

COMPARISON OF THE HEMODYNAMIC EFFECTS OF LATERAL AND SITTING POSITIONS DURING INDUCTION OF SPINAL ANAESTHESIA FOR CAESAREAN SECTION USING HYPERBARIC BUPIVACAINE

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ABSTRACT

Objective: To compare the frequency of hypotension of sitting versus lateral position during induction of spinal anesthesia for elective LSCS using Hyperbaric Bupivacaine.

Study Design: Randomized control trial.

Place and Duration of Study: The study was conducted at Military Hospital Rawalpindi, a tertiary care hospital, after seeking hospital ethics committee permission. Study was carried out for six months, from Nov 2014 to May 2015.

Patients and Methods: A total of 130 participants achieving the inclusion criteria were picked up for this study. Patients were randomized into group-S and group-L (65 in each group). Group-S received spinal anesthesia using 0.75% hyperbaric Bupivacaine in sitting position and group-L in left lateral position. Maternal Blood pressure was measured before Induction (baseline) and every 3 min after subarachnoid injection for 15 min and final outcome measured at 15 minutes. Decrease in systolic blood pressure of >20% from baseline or a value <90 mmHg was considered as hypotension.

Results: The age of the patients ranged between 25-35 years. Average age of participants were 29.18 ± 2.80 and 29.12 ± 2.52 in group S & L, respectively. In group-S hypotension developed in 34 patients (52.3%) and in group-L hypotension was observed in 20 patients (30.7%), ($p=0.013$). Mean weight in group-S was 71.77 ± 2.82 and in group-L was 70.91 ± 2.05 . Stratification with regard to age and ASA status was carried out.

Conclusion: Occurrence of Hypotension was significantly less frequent when spinal anesthesia was induced to patients in the left lateral position, for elective caesarean using 0.75% Hyperbaric Bupivacaine compared to the sitting position.

Keywords: Caesarean section, Hemodynamic Effects, Inducing position, Spinal anesthesia.

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INTRODUCTION

Central neuraxial blocks result in sympathetic block, sensory analgesia, and motor blockade. This is dependent upon concentration, dose and volume of the local anesthetic agent after insertion of a needle in the plane of the neuraxis¹. Spinal anesthesia is routinely the modality of choice for caesarean section as higher maternal morbidity and mortality rate is associated with General anesthesia². Hypotension is the most common undesirable consequence after spinal anesthesia in participants. Episodes of hypotension can trigger fetal and maternal

distress and can be detrimental to both, if persistent³. Cephalad spread of local anesthetic in the cerebrospinal fluid and compression of the aorta/vena cava by the gravid uterus usually contribute to hypotension, and are influenced by the participants' position during and just after the administration of spinal anesthesia. Aorto-caval compression may be alleviated by lateral displacement of the uterus either by placing a wedge underneath to raise one side of the maternal pelvis or by moving the participants completely laterally to one side⁴. Because hypotension may have detrimental maternal and neonatal effects, a number of strategies have been investigated for preventing hypotension.

These strategies include preloading the patient with intravenous fluids, placing patient in

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the Trendelenburg position and prophylactic use of vasopressors or leg compression devices. Butwick et al. in his review found that I.V. crystalloid prehydration has poor efficacy, co-loading with colloids is better, and pure α agonist phenylephrine is the preferred vasopressor to control hypotension⁵. Maternal position and density of bupivacaine during induction of spinal anesthesia are two most important factors which determine the speed of onset of sensory block and subsequently the hemodynamic outcomes, by manipulating the spread of local anesthetic. Spinal anesthesia can be initiated in participants in sitting as well as lateral decubitus position. Lateral Induction position may cause less hypotension compared to the sitting position⁶. In a study, the incidence of hypotension was lower (34%) in lateral induction position than in sitting induction position (56%)⁶. Despite of increase in use of spinal anesthesia, the induction position has not been standardized and is mostly at discretion of the anesthetist⁷. Because sitting position is most commonly used locally for induction of spinal anesthesia in participants, so rationale of study is to compare it with lateral induction position to decrease the burden of hypotension and its related adverse effects on mother as well as on fetus.

PATIENTS AND METHODS

This randomized control trial study was carried out at Department of Anesthesiology and Intensive care Military Hospital Rawalpindi from November 2014 to May 2015. One hundred and thirty patients accomplishing the inclusion/exclusion standards were chosen for study. They were then distributed into two groups of 65 patients each. WHO sample size calculator was used to calculate the sample size. Power of the test was kept at 80% and level of significance at 5%. Anticipated population proportion (P1) is 34% in lateral group of spinal caesarean, anticipated population proportion (P2) is 56% in sitting group of spinal caesarean⁶. Non probability Consecutive sampling technique was used. Patients aged between 25-35 years, weighing between 50 to 80 kg, ASA physical

status-I (American Society of Anesthesiology) and those having planned elective caesarean section were included in the study. While patients who refused to participate, had known allergy to bupivacaine, had cardiovascular/pulmonary/ renal or liver disease, gestational age less than 36 weeks or those undergoing emergency caesarean section were excluded from the study.

Patients were clarified with the purpose and method of the study and its risk benefit relation, after seeking approval from the hospital ethical committee. Demographic characteristics like age and weight were taken. Detailed history and clinical examination was done to include a participants in inclusion and exclusion criteria. Spine was examined. Routine Investigations like Complete Blood count, ECG were also checked. Eligible and willing mothers were divided into two groups (Group S for sitting and Group L for left lateral position) by the researcher, using Lottery method (blind balloting) and an informed written consent obtained. Standard monitoring included baseline measurement of Blood pressure (BP) and recording of heart rate (HR), pulse oximetry and electrocardiogram in the recumbent position with 15° left lateral tilt. Intravenous line was maintained with 18-gauge cannula onto the dorsum of the non- dominant hand and 10 mL/kg of Lactated Ringers solution given over 15 min prior to performance of the block. The patient was then given position by anesthetist incharge of OT into either or left lateral according to the randomization chart. For lateral position, patients were lying in left lateral position on the operating table with the knees and hips flexed. For sitting position, patients were sitting with feet extended along the operation table axis and back facing towards the anesthetist.

Patients assigned to Group-S were administered spinal anesthesia by using 25 gauge Quincke needle at the level of L3, L4 space in sitting position using 1.5ml of Bupivacaine 0.75% and then returned to supine position. Patients assigned to group-L were administered spinal anesthesia by using 25 gauge Quincke needle at

the level of L3, L4 space in left lateral position using 1.5ml of Bupivacaine 0.75% and then returned to supine position. Onset of the anesthesia was confirmed one minute after the spinal injection by asking the patient to subjectively verify the numbness of legs. Maternal vitals, including Heart rate and Blood Pressure were measured before induction and every 3 min afterwards for 10 min and final outcome was measured at 15 minutes.

Statistical package for social sciences (SPSS) version 23.0 was used to analyze the data. Descriptive figures were computed for

recorded pre-operatively. Average age in Lateral group was 29.12 ± 2.52 years with minimal age of 25 years and maximum of 35 years. In sitting group, mean age was 29.18 ± 2.80 years with minimum age of 25 years and maximum age of 35 years. The mean weight in group L was 70.91 ± 2.05 kg with minimum weight of 60 kg and maximum weight of 80 kg. In group S, mean weight was $71.77 \text{ kg} \pm 2.82$ kg with minimum weight of 62 kg and maximum weight of 80 kg. (table-I). In group S, Hypotension developed in 34 patients (52.3%) compared to 20 patients (30.7%) in group L. The *p*-value was 0.013 and chi

Table-I: Demographic profile of groups.

		Group-S	Group-L	<i>p</i> -value
Age	Mean \pm SD	29.18 years \pm 2.80	29.12 years \pm 2.52	0.898
Age	25-30 years	n=48 (73.8%)	n=47 (72.3%)	
	31-35 years	n=17 (26.2%)	n=18 (27.7%)	
	Mean \pm SD	71.77 kg \pm 2.82	70.91 kg \pm 2.05	0.049

Table-II: Distribution of patients by hypotension.

Hypotension	Group-S (Sitting position)		Group-L(Lateral position)	
	No.	Percentage (%)	No.	Percentage (%)
Yes	34	52.3	20	30.7
No	31	47.7	45	69.3
Total	65	100	65	100

both qualitative and quantitative variables. Percentages and frequencies were calculated for qualitative variables like hypotension and heart rate. Mean \pm Standard Deviation were estimated for quantitative data like weight and age. Difference in hypotension between the two groups was compared using the Chi square test, Independent sample t-test was applied for the mean comparison. Level of significance was taken as $p < 0.05$.

RESULTS

One hundred and thirty patients with inclusive criteria were chosen for the study and they were allocated into two groups. In group S, 65 patients received Spinal anesthesia in sitting position and in group L, 65 patients received spinal anesthesia in Left lateral position. Their age, weight and Baseline Blood Pressure were

square value 6.209 (table-II) (figure).

DISCUSSION

Spinal anesthesia is currently the most common anesthetic method for caesarean delivery. It produces rapid, profound and superior quality of symmetrical sensory and motor block⁸ with a lower risk of drug toxicity, due to small dosage volume used. Hypotension is a frequent occurrence after spinal anesthesia. The supine position of the mother predisposes to aorto-caval compression as a result of pressure effects from the gravid uterus leading to decreased venous return and cardiac output especially in the late pregnancy. This was evident in a study on pregnant mothers by Chun et al, which demonstrated significantly lower intra-abdominal pressure measurements with 10° left lateral tilt position as compared to

supine⁹. Displacement of uterine cavity by change in positioning, particularly left lateral posture, minimizes the aorto-caval compression and avoids the hemodynamic consequences. Subarachnoid block may be inducted to the participants in the sitting or lateral position. Induction in sitting position helps in easy identification of landmarks particularly in midline and allows better flexion of spinal column, thus making it a logical choice for obese mothers or when technical difficulty is anticipated in performing the block. Lateral posture, however, is comfortable and easy to retain for the pregnant patients. A modification of the lateral position is called Oxford position, in

of hypotension in sitting posture, although the single most important benefit with this position was easier administration of spinal anaesthesia. Analogous results with stable hemodynamics and quality of analgesia were found by Chevuri et al¹². Mendonca et al¹³ in his research study compared the outcomes of the two participants' positions (full left lateral position versus supine position with 12 left lateral tilt) following combined spinal-epidural anaesthesia using intrathecal hyperbaric bupivacaine and demonstrated decreased incidence of hypotension in the left lateral position (64%) in comparison to mothers positioned in the tilted supine group (90%). Likewise, investigation by Lewis et al.

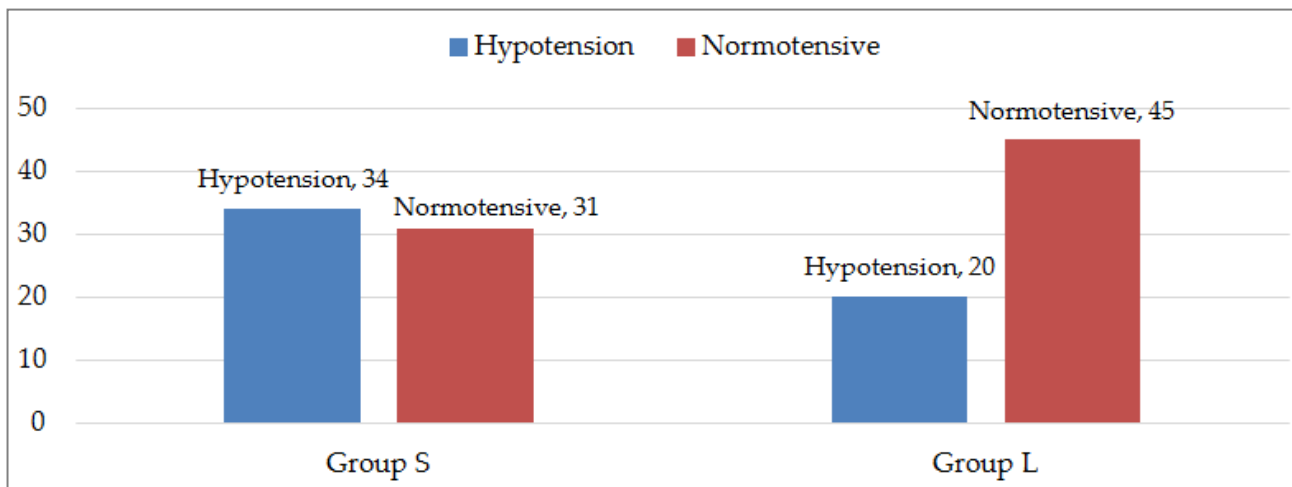


Figure: Incidence of hypotension in both groups.

which supine position is avoided till start of procedure and an upward slope is created in the thoracic region. It has two major benefits; it attenuates the aorto-caval compression and also protects the upper thoracic nerve roots from local anaesthetics exposure¹⁰. Our literature search revealed that the hemodynamic outcomes of the two induction positions in participants using hyperbaric bupivacaine have not been studied sufficiently. However, the findings of our study correlate with the finding of Obasuyi et al, who reported lower incidence of hypotension in lateral position as compared to sitting position⁶. Other studies producing similar outcomes include those of Yun et al¹¹ and Chevuri et al¹². Both of them demonstrated increased frequency

produced identical results with higher proportion of hypotension in the tilted supine group (78.6%) than lateral group (64%)¹⁴. Xin wang et al in their study assessed the effects of three different maternal positions on hypotension caused by subarachnoid block. Results of their study produced lower incidence of hypotension along with reduced ephedrine requirements in mothers who remained in full lateral posture (9.7%) than other 2 groups who shifted to tilted supine posture after receiving the block¹⁵. Furthermore, Study of Hallworth et al. demonstrated increased prevalence of hypotension to decreasing density of intrathecal bupivacaine and results showed increased frequency of hypotension in participants induced in sitting posture with

hyperbaric bupivacaine¹⁶. In comparison to aforementioned studies, Kharge et al¹⁷ did not find any significant effect of induction position on maternal hemodynamic profile and block characteristics. Likewise, results of Ortiz-Gomez et al¹⁸ did not differ considerably in terms of hemodynamic outcomes of three different induction positions and sitting induction posture did not effect on occurrence of arterial hypotension. A recently published study by Hajian et al¹⁹ revealed that keeping the participants seated for 1 to 2 minutes after the spinal anesthesia resulted in more hemodynamic stability than immediately lying down after the procedure. In our study, a total of 130 participants belonging ASA physical status-I, were included. The incidence of hypotension was statistically significantly lower in lateral position as compared to sitting position (30.7% vs 52.3%) proving the fact that participants' position during induction does play a pivotal role in development of hypotension.

CONCLUSION

Our study concluded that the frequency of hypotension was significantly less when spinal anesthesia for caesarean was induced to participants in the lateral posture compared with the sitting position using bupivacaine 0.75%.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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