

• **Misconceptions about neuraxial analgesia**

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Over the last century, neuraxial analgesia for childbirth has evolved significantly. In the early 1920s, the first descriptions of caudal analgesia were written [1]. Compared to heavy sedation with morphine and scopolamine or general anesthesia, neuraxial blocks seemed to offer many advantages to the mother and neonate. The parturient was conscious during birth and was not at risk for the aspiration pneumonitis that sometimes accompanied general anesthesia. She also was free of pain and was cooperative. The neonate was not depressed because of sedatives or anesthetics administered to the mother.

Although these advantages were recognized, some obstetricians perceived detrimental changes in labor patterns associated with the use of caudal and, later, epidural analgesia. Over the next several decades, numerous studies were performed to determine whether neuraxial analgesia in labor had significant side effects to either the parturient or the fetus. Unfortunately, the design of many of these studies led to biased results that were handed down as “truths” for a long time.

In this article the authors discuss some of the misconceptions concerning neuraxial analgesia for labor that can be found in the medical literature and in the lay press. The Internet also has proved to be an important but largely unregulated source of medical information. The authors then discuss, where possible, the origin of each misconception and how each issue is currently understood. The authors hope this discussion helps the clinician who performs neuraxial blocks to explain the procedure to colleagues and patients.

Epidural analgesia and the progress of labor

Defining the problem

The effect of neuraxial analgesia on the progress of labor has been controversial since the initial studies were performed. Numerous factors contribute to the length of labor and eventual outcome, including parity, gestational age, fetal weight, and fetal position. The onset of the first stage of labor is difficult to define and may begin before the patient enters hospital. Because there is no reliable method of determining cervical dilatation without repeated examinations, the onset of second stage of labor is also poorly defined. Because neuraxial analgesia also provides better maternal comfort than any other type of pain relief, these patients are often

treated differently by their obstetric caregivers unless strict research protocols are in place.

Despite these difficulties in determining the true effect of neuraxial analgesia on the progress of labor, everyone has an opinion on the subject. Some of the misconceptions that have been perpetuated are as follows: (1) epidural analgesia causes an increase in the cesarean section rate, (2) epidural analgesia causes an increase in the rate of operative vaginal deliveries, and 3) epidural analgesia slows labor.

The evidence

Over the past 20 years, researchers have sought to determine whether epidural labor analgesia has a negative effect on labor progress. Some studies show strong associations between epidural analgesia and the risk of adverse obstetric outcome. Strong association between two events does not prove that one event caused the other, however. In retrospective observational studies, epidural labor analgesia was associated with several undesirable outcomes. This association was present even when multivariate statistics were used in an attempt to control confounding variables. The authors of these papers concluded that epidurals probably caused the negative outcomes, and one group suggested that this retrospective data be discussed routinely with patients to help them make an informed decision [2].

Such conclusions are unwarranted. In cohort studies, epidural analgesia is administered according to a nonrandom process, such as patient request or health insurance status. Although these studies can establish an association, they cannot establish causation. Many studies have shown that women who request epidural analgesia are more likely to have long labors and operative deliveries [3]. Women who have a more painful latent phase of labor are more likely to have a dysfunctional labor that leads to obstetric intervention, however [4]. Increased pain and prolonged latent phase are also the reasons many patients choose to have epidural analgesia. Increased pain may be a marker for poor obstetric outcome, and these patients are more likely to request epidural analgesia.

Although retrospective chart reviews and prospective cohort studies cannot define effectively the cause-and-effect relationship between epidural analgesia and adverse obstetric outcome, other study designs can. Randomized controlled trials that compared epidural analgesia to other less effective therapies were considered by many investigators to be unethical and impractical [5]. Between 1980 and 2001, however, 14 randomized controlled trials that examined this question [6–19] were published (either as complete manuscripts or as abstracts). Combined, these

studies included 4324 patients from the United States, Canada, and Europe. When the data are combined using metaanalytic techniques, there is no increase in the risk of cesarean section in the epidural group compared to controls [20]. There was a significant increase in the rate of instrumental deliveries, which may be caused by factors other than the type of analgesia. For example, one group of investigators considered the presence of epidural analgesia as an indication for forceps deliveries for resident training purposes [6]. When only forceps for dystocia are considered, there was no significant increase in the epidural group.

Similarly, when all the data available from randomized trials are combined, there is no difference in the length of the first stage of labor. There is, however, a statistically significant difference in the length of the second stage of labor of approximately 15 minutes (Table 1). Whether this is clinically important is debatable.

Table 1. Metaanalytic results of the effect of epidural analgesia on the progress of labor

Outcome	No. of studies included	Epidural n/N or N	Opioid n/N or N	<i>P</i> value
Cesarean section ^a	14	172/2161	167/2163	1.0 (0.77, 1.26) NS
Instrumented vaginal delivery ^a	11	344/1813	226/1840	2.08 (1.48 – 2.93) <i>P</i> < 0.05
Instrumented vaginal delivery for dystocia ^a	3	39/538	23/542	1.53 (0.29 – 8.08) NS
Labor length — 1st stage ^b	7	1012	1050	26 min (-8.0 – 60) ^c NS
Labor length — 2nd stage ^b	8	1068	1103	15 min (9 – 22) <i>P</i> < 0.05

Cesarean section, forceps delivery, and length of labor are shown.

Abbreviations: n, number of events; N, total number of patients in the analysis.

[a] Dichotomous data are shown as odds ratio and 95% confidence interval using a random effects model. An odds ratio of < 1 favors epidural analgesia.

[b] Continuous data are shown as weighted mean difference and 95% confidence interval using a random effects model.

[c] Negative numbers favor epidural analgesia.

Although randomized controlled trials theoretically yield data of highest quality and least bias, there are some consistent problems when this study design is applied to labor analgesia. The first problem is that it is unethical to withhold all forms of pain relief, and a “placebo-controlled” trial cannot be performed. The investigators always compare one treatment to another—in this case opioid analgesia to epidural analgesia. Even when this is done, the treatment cannot be blinded because the quality of analgesia is obviously different between the groups. In all of the trials used in the metaanalysis cited previously, analgesia was better in the

epidural group compared to the opioid group. This difference might have led to one of the groups being treated differently than the other. One study clearly had an increase in the forceps rate because of the presence of epidural analgesia. Another, perhaps more important, limitation of these studies is that for various reasons, patients who were randomized to a specific group did not receive the allocated treatment. Typically, 30% to 40% of patients either did not receive the allotted treatment or (more commonly) crossed over from the nonepidural to the epidural group to benefit from the superior analgesia available with the latter treatment. This result may seriously bias the results by “contaminating” the nonepidural group with patients who received epidural analgesia, which potentially reduces the measured difference between the groups.

To avoid the crossover problem in an ethically acceptable fashion, some investigators have studied institutions that had no epidural analgesia service on the labor floor and then, over a brief period of time, introduced epidural analgesia into practice. One could then study the impact of epidural analgesia on the cesarean delivery rate and other parameters. Since 1990, five published studies have done this [21–25]. As can be seen in Fig. 1, there was no appreciable change in the cesarean section rate even with a large incremental change in the epidural rate. A recent metaanalysis of published and unpublished data confirmed that there was no increase in the incidence of forceps deliveries caused by increased availability of epidural analgesia [26].

Fig. 1. Cesarean section rate plotted against the epidural rate in five published studies in which an epidural service was rapidly instituted (or withdrawn). Each line represents a study. The symbols are roughly proportional in size to the number of patients in the study. X = [21]; + = [22]; Åú = [23]; * = [24]; = [25].

The study design also has serious limitations and is susceptible to bias. All of these studies had a retrospective component and were hampered by the use of “historical control” data. There was no attempt to control the analgesia selected or the indication for operative delivery. The obstetric practice may change over time, either through staff education or changes in personnel and departmental policies. Of note, most of the studies tried to control for these factors by trying to reduce the time difference as much as possible.

Summary

Epidural analgesia does not cause an increase in cesarean section rate. The rate of operative vaginal deliveries may be increased in patients who have epidural

analgesia, but not because of dystocia. Other factors, such as changes in obstetric management, may be responsible for this observation. Finally, epidural analgesia does not increase the first stage of labor but may increase the duration of the second stage by approximately 15 minutes. Depending on the clinical setting, this change may or may not be clinically significant.

Epidural analgesia and preeclampsia

Defining the problem

Whether epidural analgesia is appropriate for use in severely preeclamptic women has been controversial. Although there is no question that this modality provides better pain relief than parenteral opioids and pudendal block, some obstetricians have withheld epidural analgesia from their preeclamptic patients because of fear of severe hypotension and fetal distress [27]. In this section the authors discuss the risks and benefits of neuraxial analgesia in the preeclamptic parturient.

The evidence

Preeclampsia is a multisystemic disorder characterized by hypertension and proteinuria [28]. Although maternal mortality has decreased dramatically in recent years, significant morbidity, such as cerebral hemorrhage, pulmonary edema, and renal failure, still occurs secondary to severe hypertensive crises. Fetal compromise also may occur because of a reduction in intervillous blood flow secondary to increased vascular resistance and an increase in maternal blood viscosity [29].

Uterine blood flow is directly proportional to the perfusion pressure and varies inversely with uterine vascular resistance [30]. Because of a decrease in circulating blood volume, some patients with preeclampsia are more susceptible to hypotension than normal parturients. Hypotension may reduce perfusion pressure and uterine blood flow. Hypotension may stimulate sympathetic tone and further reduce perfusion by increasing vascular resistance.

Some evidence suggests that patients with preeclampsia are more likely to have “ominous” fetal heart rate tracings when compared to matched controls. There is also almost a threefold increase in the incidence of this finding in patients who have received epidural analgesia [31]. The high incidence of poor fetal heart rate tracings in preeclampsia would be expected considering the effect of the disease

on uterine vascular resistance. Transient fetal heart rate changes also may occur in normotensive parturients and may not be specific for fetal compromise.

Numerous advantages to neuraxial analgesia in preeclamptic parturients have led most obstetric anesthesiologists (and their obstetric colleagues) to recommend this treatment. Epidural analgesia effectively reduces labor pain and reduces sympathetic tone. In the absence of hypotension, the epidural analgesia increases uterine blood flow. This effect has been measured in humans as an increase in intervillous perfusion [32].

Recently, the safety of epidural analgesia for preeclamptic parturients has been established. In a large retrospective review of parturients with severe preeclampsia, Hogg et al found no difference in the incidence of cesarean section for fetal distress between patients who received epidural analgesia and those who did not [33]. None of the patients in either group experienced pulmonary edema or renal failure. In a randomized controlled trial of 738 patients that compared epidural analgesia to intravenous opioid analgesia, Lucas et al found no difference in the total incidence of cesarean delivery or cesarean delivery for fetal distress between the groups [34]. Neonatal outcome, as measured by need for intensive care, Apgar scores, and umbilical artery pH, was similar. Of note, there was a 20-fold increase in the use of naloxone in neonates in the intravenous opioid group. Analgesia was superior in the epidural group.

Summary

Current evidence suggests that epidural analgesia is safe and desirable for parturients with preeclampsia provided that there is no contraindication (such as severe coagulopathy) and blood pressure is maintained appropriately. The direct benefits include excellent pain relief for the parturient without concomitant neonatal depression. In some patients, general anesthesia can be avoided by placing an epidural catheter early in labor.

Epidural analgesia and breastfeeding

Defining the problem

Breastfeeding provides many advantages to infants and their mothers when compared to alternative feeding methods [35], including benefits to the health, nutrition, and immunologic system of the infant. Breastfeeding also facilitates

maternal-infant bonding. Procedures and medications that reduce the likelihood of breastfeeding success are undesirable.

Labor medications, such as local anesthetic agents, opioids, and barbiturates, are distributed to the fetus [36]. Some of these medications may alter the neonate's behavior [37] and they could, theoretically, reduce the infant's ability to breastfeed.

Several Internet authors assume that epidural analgesia interferes with breastfeeding and propose physiologically improbable mechanistic theories. One author proposed that epidural analgesia decreases muscle tone in the breast, which leads to inverted nipples and breastfeeding difficulty [38]. One should note that there is no support in the conventional medical or nursing literature for this theory, which purportedly came from the November 1997 meeting of the Southeastern Lactation Consultants Association. A second author proposed that the preepidural intravenous fluid preload causes maternal areolar edema that makes latching difficult or impossible [39]. Again, there is no confirmation in the standard medical or nursing literature.

In a review article that assessed the effect of epidural analgesia on breastfeeding, Walker recommended the reduction in the use of epidural analgesia to enhance breastfeeding [40]. These conclusions, unfortunately, are based on studies that do not take obstetric confounding factors into account and studies that report surrogate outcomes (such as neuroadaptive capacity scores) that have not been correlated with breastfeeding outcomes.

The evidence

Unbiased information on the effect of epidural analgesia on breastfeeding is difficult to obtain because successful breastfeeding is poorly defined and numerous confounding factors may influence the outcome. To date, no randomized trials have compared breastfeeding outcomes in patients who received epidural analgesia to patients who received no medication. Two studies that showed a detrimental effect of intrapartum analgesia on breastfeeding were small and included medications other than those given in the epidural space. These studies did not control for obstetric events such as prolonged labor or operative delivery [41,42].

Recently, two prospective cohort studies have been performed to determine whether breastfeeding success was influenced by intrapartum medications. Albani et al studied 2175 patients who expressed a desire to breastfeed. In their series, the success rate, as defined by breastfeeding at the time of discharge from

hospital, was extremely high: 96.5% in patients who received epidural analgesia and 97.8% in those who did not. Logistic regression that controlled for intrapartum events suggested that epidural analgesia actually may have promoted breastfeeding success [43]. In a second study, the authors compared breastfeeding success at 6 weeks postpartum in all consenting patients who gave birth at their institution in a 2-month period of time. In the authors' sample of 189 parturients, 59% received epidural analgesia or a combined spinal and epidural technique, 18% received intramuscular opioids within 24 hours of birth, and 23% received no medication. In the study, all patients were breastfeeding at the time of hospital discharge. The authors were able to contact 94% of women between 6 and 8 weeks postpartum. At that time 72% were breastfeeding fully, 20% were breastfeeding partially, 1% were giving token breastfeeds, and 13% were no longer breastfeeding. There was no correlation between breastfeeding success and the use of intrapartum parenteral opioids, neuraxial opioids, or neuraxial local anesthesia (Table 2). Women who were exposed to intrapartum medication did not seek breastfeeding assistance more often than those that did not [44]. The authors concluded that in a setting that strongly promoted breastfeeding, epidural analgesia does not reduce the success rate.

Table 2. The effect of intrapartum medications on breastfeeding success at 6 weeks postpartum

Drug (epidural or intrathecal)	Odds ratio	95% confidence interval	<i>P</i> value
Fentanyl	0.7	0.24–2.09	0.53
Sufentanil	0.67	0.13–3.42	0.63
Lidocaine	0.94	0.38–2.32	0.89
Bupivacaine	1.03	0.4–2.64	0.95

Summary

Breastfeeding is important for maternal and infant health. Every effort should be made to promote breastfeeding through professional support and family education. Although intrapartum local anesthetic agents do not directly interfere with breastfeeding, hospital routines that reduce early maternal-newborn contact should be avoided [45].

Epidural analgesia and back pain

Many health care professionals and patients erroneously believe that epidural analgesia during labor causes long term back pain. This issue is fully discussed in the article by Munnur elsewhere in this issue.

Consequences of withholding epidural analgesia

Defining the problem

Although numerous side effects and complications are attributed to epidural analgesia that are not caused by the technique, some side effects and complications do occur. Common side effects include lower limb weakness from the local anesthesia, hypotension, pruritus from neuraxial opioid, and intrapartum urinary retention. Postdural puncture headache often can be troublesome postpartum. Rarely, intrathecal opioids can produce profound immediate or delayed respiratory depression. Finally, permanent nerve damage secondary to compression (hematoma, abscess), physical trauma, or interruption of the blood supply to the spinal cord may occur. Because of this, some practitioners believe that there can be no harm in withholding epidural analgesia and do not offer it. This is a misconception.

The evidence

The evidence to support the case that the unavailability of neuraxial analgesia causes harm is not as strong as that cited to discuss the previous issues. Taken together, however, there is enough potential harm caused to raise the possibility that indirect harm to mother and fetus may occur.

Increased need for other modes of pain relief

If epidural analgesia is unavailable, most women choose an alternative method of pain relief. Each of these has undesirable side effects. Opioids may cause maternal sedation, respiratory depression, nausea, and vomiting. They also may cause orthostatic hypotension and reduced gastric emptying, which make general anesthesia, if needed, more dangerous. Finally, because all opioids cross the placenta, the fetus and neonate may be affected. Changes in the fetal heart rate tracing and neonatal respiratory depression are common [46]. Whether opioids provide adequate analgesia is questionable [47].

Inhalational analgesia is available in some institutions. Although analgesic concentrations of potent inhalational agents were used in the past, nitrous oxide in oxygen is the most commonly used analgesic currently available. Nitrous oxide seems to have fewer fetal and neonatal effects than a parenteral opioid, although some maternal side effects (sedation, nausea) are similar. Most patients agree that inhaled nitrous oxide has some beneficial effects during labor, but there is little

objective evidence that nitrous oxide relieves pain [48]. The beneficial effects may be caused by other mechanisms.

Increased incidence of general anesthesia for cesarean section

Women who have effective epidural analgesia require general anesthesia less often for emergency cesarean delivery. This effect was well documented, on a “macro” scale, in the most recently available assessment of obstetric anesthesia manpower workforce survey [49]. If an epidural catheter is in place, a sufficient dose of local anesthesia to provide surgical anesthesia can be given quickly. In special circumstances, such as twin pregnancies, the epidural catheter may be used for operative delivery of the second twin. Cesarean section under neuraxial anesthesia has many advantages to the mother and fetus. These advantages include the psychological benefit of being conscious during the birth, earlier breastfeeding, and superior postoperative analgesia. There is also some evidence that neuraxial anesthesia might be safer for the mother, because of airway considerations, in an emergency situation [50].

Risk of posttraumatic stress disorder

One often hears the statement “pain never killed anyone” on the labor floor. Severe, prolonged pain may cause serious psychological and potentially physical damage to the parturient, however. In susceptible patients, the birth experience may trigger posttraumatic stress disorder. This disorder, characterized by fear, helplessness, and other psychological disturbances such as flashbacks, avoidance behavior, and poor sleep, was first described among veterans of the Vietnam War. Subsequently, it has been recognized in numerous traumatic settings, including childbirth. During the event, the person feels seriously threatened by death or severe injury and is often helpless to prevent it. Women are more susceptible to posttraumatic stress disorder if they suffered previous trauma [51]. Although the exact incidence is unknown, predisposing factors include lack of consent for procedures, lack of a sense of control, and a sense of powerlessness. The incidence also is correlated with the amount of physical pain experienced [52].

The psychological impact of posttraumatic stress disorder can vary greatly; however, it may manifest in future pregnancies. Women may choose to have an abortion instead of reliving the experience of a vaginal delivery. Some women also request a cesarean delivery without “medical” indication. In one series, 30% of women who requested a cesarean section for personal reasons cited fear of

excruciating, unrelieved pain as the reason [53]. These women place themselves at higher risk than necessary because of their past traumatic experience.

Summary

Although neuraxial analgesia may have side effects, patients may be harmed by not providing this form of analgesia. In particular, the newborn may suffer from the effects of opioids and other depressant drugs if given intrapartum. Mothers may be placed at risk because of the requirement for general anesthesia for emergency deliveries. Finally, susceptible parturients may be at risk for posttraumatic stress disorder, which leads to psychological problems that may hamper their ability to enjoy their newborn or plan future pregnancies.

Summary

Neuraxial analgesia is the most effective treatment for labor pain. Although there are known risks and side effects, many problems are attributed to the technique without appropriate scientific assessment. Some observations, such as the increased use of forceps and prolonged second stage of labor, are associated with epidural analgesia, but there is not enough evidence to categorically state whether the technique caused the problems. These topics warrant continued investigation.

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