

Original Article

Comparative study between lumbar epidural and spinal anaesthesia in elective caesarean section: comparison of maternal status during operation and in the post operative period

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Abstract

The caesarean section (C/S) is preferably done under regional techniques like spinal and epidural anesthesia. Both these techniques are also preferable to general anaesthesia which allows the mother to remain awake during caesarean delivery. After the approval of the institutional ethical committee, sixty (60) patients were equally divided into group-I (Spinal group) and 'group-II (Epidural group). The intra-operative hemodynamic parameters (blood pressure & heart rate) and any event like nausea, vomiting, discomfort, shivering and the overall maternal satisfaction were compared between the groups. During post operative period mothers were interviewed for pain relief and choice of anesthetic technique. The mothers were also interviewed regarding their experiences of present anesthetic technique in comparison to the previous experiences. All data were analyzed statistically. The epidural group is significantly superior to spinal group in maternal satisfaction, frequency & magnitude of hypotension and postoperative pain relief. The hypotension that was needed to be treated with vasopressor was significantly different between the two groups (Spinal 33.33%, Epidural 10.00%, $P < 0.05$). There is no significant difference between the groups regarding the analgesic requirement. The mothers of epidural group had chosen the technique and recommended this as the ideal technique for elective CS. But the time taken to start operation after the epidural anaesthesia was longer than spinal technique. The prolong onset to start the operation is an opportunity to make rapport between the mother and the anesthesiologist.

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Introduction:

A Cesarean Section (CS) is usually performed when a vaginal delivery would put the baby's or mother's life at risk. But in recent times it is also performed upon request of mother. In case of an elective CS, there is enough time to evaluate the mother and to determine the type of anesthesia. Regional anesthesia has the advantage over general anaesthesia by allowing mother to remain awake during delivery. Postoperative pain is also better managed with regional anesthesia. More over, in regional anesthesia, the parents are able to share the experience of delivery, which may enhance parents-baby bonding¹. Beside this, anesthesia related maternal mortality is also decreased when CS is done under regional anesthesia^{2,3}. In UK, the fall was 12.8 to 1.7 per one million live births and in USA, it was 4.3 to 1.9 per one million live births

between the late 1970s and the late 1980s. This is believed to be partly due to the increasing use of regional anesthesia for cesarean delivery⁴. Therefore regional anesthesia (spinal or epidural anesthesia) for elective cesarean section is becoming popular to the anesthesiologists considering the risks and benefits of the mother and her fetus.

But regional anesthesia is not without side effect. Potential adverse effects common to both spinal and epidural anesthetic techniques include: failure to provide adequate anesthesia, maternal hypotension, post dural puncture headache (PDPH), itching and transient backache over the injection site etc⁵. Rare but serious complications include meningitis, compression of the spinal cord from a blood clot or abscess and damage to nerve roots causing paresthesia or weakness. Recently spinal needles are designed to minimise the incidence of PDPH⁵.

The epidural needle is also designed to minimize dural puncture⁶. However, some women prefer general anesthesia as they want to be asleep during the operation. General anesthesia may also be required for elective cesarean sections if regional anesthesia is contraindicated.

Though both spinal and epidural techniques are the popular regional anesthesia for CS; but the acceptability differs in different region of the world in different time. The epidural technique was the regional anesthesia of choice for cesarean section in North America in 1992, but this popularity had changed from epidural to spinal anesthesia by 1997⁷. In UK, spinal anesthesia has been a preferred technique in the last decade⁸. In a recent hospital survey (total 37,000 births a year) in the South-West Thames region of the UK, the rate of regional anesthesia for elective cesarean section was 94.9%, with spinal anesthesia being used in 86.6% of these cases⁹.

According to ASA guidelines there are no decisive answer to the choice spinal or epidural block. Literature is also unable to give a definitive suggestion about preciseness of regional technique for caesarean section. The choice now depends on maternal wishes, mother and fetal condition and the preference of the anesthesiologist. Aim of our study was to find a suitable type of anaesthesia for elective caesarean section which would be more comfortable, feasible and acceptable to the mother and also friendly to the fetus.

Patient and Method

The institutional ethical committee approval and written informed consent from sixty (60) patients were obtained for this prospective randomized controlled clinical trial (RCT). The patients had the normal history of singleton pregnancy and an ASA physical status I & II. Pre-anaesthetic assessments were done on the day before surgery. The patients with suspected or manifest bleeding disturbances, gross abnormality in vertebral column, infection in the back, presence of liver and kidney diseases, patient taking anticoagulant and patient with pregnancy induced hypertension (PIH) or preeclampsia were excluded from the study. The patients selected for the study was divided into two groups: **Group – I (Spinal):** 30 Patients selected, **Group – II (Epidural):** 30 patients selected. The patients were briefed about the study and the procedure and a token of serial numbers were asked to draw from a basket. The odd numbers were considered as the “spinal group” and the even numbers were considered as the “epidural group”.

At the day of operation, a patient was brought into the operating theatre, allowed to lie down in left lateral position. The base line BP, HR and SpO₂ was measured and recorded. An intravenous channel was established with a wide bored (18G) cannula and then the patients were pre-loaded with Hartman's solution at the rate of 15ml. per Kg. body weight in 30 minutes. According to the number of the token which she obtained on the previous day, anesthetic technique was employed.

The parturient of Group-I received 10mg of hyperbaric bupivacaine 0.5% (2 mL) intrathecally. A Whitacre 25-gauge spinal needle was used at the L₂₋₃ or L₃₋₄ interspace in the left lateral position. After spinal anesthetic technique, the patient was turned to supine position and a pillow was placed under her head. The operating table was immediately tilted 15 degree to the left, and a urinary catheter was inserted.

An 18-gauge Tuohy epidural needle was used in Group-II. After aseptic wash and sterile draping, the Tuohy epidural needle was introduced into the epidural space through L₂₋₃ or L₃₋₄ interspace applying loss of resistance technique. Keeping the needle in the epidural space, 3 ml of 2% lignocaine was given through the needle and then an epidural catheter was inserted carefully. The epidural catheter was fixed after keeping 3 to 5 cm in the epidural space with the tip directed cephalad. Then the patient was turned in supine position. After confirming the position of the catheter tip, a mixture of 10 ml of 0.5 % isobaric Bupivacaine, 5ml of 2% Lignocaine, 1 ml (50 micrograms) Fentanyl was injected gently. After few minutes the quality of sensory and motor block was assessed.

Oxygen 4 L/min was administered through a facemask until delivery. Hypotension was treated with ephedrine and additional IV fluids. The Hypotension was defined when systolic blood pressure was below 90 mm Hg or 30% decrease in systolic pressure from the baseline value. Oxytocin 5 i.u. were administered IV after delivery.

During operation, ECG and SpO₂ were continuously monitored. Haemodynamic parameters including systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP) and heart rate (HR) were measured every one minutes until the birth of the child and thereafter every five minutes until the patient were moved to the postoperative ward. The level of sensory and motor blockade was assessed along with the other parameters. Maternal satisfactions was measured using the following scale –

Table-I
10 point's maternal satisfaction score, 2 points for each parameter.

| Parameters | Score of 2 | Score of 1 | Score of 0 |
|--------------------------|----------------|-----------------|-------------------|
| 1. Nausea/Vomiting | No nausea | Nausea | Vomiting |
| 2. Chest pain | No chest pain | Some heaviness | Pain |
| 3. Restlessness | Calm and quite | Apprehended | Restless |
| 4. Lower limb discomfort | No discomfort | Mild discomfort | Severe discomfort |
| 5. Shivering | No shivering | Mild shivering | Severe shivering |

Table-II

Level of maternal satisfaction: The 10 points maternal satisfaction score was divided into 3 categories:

| Maternal satisfaction | Score |
|-----------------------|--------------|
| Highly satisfied | score 8 – 10 |
| Fairly satisfied | score 5- 7 |
| Not satisfied | score < 5 |

In spinal group, post operative analgesia was maintained with intramuscular opioid and NSAID. But in epidural group, mixture of bupivacaine and fentanyl was administered through the epidural catheter to manage post operative pain. Pain and side effects were recorded at 3 hours interval for 24 hours post operatively. The investigators were blinded to the study group.

The patients were visited during the first postoperative day and were interviewed with the following questionnaires –

1. Did you feel any pain or discomfort during operation? **Yes/No**
2. Would you like to have similar anesthesia for future Cesarean delivery? **Yes/No**
3. Would you like to suggest this type of anesthesia for Cesarean delivery? **Yes/No**
4. Have you got any previous experience of CS? **Yes/No**
5. Is the last experience of anesthesia better from that one? **Yes/No**

For statistical analysis, the unpaired 't' test and X^2 test for quantitative and categorical data, respectively, were used with SPSS Version 9.0. $P < 0.05$ was considered significant.

Results

The two groups were similar for age and weight (Table - III).

The base line hemodynamic data were analyzed by comparing blood pressure (BP) and heart rate (HR) between the groups. There is no significant difference between the two groups as shown in Table IV.

Table - III
Demographic data.

| Variables | Spinal group (n = 30) | Epidural group (n = 30) | 't' value | P value |
|-------------|-----------------------|-------------------------|-----------|---------|
| Age (Yrs) | 26.7 ± 4.46 | 25.7 ± 3.10 | 1.00 | 0.323 |
| Weight (Kg) | 62.6 ± 4.07 | 61.33 ± 6.20 | 1.09 | 0.280 |

Mean ± SD; $P < 0.05$ – significant.

Table - IV
The baseline values of mean BP and Heart rate

| Variables | Spinal group (n=30) | Epidural group (n=30) | 't' value | P value |
|----------------------|---------------------|-----------------------|-----------|---------|
| SBP in mm of Hg | 117.58±12.08 | 119.30±11.95 | 0.541 | 0.336 |
| DBP in mm of Hg | 77.56±9.63 | 78.24±9.21 | 0.295 | 0.241 |
| MAP in mm of Hg | 92.5± 6.47 | 93.7 ± 5.30 | 0.786 | 0.435 |
| HR in beats per min. | 80.3± 7.29 | 82.45±6.25 | 1.226 | 0.225 |

Mean ± SD; $P < 0.05$ – significant.

During operation, Blood Pressure (BP) was a fall in both groups. The falls were rapid and marked in spinal group than the epidural group. Hypotension that was needed to be treated with vasopressor was significantly different among the two groups (Spinal 33.33%, Epidural 10.00%, $P = 0.0283$). There is no significant difference between the two groups regarding the analgesic requirement (Spinal 13.33%, Epidural 10.00%, $P = 0.987$). Additional analgesics were required for 04 (four) patients of the spinal group and 03 (three) patients of the epidural group. (Table V).

Maternal satisfaction is significantly high in Epidural than in Spinal group. P value is equal to 0.004. (Table VI).

In Spinal group, 20 (68.97%) patients complained of pain in the first night of the post operative period; while in epidural group the figure was only one (3.45%), ($P = 0.000$). Fifteen patients from spinal group and twenty five patients from epidural group have chosen the current anesthetic technique for their future CS and also recommended as an ideal technique for CS. P value is equal to 0.006 (Table-VII).

In the Spinal group, 14 (48.28%) patients have the experience of previous CS (04 under General anesthesia and 10 under spinal anesthesia) and in the Epidural group the number is 16 (55.17%) (03 under general anesthesia and 13 under spinal anesthesia). There was not a single mother among the two groups, who had previous experience of Epidural technique. (Table – VIII).

Table – V
Comparison of intra operative events

| Variables | Spinal group (n = 30) | Epidural group (n = 30) | χ^2 values | P values |
|--|--------------------------|----------------------------|--------------------|-------------|
| Hypotension (needed to be treated with vasopressors) | 10 (33.33%) | 03 (10.00%) | 4.81 | 0.0283 |
| Additional analgesia | 04 (13.33%) | 03 (10.00%) | 0.01 | 0.987 |

$P < 0.05$ – significant.

Table - VI
Level of maternal satisfaction.

| Maternal satisfaction | Spinal group n = 30 | Epidural group n= 30 | χ^2 values | P values |
|-----------------------|------------------------|-------------------------|--------------------|-------------|
| Highly satisfied | 08 (27.59%) | 20 (68.97%) | 10.84 | 0.004 |
| Fairly satisfied | 16 (51.72%) | 09 (27.59%) | | |
| Not satisfied | 06 (20.69) | 01 (3.45%) | | |

$P < 0.05$ – significant; $P < 0.01$ – highly significant

Table -VII
Post operative interview of the mothers.

| Parameters | Spinal group N = 30 | Epidural group N = 30 | χ^2 values | P values |
|-------------------------------------|------------------------|--------------------------|--------------------|-------------|
| Complain of pain in the first night | 20 (68.97%) | 01(3.45%) | 21.57 | 0.000 |
| Choice of anesthesia for future CS | 15 (51.72%) | 25 (86.21%) | 7.63 | 0.006 |
| Recommended ideal technique for CS | 15 (51.72%) | 25(86.21%) | 7.63 | 0.006 |

$P < 0.05$ – significant; $P < 0.01$ – highly significant

Table – VIII
Numbers of mothers having previous CS.

| | Previous CS under | | | | | No H/O CS 15 | Total 29 |
|----------|-------------------|--------|----------|--------|-------|-----------------|-------------|
| | GA | Spinal | Epidural | Others | Total | | |
| Spinal | 04 | 10 | 00 | 00 | 14 | | |
| Epidural | 03 | 13 | 00 | 00 | 16 | 13 | 29 |

Table – IX
Comparison between the anesthetic techniques of two CS.

| Group | The previous anesthetic technique better | The current anesthetic technique better | Both are same | Total |
|----------------------|--|---|---------------|-------|
| Spinal | 02 | 02 | 10 | 14 |
| Epidural. | 01 | 14 | 01 | 16 |
| X ² value | | 16.64 | | |
| P value | | 0.000 | | |

$P < 0.05$ – significant; $P < 0.01$ – highly significant

Among the 14 mothers of Spinal group, who had a previous experience of anesthesia, 02 mothers expressed that the current technique was better than the previous one; another 02 told that the previous technique was better than the spinal anesthesia and the remaining 10 mother considered that the both techniques were equal. On the other hand, out of 16 patients of Epidural group, 14 patients were in favor of current (Epidural) technique, one patient said that previous (Spinal) one was better and one mother found no difference between the techniques of anesthesia. (Table – IX).

Discussion

The regional anesthetic techniques are widely accepted for elective cesarean section. In the study we tried to find out an ideal regional technique considering better outcome of mother. The parameters taken into account to compare the two techniques are- hemodynamic stability, need for additional analgesics, maternal comfort, postoperative pain management, and overall maternal satisfaction. The present and previous experiences of mothers were also compared. Recommendation of the mothers about anesthetic technique for CS has also been taken into account.

The hemodynamic instability is one of the most common concerns in both the procedures. There was a fall of blood pressure in both techniques. The

proportion was more in spinal anesthesia where the fall was rapid and marked, which was treated with vasopressor and/ or additional intravenous fluid to maintain optimum level of blood pressure. This is comparison to the study done by Scott in 1995⁸. The fall of blood pressure in the epidural group was also marked; but the total number of patient is significantly less than that of the spinal group ($P < 0.05$). The fall of blood pressure in epidural group was slow, not rapid. This was also found in the study of Scott⁸. No abrupt change of heart rate was observed in either groups. This was probably due to prompt management of hypotension by vasopressor and fluid.

Regional anesthesia results in less neonatal exposure to drugs⁷. But with Spinal technique the potential for hypotension poses the greatest threat to the mother and fetus⁷. Although the incidence of hypotension is not infrequent in epidural technique but it occurs earlier and more rapidly with the spinal approach. Hypotension lowers maternal mean arterial pressure (MAP) and uteroplacental perfusion⁸.

In the regional techniques the mothers were not given sedation until the baby was delivered. So, up to the time of delivery, the mother remains awake. Maternal comfort at this (or the entire intraoperative) period is important. Hypotension

results from temporary sympathectomy is inevitable. Reduced preload (increased venous capacitance and pooling of blood volume in the splanchnic bed and lower extremities) and reduced afterload (decreased systemic vascular resistance) lower maternal mean arterial pressure (MAP), leading to *nausea*, vomiting and dysphoria⁹. For these reasons the mother may become *restless*. *Shivering* is another known complication of neuroaxial block. There may be acid eructation due to fasting. In addition, there might be epigastric or chest discomfort due to traction of peritoneum during surgery. Numbness may cause *lower limb discomfort* in some mothers. We considered these variables as indicators of maternal comfort or satisfaction. It was found that mothers of epidural group were highly satisfied in comparison to spinal group and the number of mother not satisfied with the anesthetic technique is high in spinal group ($P < 0.01$).

Post operative pain relief was better maintained by continuous infusion of analgesics through epidural catheter. Where as, analgesia in the spinal group was maintained with intramuscular opioids or NSAIDs. Four (13.33%) patients in the spinal group and three (10%) from the epidural group were also required additional analgesics. In the postoperative interview, a significantly higher number of mothers of epidural group ($P < 0.01$) told that they did not feel pain on the postoperative night. The mothers who were comfortable in the intraoperative period and those who did not feel pain in the post operative period had chosen the technique for their future cesarean delivery and also recommended the technique as a ideal for elective cesarean section ($P < 0.01$).

The mothers who have previous CS under spinal anesthesia in spinal group said that there was no difference in the anesthetic experiences between the previous and current ones. But the mothers of epidural group regarded the current technique as better procedure (P value 0.000). Unfortunately there was no mother who has a previous experience of epidural anesthesia in both the groups. So, the mothers of spinal group have nothing to compare except few cases of general anesthesia.

Conclusion

The wellbeing of mother mainly depends on haemodynamic stability which could be better achieved with epidural anesthesia. Beside this, post operative analgesia was also better managed with continuous epidural technique which allowed them early breastfeeding and ambulation.

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