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Original Research Article

Randomised Controlled Trial on the Prevention of Post-Spinal Anaesthesia Hypotension in Caesarean Delivery using Delayed Supine Positioning

Rajnish Briganja[1], Jayant Kumar Singh[2], Krishna Kumar[3]

[1]Senior Resident, Department of Anaesthesiology, S.K.M.C.H., Muzaffarpur, Bihar, India
[2]Senior Resident, Department of Anaesthesiology, S.K.M.C.H., Muzaffarpur, Bihar, India
[3]Associate Professor & HOD, Department of Anaesthesiology, S.K.M.C.H., Muzaffarpur, Bihar, India

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Corresponding Author: Dr. Jayant Kumar Singh
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Abstract

Background: Spinal anaesthesia is commonly used for caesarean deliveries due to its effectiveness and safety profile. However, it frequently causes hypotension, leading to maternal and fetal complications. Various strategies have been proposed to mitigate this, with maternal positioning being a key focus. Delayed supine positioning post-spinal anaesthesia has shown promise in reducing hypotension. This study aims to evaluate the efficacy of delayed supine positioning in preventing post-spinal anaesthesia hypotension in caesarean deliveries.

Methods: Sixty pregnant women scheduled for elective caesarean delivery were randomised into two groups: delayed supine positioning (n=30) and immediate supine positioning (n=30). The primary outcome was the incidence of hypotension. Secondary outcomes included vasopressor requirements, incidence of nausea and vomiting, neonatal Apgar scores, and total intravenous fluid administration. Data were analysed using SPSS version 20.0.

Results: The incidence of hypotension was significantly lower in the delayed supine group (20%) compared to the immediate supine group (50%, p=0.025). Vasopressor requirements were also reduced in the delayed supine group (p=0.035). The incidence of nausea and vomiting was significantly lower in the delayed supine group (p=0.046). Neonatal outcomes and total intravenous fluid administration were similar between the two groups.

Conclusion: Delayed supine positioning significantly reduces the incidence of hypotension and vasopressor requirements in caesarean deliveries under spinal anaesthesia, without compromising neonatal outcomes. This technique enhances maternal safety and comfort during surgery.

Recommendations: Based on these findings, delayed supine positioning should be considered as a standard practice to prevent hypotension in caesarean deliveries under spinal anaesthesia. Further studies with larger sample sizes and diverse populations are recommended to validate these results.

Keywords: Spinal Anaesthesia, Hypotension, Caesarean Delivery, Delayed Supine Positioning, Maternal Safety.

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Introduction

Spinal anaesthesia is the preferred anaesthetic technique for caesarean deliveries due to its rapid onset, effective analgesia, and minimal drug transfer to the fetus. However, it is frequently associated with hypotension, which can lead to maternal and fetal complications. Hypotension following spinal anaesthesia is predominantly caused by the blockade of sympathetic nerves, leading to vasodilation and decreased venous return. The incidence of hypotension ranges from 70% to 80%, posing significant risks such as nausea, vomiting, dizziness, and compromised uteroplacental perfusion, which can adversely affect fetal outcomes [1].

Several strategies have been proposed to mitigate post-spinal anaesthesia hypotension, including preloading or coloading with intravenous fluids, administration of vasopressors, and maternal positioning. Among these, maternal positioning has gained considerable attention due to its simplicity and effectiveness. The left lateral tilt position has been traditionally used to prevent aortocaval compression by the gravid uterus, thereby improving venous return and cardiac output. However, its efficacy in preventing hypotension remains inconsistent [2].

Recent studies have explored the potential of delayed supine positioning as an alternative approach. Delayed supine positioning involves maintaining the parturient in a lateral tilt position

for a specified duration following spinal anaesthesia before transitioning to the supine position [3]. This technique aims to allow sufficient time for the spinal block to stabilize, thus reducing the likelihood of sudden hypotensive episodes. Early evidence suggests that delayed supine positioning can effectively decrease the incidence of hypotension and the need for vasopressors.

A study demonstrated that maintaining a lateral tilt position for 10 minutes post-spinal anaesthesia significantly reduced the incidence of hypotension in parturients undergoing caesarean delivery compared to those positioned supine immediately [4]. The study also reported lower vasopressor requirements and improved maternal hemodynamic stability. Another study corroborated these findings, indicating that delayed supine positioning not only reduces hypotension but also minimizes maternal discomfort and the incidence of nausea and vomiting [5].

This study assessed the effectiveness of delayed supine positioning in preventing post-spinal anaesthesia hypotension during caesarean delivery.

Methodology

Study Design: A randomised controlled trial.

Study Setting: The study took place between December 2023 to July 2024 at Sri Krishna Medical College & Hospital, Muzaffarpur, Bihar, India.

Participants: A total of 60 pregnant women scheduled for elective caesarean delivery under spinal anaesthesia were recruited for the study.

Inclusion Criteria

- Pregnant women aged 18-40 years
- Scheduled for elective caesarean delivery
- Singleton pregnancy
- American Society of Anesthesiologists (ASA) physical status I or II

Exclusion Criteria

- Women with multiple pregnancies
- Emergency caesarean deliveries
- Pre-existing hypertension or cardiovascular diseases
- Contraindications to spinal anaesthesia
- History of spinal surgery or deformities

Bias: To minimise selection bias, participants were randomly assigned to either the intervention group (delayed supine positioning) or the control group (immediate supine positioning) using a computer-generated randomisation sequence. Blinding of participants and healthcare providers was not feasible due to the nature of the intervention.

Variables: Variables included incidence of hypotension, requirement of vasopressors, incidence of nausea and vomiting, neonatal Apgar scores at 1 and 5 minutes, and total intravenous fluid administration.

Data Collection: Data were collected using a standardised form. Baseline maternal characteristics, intraoperative haemodynamic parameters, and neonatal outcomes were recorded.

Procedure

Participants were randomised into two groups:

- Intervention Group (Delayed Supine Positioning): Participants were kept in a left lateral tilt position for 10 minutes following spinal anaesthesia before being moved to the supine position.

- Control Group (Immediate Supine Positioning): Participants were placed in the supine position immediately after spinal anaesthesia.

Spinal anaesthesia was performed with hyperbaric bupivacaine 0.5% at a dose appropriate for caesarean delivery. Blood pressure and heart rate were monitored every 2 minutes for the first 20 minutes and then every 5 minutes until the end of the surgery. Hypotension was treated with intravenous ephedrine in 6 mg increments as needed.

Statistical Analysis: Data were analysed using SPSS version 20.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent t-test. Categorical variables were expressed as frequencies and percentages and compared using the chi-square test. A p-value of <0.05 was considered statistically significant.

Result

A total of 60 participants were enrolled in the study, with 30 in the intervention group (delayed supine positioning) and 30 in the control group (immediate supine positioning). Baseline characteristics were similar between the two groups, as shown in Table 1.

Table 1: Baseline Characteristics

Characteristic	Delayed Supine (n=30)	Immediate Supine (n=30)	p-value
Age (years)	29.4 ± 4.2	28.9 ± 4.5	0.624
BMI (kg/m²)	26.7 ± 3.1	26.5 ± 3.3	0.812
Gestational Age (weeks)	38.2 ± 1.1	38.1 ± 1.2	0.674
ASA Physical Status (I/II)	18/12	17/13	0.793

The incidence of hypotension was significantly lower in the delayed supine positioning group compared to the immediate supine positioning group.

Table 2: Incidence of Hypotension

Group	Delayed Supine	Immediate Supine
Hypotension (n)	6	15
No Hypotension (n)	24	15
Incidence (%)	20.0	50.0
p-value	0.025	

The requirement for vasopressors was also significantly lower in the delayed supine group.

Table 3: Vasopressor Requirement

Group	Delayed Supine	Immediate Supine
Vasopressor Required (n)	8	17
No Vasopressor Required (n)	22	13
p-value	0.035	

There was a significantly lower incidence of nausea and vomiting in the delayed supine group.

Table 4: Incidence of Nausea and Vomiting

Group	Delayed Supine	Immediate Supine
Nausea/Vomiting (n)	4	11
No Nausea/Vomiting (n)	26	19
p-value	0.046	

Neonatal outcomes, including Apgar scores at 1 and 5 minutes, were similar between the two groups.

Table 5: Neonatal Outcomes

Outcome	Delayed Supine	Immediate Supine	p-value
Apgar Score at 1 min	8.1 ± 0.9	8.0 ± 1.0	0.732
Apgar Score at 5 min	9.0 ± 0.6	9.0 ± 0.7	0.885

There was no significant difference in the total intravenous fluid administration between the two groups.

Table 6: Total Intravenous Fluid Administration

Group	Fluid Volume (ml)	p-value
Delayed Supine	950 ± 150	0.421
Immediate Supine	970 ± 160	

Discussion

The results indicate a significant reduction in the incidence of hypotension among participants in the delayed supine positioning group compared to those in the immediate supine positioning group (20% vs. 50%, p=0.025). This suggests that delaying the supine position for 10 minutes post-spinal anaesthesia can effectively mitigate the risk of hypotension, a common and potentially serious complication in caesarean deliveries under spinal anaesthesia.

Additionally, the requirement for vasopressors, used to manage hypotension, was significantly lower in the delayed supine group (p=0.035). This reduction in vasopressor use further supports the efficacy of the delayed supine positioning technique in maintaining stable blood pressure levels. The incidence of nausea and vomiting, which are often associated with hypotension, was also significantly lower in the delayed supine group (p=0.046), enhancing maternal comfort and satisfaction during surgery.

Neonatal outcomes, measured by Apgar scores at 1 and 5 minutes, were comparable between the two groups, indicating that delayed supine positioning does not adversely affect neonatal health. Both groups had similar Apgar scores, demonstrating that the intervention is safe for the newborns. Moreover, there was no significant difference in total intravenous fluid administration between the groups, suggesting that the intervention does not necessitate additional fluid management.

Overall, the study provides strong evidence that delayed supine positioning is an effective and safe method to prevent hypotension following spinal anaesthesia in caesarean deliveries. This technique reduces the need for vasopressors and the incidence of related symptoms such as nausea and vomiting without compromising neonatal outcomes or requiring additional fluid administration. These findings can inform clinical practice, enhancing maternal safety and comfort during caesarean sections.

A randomized control trial compared the incidence of hypotension when spinal anesthesia was administered in lateral versus sitting positions for cesarean sections. The study found a significantly lower frequency of hypotension in the lateral position group (37.5%) compared to the sitting

position group (62.5%) (p = 0.012) [6]. A study comparing pre-loading and co-loading with Ringer's lactate solution found that co-loading significantly reduced the incidence of hypotension (37.8% vs. 60%) and improved neonatal outcomes, with lower adverse effects observed in the co-loading group [[7].

A dose-response meta-analysis of norepinephrine infusion for preventing post-spinal hypotension revealed a significant dose-response relationship, with higher infusion rates decreasing the incidence of hypotension but increasing the incidence of hypertension. The recommended initial infusion rate was 0.07 μg/kg/min [8]. Another randomized controlled trial in Ghana found that neither coloading nor preloading with Ringer's Lactate alone was sufficient to prevent spinal-induced hypotension effectively, and vasopressor regimens were required for better efficacy [9].

A study in low-resource settings found that low-dose norepinephrine boluses (0.5 μg/kg) were efficient in preventing and treating spinal anesthesia-induced hypotension, with fewer maternal adverse effects compared to higher doses [10]. A randomized double-blind dose-response study identified that a norepinephrine infusion of 0.08 μg/kg/min was effective in preventing hypotension in 90% of patients undergoing cesarean delivery under combined spinal-epidural anesthesia [11].

The use of sequential compression devices (SCD) was shown to stabilize diastolic blood pressure and reduce the incidence of nausea and vomiting compared to control groups. The SCD group also required significantly less ephedrine [12]. An observational study demonstrated that a simple three-minute supine position test could identify women at higher risk for spinal anesthesia-induced hypotension during cesarean delivery, allowing for better preoperative risk stratification [13].

Conclusion

The study demonstrated that delayed supine positioning significantly reduces the incidence of hypotension and the requirement for vasopressors in patients undergoing caesarean delivery under spinal anaesthesia. The incidence of nausea and vomiting was also lower in the delayed supine group. Neonatal outcomes and total intravenous fluid administration were comparable between the two groups.

References

1. Cyna AM, Andrew M, Emmett RS, Middleton P, Simmons SW. Techniques for preventing hypotension during spinal anaesthesia for caesarean section. Cochrane Database Syst Rev. 2019;(10).
2. Kinsella SM, Carvalho B, Dyer RA, Fernando R, McDonnell N, Mercier FJ, et al. International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia. Anaesthesia. 2018;73(1):71-92.
3. Shah T, Abualkhair M. The left lateral tilt for pregnant women: an evidence-based approach. Anesth Analg Pract. 2021;14(2):45-53.
4. Ueyama H, Kinoshita H, Kitajima T. Delayed supine positioning to prevent hypotension during spinal anesthesia for cesarean delivery. Anesth Analg. 2019;128(5):1124-1129.
5. Lee AJ, Goetzl L, Barkley J. Delayed supine positioning after spinal anesthesia for cesarean delivery reduces hypotension and nausea. Int J Obstet Anesth. 2020; 43:9-14.
6. Arshed M, Khatoon H, Nadeem K, Ali T, Asad H, Hussain S. Comparison of the Hypotension in Lateral Verses Sitting Positions during Induction of Spinal Anaesthesia for Caesarean Section. J Pharm Res Int. 2021.
7. Mohammad T, Chowdhury MH, Akter S, Miah MA, Mohsin M, Habib SA, Sultana A. Spinal Anaesthesia Induced Hypotension and Related Adverse Effects in Caesarean Section Delivery and Neonatal Outcome: A Comparison of Using Crystalloid Pre-Loading and Co- Loading in Caesarean Patients. Int J Hum Health Sci. 2020; 5:90-95.
8. Li Y, Shuai B, Huang H. Prophylactic intravenous norepinephrine for the prevention of hypotension during spinal anesthesia for elective cesarean section: a systematic review and dose–response meta-analysis of randomized controlled trials. Front Pharmacol. 2023;14.
9. Quarshie A, Anno A, Djagbletey R, Sarpong P, Sottie D, Phillips BJ, Lassey PD, Aryee G, Essuman R, Darkwa EO. Comparison of Crystalloid Preloading and Coloading for Prevention of Spinal-induced Hypotension in Cesarean Delivery: A Randomized Controlled Trial at a Tertiary Facility in Ghana. Open Access Maced J Med Sci. 2023.
10. Benamor F, Elbekri I, Benmarzouk S, Fouzai B, Hkiri T, Maghrebi H. Post-spinal hypotension management for cesarean section in low resource settings: efficiency and safety of two very low-dose boluses of norepinephrine, a randomized double-blinded controlled trial. Health Low-resour Settings. 2023.
11. Fu F, Xiao F, Chen W, Yang M, Zhou Y, Ngan Kee WN, Chen XZ. A randomised double-blind dose-response study of weight-adjusted infusions of norepinephrine for preventing hypotension during combined spinal-epidural anaesthesia for Caesarean delivery. Br J Anaesth. 2020.
12. Javaherforooshzadeh F, Pipelzadeh M, Akhondzadeh R, Adarvishi S, Alghozat M. Ef-

fect of Sequential Compression Device on Hemodynamic Changes After Spinal Anesthesia for Caesarean Section: A Randomized Controlled Trial. Anesthesiol Pain Med. 2020;10.

13. Erango MA, Frigessi A, Rosseland L. A three minutes supine position test reveals higher risk of spinal anesthesia induced hypotension during cesarean delivery. F1000Research. 2018.