A Comparison of Time to Achieve T5 Blockade in Lateral versus Sitting Position During Elective Cesarean Section Under Spinal Anesthesia: A Randomized Control Trial

Abstract

Context: Spinal anesthesia is the preferred anesthetic technique for cesarean section. Lateral and sitting positions are commonly used for performing subarachnoid block in parturients. Maternal positioning affects the spread of local anesthetic drugs and affects the onset and level of block. Faster onset of block is associated with hemodynamic changes having detrimental effects in parturients.

Aims: The aim of our study is to evaluate the effectiveness of two maternal positions – lateral and sitting. Materials and Methods: This prospective randomized control study was conducted on 100 parturients undergoing elective cesarean section under spinal anesthesia. They were randomly assigned into two groups. Group L received spinal anesthesia in lateral and group S in sitting position. Time to achieve T5 blockade, hemodynamics, motor blockade, fetal pH, and Apgar score were noted. Independent sample ‘t’ test, Chi-square test, and paired t test were used for statistical analysis. Results: Time to achieve T5 dermatomal level was less in group L which was statistically significant (2.60 ± 0.535 vs. 4.34 ± 0.745 min, P < 0.001). Number of attempts required and time taken for giving spinal was significantly more in group L. The drop in mean arterial pressure and requirement of phenylephrine was more in lateral position. Conclusion: Adoption of sitting position while performing subarachnoid block for cesarean section was found to be superior to lateral position in view of better hemodynamic stability, need for fewer attempts, and better maternal comfort, though time to achieve T5 block was longer.

Keywords: Cesarean section, lateral, sensory blockade, sitting position, spinal anesthesia

Introduction

The number of cesarean sections performed has increased tremendously in the recent years. Spinal anesthesia is the preferred anesthetic technique followed as it avoids problems with general anesthesia, such as manipulation of airway, aspiration, cognitive dysfunction, and the use of polypharmacy. Most common complications associated with spinal anesthesia for cesarean section is hypotension.[1] In parturients, hypotension is mainly due to the ascent of local anesthetic drugs intrathecally and due to the aorto-caval compression by the gravid uterus.[2] Lateral and sitting positions are commonly used for performing subarachnoid block in parturients.[3] The landmarks of spine can be easily identified in sitting position and hence preferred especially in obese parturients.[1] Maternal position during the spinal anesthesia affects the cephalic spread of anesthetic drugs and in turn affects the onset and level of block.[3] Blockade of preganglionic sympathetic nerves cause most of the cardiovascular effects of spinal anesthesia.[4] So, the faster onset of block may be associated with rapid hemodynamic changes which can cause detrimental effects in parturients.[5]

The aim of our study is to evaluate the effectiveness of two maternal positions – lateral and sitting. The hypothesis of this study is that there would be a difference in speed of onset of sensory blockade between the sitting and lateral position causing hemodynamic changes in parturients.

Materials and Methods

This prospective single-blinded, parallel, and randomized control trial was conducted in a tertiary care teaching hospital after approval from the hospital ethics committee (IEC-AIMS-2018-ANES-120, Dr. Nitu Puthenveettil, Department of Anaesthesia and Critical Care, Amrita Institute of Medical Sciences, Amrita Vishwa Vidyapeetham, Kochi, Kerala, India. E-mail: nituveesundeeep@gmail.com)

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Anesthetic management was standardized by a study protocol. All parturients were premedicated with oral metoclopramide 10 mg and ranitidine 150 mg on the night prior and the morning of surgery. In the theater, 18-gauge intravenous cannula was inserted, and standard monitoring with non-invasive arterial pressure, electrocardiography, and pulse oximetry was established. The baseline vitals in the supine wedged position were noted. The patient was preloaded with 10 ml/kg of ringer lactate solution. Parturients were then randomly allocated into two equal groups, L and S by computer-generated random sequence of numbers in sealed envelopes. Group L patients were given spinal in left lateral position and group S patients were given spinal anesthesia in sitting position by a single consultant anesthetist. In sitting position, parturients were made to sit over the side of the operating table with their feet resting on a stool and arms wrapped around a pillow [Figure 1]. Hyperbaric bupivacaine 0.5% 1.8 ml with 10 µg fentanyl was given intrathecally over 20 s at L3-4 space using 25 Gauge Quincke spinal needle. After spinal drug was injected, parturients were placed in supine wedged position. A second anesthesiologist posted in the theater, who was responsible for data collection, entered the theater after patient was placed in the supine wedged position. Supplemental oxygen was given through facemask at a flow rate of 5 L/min. Additional crystalloid administration was given at the discretion of the anesthetist posted in the theater. The highest level of sensory blockade achieved was assessed by loss of sensation to pinprick. Pulse rate and mean arterial pressure (MAP) was monitored every 2 min for first 10 min and every 5 min thereafter. After delivery of the baby slow infusion of oxytocin 10 IU in 500 mL of 0.9% NS was infused over 1 h. Bradycardia is defined as heart rate (HR) <50 bpm and was treated with 0.6 mg atropine. Tachycardia is HR >100 bpm. Hypotension is decrease in MAP greater than 20% of baseline. Intravenous phenylephrine 50 µg was used to treat hypotension. Total fluid administered intra-operatively was noted. If the block up to T5 was not achieved in 20 min, general anesthesia would be administered.

Time to site spinal (time from spinal needle insertion to appearance of CSF in the needle hub), number of attempts required to place spinal, sensory level (loss of sensation to pinprick) in the midline, time taken to reach T5 dermatome, and motor block (modified Bromage scale) were assessed. Neonatal assessment was done by pediatrician by Apgar scores at 1 and 5 min and neonatal arterial blood gas sampling.

Statistical analysis

Based on the mean value of onset time for sensory block to T5 dermatome at left lateral and sitting positions (mean +/- SD was 6.8 +/- 2.7 and 9.7 +/- 5.5 min for left lateral and sitting position respectively) from existing literature[5] with 90% power and 95% confidence interval the minimum sample size comes to 50 in each group. The results are given in mean ± SD for all continuous variables and in frequency (percentage) for categorical variables. Independent sample t test was applied to compare the mean age, HR, MAP, and body mass index (BMI) between groups. Paired sample t test was applied to compare the mean HR and MAP at different time point from baseline. The Chi-square test with continuity correction was applied to find the association between categorical variables and groups. P value <0.05 was considered as statistically significant. Statistical analysis was done using IBM SPSS 20.0 (SPSS Inc, Chicago, USA).

Results

A total number of 100 patients were recruited into this study [Figure 2]. The patients in both groups were comparable with respect to age, height, weight, and BMI [Table 1]. Time to achieve T5 dermatomal level was less in group L than group S and this was statistically significant (2.60 ± 0.53 vs. 4.34 ± 0.745 min, P < 0.001). Number of attempts required to successfully place spinal was higher in group L (1.44 ± 0.577 vs. 1.06 ± 0.240, P < 0.001) which was statistically significant. The time
taken for giving spinal anesthesia was significantly more in group L (18.98 ± 2.729 vs. 12.98 ± 10.167, \( P < 0.001 \)) [Table 2]. The drop in MAP was more in lateral position and this was statistically significant at most of the time point except at 2 and 8 min [Figure 3]. Phenylephrine requirement was more in group L (77.91 ± 29.484 vs. 55.57 ± 18.898, \( P = 0.047 \)) which was statistically significant [Table 2]. The total volume of intravenous fluids administered and motor blockade achieved was comparable between the two groups. The fetal pH, Apgar score at 1 and 5 min were comparable [Table 3]. Parturients in group S found their positioning more comfortable (76 vs. 34\%, \( P < 0.001 \)).

**Discussion**

All mothers in sitting and lateral position had successful spinal anesthesia for their cesarean section. Time to achieve T5 dermatomal block was more in the sitting position. But identification of subarachnoid space was easier, time to perform spinal block and number of attempts required for successfully performing subarachnoid block were less in the sitting position. The hemodynamics was also better in sitting position with less requirement of vasopressors. Injection of hyperbaric bupivacaine in the sitting position tends to settle because of the gravitational effect. This could have prevented cephalad spread of the local anesthetic resulting in delay in achieving T5 block.

In a study by Prakash *et al.*\(^5\) the onset time for sensory block to reach T5 dermatome was compared between left lateral, modified lateral, and sitting positions. Similar to our study, they also observed that the onset time for sensory block to reach T5 dermatome was fastest in left lateral position. The highest dermatomal level attained was same in sitting and left lateral position. Study by Inglis *et al.*\(^6\) also compared the block height achieved with sitting and

### Table 1: Demographic variables

| Variables   | Group \((n=50)\) | Mean   | SD     | \( P \) |
|-------------|-----------------|--------|--------|---------|
| Age (years) | L               | 27.76  | 3.595  | 0.592   |
|             | S               | 28.12  | 3.088  |         |
| Height (cm) | L               | 156.42 | 3.939  | 0.439   |
|             | S               | 157.06 | 4.292  |         |
| Weight (Kg) | L               | 69.08  | 8.652  | 0.219   |
|             | S               | 71.44  | 10.353 |         |
| BMI (Kg/m\(^2\)) | L       | 28.242 | 3.6061 | 0.358   |
|             | S               | 28.940 | 3.9425 |         |
lateral position and concluded that faster onset of sensory block was achieved in the lateral position and that there was no difference in maximum block height or degree of motor block achieved. Nowadays, even category 1 cesarean sections are performed under spinal anesthesia to avoid complications associated with general anesthesia, such as difficult airway, aspiration, and polyphtarmacy. In fetal distress when early delivery of neonate is required, faster achievement of T5 level of block is important. But the authors found that the faster onset of block in the lateral group was offset by the longer time required to site the spinal. [9]

In a study by Russel et al. [7] comparing the hemodynamic stability and block height achieved during combined spinal epidural anesthesia in oxford, lateral, and sitting position. It was observed that the time to reach T5 level was similar in all the groups. They did not find any significant change in blood pressure between the three groups but ephedrine requirement was less in lateral group. Ramon et al. [8] studied the effects of position on maternal hemodynamics during elective caesarean delivery under spinal anesthesia. They concluded that the spinal anesthesia performed in the sitting position with hyperbaric bupivacaine and fentanyl does not influence the incidence of arterial hypotension and requirements of ephedrine or phenylephrine significantly.

A meta-analysis by Xu et al. [9] on the efficacy of different positions for neuraxial anesthesia in cesarean section concluded that lateral position might be more beneficial to parturients and neonates. Another study by Obasuyi et al. [10] comparing the hemodynamic effects of lateral and sitting position during induction of spinal anesthesia for cesarean section found that the incidence of hypotension in lateral position was less when compared to sitting position. In their study, the lowest recorded MAP was greater for lateral position. But in our study we noticed that the drop in MAP was less in sitting position and the requirement of phenylephrine was lesser. Similar results were obtained in a study conducted by Rucklidge et al. [11] comparing lateral, oxford, and sitting position for performing combined spinal-epidural for elective cesarean section. They concluded that the requirement of vasopressors was less in sitting position.

In a study by Agarwal et al. [12] spinal anesthesia was given in sitting position and patient was placed in sitting position for 30 s after spinal. They noticed that these patients had slower onset of analgesia and the fall in MAP was less. Similarly in a study by El Hzkeeem et al. [13] where effects of making the patient sit up for 5 min after spinal was studied. These parturients had a lower sensory block and vasopressor requirement. So the variation in onset, time to achieve T5 block and hemodynamic variations noticed in various studies could be due to the difference in time taken to position the patient in either the sitting or right lateral position.

Induction position for spinal anesthesia in sitting and lateral position was compared by Shahzad et al. [14] and observed that the patients found lateral position to be more comfortable than sitting. Similarly, Kharge et al. [15] and Chevuri et al. [16] reported that spinal anesthesia was easy to administer in sitting position but parturients felt lateral position more comfortable than sitting position. In contrast in our study parturients found sitting position more comfortable.

Limitations of the study
Our study has a number of limitations. A single consultant anesthetist performed all the procedures, which could have resulted in a bias. We did not compare the incidence of post-dural puncture headache and bloody spinal taps which are expected to be more common in sitting position. Time to position the patient in either the sitting or right lateral position was not calculated.

Future perspectives
The study can be extended to different surgical populations. Effectiveness of modified sitting positions, such as pendant position, squatting position, crossed leg sitting position should be studied.

Conclusion
Adoption of sitting position while performing subarachnoid block for cesarean section was found to be superior to lateral position in view of better hemodynamic stability, need for fewer attempts and better maternal comfort, though time to achieve T5 block was longer.

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Conflicts of interest

There are no conflicts of interest.

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