ORIGINAL RESEARCH

Effect of Sitting versus Lateral Positioning during Spinal Anaesthesia on Maternal Haemodynamics in Caesarean Sections

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Received: 20 October, 2018

Accepted: 24 November, 2018

Published: 15 December, 2018

ABSTRACT

Background: In obstetric patients, hypotension frequently occurs as a complication of neuraxial anaesthesia. Prophylactic measures have been proposed to decrease both the occurrence and severity of hypotension. The present study was conducted to compare the maternal haemodynamic variables after spinal anaesthesia in sitting or lateral decubitus position in patients undergoing caesarean section. Materials & Methods: 60 healthy parturient undergoing caesarean section was selected. Spinal anaesthesia was induced in lateral decubitus position (group I; n=30) or sitting position (group II; n=30). Maternal haemodynamic, block characteristic, side effects, and neonate Apgar scores were recorded. Results: In group I and II, mean age (year) was 28.2±2.4 and 29.1±3.1, weight (kg) was 76.4±7.3 and 80.5±5.4, height (cm) was 162.4±8.4 and 168.3±6.2, duration of sensory block (min) was 65.2±3.5 and 72.1±5.3 and duration of motor block (minute) was 73.5±8.3 and 82.4 ± 4.6 respectively. The difference was non- significant (P> 0.05). The mean SBP (mmHg) was 128.2 ± 12.1 and 128.1±13.1, DBP (mmHg) was 76.4±11.6 and 72.5±12.4, MAP (mmHg) was 92.4±13.2 and 86.3±11.2, HR (beats/min) was 95.2±4.5 and 99.1±4.3 and maximum hypotension value (mmHg) was 73.5±2.3 and 80.4±9.6 respectively. The difference was non- significant (P > 0.05). In group I and group II, prevalence of hypotension was seen in 51% and 78%, time of first hypotension (minute) was 5.4 ± 3.2 and 5.2 ± 1.4 , duration of hypotension (minute) was 8.6 ± 2.1 and 12.3 ± 6.1 , neonatal Apgar scores at 1 minute was 9.2 ± 1.3 and 8.6 ± 1.9 and neonatal Apgar scores at 5 minutes was 10.1 ± 2.53 and 9.4 ± 2.7 respectively. The difference was significant (P< 0.05). Conclusion: When spinal anaesthesia was induced in a lateral position, there were fewer changes in maternal haemodynamic parameters, side effects, and use of vasopressors. Furthermore, this position enhanced neonatal Apgar scores.

Keywords: caesarean section, hypotension, haemodynamic

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INTRODUCTION

In obstetric patients, hypotension frequently complication neuraxial occurs as а of anaesthesia. Prophylactic measures have been proposed to decrease both the occurrence and severity of hypotension.¹ These measures include fluid loading, displacing the uterus to the left laterally, elevating the legs, administering local anaesthetics in low doses, and using vasopressors. However, the occurrence of

hypotension during spinal anaesthesia for c/s is frequent.²

It is possible to induce regional anesthesia with the patient either sitting up or lying on their side. Some have contended that the sitting position aids in the technical execution of a block, especially for obese patients, as it may make the midline easier to identify.³ Therefore, in cases where there is a pressing need to deliver the baby, it may be better to assume a sitting position. However, after conventional spinal anesthesia, parturients are immediately placed supine, while with CSE performed in the sitting position, there is a delay in assuming the recumbent position due to epidural catheter placement.⁴

Whether the patient is seated or lying on their side, spinal technique can be induced. The dissemination of local anaesthetic solution in the cerebrospinal fluid (CSF) is influenced by the patient's posture. This could affect how often and how serious hypotension is following intrathecal injection of the local anaesthetic.⁵ Research indicates that the patient's positioning may influence the occurrence of hypotension following spinal anesthesia during cesarean sections. The optimal position (lateral or sitting) for routinely starting neuraxial anesthesia during cesarean sections is debated.⁶

AIM AND OBJECTIVES

The present study was conducted to compare the maternal haemodynamic variables after spinal anaesthesia in sitting or lateral decubitus position in patients undergoing caesarean section.

MATERIALS AND METHODS

Study Design

This study was a prospective, randomized, comparative clinical trial aimed at evaluating the maternal haemodynamic responses, block side characteristics. effects. and neonatal outcomes following spinal anaesthesia administered in either the sitting or lateral decubitus position during caesarean section.

Study Population

The study was conducted on 60 healthy parturients (pregnant women scheduled for elective caesarean section) who fulfilled the inclusion criteria. Participants were randomly allocated into two groups of 30 each:

• Group I (n = 30) – Lateral decubitus position

• Group II (n = 30) – Sitting position

Study Place

The study was conducted in the Department of Anaesthesiology and Obstetrics, Sri Krishna Medical College & Hospital, Muzaffarpur, Bihar, India.

Study Duration

The duration of the study was one year and three months, from August 2017 to September 2018. **Inclusion Criteria**

- ASA (American Society of Anaesthesiologists) Physical Status I or II
- Full-term singleton pregnancy

- Scheduled for elective caesarean section under spinal anaesthesia
- Age between 18 to 35 years
- Consent to participate in the study

Exclusion Criteria

- Patients with contraindications to spinal anaesthesia
- Pre-eclampsia, eclampsia or other high-risk pregnancies
- History of cardiovascular, renal, or respiratory disease
- Allergy to local anaesthetics
- Multiple pregnancies or foetal anomalies
- Refusal to give consent

Ethical Considerations

Approval was obtained from the Institutional Ethics Committee prior to commencement of the study. Written informed consent was taken from all participants after explaining the nature, benefits, and potential risks of the study. Patient confidentiality was maintained throughout the study period.

Study Procedure

Patients were randomly assigned to one of the two groups using a computer-generated random number table. Standard monitoring (ECG, NIBP, SpO₂) was applied.

- Preloading: All patients received 500–1000 mL of Ringer's lactate solution prior to the block.
- Spinal Anaesthesia Technique:
 - Group I: Patients were positioned in the left lateral decubitus position.
 - Group II: Patients were positioned in the sitting position.
 - A 25G Quincke spinal needle was inserted at the L3–L4 or L4–L5 interspace.
 - 2.0–2.2 mL of 0.5% hyperbaric bupivacaine was administered intrathecally.
 - Immediately after administration, patients were placed in the supine position with left uterine displacement.

Surgical Technique

All caesarean sections were performed by experienced obstetricians following the Pfannenstiel incision and a standardised surgical protocol. Oxytocin was administered after delivery of the baby.

Outcome Measures

- 1. Maternal haemodynamic variables:
 - Heart rate (HR)

- Systolic and diastolic blood pressure (SBP, DBP)
- Mean arterial pressure (MAP)
- Hypotension episodes (defined as a fall in SBP >20% from baseline or <90 mmHg)
- 2. Block characteristics:
 - o Onset and level of sensory block
 - Time to achieve T6 block
 - Duration of motor block
- 3. Side effects:
 - Nausea, vomiting, shivering, bradycardia, hypotension
- 4. Neonatal outcomes:

• Apgar scores at 1 and 5 minutes

Statistical Analysis

Data were compiled and analyzed using SPSS version 21.0. Quantitative data were expressed as mean \pm standard deviation, and categorical data as frequency and percentage.

- Student's t-test was used for comparing continuous variables between groups.
- Chi-square test or Fisher's exact test was used for categorical variables.
- A P value < 0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Characteristics					
Group I (n = 30)	Group II $(n = 30)$	P value			
28.2±2.4	29.1±3.1	0.82			
76.4±7.3	80.5±5.4	0.77			
162.4 ± 8.4	168.3±6.2	0.90			
65.2±3.5	72.1±5.3	0.01			
73.5±8.3	82.4±4.6	0.02			
	I: Baseline Characte Group I(n = 30) 28.2 ± 2.4 76.4 ± 7.3 162.4 ± 8.4 65.2 ± 3.5 73.5 ± 8.3	1: Baseline CharacteristicsGroup I(n = 30)Group II(n = 30) 28.2 ± 2.4 29.1 ± 3.1 76.4 ± 7.3 80.5 ± 5.4 162.4 ± 8.4 168.3 ± 6.2 65.2 ± 3.5 72.1 ± 5.3 73.5 ± 8.3 82.4 ± 4.6			

Table 1 shows that in group I and II, mean age (year) was 28.2 ± 2.4 and 29.1 ± 3.1 , weight (kg) was 76.4 ± 7.3 and 80.5 ± 5.4 , height (cm) was 162.4 ± 8.4 and 168.3 ± 6.2 , duration of

sensory block (min) was 65.2 ± 3.5 and 72.1 ± 5.3 and duration of motor block (minute) was 73.5 ± 8.3 and 82.4 ± 4.6 respectively. The difference was non- significant (P> 0.05).

Tuble 2. Terroperative material variables					
Parameters	Group I (n = 30)	Group II $(n = 30)$	P value		
SBP (mmHg)	128.2±12.1	128.1±13.1	0.72		
DBP (mmHg)	76.4±11.6	72.5±12.4	0.67		
MAP (mmHg)	92.4±13.2	86.3±11.2	0.94		
HR (beats/min)	95.2±4.5	99.1±4.3	0.51		
Maximum hypotension value (mmHg)	73.5±2.3	80.4±9.6	0.82		



Table 2: Perioperative Maternal Variables

Table 2, figure I shows that mean SBP (mmHg) was 128.2 ± 12.1 and 128.1 ± 13.1 , DBP (mmHg) was 76.4 ± 11.6 and 72.5 ± 12.4 , MAP (mmHg) was 92.4 ± 13.2 and 86.3 ± 11.2 ,

HR (beats/min) was 95.2 ± 4.5 and 99.1 ± 4.3 and maximum hypotension value (mmHg) was 73.5 ± 2.3 and 80.4 ± 9.6 respectively. The difference was non- significant (P> 0.05).

Parameters	Group I, (n = 30)	Group II, (n = 30)	P value
Prevalence of hypotension	51%	78%	0.01
Time of first hypotension (minute)	5.4±3.2	5.2±1.4	0.82
Duration of hypotension (minute)	8.6±2.1	12.3±6.1	0.01
Neonatal Apgar scores at 1 minutes	9.2±1.3	8.6±1.9	0.03
Neonatal Apgar scores at 5 minutes	10.1±2.53	9.4±2.7	0.05

 Table 3: Incidence of Hypotension and Neonatal Apgar Scores

Table 3 shows that in group I and group II, prevalence of hypotension was seen in 51% and 78%, time of first hypotension (minute) was 5.4 ± 3.2 and 5.2 ± 1.4 , duration of hypotension (minute) was 8.6 ± 2.1 and 12.3 ± 6.1 , neonatal Apgar scores at 1 minute was 9.2 ± 1.3 and 8.6 ± 1.9 and neonatal Apgar scores at 5 minutes was 10.1 ± 2.53 and 9.4 ± 2.7 respectively. The difference was significant (P< 0.05).

DISCUSSION

Although neuraxial anaesthesia is the safest and preferred method for cesarean sections, it can lead to complications and effects on maternal haemodynamics. It is common for spinal anaesthesia to cause maternal haemodynamic instability, which can impact both mother and infant.⁷ Traditionally, it was stated that other positions had implications for resolving this problem. Only a small number of studies examined the potential link between position effect and haemodynamic stability.⁸

Prophylactic measures like pre-anesthesia hydration, vasopressors, or elevating the legs are carried out prior to spinal anesthesia but have not played a significant role in preventing hypotension.^{9,10} The present study was conducted to compare the maternal haemodynamic variables after spinal anaesthesia in sitting or lateral decubitus position in patients undergoing caesarean section.

We found that in group I and II, mean age (year) was 28.2 ± 2.4 and 29.1 ± 3.1 , weight (kg) was 76.4 ± 7.3 and 80.5 ± 5.4 , height (cm) was 162.4 ± 8.4 and 168.3 ± 6.2 , duration of sensory block (min) was 65.2 ± 3.5 and 72.1 ± 5.3 and duration of motor block (minute) was 73.5 ± 8.3 and 82.4 ± 4.6 respectively. Yun et al¹¹ in their study healthy women, at term of pregnancy, about to undergo an elective cesarean section under CSE, were randomly assigned to the sitting

or lateral recumbent position for initiation of the block. All parturients were given 1000 mL of lactated Ringer's solution in the 15 min preceding induction and an additional 300-500 mL while the actual block was being performed. On

completion of the CSE, they were turned to the supine position with left uterine displacement. A second anesthesiologist, blinded to the woman's position during CSE, evaluated the sensory level of anesthesia, maternal heart rate, blood pressure, oxygen saturation, need for ephedrine, and occurrence of nausea and vomiting. Twelve women were studied in the sitting group and 10 were studied in the lateral recumbent group. The severity and duration of hypotension were greater in those parturients who had CSE induced in the sitting (47% + / -7%) and 6 + / -3 min, compared with respectively) the lateral recumbent position (32%+/-14% and 3+/-2 min, respectively). Women in the sitting group also required twice as much ephedrine (38+/-18 mg) to correct hypotension compared with the other group (17+/-12 mg). The severity and duration of hypotension were greater when CSE was induced in the sitting compared with the lateral decubitus position.

We found that mean SBP (mmHg) was 128.2±12.1 and 128.1±13.1, DBP (mmHg) was 76.4±11.6 and 72.5±12.4, MAP (mmHg) was 92.4±13.2 and 86.3±11.2, HR (beats/min) was 95.2 ± 4.5 and 99.1±4.3 and maximum hypotension value (mmHg) was 73.5±2.3 and 80.4 ± 9.6 respectively. Simin et al¹² compared the maternal haemodynamic variables after spinal anaesthesia in sitting or lateral decubitus position in patients undergoing c/s. 76 healthy parturient, undergoing c/s, were allocated in two groups. Spinal anaesthesia was induced in lateral decubitus position (study group; n=38) or sitting position (control group; n=38). Maternal haemodynamic, block characteristic, side effects,

and neonate Apgar scores were recorded. Incidence of hypotension (50% vs 76.3%; p=0.016), bradycardia (0% vs 21.1%; p=0.014) and vasopressors consumption (36.2% vs 76.3%; p=0.012) were statistically lower in lateral position. There was no significant differences in sensory height (p=0.89) and duration of sensory and motor block between two groups (p=0.42, p=0.29; respectively).

We found that in group I and group II, prevalence of hypotension was seen in 51% and 78%, time of first hypotension (minute) was 5.4 ± 3.2 and 5.2 ± 1.4 , duration of hypotension (minute) was 8.6 ± 2.1 and 12.3 ± 6.1 , neonatal Apgar scores at 1 minute was 9.2±1.3 and 8.6 ± 1.9 and neonatal Apgar scores at 5 minutes was 10.1±2.53 and 9.4±2.7 respectively. Obasuyi B et al.¹³ in their study one hundred American Society of Anaesthesiologists physical status I and II patients undergoing elective caesarean section were randomised to receive spinal anaesthesia in the lateral position (Group L) or the sitting position (Group S). Using the L3-4 interspace, patients received intrathecal plain bupivacaine, 10mg or 12 mg according to their height, after which they were placed immediately in the supine position with left uterine displacement. Maternal blood pressure was measured every minute for 10 min, every three min for 20 min and 5-minutely thereafter. Hypotension was defined as a fall in systolic blood pressure >20% or a value <90 mmHg. There was no difference in the lowest recorded systolic blood pressure in Group L (99.2±8.9 mmHg) compared with Group S (95.4±12.3 mmHg, P=0.081). However, the lowest recorded mean arterial pressure was greater in Group L (72.9±11.2 mmHg) than in Group S (68.2±9.6 mmHg; P=0.025). The incidence of hypotension was lower in Group L (17/50, 34%) than in Group S (28/50, 56%; P=0.027). Onset of hypotension was similar between groups.

LIMITATIONS OF THE STUDY

- Small sample size (n=60), limiting generalisability of results.
- The study did not assess long-term maternal or neonatal outcomes.
- Observer bias may be present despite randomization.
- The effects of anaesthetic spread and block height were not correlated with BMI or spinal anatomy.

- The study was conducted at a single centre; multi-centre studies may yield broader insights.
- Patient anxiety and comfort related to positioning were not evaluated.

CONCLUSION

Authors found that the lateral decubitus position for administering spinal anaesthesia in parturients undergoing elective caesarean section provides better haemodynamic stability compared to the sitting position. The lateral position was associated with a significantly lower incidence of hypotension and reduced requirement for vasopressors, without compromising the efficacy of sensory and motor blockade or neonatal outcomes. Although the onset and level of anaesthesia were comparable in both groups, the reduced haemodynamic fluctuations and fewer side effects observed in the lateral group suggest that it may be a safer and more favorable position, particularly in patients at higher risk of haemodynamic compromise. Furthermore, this position enhanced neonatal Apgar scores.

Therefore, the lateral decubitus position can be considered a preferable alternative to the sitting position for spinal anaesthesia in caesarean section, especially in clinical scenarios where maintaining maternal haemodynamic stability is critical.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to the Department of Anaesthesiology and Obstetrics at, Sri Krishna Medical College & Hospital, Muzaffarpur, Bihar, India. for their support throughout this study. Special thanks to Dr. (Assit. Professor) Krishna Kumar. Department of Anaesthesia, Sri Krishna Medical College & Hospital, Muzaffarpur, Bihar, India, for their guidance and expertise. We are grateful to the patients who participated in this research and to the Institutional Ethics Committee for ethical approval. We also appreciate the assistance of the nursing staff and healthcare professionals. Lastly, we thank our families for their unwavering support during this study.

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