e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(3); 134-139

Original Research Article

Effect of Epidural Analgesia in Labour and Assessing Its Effects on Maternal and Neonatal Outcome

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Received: 18-12-2023 / Revised: 21-01-2024 / Accepted: 26-02-2024
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Conflict of interest: Nil

Abstract:

Background and Aim: While the safety of using epidural analgesia during labour is well-established, there is a lack of comprehensive data regarding its impact on neonatal and child outcomes. The study aimed to investigate the impact of epidural analgesia during labour and assess its effects on both the mother and the newborn. The specific objectives were to measure the level of pain relief experienced by mothers using the Visual Analogue Scale (VAS) and to evaluate the frequency of operative or instrumental deliveries associated with epidural analgesia. Investigating the duration of labour with epidural analgesia and investigating neonatal outcomes through the use of APGAR scores.

Material and Methods: During the study period, 100 parturient women who visited the hospital while in labour and chose to have epidural analgesia were included as cases. These women met the eligibility criteria and provided written informed consent to participate in the study. During the study period, a total of 100 women who visited the hospital and met the eligibility criteria were included as controls after providing written informed consent for the study. Following a test dose of 3 ml of 2% lignocaine with 1:2,00,000 adrenaline, an initial bolus of 10 ml of 0.1% Ropivacaine+1microgram/cc Fentanyl is administered.

Results: The study found that most of the participants fell into the 26-30 age range. In the Control group, the average duration of the active stage was 310.01 minutes, while in the Cases group, it was 270.54 minutes. However, the overall difference did not show any significant statistical findings. In the study, it was observed that the mean VAS scores in Group II (Control) were higher, with a value of 8.42, compared to Group I (Cases), which had a mean score of 5.23.

Conclusion: In patients who received epidural analgesia, there was no evidence of an increase in the incidence of instrumental deliveries or caesarean sections. The study observed a significant decrease in pain relief when epidural analgesia was administered, as measured by the verbal analogue scale.

Keywords: Epidural Analgesia, Labour, Lignocaine, Visual Analogue Score.

Introduction

Ensuring effective and safe pain relief during labour has always been a difficult task. The field of obstetric anaesthesia has evolved significantly over time. It all started with the idea of "etherisation of labour" introduced by Simpson, and later, the use of chloroform by John Snow, who administered it to Britain's Queen Victoria. Eventually, in the 1950s, neuraxial techniques emerged as a significant advancement in this field.

Over time, numerous advancements have emerged, resulting in a holistic and well-founded approach to managing labour pain. [1] Epidural analgesia is widely regarded as the gold standard for pain management during labour. In recent years, significant progress has been made in the field of managing labour pain, with a focus on using comprehensive and evidence-based approaches. In the realm of obstetrical anaesthesia, modern neuraxial labour analgesia represents a departure from the traditional emphasis solely on pain relief. Instead, there is now a greater emphasis on achieving a higher quality of analgesia overall. [2]

Epidurals may be necessary for medical reasons or administered upon the mother's request. While labour epidural analgesia is known for its effectiveness, it's important to be aware of potential adverse effects. These can include hypotension, reduced mobility, pruritus, maternal fever, foetal heart rate abnormalities, and a possible increased risk of assisted vaginal or operative delivery, although this last point is still a matter of debate. [3,4] Lower concentrations of local anaesthetic are

recommended by the American Society of Anesthesiologists/Society for Obstetric Anaesthesia and Perinatology to potentially reduce the risk of operative delivery. [5,6] The relationship between epidural analgesia in labour and potential negative effects on newborns or long-term childhood development is still not fully understood. There is conflicting information from observational studies regarding the potential connection between epidural analgesia and negative neonatal outcomes. In addition, there is a lack of research on the long-term effects of using epidurals during labour on childhood development, and the existing studies do not accurately reflect current practices. [5-8]

Using epidural analgesia can help alleviate the negative effects of pain on breathing and increase oxygen levels for both the mother and the foetus. This can be particularly helpful when other factors are also causing low oxygen levels for the mother or the foetus. Therefore, it is highly advisable to suggest epidural analgesia to patients who do not have any contraindications to this treatment method. [9]

There have been significant changes in the management of epidural analgesia during labour over the past two decades. Neuraxial opioids can be added to local anaesthetics to provide effective pain relief during labour. This allows for the use of very dilute solutions of local anaesthetics, which helps minimize any potential side effects on labour progression and motor function in the lower extremities.

With a focus on delivering pain-free experiences during childbirth, our tertiary care centre has undertaken a study to explore the significant advantages of epidural analgesia. In addition to these advantages, the research focuses on investigating pain management for women in labour and enhancing the overall quality of healthcare services provided. The study aimed to investigate the impact of epidural analgesia during labour and evaluate its effects on both the mother and the newborn. The specific objectives were to measure the level of pain relief experienced by mothers using the Visual Analogue Scale (VAS), In order to assess the frequency of operative/instrumental delivery when using epidural analgesia, investigating the length of labour when epidural analgesia is used and examining neonatal outcomes through APGAR scores.

Material and Methods

The study was conducted in the Obstetrics and Gynaecology department of a tertiary care hospital over a period of 2 years. The study participants included women in labour who met the eligibility criteria and provided written informed consent to participate in the study. The study took place in the labour room of the obstetrics and gynaecology department at a tertiary care hospital.

Criteria for inclusion were as follows: women who were experiencing their first pregnancy, aged between 23 and 25 years, at 37 weeks of gestation, with a full-term pregnancy and a head-first presentation, and currently in active labour. Exclusion criteria included various factors such as high-risk pregnancy conditions, local site infection, spinal deformity, bleeding disorder, and maternal hypovolemia. Dealing with raised intracranial tension and a patient's refusal to consent can be challenging.

Once the written informed consent has been obtained, the parturient is carefully moved onto the operation table. Vitals were recorded after attaching the monitors. The patient was positioned in a sitting posture, and their body was thoroughly cleansed, sterilised, and covered with drapes. A multi-orifice catheter with a micro bacterial filter is carefully inserted into the L3-L4 or L4-L5 intervertebral space using a loss of resistance technique, ensuring all necessary aseptic precautions are taken by the anaesthetist. Following a test dose of 3 ml of 2% lignocaine with 1:2,00,000 adrenaline, an initial bolus of 10 ml of 0.1% Ropivacaine+1microgram/cc Fentanyl is administered. Assessment of VAS conducted after a 15-minute period. The anaesthetists promptly removed the epidural catheter after the delivery. Noted were the maternal factors such as the patient's name and age, as well as the obstetric factors like obstetric history, gestational age of the foetus, and cervical dilatation. The duration of the first and second stages of labour, the mode of delivery (normal vaginal, operative vaginal, or caesarean), and the neonatal outcome (whether NICU admission was required or not) were recorded.

Any potential adverse effects of epidural, such as nausea, vomiting, and shivering, were observed, if present. During the study period, a group of 100 women who visited the hospital while in labour and chose to have epidural analgesia were included as cases. These women met the eligibility criteria and provided written informed consent to participate in the study. A total of 100 women who visited the hospital during the study period and met the eligibility criteria were included as controls after providing written informed consent for the study.

Statistical Analysis: The data was compiled and entered into a spreadsheet computer programme (Microsoft Excel 2007) and then exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were reported using measures such as means and standard deviations or median and interquartile range, depending on their distribution. The

qualitative variables were displayed as counts and percentages. Confidence level and level of significance were set at 95% and 5% respectively for all tests.

Results

The study group consisted of 200 women who were giving birth for the first time. Out of the 200 parturient, 100 were in group I, which consisted of those who received epidural analgesia during labour. The other 100 were in group II, which included nulliparous parturient in spontaneous labour who did not receive epidural analgesia.

The patients' ages range from 20 to 30 years in both groups, with an average age of 24.50 years in the epidural group and 25.26 years in the non-epidural group. A significant portion of the individuals involved in the study fell within the 26-30 age range. The mean age of cases and controls showed no significant difference. The p-value is greater than 0.05.

A significant portion of the individuals involved in the study had a gestational age ranging from 37 to 39 weeks. The mean gestational age of cases and controls did not show any statistically significant difference. In Group II (Control), the mean duration of the first stage was found to be higher compared to Group I (Cases). The two groups had an average duration of 59 minutes. Statistical analysis has confirmed the significant difference. In Group I (cases), the average duration of the second stage was 22 minutes longer compared to Group II (controls). The difference was found to be statistically significant. Table 2 provides a comparison of the average duration of the active stage in both groups. In the Control group, the average duration of the active stage was 310.01 minutes, while in the Cases group, it was 270.54 minutes. However, the overall difference did not show any significant statistical findings. The p-value is greater than 0.05.

Table 3 presents a comparison of the average VAS scores between the two groups. In the Control group (Group II), the mean VAS scores were higher at 8.42, compared to the Cases group (Group I) which had a mean score of 5.23. A notable difference was observed from a statistical standpoint. The most common mode of delivery among the study participants was FTND, followed by LSCS and forceps.

Foetal distress was the most common indication among cases, while MSAF was the most common indication among the controls. Group I (Cases) had 15 study participants (15%) who experienced side effects. Back pain was the most frequently reported side effect. In Group I, 5 study participants required NICU admission, while in Group II, the number of study participants requiring NICU admission was 10. No significant association was found between the two groups and NICU admission.

Table 1: The distribution of the study participants based on age groups

Age groups (years)	Group I Total (Cases) N (%)	Group II (Control) N (%)	Total N (%)
20-25	56 (56)	40 (40)	96 (48)
26-30	44 (44)	60 (60)	104 (52)
Total	100 (100)	100 (100)	200 (100)

Table 2: Comparison of the mean duration of active stage in both the groups

Groups	Duration of active stage (minutes), Mean±SD	P value
Group I (Cases) N=100	270.54±94.15	0.10
Group II (Control) N=100	310.001±132.15	

*Indicate statistically significance at p≤0.05

Table 3: Comparison of the mean VAS scores in both the groups

Groups	VAS scores (Mean±SD)	P value
Group I (Cases) N=100	5.23±1.42	0.10
Group II (Control) N=100	8.42±1.11	

Discussion

There are various techniques available to provide labour analgesia, some of which are specific to certain regions while others are not. Epidural analgesia provides the most effective pain relief during labour. There is on-going debate in the medical community regarding the impact of epidural analgesia on the duration of labour and rates of instrumental and caesarean deliveries. A thorough examination of the available literature reveals conflicting findings on these topics, making it a highly discussed controversy surrounding epidural analgesia.

A study was conducted on 100 patients who opted for epidural analgesia during labour, comparing them to another 100 patients who did not require this pain relief method. In both groups combined, the most prevalent age range was 26-30 years, as indicated in Table 1. The highest number of patients was observed in the gestational age range of 37-39 weeks in both groups, as observed in the study. Several studies have examined the impact of

epidural analgesia on the duration of the first stage of labour. Some studies have reported a lengthened first stage, while others have found no significant effect.

In the recent study, the researchers found that the duration of the first stage of labour was shorter in the group that received epidural anaesthesia compared to the control group. According to studies conducted by Wong et al and Fyneface-Ogan et al, it was found that epidural analgesia was linked to a shorter first stage of labour, which aligns with the findings of the current study. [6,7] It is possible that the shorter duration of the first stage is due to the improved pain relief provided by the epidural, which reduces the inhibitory effect of catecholamines on uterine contractions, resulting in faster cervical dilation. In our study, epidural analgesia was administered once cervical dilatation reached 4 cm or more. [8] In a study conducted by Dipti et al [10], it was found that the duration of the first stage was shortened in the epidural group. It is possible that the use of ropivacaine could lead to a decrease in the inhibitory effect of catecholamines on uterine contractility, resulting in rapid cervical dilatation. In Hincz's [11] study, the duration of the first stage was found to be longer in the epidural group. It is worth noting that prolonged labour appears to be more common when a higher dose of local anaesthetic is administered.

According to the American College of Obstetrician and Gynaecologists, it is recommended that obstetricians consider delaying the administration of epidural analgesia in first-time mothers until the cervix has dilated to at least 4 cm, if possible. There has been a long-standing belief that epidural analgesia is linked to prolonged delivery due to motor blockade and weakened pelvic floor muscles. This, in turn, reduces the effectiveness of maternal pushing and the involuntary bearing down reflex. However, this is not the case when dilute anesthetics are used, as the motor blockade is minimal. [11,12] Anim-Souman and colleagues conducted a thorough review of the effects of epidural analgesia in labour. They analysed data from 38 trials, which included a total of 9658 parturient. [13]

The duration of the first stage of labour did not show any notable variations, but the second stage was extended by an average of 15 minutes. It is likely that the positive outcome was a result of mothers being well-hydrated and receiving the correct dosage of pain medication. Our study yielded similar results to the research conducted by Labour EA papalkar et al [14]. On the other hand, Dipti et al. [10] found that the second stage of labour was prolonged in the epidural group. It is believed that this is caused by a motor blockade, which weakens the pelvic floor muscles and hinders the mother's ability to push effectively and experience the natural bearing down reflex. Our study yielded similar results to previous research conducted by Labour EA papalkar et al [14], Dipti et al. [10] and Hincz et al. [15] these studies found that the use of epidural anaesthesia during labour did not lead to an increase in instrumental delivery rates. Nevertheless, Anwar et al [16] and Hincz et al [15] found that patients who received epidural analgesia had a higher rate of forceps delivery. It appears that prolonged labour is more likely to occur when a higher dose of local anaesthetic agent is administered. [17] Although the duration of the active stage of labour is slightly longer in the control group compared to the cases, the difference is not statistically significant. Therefore, it can be concluded that epidural analgesia does not have any impact on the active stage of labour. These varied outcomes regarding labour may be attributed to variations in labour management and the protocol for administering pain relief.

According to the study, there was no significant difference observed between the epidural group and the control group in terms of the rates of caesarean sections, instrumental vaginal deliveries, and normal vaginal deliveries. The VAS score for pain is measured using a 10 cm line, with zero indicating the absence of pain and 10 indicating the most severe pain.

Patients who opted for epidural analgesia experienced lower VAS scores compared to those who did not request it. The EA group had a remarkably low perception of pain. Two women in the epidural group underwent caesarean sections due to foetal distress, while another woman experienced a delay in the second stage of labour. Their pain scores were also taken into account. In the group of women who received epidural analgesia, approximately 28% reported VAS scores below 4, whereas none of the women who did not receive epidural analgesia reported scores below this threshold.

No statistically significant difference was observed in the Apgar score of the newborns at 1 minute and 5 minutes in both groups, according to the present study. It was evident from the APGAR scores falling within the normal range of 7-10 and the neonates not requiring mechanical ventilation. Most of the LSCS procedures in Anwar et al's study [16] were performed due to foetal distress, as indicated by decelerations on CTG and meconium-stained liquor. Our study observed a total of seven cases of LSCS. All patients had normal CTG findings after epidural anaesthesia, so none of them required emergency LSCS right after the procedure. Out of the 100 women who received epidural during labour in this study, approximately 15 experienced some adverse effects following the administration of epidural analgesia. One of the most frequently reported side effects was back

pain, which was observed in 5 (5%) women. Additionally, other commonly observed side effects included nausea, shivering, and pain at the puncture site. It was noted that the side effects mentioned were temporary and disappeared within 24 hours after the epidural catheter was removed. None of the patients experienced any lingering complaints beyond this time frame. In the study of Labour EA [18], papalkar et al and magurie, the most frequently reported side effect was hypotension, followed by nausea, vomiting, rigour, and pruritis.

According to a study conducted by Pandya et al [19], it was found that only one patient experienced post-dural puncture headache. It is possible that the higher doses of the drug in our study may have contributed to additional side effects. Nevertheless, the side effects were not severe and could be effectively managed with symptomatic treatment. The process of labour remained unaffected.

In previous studies conducted by Paplakar et al [14], Dipti et al [10], Hincz et al. [15], and Anwar et al [16], similar findings were observed. These studies found a significantly low APGAR score at 1 minute for babies delivered by mothers receiving EA. Logistic regression models were used to confirm this observation based on their data. There are a few limitations to consider in this study. One important factor to keep in mind is that pain perception can vary significantly from person to person. This variation can potentially introduce a bias when assessing the overall analgesic effect of epidural analgesia. In addition, using a larger sample size would have greater statistical significance in relation to the current study.

Conclusion

Epidural analgesia aims to enhance the childbirth experience by providing comfort, relaxation, and pain relief. Our study focused on observing and analysing the effects of epidural analgesia on the duration of the first stage of labour. The results revealed a significant reduction in labour time for patients who received this form of pain relief. No significant increase in the incidence of instrumental deliveries or caesarean sections was observed among patients who received epidural analgesia. Verbal analogue scale measurements revealed a notable decrease in pain relief when epidural analgesia was administered. No significant complications were observed in the mother. Therefore, epidural analgesia is considered a highly effective and safe method of pain relief. It holds a significant role in contemporary obstetrics. It appears that this technique has the potential to become a widely accepted and effective method for alleviating labour pains in the near future.

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