

Comparative Evaluation of Spinal and Epidural Anaesthesia Techniques For Caesarean Section

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ABSTRACT

Introduction: Regional anaesthesia techniques for a caesarean section usually include either epidural or spinal anaesthesia. To determine the most efficient approach among the two mentioned previously, a group of patients who underwent caesarean section were retrospectively analysed to corroborate and contrast the effectiveness of spinal and epidural anaesthesia techniques employed during the procedure.

Material and Methods: Patients selected for the study included only those who met the American Society of Anesthesiologists physical status classification system (ASA) I or II and underwent caesarean sections. This study involved one hundred fifty patients each who received either spinal or epidural anaesthesia. These patients were examined retrospectively. The time from anaesthesia to surgical incision (T_A to T_S), total anaesthesia period, and the requirements of vasopressor and midazolam were evaluated among the two approaches.

Results: The T_A to T_S time and the total anaesthesia period of the group that undertook spinal anaesthesia were found to be significantly shorter when compared to the times recorded for the epidural anaesthesia group. The use of vasopressor was found to be more recurrent in the spinal anaesthesia group as their declines in blood pressure were found to be greater.

Conclusion: The T_A to T_S time and the total anaesthetic period were greater for the epidural anaesthesia group than spinal anaesthesia. On the other hand, the hemodynamic changes were significantly lesser and requirement for vasopressor hardly arised in the former group. Hence, the preference of the technique must involve a careful assessment of the anaesthetic, obstetric and other clinical situation.

Keywords: Anaesthesia, Caesarean section, Epidural, Spinal.

INTRODUCTION

Most patients undergoing caesarean sections are usually taken up under spinal or epidural anaesthesia.¹ In contrast to general anaesthesia, regional anaesthesia has been found to lessen the airway problems and risk of pulmonary aspiration that can occur due to failure of intubation.² The advantages of epidural anaesthesia include the ability to induce anaesthesia without provoking an abrupt change in the cardiovascular characteristics as in cases of haemodynamic volatility.³ Spinal anaesthesia, on the other hand, is simple and quicker, and allows a diminution of time required for anaesthesia to induction.³

However, to assess the comparative efficiency and frequency of side-effects of either of the regional anaesthesia techniques in women undergoing caesarean section is imperative, because anaesthesia in such cases is still far away from what is ideal. The selection of anaesthesia technique depends on maternal and foetal circumstances, expectant women's

and anaesthesiologists' predilection, and the surgical circumstances.²

Thus, this study was taken up to evaluate the effectiveness spinal vs. epidural anaesthesia with the help of a patient survey, so as to make out the most proficient method.

MATERIAL AND METHODS

The study methodology was approved by the Institutional Review Board (IRB). Only those mothers who met the criteria set by the American Society of Anesthesiologists physical status classification system (ASA) I or II and had undergone caesarean sections were included. However, both routine and emergency operations were included in the study. The target population included one hundred fifty patients each who undertook either spinal or epidural anaesthesia; the pertinent data were analysed retrospectively, and therefore no power calculation was performed. The patients who fell under ASA III-V classification, or who underwent general anaesthesia were excluded.

No premedication was used for any of the patients who were included. ECG, pulse oximetry and non-invasive blood pressure measurements were included for intra operative assessment. Oxygen was applied through a mask at the rate of 5 L/min. Preoperatively, 400-500 mL of lactated Ringer's solution was administered.

The technique for epidural anaesthesia involved the addition of fentanyl (100 mcg) to 0.75% levobupivacaine (15–25 mL), via the loss-of-resistance-to-air technique. The anaesthetic solution was administered using an 18-gauge Tuohy needle and a 20-gauge catheter between lumbar vertebrae 3 and 4, with the patient in the sitting position.

The procedure for spinal anaesthesia involved adding 0.5% bupivacaine (10–12 mg) and fentanyl (10–20 mcg) and was performed using a 26-gauge spinal needle to the same interspace.

The age, height, weight, gestational age and the ASA physical health status of all the selected patients were recorded. Continuous monitoring of systolic blood pressure was carried out and a decline more than 20% (in comparison to the baseline) was recorded. After the administration of the regional anaesthesia was completed, the skin sensory

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block degree was recorded and the time from anaesthesia to surgical incision (T_A to T_S) time; entire anaesthesia period; midazolam usage; and usage of phenylephrine or ephedrine were compared among the two anaesthesia techniques used. Apgar score of the newborn at one minute and five minutes; the state of the postdural puncture headache (PDPH); and the visual analogue scale (VAS) pain score at one day after surgery were also examined.

STATISTICAL ANALYSIS

Mean \pm standard deviation values were used to evaluate (T_A to T_S) time, total anaesthesia period, requirement for vasopressors and midazolam, Apgar score, and VAS pain score. To compare the two groups, the unpaired t-test was used. Chi square test was utilized for frequency evaluation. $P < 0.05$ was considered to be statistically significant. SPSS version 18.0 was used for statistical analysis.

RESULTS

No significant differences were found in the age, height, and weight, sensory block level and ASA status. It was seen that a statistically significant difference existed in the T_A to T_S time, the entire anaesthesia period, and the extent of use of vasopressors between the two groups. Both T_A to T_S time and total anaesthesia periods were shorter for the spinal anaesthesia group as compared to the epidural anaesthesia group.

The decline in systolic blood pressure, however, was seen to be more frequent in the spinal than in the epidural anaesthesia group, and hence the extent of usage of phenylephrine and ephedrine was also more (Table 1).

The differences in the one minute and five-minute Apgar score of the newborn; the VAS pain score at 1 day after surgery; and the PDPH degree were not found to be statistically significant between the two groups (Table 2).

DISCUSSION

During caesarean section operations, anaesthesia has been found to eliminate pain and hence show fewer side effects in both the mother and infant. The ideology of anaesthetists in obstetrics is that anaesthesia time must be as little as possible and also the hemodynamic changes be minimized to consistently maintain the blood flow through the uterus.

Studies have shown that maternal mortality rate is 16 times as high for general anaesthesia as that for regional anaesthesia.⁴

Thus, regional anaesthesia is the more commonly employed technique over general anaesthesia for such patients.⁵ Spinal anaesthesia usually allows a faster induction and thus, enhances the rate of turnover in the operation theatre when compared to epidural anaesthesia.⁶

Obstetric surgeons are usually inclined to the belief that it is better for the infant to be taken out as soon as possible and thus; quite a lot of hospitals administer spinal anaesthesia, even with an epidural catheter inserted with to assist for a painless vaginal delivery.⁷

The time from beginning anaesthesia to the commencing of surgery (T to T_S) and the entire anaesthesia period were found to be significantly lesser for spinal anaesthesia and that is the biggest advantage of this procedure. However, the decline in systolic blood pressure $> 20\%$ as compared to baseline was also found to be more after spinal anaesthesia. Thus, the incidence of use and the amount of ephedrine or phenylephrine used were also found to be greater with spinal anaesthesia. Also in a previous study, it was seen that the level of anaesthesia increased so quickly for spinal, which resulted in a respiratory insufficiency. Eventually it was seen that unconsciousness occurred leading to a conversion into general anaesthesia with intubation.⁸

The benefits and issues related to spinal and epidural anaesthesia stand in an obvious disparity. Also the use of a combination of spinal and epidural anaesthesia has become more common in recent times.

Since the combined spinal epidural anaesthesia shares the advantages of inducing spinal anaesthesia quickly and reinforcing intermediate blockage; the associated complications, such as high-level blockage or hypotension, can be significantly reduced by diminishing the amount of the spinal anaesthetic used.⁹ However, the anaesthesia time is longer with spinal anaesthesia itself and the level of the anaesthesia also increases fast as in spinal anaesthesia; so the drawback of abrupt hemodynamic changes still remains. A recent study has suggested the possibility of failure was higher with the use of combined anaesthesia than seen for spinal anaesthesia alone.¹⁰

The present study clearly showed that there was no difference among the groups in terms of the status of the newborn baby (as revealed by the Apgar Scores) and the pain experience by the mother after surgery. Thus, it can be proposed that, while general anaesthesia should only be used if the status of

	Spinal anaesthesia	Epidural anaesthesia	p- value
A-to-S time (min)	19.81 ± 4.23	28.46 ± 6.34	0.034
Total anaesthetic period (min)	86.34 ± 13.84	93.13 ± 12.68	0.016
SBP decrease $> 20\%$	46.4%	22.8%	0.038
Ephedrine/phenylephrine use	76.4%	32.5%	0.042
Ephedrine (mg)	7.8 ± 2.4	2.7 ± 1.8	0.029

Table-1: Intraoperative characteristics for the different anaesthesia techniques.

	Spinal anaesthesia	Epidural anaesthesia	p- value
Apgar score (at 1 min)	8.54 ± 0.23	8.78 ± 0.45	0.083
Apgar score (at 5 min)	9.34 ± 0.46	9.56 ± 0.31	0.143
VAS pain scores on postoperative day 1	3.12 ± 1.13	3.43 ± 1.26	0.282

Table-2: Apgar scores and maternal pain scores after caesarean section.

foetus worsens rapidly; spinal anaesthesia must be preferred for use in cases of relative urgency. The use of epidural anaesthesia should be minimized with careful monitoring of haemodynamic changes in those cases and preferred only where the patient's and foetus's state is stable.

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CONCLUSION

The time from anaesthesia to the commencement of surgery (T_A to T_S) and the entire anaesthetic period were found to be longer with epidural anaesthesia. However, the haemodynamic changes were small and vasopressor use was also minimal. Also, the Apgar score was similar in both groups, thus the type of anaesthesia used was found to have no different effects on the newborn. Hence, the selection of the anaesthetic technique used must depend upon the anaesthetic, obstetric and clinical situation in each and every case.

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