Original Article

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A Comparison of Onset of Anesthesia Between Spinal Bupivacaine 5 mg with Immediate Epidural 2% Lignocaine 5ml and Bupivacaine 10 mg for Caesarean Delivery

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Abstract

Introduction: In separate surgeries, spinal anesthesia is usually performed using lidocaine percent 5 and bupivacaine percent 0.5. This procedure is followed by many difficulties, including extending the level of anesthetics to places greater than the local injection site. **Materials and methods:** This research was performed with 60 patients posted for elective caesarean delivery belonging to ASA Grade I & II. Patients were allocated randomly into 2 groups of 30 each. (Spinal bupivacaine 5 mg with instant epidural 2 percent lignocaine) mixed spinal epidural (CSE) group and Spinal (S) group (Spinal bupivacaine 10 mg). **Results:** Compared to patients who underwent mixed spinal-epidural anesthesia, patients in group S showed a quicker onset of anesthesia (meantime) (group CSE). There is no clinically relevant onset of anesthesia (p-value = 0.08). In group S, the time for the first hypotension is considerably early. For a value of < 0.001, the p-value is statistically important. In Category S, the lowest calculated SBP was substantially found. The p-value with a value of <0.001 is statistically important. In Group S, the number of patients with hypotension was slightly (p-value = 0.03) higher (19 patients) than in Group CSE (11 patients). Group CSE reported a statistically important early 2 segment regression period with a p < 0.001 value. The early recovery in the CSE community is statistically important, with a value of p<0.001. **Conclusions:** The low-dose CSE procedure, especially for high-risk patients at risk of precipitous hypotension, is a choice for supplying anesthesia for caesarean delivery.

Keywords: Spinal anaesthesia, elective caesarean delivery, precipitous hypotension.

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Introduction

Epidural Anaesthesia is a procedure that blocks the spinal nerves in the epidural space by receiving analgesia and anesthesia as the nerves exit from the dura and then proceed through the intervertebral foramina.[1] Epidural anesthesia is one of anaesthesiology's most useful and flexible techniques, enabling the anesthetist to obtain an epidural block at several stages of the spine. It may be used with a catheter that requires intermittent boluses and/or continuous infusion as a single-shot technique. Epidural procedures are commonly used for obstetric analgesia, control of postoperative pain, operative anesthesia, and treatment of chronic pain,[2,3] It may be used to complement general anesthesia, eliminating the requirement for deep general anesthesia levels and thereby offering a more hemodynamically safe course of action. It gives improved management of postoperative pain and more rapid healing from surgery.

Combined spinal-epidural anesthesia (CSE) is a local anesthesia procedure where the epidural dosage of anesthesia is delivered directly before or after the (most common) spinal dose.[4] The frequency and magnitude of hypotension can be minimized by low-dose intrathecal injections as part of the CSE technique for caesarean delivery. It is unclear whether the onset of anesthesia is affected by an epidural component administered concomitantly with a low-dose spinal component. This study was designed to assess the differences in surgical anesthesia obtained between spinal Bupivacaine 5 mg combined with an immediate 2% Lignocaine 5 ml epidural bolus and conventional spinal Bupivacaine 10 mg for elective caesarean delivery.

Subjects and Methods

The anesthesiology department performed an observational clinical study on 60 randomly chosen patients who were scheduled for elective cesarean delivery at Gandhi hospital. The selection of patients for the study was done considering the inclusion and exclusion criteria as mentioned below.

Inclusion Criteria

Pregnant women aged between 18-30 years, ASA grade I & II, having ± 20% of ideal body weight in patients undergoing elective cesarean delivery.

Exclusion Criteria

Patients allergic to bupivacaine and lignocaine, ischemic heart disease, hepatorenal dysfunction, immunocompromised patients

On the day before the operation, both patients were exposed to a pre-anesthetic assessment that involved a thorough background and review of the patient's general health, airway evaluation using Mallampati scoring, evaluation of nutritional status, height, and weight, a detailed evaluation of the cardiovascular system, pulmonary system, and nervous system to recognize comorbidities that could be complicated. After explaining the protocol, informed consent was received.

All the basic tests were conducted on all patients.

Patients were then grouped into two classes of 30, each using Microsoft Excel's computer-generated randomization algorithm.

Combined spinal-epidural (CSE) group (Spinal bupivacaine 5 mg with immediate epidural 2% lignocaine):

In this group, Patients received 5 mg bolus intrathecal bupivacaine with immediate epidural 2% lignocaine 5 ml.

Spinal (S) group (Spinal bupivacaine 10 mg):

In this group, patients received injection bupivacaine 10 mg bolus intrathecal dose followed by epidural saline 5ml.

Patients were recommended to retain null oral status for 8 hours on the day of the operation. Vital hemodynamic parameters such as pulse rate, non-invasive arterial blood pressure, oxygen saturation, and ECG were reported using multipara testing, and the patient was moved to the operation theatre. With an 18G intravenous catheter, the intravenous line was protected. Premedication was given with I.V. Ondansetron 4mg and I.V. Ranitidine 50mg. A 10-point graphic analog of the pain scale was clarified to the patients.

Procedure

The anesthesia was done with the patient in the left lateral position using a needle-through-needle CSE procedure. Using a midline approach with a lack of resistance to saline at the L2-3 interspace, an 18-gauge Tuohy needle was inserted into the epidural space. To puncture the dura, a 26-gauge pencil-point needle was then moved through the Tuohy needle. After checking the free flow of cerebrospinal fluid, hyperbaric bupivacaine 5 mg was given to patients in the CSE community and 10 mg (0.5 percent bupivacaine 2 mL) was inserted progressively with the cephalad-pointing orifice to those in Group S. The spinal needle was removed and inserted 3 cm into the epidural space by an epidural catheter. Group CSE received 2% lidocaine with epinephrine 1:200000 5 mL epidural after a negative aspiration test, and Group S received 5 ml saline after a negative aspiration test. The epidural catheter was secured in place and the patient used a wedge pillow under the right hip to position the supine with left uterine displacement. Throughout the process, lactated ringer solution was infused at 10 ml/kg/h, but no liquid preload or color was provided.

The dermatomal sensory block level was measured bilaterally (defined by pinprick pain loss) every minute after spinal injection until T6 was hit by the block, then every 2 minutes until the full sensory block was reached. If the sensory level did not exceed T6 after 15 min, an additional 2% lidocaine was applied via the epidural catheter in 5 mL intervals, up to a limit of 20 mL, before the target dermatome was met.

As soon as a block was shown to T6, surgery with a Pfannenstiel skin incision was permitted. The uterus was, in all cases, externalized for reconstruction. Using a 10-point visual analog scale (VAS 0–10), patients were asked to record intraoperative pain at any time during surgery. If the VAS pain score was greater than or equal to 4, a 2% lidocaine 5 mL epidural bolus was given, repeated every 5 minutes if desired until the VAS score was <4. If this did not happen after 20 mL, the patient will be given general anesthesia.

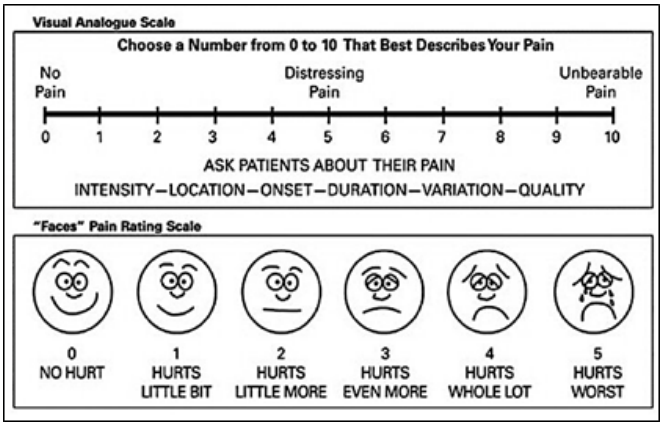


Figure 1: VAS SCALE

Heart rate (HR) and SpO2 were tracked continuously. Baseline Systolic blood pressure (SBP), heart rate (HR), and diastolic blood pressure (DBP) were recorded. SBP was assessed at

the time of skin incision, uterine incision, fetus birth, uterine closure, and skin closure during the procedure. Hypotension, described as a <90 mmHg systolic blood pressure (SBP) or a 30 percent reduction from baseline, was handled promptly with phenylephrine 50 μg or ephedrine 5 mg intravenous boluses (when maternal HR was <60 beats/min) repeated as needed. The overall number of intravenous vasopressor patients and the duration from spinal injection to the first onset of hypotension has been documented.

Periods have been reported from completion of spinal injection to T6 block (defined as the time of onset of anesthesia), length of operation, the maximum height of the sensory dermatome, and the need for intraoperative epidural supplementation. Using the modified Bromage scale, lower limb motor blockade was measured using-

Grade 0 = lack of disability (No motor block, free movements of legs & feet with the ability to raise extended leg)

Grade 1 = Capable of flexing knees with free movement of feet, but not of raising extended legs

Grade 2 = Unable to flex knees or lift extended legs, but with free foot movement

Grade 3 = Unable to move the feet or legs.

Adverse effects, if any, with bupivacaine (cardiotoxicity) and lignocaine (central nervous system toxicity) were noted.

Statistical Methods

Using Microsoft Excel 2019, mathematical tests were conducted (Ver. 16.42). The mean ± standard deviation of all values was expressed as (SD). Data for normality has been reviewed. For intergroup analysis of the means, the independent t-test was applied. Using the chi-square test, categorical data were analyzed. The p-value was known to be statistically relevant at or below 0.05.

Results

At Gandhi Medical College, this retrospective clinical study was performed on 60 patients who were randomly divided into two groups consisting of 30 each. Patients in group 'S' underwent traditional anesthesia, while group 'CSE' received mixed spinal anesthesia and epidural anesthesia.

The mean age of patients in group S and group CSE were 24.66 ± 2.95 and 25.26 ± 2.98 respectively. The weight and height distribution, gestational age of patients is shown in table 1. In terms of age, weight, height, and gestational age, both groups were statistically identical (p-value >0.05). The baseline hemodynamic parameters for both groups were similar, such as systolic blood pressure, diastolic blood pressure, and heart rate.

The onset of anesthesia (time to T6 from spinal injection) was faster in group S with a mean of 8.8 while in group CSE mean

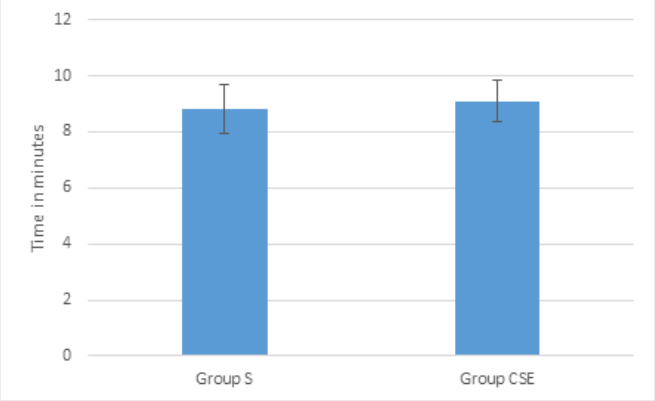
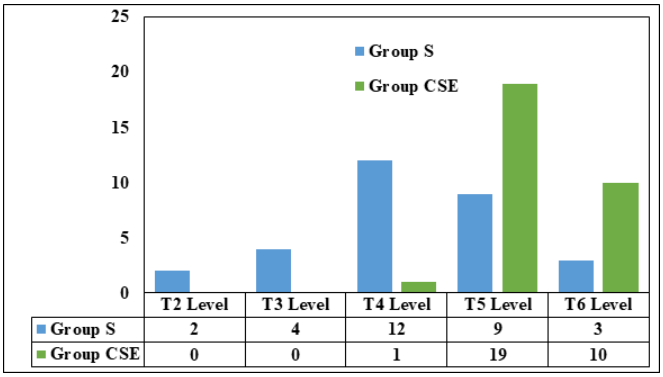


Figure 2: Comparison of onset of anaesthesia

onset was 9.1. However, on statistical analysis both the groups were similar.



	T2 Level	T3 Level	T4 Level	T5 Level	T6 Level
Group S	2	4	12	9	3
Group CSE	0	0	1	19	10

Figure 3: Comparison of level of analgesia

In both classes, the highest degree of sensory blockade obtained after the neuraxial block (loss of pinprick pain sensation) was tested and is seen in figure 3. Six patients belonging to group S had analgesic levels of T3 or higher while no patient in the CSE group attained T3 or higher levels of analgesia.

The patients in the spinal group had faster hypotensive episodes compared to the CSE group with a statistically significant difference between both. The lowest SBP recorded and the number of patients having hypotension was compared between both groups and group S had significantly lower SBP and more patients had hypotension compared to the CSE group.

Changes in SBP with various events during the caesarean delivery

Considering the time required for 2-segment regression, a distinction of the length of anesthesia was made between

Table 1: Comparison of demographic data in both groups

	Group S	Group CSE	P -value
Age (years)	24.66 ± 2.95	25.26 ± 2.98	0.21
Weight (kgs)	58.13 ± 3.28	57.10 ± 3.19	0.11
Height (cm)	164.76 ± 3.54	163.53 ± 3.44	0.08
Gestational age (Weeks)	37.76 ± 0.67	37.83 ± 0.53	0.33
ASA I	27	26	NA
ASA II	3	4	
Baseline hemodynamic parameters			
Baseline SBP (mm Hg)	120.13 ± 7.68	121.10 ± 7.53	0.31
Baseline DBP (mm Hg)	77.36 ± 4.02	73.30 ± 4.34	0.16
Baseline HR (BPM)	82.80 ± 7.69	82.93 ± 7.15	0.47

Table 2: Comparison of time taken from spinal injection to first hypotension and lowest SBP

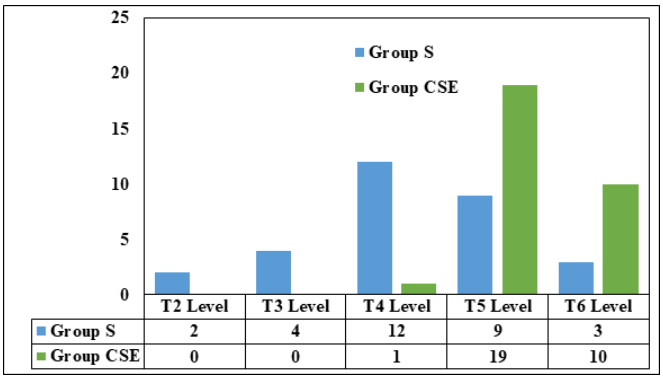
	Group S	Group CSE
Comparison of time taken from spinal injection to first hypotension		
Mean	3.56	5.06
Std. Deviation	0.67	0.94
p value	<0.001	
Comparison of lowest SBP		
Mean	86.6	89.83
Std. Deviation	4.82	3.33
p value	0.001	

Table 3: Comparison of number of patients having hypotension and administered with vasopressors

	Yes	No	Total
Comparison of number of patients having hypotension			
S group	19	11	30
CSE group	11	19	30
p value: 0.03			
Comparison of number of patients administered with vasopressors			
S group	18	12	30
CSE group	11	19	30
p value: 0.06			

Table 4: Comparison of 2-segment regression time and of time taken for recovery to Bromage -1

	Group S	Group CSE
Mean	62.26	40.23
Std. Deviation	6.34	3.04
p value	<0.001	
Comparison of time taken for recovery to Bromage -1		
Mean	248.36	73.73
Std. Deviation	22.42	19.33
P-value	<0.001	



	T2 Level	T3 Level	T4 Level	T5 Level	T6 Level
Group S	2	4	12	9	3
Group CSE	0	0	1	19	10

Figure 4: Changes in SPB with various events

the two classes. Compared to group S, patients in the CSE group had a statistically important quicker regression time. Recovery of patients after the block was compared between the two groups, taking into account the time required for Bromage grade 1 recovery. Compared to group S of statistical significance, Group CSE had higher recovery rates.

Discussion

Spinal anesthesia, particularly in the case of elective surgeries, is the treatment of choice for a cesarean section because it eliminates the most common complications associated with general anesthesia, such as aspiration, difficult intubation, and adverse effects of general anesthetics on the fetus. Some side effects can, however, often occur from spinal anesthesia, with hypotension induced by the preganglionic sympathetic block being the most frequent. Sympatholytic caused by spinal blocks contributes to vasodilatation which thus causes hypotension in mothers. Uterine blood supply and fetal circulation may be impaired by a reduction in systolic pressure, and therefore cause fetal hypoxia and acidosis. The frequency of spinal anesthesia hypotension is smaller in working patients than in non-working patients. This may result from the autotransfusion of approximately 300 ml of blood from the vascular system that happens during each uterine contraction. Nausea and vomiting are other neurological symptoms of spinal anesthesia. While the mechanism remains uncertain, a secondary result can be linked with maternal hypotension, which in turn allows brain blood pressure to decline. Hypotension correction typically reduces these effects.

Spinal anesthesia in obstetrics varies in many aspects from spinal anesthesia in non-pregnant patients. For spinal anesthesia in pregnancy, smaller doses of local anesthetic are required, and cerebrospinal fluid (CSF) dissemination is less predictable. In pregnant patients, hypotension, spinal headaches, and spinal opioid side effects are more frequent than in general surgical patients. Because of the elevated lumbar lordosis, technological difficulties in reaching the subarachnoid space can be greater in pregnancy.

Brownridge first reported the combined spinal and epidural anesthesia technique; he inserted an extradural catheter at L1-L2 and then administered spinal anesthesia at L3-L4. To extend the block and for postoperative analgesia, the extradural catheter was used. Other employees first identified the extradural space with a Tuohy needle and, given the intrathecal injection, used this as an introducer for the spinal needle, then inserted an extradural catheter. The advantages of the combination technique are the rapidity of the spinal block's onset and density, combined with the ability to extend the block and provide the extradural catheter with postoperative analgesia.

Rawal, Schollin, and Wesstrom et al.[5] reported that with the combined technique, intraoperative analgesia was better during the Caesarean section than with extradural anesthesia alone.

Thoren,[6] compared the combined spinal-epidural technique with spinal block for caesarean section. An 18-gauge Tuohy needle is placed in the epidural space and through it; a 26-gauge Quincke spinal needle is introduced. A local anesthetic is given through the Quincke needle which is then removed. An epidural catheter is then inserted into the epidural space with the bevel of the Tuohy needle facing in the cephalad direction from the beginning. In the CSE group, bupivacaine, 1.5 ml of 0.5 percent hyperbaric fluid, was administered and compared with 2.5 ml of the same solution in the spinal group. In the spinal group, the moment of block onset was shorter and the block was higher. Both patients in the CSE community were expected to have their blocks of epidural bupivacaine expanded. In both classes, surgical anesthesia was decent to outstanding and there were no variations in ratings for Apgar.

The goal of the study was to compare anesthesia onset for cesarean delivery between spinal Bupivacaine 5 mg and immediate epidural 2 percent Lignocaine 5 ml and Bupivacaine 10 mg. After receiving informed consent, 60 ASA grade I & II pregnant women aged between 18-30 years were divided into 2 classes with around 20 percent of the ideal body weight undergoing elective cesarean delivery.

There is no statistically meaningful difference between the two groups in demographic data measuring age, weight, height, and gestational weeks, as seen in [Table 1]. The duration taken from the spinal injection to T6 is the start of anesthesia. Comparison of the onset of anesthesia between the classes of our sample. The mean outcome in Group S is 8.8 and the mean in Group CSE is 9.1. This means that patients in group S have a quicker onset of anesthesia (meantime) relative to patients who got mixed spinal-epidural anesthesia (group CSE). There

is no clinically relevant onset of anesthesia (p -value = 0.08)

In a study by L.Z. Wang et al.[7] Compared with 2 groups where the C group received intrathecal isobaric bupivacaine 10 mg with sufentanil 2.5 mcg followed by epidural saline 5 ml and group L received intrathecal isobaric bupivacaine 5 mg with sufentanil 2.5 mcg followed by epidural 2 percent lignocaine 5 ml, the reported time of onset of anesthesia was not statistically important.

Scott W Simmons et al,[4] in a study showed that "the meantime for successful anesthesia was quicker in women who received a low spinal dose compared with CSE, but the significance of this difference is unlikely to be statistically important".

A Tyagi et al,[8] in their study observed that in "the single-shot spinal group, the initiation of the full sensory and motor block was found to be slightly faster than in the CSE group".

WHL Teoh, E Thomas, HM Tan,[9] in a study observed that "the CSE group receiving intrathecal bupivacaine 3.75 mg, the time is taken to attain maximal sensory block was longer than in the CSE group receiving intrathecal bupivacaine 9 mg. Time is taken from spinal injection to first hypotension. The time for first hypotension is significantly early in Group S. The mean time taken from spinal injection to first hypotension in Group S is 3.56 and in Group CSE is 5.06." The p-value is statistically significant with a value < 0.001.

In a study by L.Z. Wang et al,[7] observed that, "the group receiving intrathecal bupivacaine 10 mg followed by epidural saline 5 ml relative to the group receiving intrathecal bupivacaine 5 mg followed by epidural 2 percent lignocaine 5 ml, the duration from spinal injection to first hypotension was early."

In the present study comparison of the lowest SBP between the 2 groups. The lowest measured SBP was observed significantly in Group S. The mean value in Group S is 86.6 and in Group CSE is 89.83. The p-value is statistically significant with a value <0.001.

A study by A Malvasi et al,[10] observed that "The hypotension found was slightly higher in the spinal community relative to the CSE group (p<0.001)."

L.Z. Wang et al,[7] in a study observed that "mean lowest SBP was comparable between CSE and spinal groups."

Marc Van de Velde et al,[11] in a study on the median lowest reported SBP was higher in the LOW - CSE group receiving 6.5 mg intrathecal hyperbaric bupivacaine than in the HIGH - CSE group receiving 9.5 mg intrathecal hyperbaric bupivacaine in the joint spinal anesthesia trial for cesarean delivery. Compared to the Medium category, more patients experienced hypotension in the HIGH group.

WHL Teoh, E Thomas, HM Tan,[9] in a study observed, that "the CSE group who received 3.75 mg intrathecal hyperbaric bupivacaine experienced less hypotension when compared to CSE group who received 9 mg intrathecal hyperbaric bupivacaine (14% vs. 73%, p<0.001)".

In our study comparison of several patients having hypotension between 2 groups. Group S had 19 patients with hypotension and Group CSE had 11 patients with hypotension implying Group S had more patients with hypotension. The p-value is 0.03 which is statistically significant.

Scott W Simmons et al,[4] in a study mentioned that "CSE appeared to reduce the incidence of intraoperative hypotension compared to low dose spinal anesthesia".

DH Choi, H-J Ahn, J-A Kim,[12] in a study observed that "a greater number of patients had hypotension in the spinal group who received 9 mg intrathecal bupivacaine than CSE group who received intrathecal bupivacaine 6mg followed by 10 ml of 0.25% epidural bupivacaine."

Etsuro Nagata et al,[13] in a comparative study observed that "the incidence of hypotension was significantly lower in 8 mg bupivacaine intrathecal spinal group (37%) than 10 mg bupivacaine intrathecal spinal group(71%)".

The length of anesthesia in our sample is taken as a two-section regression period. Community CSE displayed regression time at the beginning of 2 parts. A shorter anesthesia period is implied by the previous 2 section regression time. The two-segment regression time mean value in group S is 62.26 and in the group, CSE is 40.23, as seen in table 11. For a value of < 0.001, the p-value is statistically important.

In a study, A Tyagi et al,[8] found that sensory and motor block durations were identical in the CSE and single-shot spinal anesthesia classes.

Mi Ja Yun et al,[14] in a study on CSE anesthesia using a reduced dose of spinal bupivacaine had faster regression to L1 dermatome(p<0.004) in the group receiving intrathecal 5 mg bupivacaine than groups receiving 10 mg and 7.5 mg intrathecal bupivacaine.

The recovery from anesthesia to the Updated Bromage Scale -1 is taken as the time taken for recovery. In Group CSE, the recovery was early. The mean value of time taken for recovery of Bromage-1 in Group S is 248.36 minutes and 73.73 minutes in Group CSE. For a value of <0.001, the p-value is statistically important.

D'Ambrosio et al,[15] in a comparative study between two concentrations of intrathecal levobupivacaine for combined spinal – epidural anaesthesia observed faster motor recovery in group receiving intrathecal 0.25% levobupivacaine 7.5 mg.

DH Choi, H-J Ahn, J-A Kim,[12] in a comparative study between low-dose spinal-epidural anesthesia (received 6 mg intrathecal bupivacaine followed by 10 ml of 0.25% epidural bupivacaine) and single-shot spinal anesthesia (received 9 mg

intrathecal bupivacaine) observed shorter motor recovery time in CSE group.

Marta J Cenkowski et al,[16] in a randomized clinical trial on low-dose bupivacaine spinal anesthesia for cesarean section, Marta J Cenkowski et al.16 had slightly longer motor recovery times and shorter stay in the recovery bed.

In our study both the groups did not show any adverse effects with local anesthetics bupivacaine and lignocaine.

Therese K Abboud et al,[17] studied epidural anesthesia in obstetrics, lidocaine with and without epinephrine has maternal, fetal, and neonatal effects. They concluded that the addition of epinephrine to lidocaine during usual parturient epidural anesthesia has no detrimental effects on women, fetus, neonate, or delivery development and only prolongs the period of anesthesia and restricts lidocaine placental transfer.

Pekka Tarkkila et al,[18] in a study Bupivacaine was found to be effective for spinal anesthesia for temporary radicular irritation after bupivacaine spinal anesthesia.

Limitations

- The study is non-blinded leading to observer bias
- In Group S, an epidural saline bolus was used in the analysis to ensure methodological similarity in both categories. In normal clinical practice, this is not carried out.
- It is not necessary to test the precision of epidural catheter positioning. Malposition may have existed, but because all epidural catheters functioned properly for intraoperative supplementation, it is thought impossible.
- The study did not evaluate intraoperative complications such as nausea and vomiting considering prophylaxis was provided by giving anti-emetic drugs.

Conclusion

From this analysis, we infer that intrathecal bupivacaine 5 mg with an immediate 2 percent lidocaine 5 ml epidural bolus offers an anesthetic onset and effectiveness equivalent to bupivacaine 10 mg with an immediate 5 ml saline epidural bolus thus enhancing maternal hemodynamic stabilization for caesarean delivery. The low-dose CSE procedure, especially for high-risk patients at risk of precipitous hypotension, is a choice for supplying anesthesia for caesarean delivery.

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