obstetrician and anesthesiologists: “We are informed that the Obstetrician viewed the anesthetic as the cause of reduced frequency of uterine contractions, and of a prolongation of the seventh labor of Queen Victoria” [1]. However, the opinion of the patient about the benefit of the analgesia is positive, as “The Queen appeared very cheerful and well, expressing herself much gratified with the effect of the chloroform” [1].

A short paragraph in the Leading Article section of the Association Medical Journal of Sunday April 15, 1853 announced the safe delivery of a prince by Queen Victoria and confirmed her use of and benefits from chloroform. It was also editorialized: “[...] the Royal Majesty of the patient, and the excellence of her recovery, are circumstances which will probably remove much of the lingering professional and popular prejudice against the use of anesthesia in midwifery, even when sanctioned by competent authority, and induced with requisite precaution” [2].

As a sign of the deep controversy about the use of chloroform analgesia in labor, on Saturday May 14, 1853, The Lancet editorial section published a strongly worded denial of the use of chloroform by Queen Victoria, describing the “[i]ntense astonishment [...] excited throughout the profession by the rumour that Her Majesty during her last labour was placed under the influence of chloroform, an agent which has unquestionably caused instantaneous death in a considerable number of cases” [3]. It also authoritatively stated: “In no case it could be justifiable to administer chloroform in perfectly ordinary labor.” The editorial last paragraph warns about “[...] the consequences of allowing such a rumour respecting a dangerous practice in one of our national palaces to pass unrefuted” because “Royal examples are followed with extraordinary readiness by a certain class of society in this country” [3]. The Medical Times and Gazette subsequently published rebuttals on Saturday May 21, explaining some of the medical details about the procedure and asked for a no-exception exemption from press criticism of the “sacred pale of the family circle”, in a peculiar early defense of a patient-centric right of choice about analgesia in labor [4]. Queen Victoria ruled the British Empire for over 60 years, the longest reigning Monarch in the history of England, and her use of labor analgesia was extremely influential because of her stature and the public resonance of many of her visible personal selections and choices. As an example, her choice of a white wedding dress on February 10, 1840,

is widely recognized by social historians as the reason why so many brides wear white up to the present time [5, 6]. Her choice for chloroform labor analgesia and the publicity that followed should therefore be regarded as a truly seminal event in the evolution of analgesia for labor.

### Progress in the Neuraxial Analgesia for Labor

In 1943, a large series of continuous caudal analgesia (CCA) were used in 10,000 cases of labors and deliveries “in North American medical schools and teaching hospitals” [7]. Citing the pain of labor as “a contributing factor to childless marriages and one of the major factors of the one-child family of our present civilization” and the practitioner’s technical expertise as an important variable for the success, failure and/or complications of the technique, the treatise described using a “special malleable stainless steel 19 gage needle [...] inserted in the midline in the direction of the (sacral) hiatus at about 45 degree angle with the skin.” Once “the needle pierces the sacrococcygeal ligament” [...] “...the needle is thrust slowly and evenly in the midline for 1–2 in. within the sacral canal”. The initial trial dose of 8 ml is followed 10 min later by a second dose of 30 ml of 1.5 % metycaine. Additional boluses of 20 ml are “injected every 30–40 min [...] to keep the patient comfortable for the entire course of labor” [7].

The authors discuss some special indications of the CCA in detail from his personal series of 1,150 cases [7]. “Premature Babies” are said to benefit from the CCA because “labor is generally shorter and usually spontaneous, and the noxious “narcotic, hypnotic and anesthetic influence to their underdeveloped respiratory and cardiovascular mechanisms” is avoided. Additionally, women are “alert and usually cheerful” and “not secreting various harmful endocrine products” secondary to “pain, anxiety and fear”. Finally, the “minimum [...] systemic shock [...] prepares the prompt formation of maternal milk [7].

Continuous caudal analgesia in this series was also administered in 11 cases of severe preeclampsia and eclampsia, and “within 20 min after the caudal injection”, systemic hypertension was less severe, urinary output increased, “convulsions were controlled” and the “mental cloudiness of these patients cleared remarkably” and “they became more cooperative”. Fetal heart rate did not “appreciably change” and all “were delivered without mortality or unusual postpartum morbidity” [7]. In 15 additional cases, CCA was used in cesarean sections for obstetric indications, with no maternal or fetal mortality, and “morbidity of women and babies appeared to be less than usual” [7].

It is noteworthy that only approximately 46 out of 1,150 cases of these personal series are presented under the

header of “Indications for the Use” of CCA. It is therefore likely that most patients received CCA for labor analgesia, although the selection criteria of this largest group is not specified [7•]. Overall, 91.3 % (were) managed through labor and delivery without the need for any other form of analgesia or anesthesia beyond the CCA. The most common failures noted were “inability to insert the needle in the canal (56 cases) and “[...] anxiety on the part of the patient with emotional distress, which indicated sedation and general anesthesia (23 cases)” [7•].

Results and complications of CCA from this series and from the total of an additional 10,000 historic cases are remarkably similar to modern case series for labor analgesia. About 80 % of the women experienced “complete relief of pain” [7•], which is similar to the current figure of approximately 85–95 %, depending on the specific technique and investigation [8•, 9–11]. Moreover, 12 % had “partial relief of pain” and 8 % were “considered as failures” in this series. Hypotension, nausea and “post-delivery headache” were observed in 9, 7 and 0.4 % of the cases, respectively. Infection at the site of injection were about 0.8 % and considered “simple cellulitis”, with only five cases of “severe cellulitis or peridural abscess” [7•].

The importance of intensive training in the technique is also emphasized along with the analgesic efficacy of CCA [7•]. Some important obstetrical observations for the future development of neuraxial labor analgesia are presented in the Summary: the “incidence of operative obstetrics” and the “incidence of posterior positions is increased”, and the “first stage of labor is definitely shortened” and “[...] the terminal part of the second stage of labor is greatly prolonged unless outlet forceps are used [...]”. Furthermore, CCA “may be expected to decrease considerably” fetal morbidity and mortality, “since there is apparently less birth shock “than by any other method” [12], and on the association with an incidence of instrument-assisted vaginal delivery [13, 14]. The prophetic value of this 1943 publication is significant. This large case series shows that neuraxial analgesia in labor is effective and safe, but requires a high degree of technical skills from the practitioner and a close cooperation with the obstetrician. In addition, there are some effects with which epidural labor analgesia is associated (e.g. a higher incidence of assisted vaginal deliveries [15]), but others with which it is not (e.g. an increase in need for cesarean delivery [15, 16]). Whereas epidural labor analgesia has been shown to be associated with an increase in the duration of the first and second stage of labor, these increases are minor (on average 42 and 14 min, respectively) [15, 17, 18], and there is some suggestion that intrathecal opioid delivered in the context of combined spinal-epidural (CSE) analgesia may be associated with a shorter duration of the first stage of labor [16].

The adoption of neuraxial technique analgesia by laboring women was likely also influenced by the advancing role of women in the United States in the first half of the twentieth century. Women’s participation in the industrial effort during World War I, the 19th Amendment of 1920 securing voting rights, and the increasing number of professional options available as more women gained access to University education, are but a few of the important social emancipating events likely to have influenced the demand for labor analgesia.

However, more than four decades later, the authoritative opinion of two leading European Obstetricians still was not favorable regarding neuraxial labor analgesia.

### The Dublin School

Chapter Eighteen in the Second Edition (1986) of the influential and widely distributed obstetric manual “Active Management of Labour” by two prominent Irish obstetricians Kieran O’Driscoll and Declan Mehagher, is dedicated to “epidural anaesthesia” during labor and delivery, and presents a very critical and limited view of its role [19]. The manual describes the obstetric practice in “the largest obstetric unit in the British Isles”, the Maternity Hospital of Dublin, representing a total of 153,005 births over a period of 22 years. Epidural analgesia during labor is described as playing a negative role in the response of the organism to “toxaemia, haemorrhage and ruptured uterus”, in addition to exposing the parturient to the risks of severe post-dural puncture headache and urinary retention. Furthermore, “epidurals placed early in the course of labor are a cause of unnecessary cesarean sections, and late epidurals are associated with increasing the use of forceps in up to 70 % of deliveries in primigravidae and unlikely to be reduced much below 50 % in primigravidae who have received epidural anaesthesia” [19].

The recommendation of the authors is to employ epidural analgesia in a very small and selected, but poorly defined, group of primigravidae: those “unduly upset” about the prospect of labor at the point of admission to the obstetric unit, “those who, despite initial composure” become “unduly upset soon afterwards”, and “those who were not in sight of delivery after 6 hours”. The authors conclude that epidural analgesia “has no contribution to make to the management of labour in multigravidae” [19].

The authors state “the most characteristic feature of the conventional attitude to management of labour is the strong emphasis placed on the element of “the mounting sense of frustration [...] because she feels herself to be a helpless victim of powerful natural forces over which she can exercise little or no influence”. Consequently, a “[...] dramatic improvement in the outlook of a woman in labor

can be expected when the impasse that results from inefficient uterine action is broken and progress restored". In the obstetricians' opinion, "acceleration with oxytocin is therefore often more constructive than analgesia in the relief of pain" [19].

Oxytocin may help labor progress and thereby decrease the total duration of labor pain. Animal data supports the role of oxytocin in decreasing pain sensitivity, and a recent review assessing its role in human subjects found that seven out of nine studies suggest the same potential analgesic properties [20]. However, the results are inconclusive as the number of studies are fairly limited and are varied in their methodology. Moreover, the mechanism by which intravenous oxytocin could have central analgesic properties is not elucidated, since its peptide structure should prevent it from readily crossing the blood–brain barrier [21]. The possibility of a peripheral analgesic effect has been investigated [20, 22, 23] and implicates the oxytocin projections to the dorsal horn, as well as indirect pathways linking to the endogenous opioid system. While promising, the theories on oxytocin's role in pain modulation remain not well understood [20, 21].

### Religious, Social and Economic Factors and Availability of Epidural Labor Analgesia

Traditionally, the word of the Bible about labor pain has spread its influence across millennia in limiting the interest of providers of Obstetric Services, of women in labor, and of the general population in labor analgesia. "I will make your pains in childbearing very severe; with painful labor you will give birth to children" (Genesis 3:16, The New King James Version), the Lord declares after Adam and Eve are proscribed from the Garden of Eden. These proclamations from the Bible thus ordained childbirth as a necessarily painful process, and laid the groundwork for rejection of labor pain management in the Christian and Jewish faiths [24]. In the Arab-Islamic heritage, pain is regarded as a test of faith, rather than as a divine punishment for sins. This attitude of "spiritual coping," might also influence a laboring mother's request for analgesia, as there is an expectation that God's mercy will intervene in exchange for her patience and pain endurance [25, 26].

Moreover, the attribution of labor pain to magical sacrificial effects has historically been common, particularly in less developed parts of the world. For example, in Southern Italy, a longstanding pagan tradition holds that without pain, "labour would not play its sacrificial role and the baby would, therefore, be exposed to complications" [27].

In the course of the twentieth century, our knowledge about the potentially deleterious effects of labor pain has

evolved [28••]. Although individual perception and tolerance of pain varies greatly due to psychosocial, genetic and environmental factors, it can have negative effects on both the mother and fetus. Unmanaged pain induces activation of the sympathetic nervous system that exerts effects on the cardiovascular and respiratory systems, which can be especially problematic for complicated deliveries [29]. Moreover, severe pain during delivery is associated with a potential host of residual psychological issues, namely depression and post-traumatic stress- like symptoms [28••, 29]. Since the widely publicized use of analgesia in labor by Queen Victoria, the art and science of anesthesia and of obstetrics, the refinement of neuraxial techniques, and the cumulated data about risks and benefits of labor epidural analgesia have reached a point of sufficient maturity [8••, 17] to lead us to ask why the majority laboring women are not offered the choice of epidural analgesia?

The provision of neuraxial analgesia in labor does require a critical convergence of goals among patients, obstetric, and anesthesia services. The main barriers to safe and effective administration of labor analgesia include adequate practitioner training, staff reserves, and availability of the proper technologies and medicines, particularly in low resource countries [30]. Nevertheless, the desire for such services appears to exist, and there is some evidence that when labor epidural analgesia is offered, parturients chose to have it. The demand for labor epidural analgesia is especially high for women with prior knowledge of epidural options and previous delivery experience [31]. In Nigeria, 85 % of parturients said they would choose labor analgesia if it were an option, although only 40 % could receive it at the time of the study [32]. In one hospital in Sicily, when labor epidural analgesia was routinely introduced as a choice, the epidural rate quickly reached a quota of 50 % of all deliveries [33•]. The experience in a private hospital in Turkey, where 94 % of 8,386 vaginal deliveries received epidural analgesia in the period 1993–2006, compared to a rate of 11.4 % in University hospitals and < 2 % in other hospitals in Turkey, shows that high labor epidural rates are possible even in countries where the norm is for much lower rates [34••].

In order to be safe and efficacious, epidural labor analgesia requires intensive training of providers, and 24/7 access. The path forward for the rest of the women in labor of the world is limited by education of the obstetric providers, technical expertise of the anesthesia services and cost. To address cost, the minimal necessary "tool box", to implement a fiscally responsible epidural analgesia service, including acceptable standards of care, equipment, and monitoring, could be potentially recommended by a multidisciplinary expert panel of experienced providers. In some countries (e.g. China, Africa), small task force groups of anesthesiologists expert in the technique are invited to

train local medical providers over a period of weeks to months [35–39]. The paucity of anesthesiologists in many less developed Nations [30] could also potentially be overcome by training specialized nurses to deliver epidurals. There is some evidence that a better control of labor pain may even decrease the cesarean delivery rates with the associated decrease in associated cost and morbidity [40, 41].

In developed countries such as Germany [42], Norway [43], and Italy [15, 44], where rates of labor epidural analgesia are lower than 15 %, the task-force intervention focus may help to improve the slowly growing trend, organize the existing resources and modify negative perceptions of a women's choice for epidural labor analgesia.

## Conclusion

One hundred and sixty years after the emblematic and influential use of analgesia in labor by Queen Victoria, the majority of laboring women in the world do not have the choice of epidural analgesia, the “most effective method of intrapartum pain relief in contemporary clinical practice” [8•]. Acceptance of labor analgesia by obstetrician providers has progressed in the past 50 years in North America, as equipment and dosing of local anesthetic has been further refined. Despite cultural and religious factors, laboring women often choose epidural labor analgesia when it is available to them [31, 34, 42, 45••].

In many areas of the developed world, women already deliver in the hospital maternity wards where anesthesia services are available. It may be possible to expand the role of anesthesia services to provide neuraxial labor analgesia with only a small fractional increase in the total cost of infrastructure required to care for the patient. In the less developed areas of the world, options for a minimal effective fiscally responsible service should be explored, along with sustainable methods of education of local providers of obstetric services.

When more laboring women are offered the choice of labor epidurals, the adoption rate of these techniques are likely to grow dramatically.

## Compliance with Ethics Guidelines

**Conflict of Interest** Andrea Torri declares that he has no conflict of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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