ORIGINAL RESEARCH

To Determine The Effectiveness And Safety Of Combining Spinal Epidural (CSE) And Epidural Techniques For Labor Pain Relief

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ABSTRACT

Aim: To determine the effectiveness and safety of combining spinal epidural (CSE) and epidural techniques for labor pain relief.

Materials and Methods: Data was obtained from the records of 120 healthy pregnant women, with 60 women in each group. These women were between the ages of 20 -40 and sought epidural analgesia during active labor when their cervix was dilated between 3-4 cm. They were feeling uterine contractions and had uncomplicated term labor between 37-41 weeks of gestational age. In Group A (CSE): The CSE method was executed via the single in terspace needle-through-needle approach (Pajunk). Group-B (epidural): In the epidural group, the epidural space was located by using the absence of resistance to saline with an 18-G Tuohy needle.

Results: There was a significance difference in maternal heartrate at 30 min safter in jection(GroupA:95.97 ± 3.48,GroupB:90.02 ± 3.36). No significance difference in terms of maternal respiratory rate, Blood pressure and foetal heart rate (before analgesia, 15 mins after injection and 30 mins after injection) in both groups. There was adelay in on se to fanalgesia in Group B(Epidural):(12.95 ± 1.34min)when compared to Group A(CSE):(3.87 ± 1.21min) and duration of analgesia was not significantly different.Twogroupsweresimilarinpainscorebefore injection. However, at 15 mins after injection, pain score decreased in Group A(3.81± 0.78)compared to Group B (4.76 ± 1.22). Duration of 1st stage of labor did not differ between groups. But in case of duration of second stage, which lasted longer in Group A (75.12 ± 9.65 min) compared to Group B (55.34 ± 8.67). 55% in Group A and 50% in Group B are in need of oxytocinaugmentation. The mode of delivery was similar between two groups with normal vaginal delivery rate in Group A(CSE) was 88.33%and group B (epidural) was 83.33%. Apgar scores did not differ much in two groups (P=41).

Conclusion: The majority of patients in the CSE group needed an extra dosage. No significant disparities were seen between the groups in relation to the duration of initial labor, fetal heart rate, maternal blood pressure, need for oxytocin augmentation, necessity for episiotomy, and method of delivery.

Keywords: Combining spinal epidural, Epidural techniques, Labor, Pain

INTRODUCTION

Childbirth is a momentous event in a woman's life, often accompanied with substantial agony and unease. Studies have shown that labor pain is classified as one of the most severe forms of pain [1]. Moreover, it might have detrimental consequences to the developing baby, affecting its respiratory, circulatory, and neuroendocrine systems, and possibly resulting in fetal hypoxia [2,3]. Fortunately, the treatment of labor pain has advanced, providing a variety of procedures and drugs to reduce suffering for both the mother and fetus, while also assisting the progress of labor [4]. Regional analgesia has been identified as the most efficient method for treating pain during delivery and may be provided via procedures such as epidural, spinal, or a combination of both [5]. Epidural analgesia has shown to be a very effective technique for alleviating pain during childbirth [6]. Epidural analgesia is achieved by administering local anesthetics and opioids into the epidural space, which effectively inhibits the transmission of pain signals from the lower body to the central nervous system. An injection of local anesthetic is administered directly into the epidural region around the spinal column using a catheter inserted into that area [3,5]. When compared to non-epidural techniques, epidural

analgesia is considered to be the better and safer choice for relieving labor pain [6]. It is well recognized for its ability to provide substantial pain relief, enabling women to experience delivery with less discomfort. Spinal analgesia, including the direct injection of drugs into the spinal column, provides a quicker start of pain relief. However, its comparatively shorter duration restricts its use in managing labor pain. Moreover, the use of very delicate catheters in the spinal area heightens the likelihood of nerve damage [5]. Alternatively, combined spinal-epidural analgesia (CSE) combines the advantages of spinal and epidural treatments, offering quick and intense pain relief while allowing for adjustable dosage [7]. CSE refers to the administration of a modest quantity of local anesthetic and/or opioid into the subarachnoid space to induce pain relief. This is followed by either a single dose or continuous injection via the epidural catheter [5]. CSE may provide more effective pain treatment and achieve a quicker dilatation rate in the cervix compared to using just an epidural [8-10]. An optimal medication combination for labor analgesia should provide prolonged pain relief while causing minimum motor impairment and negligible transfer to the placenta. They should not have any substantial negative effects on the mother and fetus. Bupivacaine is the preferred choice for providing pain relief during childbirth epidural analgesia. When compared to earlier local anesthetics, bupivacaine offers superior pain relief and is less likely to cause tachyphylaxis when used over a lengthy period of time. The usage of greater dose may lead to cardiac and central nervous system damage if accidentally injected intravenously. Combining opioids such as fentanyl with local anesthetic bupivacaine is preferred since it helps to reduce the required dosage and minimize unwanted effects. It decreases the amount of local anesthetic needed by about 25%. Fentanyl was selected above other opioids because to its elevated lipid solubility and greater affinity for the μ-opioid receptor[10]. The combination of opioids with local anaesthetic drugs has a synergistic effect, enhancing pain relief and minimizing the occurrence of motor block, particularly in the lower limbs. Hence, the objective of this research is to assess and contrast the efficacy of CSE analgesia with epidural analgesia in facilitating painless labor.

MATERIALS AND METHODS

This retrospective case study was undertaken in a tertiary care hospital. Data was obtained from the records of 120 healthy pregnant women, with 60 women in each group. These women were between the ages of 20 -40 and sought epidural analgesia during active labor when their cervix was dilated between 3-4 cm. They were feeling uterine contractions and had uncomplicated term labor between 37-41 weeks of gestational age. The exclusion criteria included complex pregnancies, placenta previa, pregnancy-induced hypertension, contraindications for regional analgesia, and pre-eclampsia. The study population is divided into two groups, namely. Group A was administered combination CSE, whereas Group B was given just epidural analgesia. The regional blocks were conducted in the flexed sitting posture at either the L2-L3 or L3-L4 in tervertebral area, after administering a standard fluid preload of 500-1000ml Hartmann's solution, in a sterile environment. Every blood study for each patient was thoroughly examined, and written agreement was obtained following a comprehensive explanation of the procedure's risks and advantages. In Group A (CSE): The CSE method was executed via the single interspace needle-through-needle approach (Pajunk). The epidural area was located by observing the absence of resistance to saline using an 18-G Tuohy needle. Subsequently, an intrathecal injection was administered using a 27G sprotte needle, consisting of 2mg of Bupivacaine and 25mcg of Fentanyl. A 20G multiport epidural catheter was placed into the epidural space to a depth of 4-5cm. Following a negative aspiration test (indicating no presence of blood or cerebrospinal fluid), a 3ml dosage of 0.25% Bupivacaine was administered. Subsequently, an infusion was started at a rate of 8-10ml/hr, consisting of 0.08% Bupivacaine and 2mcg/ml fentanyl. Group-B (epidural): In the epidural group, the epidural space was located by using the absence of resistance to saline with an 18-G Tuohy needle. As stated before, after a negative aspiration, a test dose of 3 ml of 0.25% bupivacaine was delivered. Subsequently, a continuous infusion of 0.08% bupivacaine with fentanyl at a concentration of 2mcg/ml was provided at a rate of 8-10 ml/hr.

Data was collected from the time of procedure to till the tim eofdeli very bymidwife, remainingdata was collected from MRD. Intravenous fluid was started and routine monitoringincludingtheverbal NRS(numericpainscore (0-10)was assessedinall parturients(0=nopain,1-3mild pain, 4-6 moderate pain, 7-10 severe pain). Vital parameters of the mother such as heart rate, blood pressure, respiratory rate, foetal heart rate before analgesia, 15mins after injection, 30 mins after injection and maternal satisfaction were recorded. Adverse effects such as PDH, nausea, vomiting was recorded. The duration of the first and second stages of labor, need for additional dose, maternal satisfaction and mode of delivery werea lsorecorded. The assessment of neonatal well-being was conducted by evaluating A pgar scores at 1 and 5 minutes. The same inquiries were conducted many times, and the specifics of these inquiries, together with demographic information, were gathered and documented using a pre-established structured data collecting sheet or proforma. The gathered information was then used for statistical analysis.

STATISTICAL ANALYSIS

The data were analyzed using version 25.0 of the SPSS software. The mean and standard deviation of normally distributed numeric data were compared between two groups using an unpaired t-test. The Mann Whitney U test was used to compare the median (IDR) of non-normally distributed numeric data. The comparison of categorical variables was conducted using either the Chi-square test or Fisher's exact test. A significance level of less than 0.05 was used to determine statistical significance.

RESULTS

Data of 60 women in each group i.e, Group A (CSE) (n=60) and Group B(Epidural) (n=60) was extracted. Demographic characters were similar between two groups **(Table 1).**

Table1:Basic parameter of the participants

Parameter	Group A	Group B
Age(in Years)(mean± SD)	30.01±3.52	30.12±3.76
Height(in cm)(mean± SD)	167.53±2.87	166.98±2.37
Weight(in kg)(mean± SD)	80.94±3.38	85.12±3.74
BMI(mean± SD)	29.32±1.24	31.75±1.89
Gravidan (%)		
Primi Gravida	12(20%)	7(11.67%)
Multi Gravida	48(80%)	53(88.33%)
Parityn (%)		
Nullipara	10(16.67%)	8(1.33%)
PrimiPara	15(25%)	19(31.67%)
Multipara	35(58.33%)	33(55%)
ASA Groupn (%)		
1	30(50%)	30 (50%)
2	30(50%)	30(50%)

There was asignificance difference in maternal heart rate at30minsafterinjection(GroupA:95.97 ± 3.48,GroupB:90.02 ± 3.36). No significance difference in terms of maternal respiratory rate, Blood pressure and foetal heart rate (before analgesia, 15 mins after injection and 30 mins after injection) in both groups. **(Table 2).**

Table2: Maternal and fetal hemodynamic parameters

	Group A	Group B	P value
Maternal Heart rate			
Before analgesia	103.05±5.75	99.87±3.47	0.03
At 15minutes after injection	99.78±4.42	99.08±3.27	0.31
At 30minutes after injection	95.97±3.48	90.02±3.36	<0.001*
Maternal Respiratory rate			
Before analgesia	17.34± 1.19	17.18± 1.12	0.22
At 15minutes after injection	16.33± 0.78	16.19± 0.88	0.31
At 30minutes after injection	16.33 ± 0.78	16.19 ± 0.88	0.41
Maternal Systolic BP			
Before analgesia	132.87±4.54	121.46±4.63	<0.001
At 15minutes after injection	122.11±4.35	121.12±4.65	0.27
At 30minutes after injection	112.14±5.36	109.04±5.62	0.37
Maternal Diastolic BP			
Before analgesia	85.12±2.89	88.05±2.93	0.03
At 15minutes after injection	82.12±3.36	87.32±3.92	<0.001*
at30 minutes after injection	79.13±3.53	76.01±2.87	0.007
Fetal heart rate			
Before analgesia	151.21±3.75	150.05±3.74	0.52
At 15minutes after injection	149.98±4.43	149.12±4.65	0.32
At 30minutes after injection	149.54±4.12	148.56±4.42	0.16

There was a delay in on set of analgesia in Group B(Epidural): (12.95 ± 1.34min) when compared to Group A(CSE):(3.87 ± 1.21min) and duration of analgesia was not significantly different. Two groups were similar in pain score before injection. However, at 15 mins after injection, pain score decreased in Group A (3.81± 0.78) compared to Group B (4.76 ± 1.22).Most of the patients in the CSE group required an additional dose medication to relieve their pain(45%in the CSE group vs. 25% in the epidural group, p = 0.04) Maternal satisfaction was mostly defined as good in both groups.(**Table 3)**

Table 3: Analgesics and pain assessment in both groups

	Group A	Group B	P value
The onset time of analgesia(minute)	3.87±1.21	12.95±1.34	<0.001*
The duration of analgesia(In minutes)	521.34±17.87	486.74±15.98	0.21
Initial pain score before injection	8.57± 0.87	8.57± 0.87	0.43
Mild pain	0	0	
Moderate Pain(4To6)	3(5%)	3(5%)	
Severe Pain(7To10)	57(95%)	57(95%)	
15minutes after injection	3.81±0.78	4.76± 1.22	<0.001*
Mild Pain(1To3)	21(35%)	10(16.67%)	
Moderate Pain(4To6)	39(65%)	47(78.33%)	
Severe Pain(7To10)	0(0%)	3(5%)	
Number needed additional analgesic	27(45%)	15(25%)	0.04
Dose of additional analgesic(mg)	0.14± 0.05	0.18± 0.05	0.23

Duration of 1st stage of labor did not differ between groups. But in case of duration of second stage,which lasted longer in Group A (75.12 ± 9.65min) compared to Group B (55.34 ± 8.67). 55% in Group A and 50% in Group B are in need of oxytocinaugmentation. The mode of deli very was similar between two groups with normal vaginal delivery rate in Group A(CSE) was 88.33%and group B (epidural) was 83.33%. Apgar scores did not differ much in two groups (P=41). **(Table 4).**

Table 4: Obstetric and neonatal outcomes

	Group A	Group B	P value
Gestational weeks(Days)	38.22±1.14	38.41± 0.87	0.14
Initial cervical dilatation(cm)	4.06±0.84	4.13± 0.93	0.11
Initial cervical effacement(%)	66.02±4.77	68.12±4.52	0.19
Duration of first stage(minute)	444.54±15.65	430.73±15.89	0.26
Duration of second stage(minute)	75.12±9.65	55.34±8.67	<0.001*
Need For Oxytocin Augmentation(%)	33(55%)	30(50%)	0.22
Mode Of Delivery n(%)			
Instrumental delivery	7(11.67%)	10(16.67%)	0.41
NVD(normal vaginal delivery)	53(88.33%)	50(83.33%)	
Need for Episiotomy(n)(%)	15(25%)	18(30%)	0.16
Apgar score at 1minute	7.42± 1.17	7.42± 1.17	0.32
Apgar score at 5minutes	8.73±0.66	8.73±0.66	0.38

DISCUSSION

The epidural approach has been widely regarded as the most reliable and effective operation for over four decades. The CSE approach has gained popularity due to its ability to deliver faster pain relief with less motor weakness[11,12]. This research was done retrospectively to evaluate the effectiveness of mixed spinal epidural analgesia with the epidural analgesic approach in labor. According to the latest research, CSE (Combined Spinal-Epidural) led to a quicker start of pain relief, with an onset that was 3.87 minutes faster compared to using epidural alone. Cascio M et al.[13] propose that the use of the CSE method results in a rapid initiation of pain relief. Multiple prior investigations have shown comparable results [14,15]. A research conducted by Ngampraser twong P et al.[16] shown that the onset of anesthesia was 7.8 minutes quicker in patients who received combined spinal-epidural anesthesia (CSE) compared to those who received epidural anesthesia alone. The onset of anesthesia ranged between 8 minutes and 3 minutes, according to several research. The variability in the time discrepancies may be ascribed to the composition and dose of anesthetic drugs used. The CSE group received a dosage of 2mg of Bupivacaine combined with 25mcg of Fentanyl, with a concentration of 0.08% Bupivacaine and 2mcg/ml of Fentanyl, administered at a rate of 8-10ml/hr. The epidural group received a continuous infusion of 0.08% Bupivacaine with 2mcg/ml of Fentanyl at a rate of 8-10ml/hr.

According to the recent research conducted by Ngam prasert wong P et al[16], the duration of analgesia did not show any statistically significant difference (P=0.21) (P=0.542). The verbal Numeric Rating Scale (NRS), ranging from 0 to 10, was used to evaluate pain levels in all the women in labor. A score of 0 indicated no pain, scores of 1 to 3 indicated mild pain, scores of 4 to 6 indicated moderate pain, and scores of 7 to 10 indicated severe pain. The CSE group saw a decrease in Pain score 15 minutes after injection compared to the epidural approach. Additionally, a greater percentage of patients in both groups reported moderate pain (4-6).The study conducted by Collis RE *et al[14]*. Anaes the tist chosetoincrease the dose of bupivacaineinthecombined spinal-epidural group and to give 50-100 µg fentanyl as a bolus in the standardepidural group. The average number of

additional epidural analgesic doses was significantly higher in the CSE group than in the epidural alone group (p=0.007). In this study, whomever required an additional dose were given to achieve satisfactory analgesia. The number of patients required additional dose were more in CSE group than epidural group with no statistical difference.

Mean of required additional dose was ((0.14 ± 0.05) vs (0.18 ± 0.05), p =0.23) between two groups. Initial cervical dilationin Group A(4.06 ± 0.84)and GroupB(4.13 ± 0.93)has no significant difference, which was comparable to the study by Bhagwat AG *et al[*17].Many studies have shown a relationship between the use of epidural and prolonged second stage labor[15-19].This study shows no differences between groups in duration of first stage of labor[13].Duration of second stage of labor was prolonged in CSE group compared to epidural group. Use of traditional, local anaesthetic-based epidural analgesia was reported be associated with more frequent use of oxytocin induction and higher risk of instrumental vaginal delivery[15].In our study there was no statistical difference in case of need of oxytocinaugmentation in both the groups with P=0.22 and higher percent of normal vaginal delivery in both the groups (88.33% and 83.33%) compared to instrumental delivery(11.67%and16.67%) as same as the study conducted by Pascual-Ramirez J *et al*.,[20]which has higher NVD compared to instrumental delivery. All the neonates had Apgar score of 8 at 1 min and 5 min.

The research was a retrospective observational study that aimed to compare the treatment effectiveness and safety of two distinct modalities of labor analgesia. A significant constraint of the research was the absence of a priori sample size computation. The post-hoc power analysis for the main outcome indicated that the trial had sufficient power, therefore minimizing the effect of chance. Moreover, it cannot be completely ruled out that there may be a potential influence of natural selection bias on the selection of modality, as well as reporting bias and result ascertainment bias owing to the absence of blinding. However, the research results are closer to a real-world setting than to a controlled clinical experiment. The baseline characteristics of the population in both groups exhibited negligible changes, indicating a low likelihood of confounding effects. The possibility of an unknown confounding effect caused by other factors cannot be entirely eliminated due to the absence of randomization.

CONCLUSION

Overall, the CSE approach offers faster pain relief and longer-lasting pain relief in the second stage compared to the localized epidural procedure. There is a disparity in the initial pain score and the pain score 15 minutes after injection in both groups. The majority of patients in the CSE group needed an extra dosage. No significant disparities were seen between the groups in relation to the duration of initial labor, fetal heart rate, maternal blood pressure, need for oxytocin augmentation, necessity for episiotomy, and method of delivery. The obstetric and neonatal outcomes exhibited no significant differences between the groups.

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