International Journal of Research in Medical Sciences
Noorjahan et al. Int J Res Med Sci. 2024 Mar;12(3):892-897
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20240535

Original Research Article

Effect on haemodynamic parameters following spinal anaesthesia in sitting versus left lateral position for lower segment caesarean section: a comparative study

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Received: 22 January 2024
Accepted: 15 February 2024

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ABSTRACT

Background: The percentage of caesarean deliveries carried out under spinal anaesthesia has greatly increased over the last 20 years. However, hypotension remains the most common complication of spinal anaesthesia.
Methods: The study groups divided into two, named group S and group L. The total sample size was 76, 38 patients in each group. All the patients were given 2 ml of hyperbaric bupivacaine (0.5%) in L_{3-4} midline intrathecal space in sitting position in group S, and in left lateral position in group L.
Results: The comparison of heart rate showed that there was less heart rate fluctuation in group S. Statistically significant difference in mean systolic and diastolic blood pressure was seen between the groups during 2nd to 6th minutes, with more stability in group S. The mean MAP was found to be statistically significant in between 2 to 6 minutes and after 25 minutes. The mean onset time of hypotension in the group S was 17.07±7.98 minutes and that in the group L was 11.54±4.66 minutes.
Conclusions: There were no significant differences in the time to reach sensory block level T6, degree of motor blockade (Bromage scale), neonatal outcome and complications in between the two groups. However onset of spinal anaesthesia is faster in the lateral position. Similarly hypotension is more in the left lateral position. The insignificant difference in block height could be because of adjustments in table position.

Keywords: Caesarean section, Hypotension, Spinal anaesthesia

INTRODUCTION

The percentage of caesarean deliveries carried out under spinal anaesthesia has greatly increased over the last 20 years.[1] Neuraxial anaesthesia is the preferred choice for caesarean delivery in most countries unless contraindicated due to decrease in maternal mortality as shown by the UK Confidential Enquiry into Maternal death.[2] However, hypotension remains the most common complication of spinal anaesthesia with an incidence of 30-60%.[3] Hypotension is due to combination of sympathectomy of spinal anaesthesia, peripheral venous pooling and aorto-caval compression. It creates problems for both the mother and fetus.[4] Prophylactic methods like pre-anaesthetic hydration, leg rise or use of vasopressors are not much useful.[5]

Whether the use of the lateral or the sitting position, which one is best for routine initiation of neuro-axial anaesthesia for caesarean section is still controversial.[6] Previous studies have shown that the prevalence and severity of hypotension is associated with the height of

the block.[7] Those who claim better hemodynamic stability in the lateral position argue that gravity dependent peripheral pooling is more in the sitting position or there is slower recovery from sympathectomy induced venous pooling.[8] Other investigators favouring the sitting position maintain that maternal position during the spinal anaesthesia affects the onset and level of block.[9] Moreover, the landmarks of the spine can easily be identified in the sitting position, especially in obese patients.

In view of the above literature, we have planned to compare the hemodynamic profile after spinal anaesthesia in sitting versus left lateral position after removing some of the confounding variables. We aim to achieve this by avoiding injection at or above L 2-3 intrathecal space, targeting maximum block height not above T5, avoiding the legs hanging by the side of the table in the sitting position, and ensuring a wedge below the right buttock immediately after supine positioning. We will also ensure calm environment as a higher pre-operative sympathetic tone (manifest as higher baseline heart rate) which is a predictor for more profound hypotension after spinal anaesthesia.[10]

The aim of the study is, to compare the hemodynamic parameters after spinal anaesthesia given in either sitting or left lateral position for lower segment caesarean section, to compare the time of sensory blockade up to T6 dermatome, to compare motor blockade at 5 mins and 10 mins, to compare Apgar score at 1 min and 5 mins, and to compare complications and side effects if any among both groups.

METHODS

A prospective, single blinded, randomized control trial study was conducted in the Department of Anaesthesiology, Regional institute of medical sciences (RIMS), Imphal, Manipur from September 2021 to December 2022 consisting of 76 patients totally. The permission of the Research Ethics Board, RIMS, Imphal, Manipur was obtained before initiating the study. Informed written consent were taken from all patients.

Inclusion criteria

Inclusion criteria included patients with age between 18 to 40 years, ASA (American Society of Anaesthesiology) category 2, singleton pregnancy and height between 150-170cm.

Exclusion criteria

Exclusion criteria included patients with Body mass index (BMI) > 35 Kg/m^2, gestational age <36 weeks, hypertensive disorder of pregnancy, diabetes mellitus, foetal abnormality, and contraindications of spinal anaesthesia (patient refusal, allergy to study drugs, local infection, spinal deformity etc).

The study groups were divided into two, named group S and group L. The total sample size was 76 (38 patients in each group). Patients were allocated by using computer generated randomization chart. In Group S, all the patients were given 2 ml of hyperbaric bupivacaine (0.5%) in L_{3-4} midline intrathecal space in sitting position with the legs extended horizontally on the OT table (not hanging by the side of the OT table), and in the Group L, all the patients were given 2 ml of hyperbaric bupivacaine (0.5%) in L_{3-4} space in left lateral position.

Premedication was done with metoclopramide 10 mg intravenous injection within 2 hours of surgery and clear liquid up to 150 ml was allowed within 2 hours of surgery. Baseline parameters like non-invasive blood pressure (NIBP), heart rate (HR), respiratory rate (RR) and oxygen saturation (SpO_2) at room air were recorded in the preoperative room.

An intravenous (IV) access was established with 18G or 20G cannula in a suitable large vein and 10ml/Kg of Ringer Lactate was given within 15-30 min. of spinal anaesthesia. Monitoring of baseline parameters was repeated in supine wedged position once the patient was inside the operation theatre (OT). After sterile preparation Group L patient was given spinal anaesthesia in the left lateral position and Group S patient was given the same in the sitting position by an anaesthesiologist as per the randomization plan. Hyperbaric bupivacaine (0.5%) 2ml was given intrathecally over 20 seconds at L_{3-4} space using 25 Gauge Quincke spinal needle. After the spinal drug was injected, patient was placed in the supine wedged position. Supplemental oxygen was given through the face mask at a flow rate of 2-5L/min.

The highest level of sensory blockade achieved was assessed by loss of touch sensation to spirit cotton swab. Time to reach T6 dermatome was noted. Motor blockade was assessed at 5 min and 10 min by Bromage scale (0= the patient could raise legs; 1= could flex the knees; 2= could move only the toes; 3= patient could not move the legs completely). Bradycardia (HR< 50 bpm) was treated with IV atropine 0.3-0.6 mg. Intravenous Mephentermine (3 mg increments) was used to treat hypotension. If the block up to T6 was not achieved within 20 minutes, the case was deemed as failure and excluded from the study. General anaesthesia was given for ethical reason.

RESULTS

The patients were randomly divided into two groups each having 38 patients where one group is given hyperbaric bupivacaine (0.5%) 2 ml intrathecally in sitting and another group in left lateral position and haemodynamic and block characteristics were studied.

Both the groups are comparable as there is no significant differences ($p>0.05$) in the demographic parameters (Table 1).

The comparison of heart rate among the participants from the two groups at different time points have been expressed graphically in (Figure 1). Significant difference in heart rate was evident between the two groups in the 2nd (p-value: 0.002), 4th minute (p-value: 0.002), followed by 15th (p-value: 0.007) and 20th (p-value: 0.003) minute. Better hear rate stability noted in sitting group.

Table 1: Demographic profile.

Mean±SD	Group S (sitting) (n=38)	Group L (left lateral) (n=38)	Mann Whitney U value	P value
Age (in years)	29.18±4.96	29.13±4.95	0.037	0.847
Weight (in kg)	61.87±8.84	62.97±6.15	665.0	0.552
Height (in cm)	156.34±2.87	155.30±2.09	589.5	0.159
BMI (Kg/m^2)	26.21±2.96	27.00±2.16	591.0	0.173

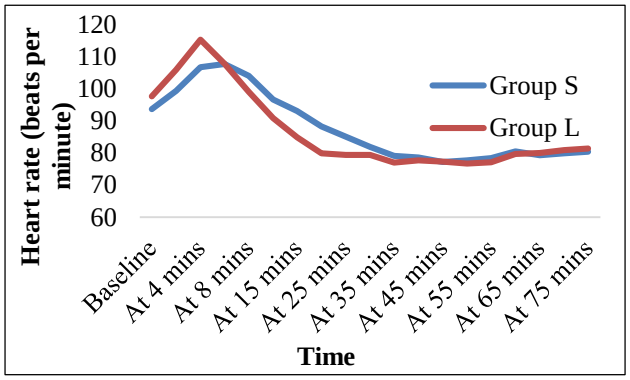

Figure 1: Graph showing the comparison of the mean intra-operative Heart Rate (HR) in the two groups.

Statistically significant difference in mean SBP was evident between the groups during 2nd to 6th minutes (p-value: 0.031 after 2 minutes, p-value: <0.001 after 4 minutes, p-value: 0.035 after 6 minutes), where difference in mean systolic pressure was 4.658, 9.526- and 6.842-mm Hg, respectively. The distribution of mean systolic blood pressure within the two groups at different time has been presented in (Figure 2), there were better stability in SBP in sitting group.

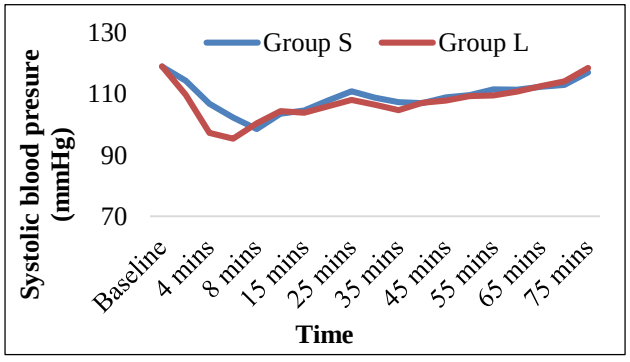

Figure 2: Mean difference in systolic blood pressure between Group S and Group L.

The mean diastolic blood pressure was measured at the baseline at 73.47±9.38 mmHg. The difference in mean diastolic blood pressure was found to be statistically significant after 2nd (p-value: 0.001), 4th (p-value: <0.001) and 6th minute (p-value: 0.002), followed by 25th (p-value: 0.028) and 35th minute (p-value: 0.030) after administration of the spinal anaesthesia. The inter-group comparison for mean diastolic blood pressure was also graphically presented in the (Figure 3). Overall the DBP maintained well in sitting position.

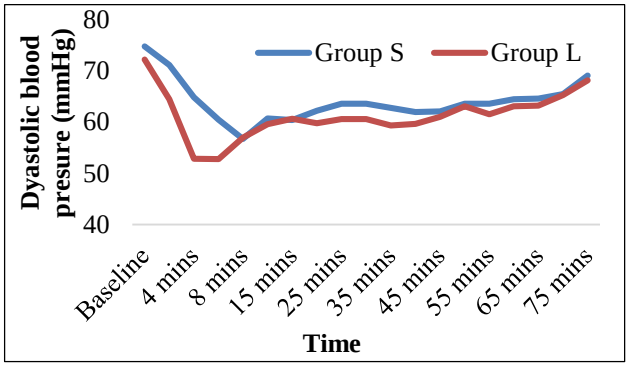

Figure 3: Mean difference in diastolic blood pressure between Group S and Group L.

Change in mean MAP for all the participants in two groups are shown in and (Figure 4). At the baseline there was no significant difference in MAP between the two groups. Though, between 2 to 6 minutes and after 25 minutes difference in mean MAP was found to be statistically significant.

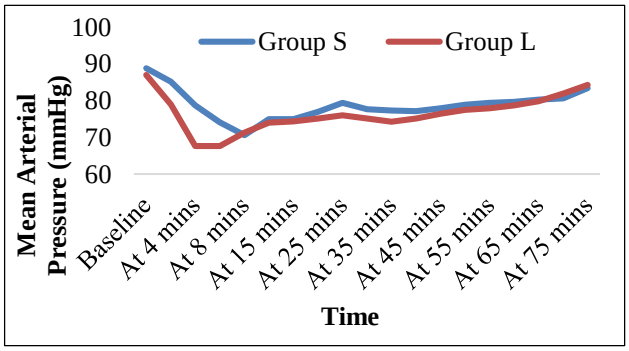

Figure 4: Mean difference in mean arterial blood pressure between Group S and Group L.

Systolic blood pressure after spinal anaesthesia fell below 90 mmHg or less than 80% of the systolic blood pressure from baseline for most of the participants. The prevalence of this hypotension after administering the spinal anaesthesia was more among the left lateral group compare to sitting group. The mean onset time of hypotension in the sitting group was 17.07±7.98 minutes and that in the left lateral position was 11.54±4.66 minutes. The mean time to reach the sensory block level T6 were comparable in both the groups.

Table 2: Comparison of motor blockade at 5 min and 10 min between the two groups.

Motor blockade at 5 min and 10 min		Group S (n=38)	Group L (n=38) (%)	P value
After 5 minutes	Bromage 2	3 (7.89)	0 (0.00)	0.240
	Bromage 3	35 (92.11)	38 (100)	
After 10 minutes	Bromage 2	0 (0.00)	0 (0.00)	
	Bromage 3	38 (100)	38 (100)	

The motor blocked was recorded twice after administration of spinal anaesthesia, at 5 minutes and 10 minutes. After 5 minutes, all the participants were at Bromage scale 3 motor blockade for those who received the spinal anaesthesia at left lateral position. At the same time, those who received the anaesthetic agent while sitting, though majority of the participants (92.11%) achieved Bromage scale 3, there were three individuals (7.89%) who were still at Bromage scale 2 (p= 0.240). After 10 minutes, all the participants achieved Bromage scale 3 for both groups.

Apgar score for the new born was also checked at two time points, 1 minute and 5 minutes after birth. Only one new born had Apgar score 7 in group which received spinal anaesthesia in left lateral position. There was no new born scored below 8 in group which the parturient received spinal anaesthesia in sitting position. After 5 minutes, all the new born were scored 9. Among complications and side effects, the prevalence was high in sitting group. Among all complications nausea, vomiting and shivering were higher among the women who received the spinal anaesthesia at sitting position

DISCUSSION

This study was aimed to assess the prevalence of hypotension and its outcome among parturient who received spinal anaesthesia for elective caesarean section. Few of the salient findings came up in this study: more than two-third of the participants' systolic blood pressure fell to <90 mmHg or below 80% of the baseline systolic blood pressure. Another significant finding was the occurrence of hypotension more in the lateral group (27 out of 38 i.e. 71.05%) than in the sitting group (24 out of 38, i.e. 63.16 %) (p=0.024). Our results are higher than the study conducted by Manouchehrian et al, where out of total 106 participants, 44 (31.12%) developed hypotension.[8] This study also showed the frequency of hypotension was significantly less in the lateral position (24.5% than sitting position (57.7%).The difference could be due to more peripheral venous pooling in their study. We tried to minimize this problem by avoiding the legs hanging by the side of the table while giving spinal anaesthesia in the sitting position. Another study by Atashkhoei et al showed the incidence of hypotension to be higher in sitting position than lateral position (76.3% vs 50%; p value = 0.016) whereas in our study hypotension is more in the lateral position.[11] Differences in preloading status and use of vasopressors might also contribute to different finding. Most of the patients developing hypotension received intravenous injection mephentermine 3-6 mg incremental dose besides fluid loading.

In a study conducted by Calvache et al the overall prevalence of hypotension was similar 42.5% vs 50% (p value = 0.51) with or without wedge below right hip joint.[12] Also, hypotension in Calvache et al study was defined as reduction in systolic blood pressure of 25% from baseline.[12] Ramayyan et al found that hemodynamic stability was more in the sitting position whereas Kharge et al found no significant difference in hemodynamic parameters in the two positions but the participants seemed more comfortable in the lateral position (p< 0.001).[9,13]

In this study we could not find significant difference in the time to reach sensory block level to T6 in the sitting versus left lateral positions (3.97±0.94 min; 4.05±0.90 min; p=0.57). Though one of our earlier study found the onset to be faster in the lateral position, the insignificant finding might result from adjustment in table position by the attending anaesthesiologist.[14] Manouchehrian et al found that the mean time of onset for sensory block level T6 was faster in the lateral position (1.30±0.43 minutes) than sitting position 4.54±2.12 min, (p<0.001).[8] Ramayyan et al also found that the time to reach T5 dermatome was less in lateral position (2.60±5.35 vs 4.34± 0.745 min; p <0.001).[9] Mutreja et al also held the opposite view. Reaching T6 dermatome was faster in sitting position (105±52.24 seconds vs 120.94±51.40 seconds, p> 0.05).[15]

Complications from our study were nausea, vomiting and shivering. We did not encounter any case of post dural puncture headache. Urinary retention could not be assessed as most of the patients were catheterised as

departmental protocol by the obstetrician. Incidence of nausea was 17.11% among the study participants, which majorly affected the participants of sitting group (21.05% vs lateral group: 13.16%). In Patel et al the incidence of nausea was found to be 61% which was notably higher than our study, while Naz FA et al recorded only 32% incidence of nausea and vomiting.[16,17] Assen et al recorded an incidence of 8.3% of nausea and vomiting after spinal anaesthesia where leg elevation was used to control hypotension.[18] The study conducted by Rout et al also supported the method of leg elevation and wrapping in prevention for spinal anaesthesia accompanying hypotension.[19]

In our study injection mephentermine was used as vasopressor to control maternal hypotension. There was no difference in neonatal outcome in terms of Apgar score within the two groups. In other studies, neonates whose mothers received phenylephrine had higher umbilical artery pH and lower base deficit than neonates whose mothers received ephedrine although both drugs successfully treated hypotension.[20] To maintain the maternal arterial pressure during spinal anaesthesia, bolus phenylephrine or ephedrine can be used though phenylephrine was found to be more effective[21]. Recently, norepinephrine was also proposed as an ideal vasopressor, as it may be associated with less maternal bradycardia than phenylephrine.[22]

CONCLUSION

There were no significant differences in the time to reach sensory block level T6, degree of motor blockade (Bromage scale), neonatal outcome as measured by Apgar score and complications like nausea, vomiting and shivering. However onset of spinal anaesthesia is faster in the lateral position. Similarly hypotension is more in the left lateral position. The insignificant difference in block height could be because of adjustments in table position.

ACKNOWLEDGEMENTS

Authors would like to thank the Department of Anaesthesiology, Regional institute of medical sciences, Imphal, Manipur, India. Authors would like to thank the Junior Residents for helping in data collection, and to the HOD and other Senior Residents for helping in data compiling. Authors are also thankful to the patients who had participated in this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of RIMS, Imphal, Manipur

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Cite this article as: Noorjahan, Binarani M, Dhayanithy M, Koyu S, Lollen L, Vigneshwaravibhava K. Effect on haemodynamic parameters following spinal anaesthesia in sitting versus left lateral position for lower segment caesarean section: a comparative study. Int J Res Med Sci 2024;12:892-7.