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Original Research Article

Faster Onset (T5 Blockage) in Lateral Position during Elective Caesarean Section under Spinal Anaesthesia

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Abstract:

Background: Spinal anaesthesia has emerged as technique of choice for routine scheduled caesarean section. The aim of our study was to evaluate the effectiveness of two maternal positions-lateral and sitting during administration of spinal anaesthesia for elective caesarean section. The hypothesis of this study is that there would be a difference in speed of onset of sensory blockade between sitting and lateral position causing hemodynamic changes in parturients.

Methods: This prospective single-blind, randomized study was carried out in pregnant patients with singleterm pregnancy, taken up for elective caesarean section under spinal anaesthesia. They were divided into two groups:

Group L: Parturients who were to receive spinal anaesthesia in lateral position,

Group S: Parturients who were to receive spinal anaesthesia in sitting position. Time to reach sensory block at T5 level, maximum sensory blockage and Bromage score was recorded. Non-Invasive Blood Pressure, HeartRate and oxygen saturation was recorded at 2-minute intervals from giving Sub-Arachnoid Block (time zero) up to 10 min and then at 5 min intervals till the end of surgery.

Results: Time to achieve T5 blockage in lateral group was 5.09±0.88 min and in sitting group was 6.38±0.96 min which was statistically significant (p= 0.00). Incidence of hypotension was more in lateral group 23 (22.5%) than sitting group 19 (18.6%), (p=0.479). The requirement of vasopressor was more in Group L (Lateral group) 8.00 ± 2.34 mg than Group S (Sitting group) 6.80 ± 2.9 mg (p=0.001).

Conclusion: Spinal anaesthesia for elective caesarean section with 2 ml hyperbaric bupivacaine 0.5% can be given in either position, although lateral position is associated with faster onset of block with higher vasopressor requirement

Keywords: Caesarean section, Lateral position, Parturient, Sitting position, Spinal anaesthesia.

Introduction

Spinal anaesthesia has emerged as the technique of choice among regional anaesthesia techniques for routine scheduled caesarean section delivery. It offers fast, profound and symmetrical sensory and motor blockade in patients undergoing caesarean section delivery.[1] Most commonly adopted positions include lateral, sitting and classic oxford position, and so on.[2]

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.[3]

Positions for neuraxial anaesthesia for caesarean delivery have produced conflicting result for speed of onset of block, with faster onset to achieve block to T5 being reported in left lateral position, to no difference in speed of onset of sensory block between the left lateral, oxford and the sitting position.[4,5] Faster onset of block to high level can cause rapid hemodynamic changes and hypotension which can have detrimental effect, especially in parturients with cardiac disease.

The aim of our study was to evaluate the effectiveness of two maternal positions lateral and sitting during

administration of spinal anaesthesia for elective caesarean section. The hypothesis of this study is that there would be a difference in speed of onset of sensory blockade between the sitting and lateral position causing hemodynamic changes in parturients. Primary Objective- To compare the time to achieve T5 blockage in lateral versus sitting position during elective caesarean section under spinal anaesthesia. Secondary Objective: To assess the adverse effect / haemodynamic disturbances, if any.

Materials and Methods

After taking institutional ethical committee clearance (RNT/Stat./IEC2021/456/Dated-04/08/2021), CTRI trial registration prospectively [CTRI/2021/11/037933 Registered on: 10/11/2021] and taking informed written consent from the patients for participation, this prospective single-blind, randomized study was carried out in the Department of Anaesthesiology at obstetric operation theatre at Panna Dhai Zanana hospital attached to RNT Medical College, Udaipur (Rajasthan).

Sample Size

Superiority trial of mean in a parallel group design: Equal allocation.

Formula: Sample size= $\frac{Z\sigma^2[Z_{1-\alpha}+Z_{1-\beta}]^2}{[\mu_T-\mu_{S-\delta}]^2}$

σ =Standard deviation is0.745 minutes as per study done by Ramayyan A et al.[6]

$Z_{1-\alpha}$=1.65 (for one tailed test and 5% α error).

$Z_{1-\beta}$=0.84(for one tailed test and 80% power).

μ_T= Mean in study group (lateral)=2.6 minutes.

$\mu_{S=}$ Mean in study group (sitting)=4.34 minutes.

μ_T-$\mu_{S=}$ Expected mean difference that is 1.74 minutes in previous study.

δ=Superiority limit of the difference in mean that assumed = 2 minutes.

So, after putting values in formula, number needed in each group= 102 in each group.

Inclusion Criteria

This study was carried out in pregnant patients with single term pregnancy, taken up for elective caesarean section under spinal anaesthesia for various indications like previous caesarean section, breech presentation, cephalopelvic disproportion, pregnancy following infertility treatment, cord around neck and non-progression of labour.

Exclusion Criteria

Patient refusal to participate in study, emergency indication of Caesarean Section, patients having contraindication for subarachnoid block, patient having associated systemic illness, history of seizures, coma, neurological signs or symptoms (Eclampsia), any allergy to local anaesthetics or any drug and parturient with extremes of height (<150 or >170cm), with extremes of weight (BMI <20 kg/m^2or > 35kg/m^2, with spinal deformity.

Group Allocation

This study was conducted in a prospective randomised single-blind fashion. All patients undergoing for study were subjected to a detailed pre-anaesthetic examination and routine investigations during this evaluation. Patients who fulfilled inclusion criteria were enrolled in the study. They were divided into two groups on the basis of position during spinal anaesthesia.

Group L(n=102)**:** Parturients who were receiving spinal anaesthesia in lateral position.
Group S(n=102)**:** Parturients who were receive spinal anaesthesia in sitting position.

Pre-anaesthetic evaluation: Demographic data (age, weight, height, BMI), past obstetric/gestational data (gravida, parity, history of abortions, live births), details of present pregnancy (gestational age, any significant history), indication of caesarean section was be recorded. If patient fulfil the inclusion criteria and give the informed written consent, then they were be enrolled for the study. Anaesthesia technique was be explained to the patient prior to administration of spinal anaesthesia.

Spinal Anaesthesia Technique

Elective Caesarean Section, patients were kept fasting as per guideline (American Society of Anesthesiologists).[7] After securing a 20 G peripheral IV cannula, preloading with Ringer lactate 10 ml/kg or 500 ml just before administration of SAB was done in all cases. Standard monitoring including non-invasive blood pressure, pulse oximetry and electrocardiography was be applied. Baseline blood pressure (systolic, diastolic, mean arterial pressure), heart rate and peripheral oxygen saturation on air were recorded. Baseline vitals were taken is average of three reading, 2 minutes apart on OT table then patient was positioned as in left lateral or sitting position as per their group allocation. Back was painted with povidine iodine and spirit, with all aseptic precautions lumbar puncture was performed in L3 – L4 intervertebral space using a 25 Gauge Quincke point spinal needle via midline approach and keeping bevel up. After getting free flow of cerebrospinal fluid, intrathecal 10 mg of 0.5 % bupivacaine injection (hyperbaric) was administered as per group allocation and sterile dressing was applied. Patient was turned supine and a wedge under right hip was placed to provide left lateral tilt to uterus preventing aortocaval compression. End of Spinal Injection was taken as time zero for all the data recording. Oxygen at a rate

of 5 L/minute by Hudson mask was administered. All data was recorded in the proforma.

The sensory block was assessed by pin prick method using a short bevelled 24G needle checked bilaterally in mid-clavicular line and no perception to pin prick was considered as sensory block. Motor block was assessed by using Bromage scale.[8]

0=able to flex hip\knee and ankle (no motor block)
1= able to move knee and ankle, unable to flex hip i.e unable to raise extended legs (partial motor block)
2=able to flex ankle, unable to flex hip\knee (almost complete motor block)
3=unable to move any part of lower limb (complete motor block).

Sensory and motor block was assessing every 2 minutes after SAB. Surgery was allowed to start when sensory block reached up toT6 level and maximum Bromage score of 2 or 3 was achieved. After 10 minutes if still sensory block was below T6 but no pain at surgical site while pinching with tooth forceps along with Bromage score 2 or 3 then surgery was allowed to start in spinal anaesthesia with an aim of supplementing it anytime. If there was pain after 10 minutes of spinal anaesthesia at surgical site and Bromage Score is 0 or 1 then the case was declared as failed spinal and proceeded with conversion in general anaesthesia and was excluded from the study. Time to reach sensory block at T5 level, time to achieve maximum sensory blockage and Bromage score, was recorded. NIBP, HR, and SPO2 was recorded at 2 minutes intervals from giving SAB (time zero) up to 10 min and then at 5min intervals till the end of surgery.

Statistical analysis: Data was entered in MS EXCEL and analysed using SPSS version 20. Categorical data was presented as number (proportion) and compared with chi-square test. Continuous variable was presented as Mean ± SD and compared using t-test $P < 0.05$ was considered statistically significant.

Results

Table 1: Demographic distribution

Demographic data	Group L (n= 102)	Group S (n= 102)	P value
Age (years)	27.49±4.94	28.06±5.07	0.419
Weight (kg)	65.50±6.76	66.48±3.68	0.192
Height (cm)	156.34±4.21	156.55±3.38	0.691
BMI (kg/m^2)	26.43±3.01	26.42±1.86	0.975

*Test used – 't' test, Data expressed in Mean± SD

Table1: Show that two groups were statistically comparable regarding mean age, mean height, mean weight and BMI of patients.

Table 2: Time to achieve T_5 blockage and motor blockage

	Group L (n=102)	Group S (n=102)	P value
Time to achieve T_5 blockage (min.)	5.09±0.88	6.38±0.96	0.000
Motor blockage (Bromage score)	2.92±0.27	2.88±0.38	0.387

Test used – 't' test, Data are expressed as Mean± SD.

Table 2 Shows that time to achieve T5 block in both groups is statistically significant ($p < 0.05$) and comparable motor blockage (p=0.387).

Table 3: Sensory block characteristics

Maximum sensory level	Group L (n=102)	Group S (n=102)	P value
T_2 level	1 (1.0%)	0 (0%)	0.183
T_3 level	5 (4.9%)	10 (9.8%)	
T_4 level	55 (53.9%)	43 (42.2%)	
T_5 level	41 (40.2%)	49 (48.0%)	
Time to achieve T_5 blockage (min.)	5.09±0.88	6.38±0.96	0.000

Pearson Chi-square test and data expressed n (%)

Test used – 't' test, Data are expressed as Mean± SD

Table3 Shows that two groups were statistically comparable regarding maximum sensory level (p=0.183).Time to achieve T5 block in the two groups was statistically significant (p=0.00).

Table 4: Comparison of incidence of hypotension, shivering, bradycardia, vasopressor requirement between 2 groups

Variable	Group L	Group S	P-value*

Incidence of hypotension (%)*	23 (22.5%)	19 (18.6%)	0.479
Incidence of shivering (%)*	5(4.9%)	2(1.9%)	0.650
Incidence of bradycardia (%)*	8 (7.8%)	5 (4.9%)	0.793
Vasopressor requirement (mg)#	8.00±2.34	6.80±2.9	0.001

Test used # 't' test, Data are expressed as Mean± SD
* Chi-square, data are expressed in %

Table 4 shows that two groups were statistically comparable regarding incidence of hypotension (p = 0.479), incidence of shivering (p=0.0.650), incidence of bradycardia (p=0.793), and there was statistically significant difference regarding vasopressor requirement (p=0.001).

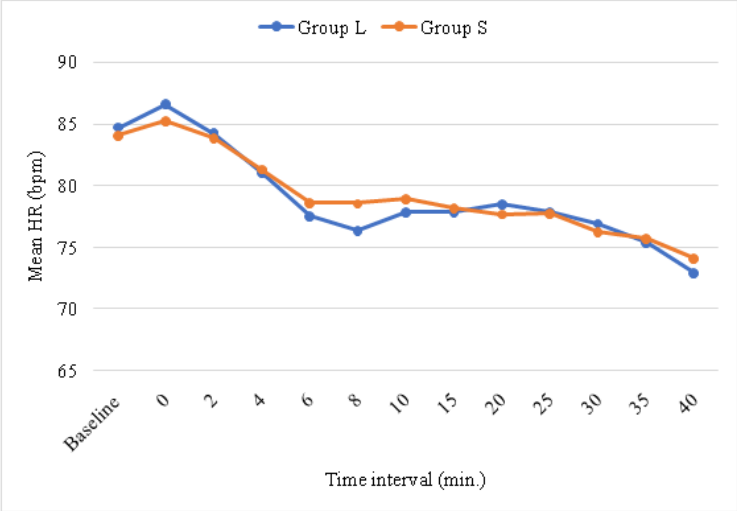

Figure 1: Comparison of mean heart rate between two groups

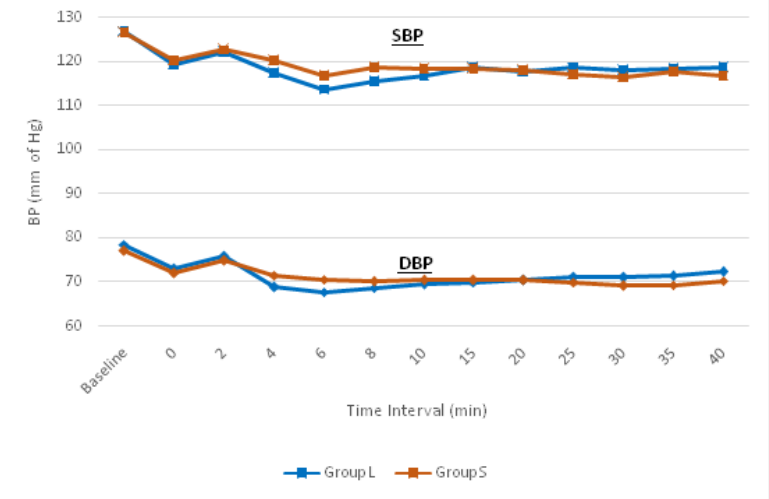

Figure 2: Comparison of Mean Systolic and Diastolic BP between two groups

Discussion

Spinal anaesthesia was preferred technique of regional anaesthesia for elective caesarean section. Spread of local anaesthetic is affected by many factors like intra-abdominal pressure, height of patient, position, curves of vertebral column and body centre gravity which could influence the displacement of CSF and spread of local anaesthetic and subsequently lead to variability of anaesthetic effect.[9,10] Positioning during induction of neuraxial anaesthesia may significantly influenced maternal and foetus physiological condition. Choosing one appropriate position would be beneficial to parturients, anaesthesiologist and obstetrician.[7] In pregnant patient's spinal anaesthesia can perform either in sitting or in lateral position. 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 identification of anatomical landmarks is difficult.[3] Studies investigating effectiveness of position during spinal anaesthesia are limited and conflicting. So, we design this prospective study to evaluate the effectiveness of posture during spinal anaesthesia in caesarean section.

Time to achieve T5 blockage

In present study time to achieve T5 blockage in Group L was 5.09±0.88 min and in Group S was 6.38±0.96 min which was statistically significant (p= 0.00). In present study we used hyperbaric 0.5% bupivacaine 10 mg, in sitting position drug more quickly settle down due to gravity, so associated with delayed onset as compared with lateral position. Our results were coinciding by the previous studies [2,4,6,11] they found that the time to T5 blockage was faster in lateral in compared with sitting position which was statistically significant (p<0.005). Similarly, previous studies [12-15], they found faster onset in lateral Group however, results were statistically comparable.

Maximum sensory blockage

In present study we observed that the maximum sensory blockage (range) in Group L was T3(T2-T5) and in Group S was T4(T3-T5) which was statistically comparable. However, in Group L higher dermatomal achievement due to cephalic spread of drug while positioning. Our results coincides with previous studies[12,14,15] as they found maximum sensory blockage was higher in Group L then Group S. Mohamad et al[16] observed that the maximum sensory blockage in both group was (T4-T5) which was statistically comparable (p=0.23, p=0.35). Kharge ND et al[13] observed that T5 was the maximum sensory level achieved in both group which was statistically comparable. Another study done by Prakash et al.[2] observed that maximum sensory level was significantly higher in Group L (T3-T4) as compared to group S (T3-T5) (P<0.05).

Haemodynamic parameter: In present study blood pressure (SBP, DBP, MBP) lowers in group L then Group S at all the time interval after spinal anaesthesia. In which at 4 min, 6 min, 8 min, attended statistically significant difference with p valve of SBP, (0047, 0.041, 0.042), DBP (0.048, 0.047, 0.048), MAP (0.017, 0.047, 0.015) respectively. Haemodynamic changes in present study were adherence with faster and higher level of sensory blocked in Group L as compared to Group S. Our results were comparable with previous study [16]shows fall in SBP, DBP, MAP at 4 min (p=0.02, p=0.002, p=0.04 respectively) which was statistically significant. Kharge ND et al.[13] shows no statistical difference were observed between both groups in parameter of HR, SBP, DBP, of patients after spinal anaesthesia

Incidence of Hypotension and Vasopressor requirement

The present study demonstrate that incidence of hypotension occurred more in group L(22.5%) then group S(18.6%), this difference was not statistically significant. In the present study we used injection Mephentermine as a rescue vasopressor to treat hypotensive episodes.

We observed that the vasopressor consumption was more 8.00±2.34 mg in Group L then 6.80±2.9 mg in Group S, which was statistically significant (p=0.001) due to more incidence of hypotension in Group L than in Group S. Our finding was coinciding with studies[4,6,12] they also observed significantly higher requirement of vasopressor in lateral group then sitting group. Similarly, studies done by Mohamed et al[16] and Kharge ND et al[13] also concluded that total ephedrine requirement and incidence of hypotension in lateral group was higher than sitting group, but these results were statistically not significant.

Limitations

1. Time to position the patient in either sitting or left lateral position was not calculated.
2. Time to achieve CSF tape after position was not recorded, which may denote easy to perform spinal anaesthesia in either position.

Conclusion

From present study we observed that the time to achieve T5 blockage was statistically faster with higher vasopressor requirement in lateral group as compared to sitting group. Hence, we concluded that, in spinal anaesthesia with 2 ml hyperbaric bupivacaine 0.5% for elective caesarean section, either position can be used, although the lateral position is associated with faster onset of block with higher vasopressor requirement.

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