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Comparative Analysis of the Hemodynamic Effects of Lateral and Sitting Positions in Spinal Anesthesia Induction During Elective Caesarean Section

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ABSTRACT

Spinal anaesthesia is commonly employed in caesarean sections, with hypotension being a prevalent complication. The choice of positioning, either sitting or lateral, can influence the hemodynamic response. This study aimed to compare the effects of spinal anaesthesia induction in lateral versus sitting positions on hemodynamic parameters, sensory and motor blockade characteristics and patient comfort during elective caesarean delivery. A randomized comparative study was conducted on sixty pregnant individuals undergoing elective caesarean delivery under spinal anaesthesia. Patients were assigned to either the lateral or sitting position group. Hemodynamic parameters, sensory and motor blockade levels and patient comfort scores were recorded at various time intervals. Statistical analysis was performed using chi-square and Mann-Whitney U tests. Baseline characteristics between the groups were comparable. No significant differences were observed in mean arterial pressure, heart rate, or block characteristics between the two positions. However, spinal anaesthesia initiation was faster in the lateral group, possibly due to the use of hyperbaric bupivacaine. Patient comfort scores were significantly higher in the lateral position group compared to the sitting position. The choice of induction position for spinal anaesthesia in elective caesarean sections does not significantly impact hemodynamic parameters or block properties. However, the lateral position offers faster anaesthesia onset and higher patient comfort compared to the sitting position. Therefore, the lateral position may be preferred for pregnant patients undergoing caesarean delivery under spinal anaesthesia.

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Key Words
Caesarean sections, Hemodynamic effects, Inducing position, Spinal anaesthesia

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INTRODUCTION

Currently, spinal anaesthesia is the predominant technique used for doing caesarean sections[1-4]. Hypotension is the prevailing complication of spinal anaesthesia, with an incidence ranging from 30% to 60%[5-10]. Hypotension is a frequent occurrence in pregnant women after spinal anaesthesia. This is due to the spread of pain-relieving medications in the region around the spinal cord, as well as the pressure exerted on the large blood vessels by the pregnant woman's uterus[11-14].

Spinal anaesthesia is performed in two positions: sitting and lateral. Each position has its own set of advantages and disadvantages[15-16]. Performing spinal anaesthesia in pregnant women is facilitated by the sitting position, mostly because of the presence of obesity and the difficulty in identifying clear landmarks.

However, maintaining the seated position poses significant challenges for certain patients, such as those who have been administered sedatives, emergency patients, individuals with multiple pregnancies, those experiencing umbilical cord prolapsed and restless patients. In such instances, it is more appropriate to put the patient in the lateral position. Hence, it is crucial to understand the alterations in the patient's hemodynamic condition following spinal anaesthesia while in the lateral position[16,17].

The combination of sympathectomise induced by spinal anaesthesia and the increased pooling of blood in the peripheral vessels due to gravity results in significant hypotension when in a seated position[15,18]. Hypotension poses challenges for both the mother and fetes, leading to symptoms such as vomiting, nausea and dizziness in the mother and acidemia in the fetes[19-21]. Based on the given reasoning, it may be theoretically inferred that spinal anaesthesia in the lateral position might be linked to a lower occurrence of hypotension. Several studies have been undertaken on this matter, yielding varying results regarding the occurrence of low blood pressure and the time it takes for anaesthetic to take effect in both the sitting and lateral positions after a caesarean section[16,17].

MATERIALS AND METHODS

This tertiary care center Department of Anaesthesiology carried out an open, randomized comparative study. There are sixty pregnant individuals over the age of eighteen who are in the American Society of Anesthesiologists (ASA) Grade I and Grade II categories. These patients are close to term and having spinal anesthesia in preparation for an elective cesarean delivery. The anesthesia supervisor assigned to the theater used the randomization chart table to determine whether the patient would receive spinal anesthesia in a sitting or lateral position. Patients were therefore placed in lateral or sitting groups. An elective caesarean section is planned for a healthy parturient with a normal pregnancy. ASA Patients nearing full pregnancy and older than 18 years were included in the trial as Grade I and Grade II patients. As Patients refusal of the patient to provide consent, Hypersensitivity to bupivacaine, infection at the injection site, bleeding problem, pre-eclampsia, diabetic mellitus, febrile illness, fetal growth retardation, intrauterine growth restriction, age <18 years, gestational age <36 weeks, feverish illness and so on Exclusions from the trial were coagulopathy, elevated intracranial tension, pre-existing neurological impairments and severe hypovoluemia. A day before surgery, every patient was seen in the wards. A thorough history and comprehensive analysis were performed. The spine was inspected. Regular tests such as an ECG and full blood count were recorded.The patient was informed about the planned procedure and given the opportunity to provide written informed consent.The NBM status was confirmed on the day of operation. Informed consent and investigations were reviewed. The resuscitation medications, general anesthesia trolley and spinal anesthesia trolley were ready and inspected. The patient in the operating room had devices attached to them, including a non-invasive blood pressure monitor (NIBP), a cardio scope and a pulse oximeter. Blood pressure (B.P.), SPO2 and baseline heart rate were measured. A big bore IV line was inserted into the non-dominant hand's dorsum. Intravenous lactated Ringer's solution (10 ml/kg) was preloaded into each subject. The patient was placed in a spinal anesthesia posture. The theater's anesthesia supervisor determined the spinal anesthesia position using the randomization chart table. Position: The patient will be seated with their back to the anesthetist and their feet extended along the axis of the operating table. Patients were placed on the surgical table in the left lateral position, with their hips and knees bent. Using a 25 gauge Quincke's spinal needle, spinal anesthesia was administered to the patient while they were seated or in a lateral position at the L3-L4 level using a mid-line approach. After confirming a negative blood aspiration and allowing clear and unrestricted flow of CSF, 0.5% hyperbaric bupivacaine was administered, with the needle pointing cephalad. 1.8-2 cm of inj. bupivacaine will be administered. As soon as the spinal needle is removed, the patient will be put to sleep. Systolic, diastolic and mean blood pressure readings will be taken every two minutes for the first ten minutes following the drug injection, then every five minutes for the following thirty minutes and finally every fifteen minutes for the full hour. A pin prick in the midline was used to measure the sensory level. A 0-3 point rating system was used for the motor assessment.

- Full extension of knees and feet
- Just able to move knees and feet
- Able to move feet only
- Unable to move feet and knees

A decrease in mean arterial blood pressure of >20% of the baseline level was treated with fluid boluses followed by incremental doses of intravenous ephedrine 5 mg. A decrease in the heart rate >20% of the baseline level was treated with 0.6mg atropine intravenously. At the end of surgery, patients were asked about their satisfaction for overall comfort level for position during spinal anaesthesia in terms of three-point scale.

- Not comfortable
- Comfortable
- Very comfortable

Data obtained was analysed using free online available software. Chi square test was used to compare the hemodynamic variables analyse the categorical data, Mann Whitney U test was used to compare the non-parametric data. p-value <0.05 was considered as significant.

RESULT

In this study, patients were divided into two groups based on their positioning during a procedure: the lateral position group and the sitting position group. The distribution of patients across different ASA grades (American Society of Anesthesiologists physical status classification), mean age, mean height and mean weight were compared between the two groups. The analysis revealed no statistically significant differences between the groups in terms of ASA grades (p = 0.232), mean age (p = 0.842), mean height (p = 0.831) and mean weight (p = 0.331). This suggests that the baseline characteristics of the patients in both groups were similar, minimizing potential confounding factors and allowing for a more accurate comparison of outcomes related to positioning during the procedure (Table 1).

The sensory level blockade was assessed in patients undergoing procedures in either a lateral position or a sitting position at various time intervals. At 1 minute, the sensory level at T12 was observed in all patients across both groups. At 3 minutes, although there was a trend suggesting a difference in the sensory blockade between the groups at T12 (16.7% in lateral vs. 33.3% in sitting), it did not reach statistical significance (p = 0.084). Similarly, at 5 minutes, while there were differences in blockade levels at T10, T9 and T7, none of these reached statistical significance. At 20 minutes, there was only one patient in the lateral position group with a T5 blockade compared to none in the sitting group, but again, this difference was not statistically significant (p = 0.326). By 60 minutes, there were no significant differences in sensory blockade levels between the two groups across all observed levels (T6, T7 and T8) with similar proportions in both groups (p = 0.200). Overall, these findings suggest that there were no substantial differences in sensory blockade levels between patients in the lateral and sitting positions over the course of the observation period (Table 2).

Motor level scores were evaluated in patients positioned laterally or sitting at various time points. At 3 minutes, the proportion of patients with a motor level score of 2 was 16.7% in the lateral position group compared to 30% in the sitting position group, though this difference did not reach statistical significance (p = 0.084). Conversely, the majority of patients in both groups had a motor level score of 3 at 3 minutes, with 83.3% in the lateral group and 70% in the sitting group. By 10 minutes and 60 minutes, all patients in both groups had attained a motor level score of 3, indicating full recovery of motor function. Overall, there were no significant differences in motor level scores between patients in the lateral and sitting positions at any observed time point, suggesting similar rates of motor recovery regardless of positioning during the procedure (Table 3).

Patient comfort scores were compared between those positioned laterally and those in a sitting position. The analysis revealed significant differences

Table 1: Patient demographics

	Group		
Variables	Lateral position	Sitting position	p-value
ASA grade I	20	23	p = 0.232
ASA grade II	10	7	
Mean age (years)	23.43±1.41	23.5±1.75	p = 0.842
Mean height (cm)	155.92±4.15	156.08±4.39	p = 0.831
Mean weight (kg)	62.25±5.68	63.25±5.55	p = 0.331

Table 2: Sensory level blockade at different time intervals in both the study groups

	Groups		
Sensory level blockade	Lateral position	Sitting position	p-value
At 1 minute			
T12	30	30	
At 3 minutes			
T12	5 (16.7%)	10 (33.3%)	P= 0.084
T10	10 (33.3%)	9 (30%)	
T8	15 (50%)	11 (36.7%)	
At 5 minutes			
T10	13 (42.9%)	14 (47.0%)	P= 0.525
T9	1 (3.4%)	0	
T8	14 (47%)	15 (50.0%)	
T7	2 (6.7%)	1 (3%)	
At 20 minutes			
T5	1 (3.5%)	0	P= 0.326
T6	20 (66.7%)	19 (63.5%)	
T7	8 (26.7%)	10 (33.3%)	
T8	1 (3.2%)	1 (3.2%)	
At 60 minutes			
T6	19 (63.3%)	19 (63.3%)	P= 0.200
T7	10 (33.2%)	11 (36.7%)	
T8	1 (3.5%)	0	

Table 3: Motor level score at different time intervals in both the study groups

	Groups		
Motor level score	Lateral position	Sitting position	p-value
At 3 minutes			
2	5 (16.7%)	9 (30%)	P= 0.084
3	25 (83.3%)	21 (70%)	
At 10 minutes			
3	30 (100%)	30 (100%)	
At 60 minutes			
3	30 (100%)	30 (100%)	

Table 4: Patient comfort score in both the study groups

	Position		
Patient comfort score	Lateral	Sitting	p-value
0.00	2 (6.7%)	10 (33.3%)	P<0.001
1.00	3 (10.0%)	5 (16.7%)	
2.00	25 (83.3%)	15 (50.0%)	

between the two groups (p<0.001). In the lateral position group, only 6.7% of patients reported a comfort score of 0.00, whereas 33.3% of patients in the sitting position group reported the same score. Conversely, a higher proportion of patients in the lateral position group reported higher comfort scores, with 83.3% scoring 2.00 compared to 50.0% in the sitting position group. This suggests that patients in the lateral position tended to report higher levels of comfort compared to those in the sitting position during the procedure (Table 4).

DISCUSSION

There is often a debate about the best position for inducing spinal anaesthesia in elective caesarean sections - sitting or lateral. This choice can impact how isobaric local anesthetic drugs spread, which in turn affects the characteristics of the nerve blockade, including sympathetic, sensory and motor effects[22,17] The efficacy of utilizing hyperbaric bupivacaine for spinal anaesthesia was partially demonstrated in relation to the induction position. The investigation of hemodynamic parameters has not been adequately examined. Therefore, this study was conducted to examine the hemodynamic effects of the lateral and sitting positions during the administration of spinal anaesthesia for elective caesarean delivery. The current study involved a comparison of the demographic characteristics of both groups. Nevertheless, they appeared to have no discernible influence on the ultimate results of the study. In Obasuyi *et al*.[23] study including 100 patients, it was shown that the mean arterial pressure was higher in the lateral group compared to the sitting group. This resulted in a reduction in hypotension among the patients in the lateral group. Furthermore, they determined that the initiation of spinal anaesthesia in the lateral position led to a decreased level of block, a delayed onset of anaesthesia and a reduced occurrence of hypotension. The hemodynamic findings of our investigation contrast with those of the aforementioned study. The current study found that the posture of induction, whether sitting or lateral, did not have an impact on the average heart rate, systolic blood pressure and diastolic blood pressure. This can be attributed to the utilization of hypobaric plain bupivacaine in the aforementioned investigation. The level of spinal anaesthesia attained in both groups of our investigation was equivalent in both clinical and statistical terms. In our investigation, we administered hyperbaric bupivacaine and observed that the drug exhibited a faster settling rate in the sitting position compared to the lateral position. Therefore, the lateral position group experienced a quicker onset of anaesthesia and a higher sensory level. However, there was no variation in blood pressure. Nevertheless, this discrepancy was not statistically significant, indicating that steady and comparable hemodynamics were achieved.

Our investigation found that the initiation of spinal anaesthesia was more rapid in the lateral group compared to the sitting group. Starting from the 10th minute, patients in the lateral group attained a higher sensory level compared to those in the sitting group. The highest level of sensory perception reached was T5 in both groups. After a duration of 30 minutes, it was seen that 6.7% of patients who were placed in the lateral posture achieved a T5 level, while 39% achieved a T6 level. In comparison, the sitting group had 5% achieving T5 and 36% achieving T6. After 60 minutes, 38% of the patients who were placed in the lateral position had a T6 level and an equal proportion of patients (38%) also had a T6 level. Nevertheless, this disparity was not statistically significant. Singh *et al*.[24]. also observed similar findings. Shahzad *et al*.[16] observed that the time it took for the sensory block to begin was 4.5 minutes in the sitting group, whereas it took 5.4 minutes in the lateral group.[26] By utilizing hyperbaric bupivacaine, we achieved a more rapid onset of anaesthesia and a greater extent of sensory block in the lateral position group.

The current study observed that, after a duration of 3 minutes, 16.7% of patients who were placed in the lateral position exhibited a motor level score of 2, while 83.3% of patients had a motor level score of 3. Conversely, among patients positioned in a sitting posture, 30% had a motor level score of 2, while 70% had a motor level score of 3. The data indicates that the initiation of motor blockage was more rapid in the lateral group. Nevertheless, this disparity was not statistically significant. Starting at 6 minutes, patients in both groups exhibited a motor level score of 3.

These observations align with the research conducted by Singh *et al*.[24] and Bhat *et al*.[25] In this

study, no significant disparities were observed between the two groups in terms of maximum block height, degree of motor block and mean time required to achieve the block. In his study, Inglis et al. similarly observed similar findings among 40 women who underwent elective caesarean delivery under spinal anaesthesia, whether in the lateral or sitting positions[26]. The study found that 28.3% of individuals in the lateral position needed ephedrine to address low blood pressure. During the sitting group, only 18.3% of the patients were administered ephedrine as a treatment for hypotension. This could be attributed to the higher likelihood of experiencing hypotension in a lateral position. This observation was consistent with the findings of Ortiz-Gómez *et al*.[27].

Our investigation revealed a statistically significant difference in patient comfort scores between the two positions.In the lateral group, 83.3% of patients reported a patient comfort score of 2 (indicating a high level of comfort), compared to only 50% in the sitting position. This finding aligns with the observations made by Chevuri *et al*.[28].

CONCLUSION

The induction technique used for spinal anaesthesia has no impact on the hemodynamic parameters and block properties. However, the initiation of spinal anaesthesia was more rapid in the lateral group compared to the sitting group, perhaps due to the injection of hyperbaric bupivacaine. Nevertheless, delivering spinal anaesthesia in a sitting position was technically more straightforward. Regarding patient comfort, the left lateral posture seems to be more comfortable for pregnant patients.

REFERENCES

1. Manouchehrian, N. and M.H. Bakhshaei, 2014. Nitrous oxide effect on relieving anxiety and pain in parturients under spinal anesthesia for caesarean section. Anesthesiol. Pain Med., Vol. 4. 10.5812/aapm.16662.
2. Jaafarpour, M., Z. Taghizadeh, E. Shafiei, A. Vasigh and K. Sayehmiri, 2020. The effect of intrathecal meperidine on maternal and newborn outcomes after cesarean section: A systematic review and meta-analysis study. Anesthesiol. Pain Med., Vol. 10. 10.5812/aapm.100375.
3. Zangouei, A., S.A.H. Zahraei, A. Sabertanha, A. Nademi, Z. Golafshan and M. Zangoue, 2019. Effect of low-dose intravenous ketamine on prevention of headache after spinal anesthesia in patients undergoing elective cesarean section: A double-blind clinical trial study. Anesthesiol. Pain Med., Vol. 0. 10.5812/aapm.97249.
4. Derakhshan, P., F. Imani, Z.S. Koleini and A. Barati, 2018. Comparison of adding sufentanil and low-dose epinephrine to bupivacaine in spinal anesthesia: A randomized, double-blind, clinical trial. Anesthesiol. Pain Med., Vol. 8, No. 5. 10.5812/aapm.69600.
5. Gousheh, M.R., R. Akhondzade, H.A. Aghahoseini, A. Olapour and M. Rashidi, 2018. The effects of pre-spinal anesthesia administration of crystalloid and colloid solutions on hypotension in elective cesarean section. Anesthesiol. Pain Med., Vol. 8. 10.5812/aapm.69446.
6. Manouchehrian, N., F.R. Bashar and M. Arab, 2014. Efficacy of intrathecal injection rate of bupivacaine 0.5%. J. Babol. Univ. Med. Sci., 16: 21-28.
7. Manouchehrian, N., S. Rabiei, A. Moradi and Z. Lakpur, 2020. Comparison of intrathecal injection of fentanyl and sufentanil on the onset, duration and quality of analgesia in labor: A randomized, double-blind clinical trial. Anesthesiol. Pain Med., Vol. 10. 10.5812/aapm.99843.
8. Atashkhoei, S., R. Abri, B. Naghipour, P.H. Marandi and M.T.F. Danesh, 2018. Effect of glucose containing crystalloid infusion on maternal hemodynamic status after spinal anesthesia for cesarean section. Anesthesiol. Pain Med., Vol. 8, No. 4. 10.5812/aapm.80184.
9. Fathi, M., F. Imani, M. Joudi and V. Goudarzi, 2012. Comparison between the effects of ringer`s lactate and hydroxyethyl starch on hemodynamic parameters after spinal anesthesia: A randomized clinical trial. Anesthesiol. Pain Med., 2: 127-33.
10. Imani, F., S.R. Entezary, M.R. Alebouyeh and S. Parhizgar, 2011. The maternal and neonatal effects of adding tramadol to 2% lidocaine in epidural anesthesia for cesarean section. Anesthesiol. Pain Med., 1: 25-29.
11. Hajian, P., M. Nikooseresht and T. Lotfi, 2017. Comparison of 1- and 2-minute sitting positions versus immediately lying down on hemodynamic variables after spinal anesthesia with hyperbaric bupivacaine in elective cesarean section. Anesthesiol. Pain Med., Vol. 7, No. 2. 10.5812/aapm.43462.
12. Shafeinia, A., M.A. Ghaed and N. Nikoubakht, 2020. The effect of phenylephrine infusion on maternal hemodynamic changes during spinal anesthesia for cesarean delivery. Anesthesiol. Pain Med., Vol. 10, No. 1. 10.5812/aapm.99094.
13. Nugroho, A.M., A. Sugiarto, S. Chandra, L. Lembahmanah, R.I. Septica and A. Yuneva, 2019. A comparative study of fractionated versus single dose injection for spinal anesthesia during cesarean section in patients with pregnancy-induced hypertension. Anesthesiol. Pain Med., Vol. 9, No. 1. 10.5812/aapm-85115.

14. Chandra, S., A.M. Nugroho, H. Agus and A.P. Susilo, 2019. How low can we go? a double-blinded randomized controlled trial to compare bupivacaine 5 mg and bupivacaine 7.5 mg for spinal anesthesia in cesarean delivery in Indonesian population. Anesthesiol. Pain Med., Vol. 9, No. 2. 10.5812/aapm.91275.
15. Kelly, J.D., D. Mccoy, S.H. Rosenbaum and S.J. Brull, 2005. Haemodynamic changes induced by hyperbaric bupivacaine during lateral decubitus or supine spinal anaesthesia. Eur. J. Anaesthesiol., 22: 717-722.
16. Shahzad, K. and G. Afshan, 2013. Induction position for spinal anaesthesia: Sitting versus lateral position. J. Pak. Med. Assoc., 63: 11-15.
17. Russell, I.F., 2008. Routine use of the sitting position for spinal anaesthesia should be abandoned in obstetric practice. Internat. J. Obstetric Anesthesia, 17: 343-347.
18. Olapour, A., R. Akhondzadeh, M. Rashidi, M. Gousheh and R. Homayoon, 2020. Comparing the effect of bupivacaine and ropivacaine in cesarean delivery with spinal anesthesia. Anesthesiol. Pain Med., Vol. 10, No. 1. 10.5812/aapm.94155.
19. Rajabi, M., M.R. Razavizade, M. Hamidi-Shad, Z. Tabasi, H. Akbari and A. Hajian, 2020. Magnesium sulfate and clonidine; effects on hemodynamic factors and depth of general anesthesia in cesarean section. Anesthesiol. Pain Med., Vol. 10, No. 5. 10.5812/aapm.100563.
20. Sharwood-Smith, G. and G.B. Drummond, 2009. Hypotension in obstetric spinal anaesthesia: A lesson from pre-eclampsia. Br. J. Anaesth., 102: 291-294.
21. Yokose, M., T. Mihara, Y. Sugawara and T. Goto, 2015. The predictive ability of non invasive haemodynamic parameters for hypotension during caesarean section: A prospective observational study. Anaesthesia, 70: 555-562.
22. Zohar, E., Y. Noga, U. Rislick, I. Leibovitch and B. Fredman, 2007. Intrathecal anesthesia for elderly patients undergoing short transurethral procedures: A dose-finding study. Anesthesia Analg., 104: 552-554.
23. Obasuyi, B.I., S. Fyneface-Ogan and C.N. Mato, 2013. A comparison of the haemodynamic effects of lateral and sitting positions during induction of spinal anaesthesia for caesarean section. Internat. J. Obstetric Anesthesia, 22: 124-128.
24. Singh, N., P. Laithangbam, R. Fanai, S. Singh, D. Shashank and H. Nayagam, 2013. Comparison of the lateral, oxford and sitting positions for combined spinal and epidural anesthesia for elective caesarean section. J. Med. Soc., 27: 70-74.
25. Tali, S.H., S.A. Bhat, K. Nm and S. Yousuf, 2017. Sitting versus lateral position for induction of spinal anesthesia in elderly patients - a randomized controlled trial. Asian J. Pharm. Clin. Res., 10: 262-265.
26. Inglis, A., M. Daniel and E. Mcgrady, 1995. Maternal position during induction of spinal anaesthesia for caesarean section. Anaesthesia, 50: 363-365.
27. Ortiz-Gómez, J.R., F.J. Palacio-Abizanda, F. Morillas-Ramirez, I. Fornet-Ruiz, A.M. Lorenzo-Jiménez and M.L. Bermejo-Albares, 2015. Effect of position on maternal haemodynamic during elective caesarean delivery under spinal anaesthesia. Anestezjol. Ratownictwo, 9: 22-29.
28. Manouchehrian, N., A. Moradi and L. Torkashvand, 2021. Comparative study of effect of spinal anesthesia in sitting and lateral positions on the onset time of sensory block and hemodynamic condition in cesarean section: A randomized clinical trial. Anesthesiol. Pain Med., 11: 93-94.