

## Original Research Article

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# Comparison of haemodynamic effects of lateral and sitting positions during induction of spinal anaesthesia for elective caesarean section

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## ABSTRACT

**Background:** Spinal anaesthesia avoids the problems associated with general anaesthesia such as airway manipulation, polypharmacy, postoperative respiratory problems, and cognitive dysfunction. It can be given in lateral and sitting positions. The aim of the present study was to compare the effect of induction position for spinal anaesthesia in elective caesarean section on hemodynamic, sensory and motor block characteristics and patient satisfaction.

**Methods:** 120 ASA physical status I and II patients undergoing elective caesarean section were randomized to receive spinal anaesthesia in the lateral position or the sitting position. Hyperbaric bupivacaine (0.5%) was injected into the spinal space while the patients were either in sitting or lateral position at L3-L4 level. Effects on hemodynamic parameters, sensory block and motor block characteristics and patient satisfaction were analysed.

**Results:** Demographic characteristics did not seem to have any impact on the overall outcome of the study. Induction position for spinal anaesthesia does not affect the hemodynamic parameters and incidence of side effects when adequate preloading is done. There was no statistically significant difference in the sensory level and motor level achieved. However lateral position appears to be more comfortable than sitting position ( $P < 0.001$ ).

**Conclusions:** Inducing position for spinal anaesthesia did not affect haemodynamic stability and block characteristics in both the groups except that patients feel more comfortable in lateral position.

**Keywords:** Caesarean sections, Haemodynamic effects, Inducing position, Spinal anaesthesia

## INTRODUCTION

The number of pregnant patient undergoing caesarean section has increased in recent years and spinal anaesthesia appears to be more beneficial in these patients depending upon the condition of patient. Hypotension is a common complication of spinal anaesthesia in parturient. It may be partly due to cephalad spread of local anaesthetic in subarachnoid space and aortocaval compression by gravid uterus.<sup>1,2</sup> These factors are influenced by parturient position during and immediately after subarachnoid injection. Prophylactic measures to reduce the incidence include fluid loading, left lateral uterine displacement and use of vasopressin.<sup>3</sup>

Spinal anaesthesia avoids the problems associated with general anaesthesia such as airway manipulation, polypharmacy, postoperative respiratory problems, and cognitive dysfunction. Spinal anaesthesia can be given in lateral decubitus and sitting position.<sup>4</sup>

The sitting position appears to be optimal for the placement of spinal anaesthesia as identification of landmarks, particularly in the midline, is much easier. However, maintaining the sitting position is often difficult and uncomfortable for pregnant patients. Lateral position is generally considered comfortable and easy to maintain for the pregnant patients. But the identification of anatomical landmarks is difficult.

The medical sympathectomy following spinal anaesthesia with enhanced gravity-induced peripheral blood pooling, especially in the sitting position often results in significant hypotension. Compared to the sitting position, the lateral position may cause less hypotension.<sup>4</sup>

Hence, the open randomized study was designed to compare haemodynamic effects of lateral and sitting positions during induction of spinal anaesthesia for elective caesarean section on haemodynamic effects, sensory and motor level, patients comfort.

## METHODS

This open randomized comparative study was conducted in Department of Anaesthesiology T.N.M.C. and B.Y.L. Nair Hospital after institutional and ethics committee approval. 120 pregnant patients with age more than 18 years belonging to American Society of Anaesthesiologist (ASA) Grade I and Grade II, patient near full term undergoing spinal anaesthesia scheduled for elective caesarean section.

The position for spinal anaesthesia either sitting or lateral was decided by the anaesthesia in charge of the theatre based on randomization chart table. Accordingly, patients were included in sitting or lateral groups.

Healthy parturient with normal pregnancies scheduled for elective caesarean section. ASA Grade I and Grade II, Patients near full term and age more than 18 years were included in the study. Patients having following criteria were excluded from the study.

- Patient's refusal to give consent.
- Hypersensitivity to bupivacaine.
- Age <18 years
- Bleeding disorder, gestational age <36 weeks, pre-eclampsia, diabetes mellitus, febrile illness, intrauterine growth retardation, intrauterine growth restriction.
- Patient with infection at the site of injection.
- Coagulopathy
- Increased intracranial tension.
- Pre-existing neurological deficits.
- Severe hypovolemia.

Each patient was visited a day prior to surgery in wards. A detailed history and systemic examination was carried out. Spine was examined. Routine investigations like complete blood count, electrocardiogram were noted. The procedure to be done was explained to the patient and written informed consent was obtained.

On the day of surgery, NBM status was confirmed. Investigations and informed consent was rechecked. General Anaesthesia trolley, Spinal Anaesthesia trolley, resuscitation drugs were prepared and checked. In the

operation theatre monitors were attached to the patient – cardio scope, pulse oximeter, non-invasive blood pressure monitor (NIBP). Baseline heart rate, SPO<sub>2</sub>, blood pressure (B.P.) was recorded. A large bore IV line was taken on the dorsum of non-dominant hand. All patients were preloaded with 10ml/kg of i.v. lactated Ringer's solution. Patient was given position for spinal anaesthesia. The position of spinal anaesthesia was decided by the anaesthesia in-charge of the theatre based on randomization chart table. Sitting position: Patient will be sitting with feet stretched in the axis of the operation table and back facing towards the anaesthetist.

For lateral position, patients were lying in left lateral position on the operating table with the knees and hips in flexion. Spinal anaesthesia was performed with the patient in sitting or lateral position at L3-L4 level via mid-line approach using a 25 gauge Quincke's spinal needle.

0.5% hyperbaric bupivacaine was injected with the level of the needle facing cephalad after clear and free flow of CSF and after confirming negative aspiration for blood. Inj. Bupivacaine will be given as 1.8-2cc. Immediately after withdrawing the spinal needle, patient will be placed in supine position.

Every 2 minutes after the injection of drug for first 10 minutes then every 5 minutes for next 30 minutes then every 15 min till 1 hour's assessments will be made for systolic blood pressure, diastolic blood pressure, and mean blood pressure.

Sensory level assessment was done with pin prick in midline. Motor assessment was done with 0 to 3-point scale.

- 0-full extension of knees and feet.
- 1-just able to move knees and feet.
- 2-able to move feet only.
- 3-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 5mg. 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.

- 0-Not comfortable
- 1-Comfortable
- 2-Very comfortable

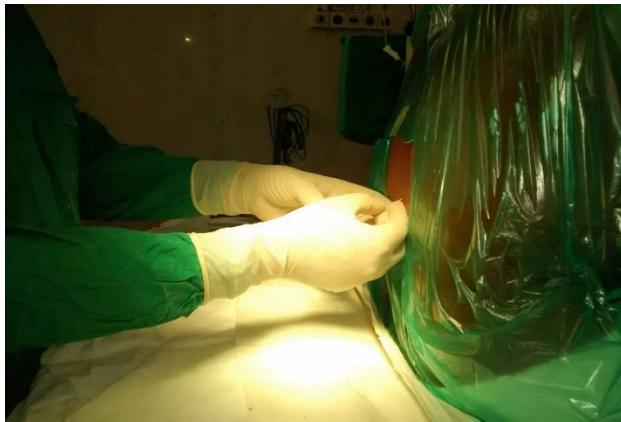
Data obtained was analysed using SPSS 14 software. Chi square test was used to compare the hemodynamic variables analyse the categorical data, Mann Whitney U test was used to compare the non-parametric data. P value <0.05 was considered as significant.



**Figure 1: Preparation for spinal anaesthesia.**



**Figure 3: Induction of spinal anaesthesia in lateral position.**



**Figure 2: Induction of spinal anaesthesia in sitting position.**

## RESULTS

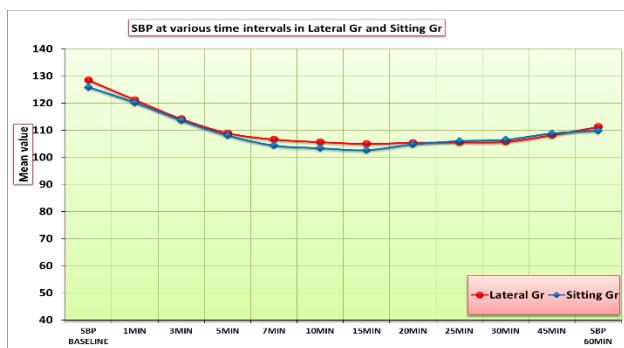
Table 1 presents the demography of the patients participated in the study. No significant differences were observed in terms of ASA grading, mean age, height and weight of the patients between the two study groups. In lateral position group, 35% patients belong to ASA Grade II and 65% belonged to ASA Grade I, while in sitting position group, 25% belonged to ASA Grade II and 75% patients belonged to ASA Grade I. The mean age of the patients in the lateral position group was 23.43 years and in sitting position group was 23.50 years. The mean height was 155 centimetres in lateral position group and 156 centimetres in sitting position group. The mean weight was 62.25 kg in lateral position group and 63.25 kg in sitting position group.

**Table 1: Patient demographics.**

Variables	Lateral position group	Sitting position group	P value
ASA grade I	39	45	P=0.232
ASA grade II	21	15	
Mean age (in years)	23.43±1.41	23.5±1.75	P=0.842
Mean height (cms)	155.92±4.15	156.08±4.39	P=0.831
Mean weight (in kgs)	62.25±5.68	63.25±5.55	P=0.331



**Figure 4: Heart rate at various time intervals in both the study groups.**



**Figure 5: Systolic blood pressure at various time intervals in both the study groups.**



**Figure 6: Diastolic blood pressure at various time intervals in both the study groups.**

No statistically significant differences were observed between the two study groups in parameters of mean heart rate, systolic and diastolic blood pressure of patients during the entire observation period after induction of spinal anaesthesia. This observation signifies that that

induction position whether sitting or lateral does not affect the haemodynamic parameters as given in Figure 4-6.

Time to achieve sensory blockade was observed in this study at different time intervals was given in Table 2. Sensory blockade at 1 minute was 100% in both the groups at T12 level. After 3 minutes 50% of the patients had shown T8 level blockade in lateral group, while in sitting group it was only 35%. After 5 min, 6.7% patients who were in lateral position had T7 level sensory blockade, while 5% had shown the same in sitting group. Time to achieve sensory block to T5 at 20 minutes was observed only in 3% patients in lateral group. This indicates that onset of anaesthesia was faster in lateral group and they achieved higher sensory level at 5 min and 20 min, however this difference was not statistically significant. At the end of 60 min of induction of spinal anaesthesia, there was no statistically significant difference in sensory level in both the groups.

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

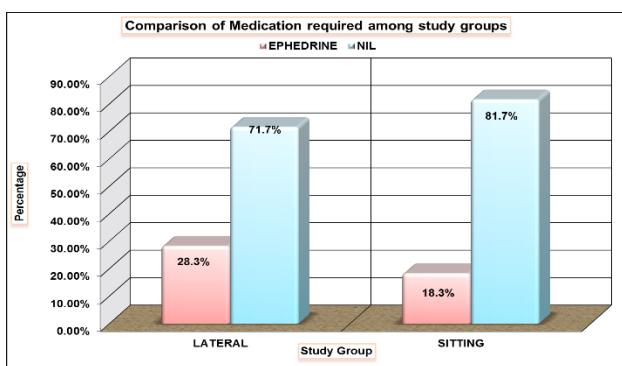
Sensory level blockade	Groups		P value
	Lateral position	Sitting position	
At 1 minute			
T12	60	60	
At 3 minutes			
T12	10 (16.7%)	20 (33.3%)	P= 0.084
T10	20 (33.3%)	19 (31.7%)	
T8	30 (50%)	21 (31.7%)	
At 5 minutes			
T10	25 (41.7%)	27 (45.0%)	P= 0.525
T9	2 (3.3%)	0	
T8	29 (48.3%)	30 (50.0%)	
T7	4 (6.7%)	3 (5%)	
At 20 minutes			
T5	3 (5%)	0	P= 0.326
T6	40 (66.7%)	39 (65.0%)	
T7	16 (26.7%)	20 (33.3%)	
T8	1 (1.7%)	1 (1.7%)	
At 60 minutes			
T6	38 (63.3%)	38 (63.3%)	P= 0.200
T7	19 (31.7%)	22 (36.7%)	
T8	3 (5%)	0	

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

Motor level score	Groups		P value
	Lateral position	Sitting position	
At 3 minutes			
2	10 (16.7%)	18 (30%)	P= 0.084
3	50 (83.3%)	42 (70%)	
At 10 minutes			
3	60 (100%)	60 (100%)	
At 60 minutes			
3	60 (100%)	60 (100%)	

From Table 3, it was seen that after 3 minutes, 16.7% of patients who were given lateral position had motor level score of 2, 83.3% patients had motor level score of 3 while 30% patients who were given sitting position had motor level score of 2 and 70% had motor level score of 3. This shows onset of motor blockade was faster in lateral group. However, this difference was statistically insignificant. From 5 minutes and onwards, patients in both the groups had motor level score of 3.

From Figure 7, it was observed that total ephedrine requirement was reduced in the sitting group compared to lateral group and the difference in dose requirement was statistically insignificant.



**Figure 7: Comparison of ephedrine requirement in both groups.**

Statistically significant difference between the two positions with respect to the patient comfort score was observed as shown in Table 4. Almost all patients from lateral position group (83.3%) were satisfied with induction position of having patient comfort score of 2 (very comfortable) as compared to 50% in sitting position. 6.7% patients were having comfort score of 0 in lateral position and it was 33.3% in sitting position group.

**Table 4: Patient comfort score in both the study groups.**

Patient comfort score	Position		P value
	Lateral	Sitting	
0.00	4 (6.7%)	20 (33.3%)	P<0.001
1.00	6 (10.0%)	10 (16.7%)	
2.00	50 (83.3%)	30 (50.0%)	

## DISCUSSION

There is always some deliberation on the induction position during spinal anaesthesia in elective cesarean sections, sitting or lateral, which may affect the spread of isobaric local anaesthetic drugs that eventually influences the characteristics of the nerve blockade (sympathetic, sensory and motor).<sup>6,7</sup> The role of induction position during spinal anaesthesia using hyperbaric bupivacaine was proven to some extent. However, its effects on

hemodynamic parameters have not been sufficiently studied. Hence this study was undertaken to compare haemodynamic effects of lateral and sitting positions during induction of spinal anaesthesia for elective caesarean section.

In the present study, demographic characteristics of both the groups were compared. However, they did not seem to have any impact on the overall outcome of the study. In the study of Obasuyi et al in 100 patients, the mean arterial pressure was greater in lateral than in sitting group that leaded to decreased hypotension in lateral group of patients.<sup>1</sup> They also concluded that induction of spinal anaesthesia in the lateral position resulted in a lower block, slower onset of anaesthesia, a lower incidence of hypotension. These hemodynamic findings of our study differ from the above study. In the present study, induction position whether sitting or lateral does not affect the mean heart rate, systolic and diastolic blood pressures. This can be explained by the fact that in the above study, they used plain bupivacaine which was hypobaric. The highest level of spinal anaesthesia achieved in both the groups of our study was clinically and statistically comparable. In our study, we have used hyperbaric bupivacaine, it is more likely that the drug settled down more quickly in sitting position than in lateral position. Hence, we got faster onset of anaesthesia and higher sensory level in lateral position group but no difference in blood pressure. However, this difference was statistically insignificant hence stable and comparable haemodynamic were achieved.

In our study, we observed that the onset of spinal anaesthesia was faster in lateral group than the sitting group. At 10<sup>th</sup> minute and onwards, patients in lateral group achieved higher sensory level than those in sitting group. Maximum sensory level achieved was T5 in both groups. After 30 minutes, 6.7% patients who were given lateral position achieved T5 level and 39% had T6 as compared to 5% in sitting group had T5 and 36% had T6. After 60 minutes, 38% patients who were given lateral position had T6 level and same number of patient (38%) had T6 Level. However, this difference was statistically insignificant. Similar findings were reported by Laithangbam et al.<sup>8</sup> Shahzadet al noticed that the onset of sensory block in the sitting group was 4.5 minutes compared with 5.4 minutes in the lateral group.<sup>9</sup> Since we have used hyperbaric bupivacaine, we got faster onset of anesthesia and higher sensory level in lateral position group.

In the present study, it was seen that after 3 minutes, 16.7% of patients who were given lateral position had motor level score of 2, 83.3% patients had motor level score of 3 while 30% patients who were given sitting position had motor level score of 2 and 70% had motor level score of 3. This shows onset of motor blockade was faster in lateral group. However, this difference was statistically insignificant. From 6 minutes and onwards, patients in both the groups had motor level score of 3.

These observations are in accordance with the studies of Laithangbam et al and Bhat et al.<sup>10</sup> In this study, we did not notice any difference between the two groups in terms of maximum block height or degree of motor block and mean time to achieve the block. Inglis et al also made the similar observations in his study conducted on 40 women presenting for elective caesarean section under spinal anaesthesia either in lateral or sitting positions.<sup>11</sup>

In this study, patients in lateral position (28.3%) required ephedrine to treat hypotension. While in sitting group, it was only 18.3% patients received ephedrine to treat hypotension. This may be due to the fact that chances of hypotension are more in lateral position. This observation was similar with the studies of Ortiz-Gómez et al.<sup>12</sup>

In our study, it is seen that there was statistically significant difference between the two positions with respect to the patient comfort score. 83.3% patients in lateral group were having patient comfort score of 2 (very comfortable) as compared to 50% in sitting position. This was in accordance with the observations of Chevuri et al.<sup>13</sup>

## CONCLUSION

Induction position for spinal anaesthesia does not affect the hemodynamic parameters and block characteristics. But the onset of spinal anaesthesia was faster in lateral group than the sitting group due to administration of hyperbaric bupivacaine. However spinal anaesthesia in sitting position was technically easier. As far as patient comfort is considered, left lateral position appears to be more comfortable for pregnant patients.

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*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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