ORIGINAL RESEARCH

To compare the effects of sitting and left lateral positions of parturients

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ABSTRACT

Aim: To compare the effects of sitting and left lateral positions of parturients. **Material and methods:** Fifty ASA grade -1 patients, who underwent lower segment caesarean section (LSCS), with singleton pregnancy were included in the study. **Results:** At the end of surgery, patients were shifted to recovery room .The level of comfort after surgery was assessed using an 11- point visual analogue scale (VAS 0-10). VAS score for both groups were comparable. Median VAS scores from Group-1 was 0 (0-1) and for Group-2 was 0 (0-3). There was no statistically significant difference (Table -1). Time taken for complete motor recovery was assessed using modified Bromage scale (0-3). Mean time for motor recovery for Group-1 and 2 were (171.9 + 9.74 min) and (180 + 10.83 min respectively. No significant difference was found between the two groups. **Conclusion:** We concluded that left lateral position is better than sitting position for induction of subarachnoid block for parturients undergoing elective caesarean section because of early onset and better intraoperative analgesia than sitting position.

Keywords: Sitting, lateral positions, subarachnoid block

INTRODUCTION

Subarachnoid block (SAB) commonly known as spinal anaesthesia, has evolved as an accepted anaesthetic technique for routine caesarean section. This is by far the most common method of anaesthesia for elective and emergency caesarean sections. The advantages leading to widespread popularity of this technique are relative simplicity of the technique and low failure rate[1-4] rapid onset of profound degree of analgesia and motor blockade providing better operative conditions[1-4] minimal maternal adverse effects if used judiciously[1-4] avoidance of general anaesthesia and its associated complications [1-4] less incidence of fetal and neonatal depression as compared to general anaesthesia[5-9] maintenance of patient's consciousness thereby allowing her to participate in delivery of baby, which is desired by many parturients in recent times[10] cost effective as compared to epidural anaesthesia[11] widely preferred and accepted by most patients.[12] There are several advantages of single-shot spinal anaesthesia. The ability to co-administer analgesics such as opioids allows post-operative analgesia, improving maternal comfort in the post-operative period. Spinal blocks also have the advantage of being more cost effective when compared with epidural anaesthesia. The difference in cost was attributed to the higher complication rate in epidurals and the significantly longer total operating room times for epidural blocks that tend to take a longer time to establish. One obvious disadvantage of spinal anaesthesia is the inability to extend the block if the original block height is deemed to be inadequate or if the surgery takes longer than predicted. It is therefore vital to ensure adequate block before commencing surgery as a failure to do so could result in patient discomfort, conversion to general anaesthesia and possible medico legal implications. A number of authors have investigated the effects of maternal posture during SAB institution for caesarean section[14].Many authors have investigated the effects of right and left lateral positions[13].There are very limited number of studies available comparing sitting and left lateral postures which suggests that placing the spinal needle in subarachnoid space is easier and faster in sitting position, rate of onset of block (sympathetic, sensory, motor) is faster in lateral position leading to higher incidence of hypotension in lateral group as compared to sitting position. Most of these studies have been conducted among western population while there is no relevant study in literature carried out with Indian maternal population. Hence, we planned to study the effects of sitting and left lateral positions on

the various characteristics of subarachnoid block in our parturient population undergoing caesarean section.

MATERIALS AND METHODS

This study was conducted in Department of Anesthesiology and Obstetrics of Patna Medical College Hospital, Patna.

Fifty ASA grade -1 patients, who underwent lower segment caesarean section (LSCS), with singleton pregnancy were included in the study.

EXCLUSION CRITERIA

Patient's refusal; any contraindication for regional anesthesia; pregnancy-induced hypertension (PIH); Weight more than 100 kgs; height either above 165cms or below 150cms and any evidence of fetal compromise.

Parturients were randomly assigned to either of the groups after obtaining informed consent. Randomization was done using a computer generated random number.

Group 1: Subarachnoid block induced in sitting posture

Group2: Subarachnoid block induced in left lateral posture.

METHODOLOGY

PRE- OPERATIVE PREPARATION

The parturients, scheduled for elective LSCS, were advised to fast and not allowed solid food for at least eight hours prior to surgery. They were allowed to take clear fluids up to 4 hours before the operation. The parturients were premedicated with oral Ranitidine 150 mg the night before and on the day of surgery (1 hour prior to induction of subarachnoid block), inj metoclopramide 10mg IV slowly one hour before surgery and 30 ml of 0.3M Sodium Citrate, within one hour of induction of subarachnoid anesthesia.

In the operating room all parturients were monitored for non- invasive blood pressure (NIBP), heart rate (HR), ECG, and pulse oximetry. Baseline BP and HR were recorded before positioning the patients for subarachnoid block. All parturients were preloaded with 1000 ml of lactated Ringer's solution just before subarachnoid block.

Following pre-loading parturients were placed in their respective positions. Under strict asepsis, after cleaning and draping, a 25G Quincke type spinal needle was inserted into L2-3 interspace, using midline approach, to locate the subarachnoid space .The time lapse from skin puncture to appearance of cerebrospinal fluid (CSF) at the hub of spinal needle was taken as time taken to locate the subarachnoid space. Once a free flow of CSF was obtained, hyperbaric bupivacaine 0.5%, 2.2 ml, was injected into subarachnoid space. After induction of subarachnoid block parturients were immediately placed in modified supine posture maintaining a left lateral tilt (approx 20 degress) using a wedge under the right hip. Following induction of subarachnoid block the same person who had instituted the block made assessment of the height of block. This assessment was made every 2 minutes until sensory level of the block had reached T6 dermatome level. The level of block was assessed for pain, temperature and pressure sensation using pinprick, spirit swab and blunt end of needle respectively. Once the height of the block had reached T6 dermatome level, assessment was made after every 10 minutes. The dermatomal level, where sensory anesthesia had been stationary for more than 10 minutes, was recorded as maximum height of the block.

After induction of subarachnoid block, HR and BP were monitored every 3 minutes for the first fifteen minutes, and at intervals of five minutes thereafter, till half an hour i.e 30 mins. Any fall in systolic BP, either below 100mmHg or from 20% of the baseline level and complaints of nausea, giddiness were treated with rapid infusion of crystalloids (lactated Ringer's solution) titrated to effect and IV increments of Mephentermine 3mg. The time interval from the induction of subarachnoid block to in first dose of vasopressor agent was noted. The total dose of vasopressor required to maintain normotension (systolic BP either above 100mmHg or within 20% of the baseline value) was also noted.

A continuous verbal contact was maintained with the patients throughout the surgery .Any complaint of intraoperative discomfort like pain at incision site, or during handling of the uterus or retrosternal discomfort was noted and graded as mild, moderate and severe. The discomfort, depending on the severity, was initially treated with either reassurance of the patient or 50% nitrous oxide in oxygen. All patients were observed for complications, like nausea, vomiting giddiness, dyspnea and high block. All the parturients were given oxygen, throughout the surgery with face-mask at a flow rate of 2 liters per minute. Duration of surgery and amount of IV fluids infused intaoperatively were recorded.

After conclusion of the surgery, patients were shifted to recovery room. The comfort of the patients after surgery was assessed using an 11- point visual analogue scale (VAS 0-10). Assessment of the motor blockade was made using Modified Bromage Scale (MBG) (0-3) till patients achieved score of 0; 0-no motor blockade , 1 – unable to flex hip, 2-unable to flex knee, 3-unable to planterflex ankle. The time from induction of subarachnoid block to achievement of MBG score of 0 was taken as time for complete motor recovery.

Post operative pain relief consisted of diclofenac 75 mg IM 8 hourly and pentazocine 10 mg IV (in incremental doses), whenever required. All patients were examined and interviewed everyday till 72 hours after surgery to note the occurrence of post-dural puncture headache (PDPH). A diagnosis of PDPH was made only if following criteria were fulfilled:- a)the headache occurred typically after the patient became

ambulatory and was aggravated in the erect or sitting position, and was relieved by lying down; b) the localization was mostly occipital or frontal; and c) the headache was accompanied by dizziness, vomiting, rigidity of the neck and visual or auditory disturbances. Patients suffering from PDPH were treated with simple analgesics, bed rest, plenty of oral or IV fluids, and antiemetics.

STATISTICS ANALYSIS

Descriptive statistics of each variable were obtained and subjected to statistical analysis. "Two sample t-test" will be applied to the continuous variables (Demographic data; SAB characteristics; haemodynamic parameters and vasopressor and IV fluid requirement) of the two groups. Pearson Chi-Square test with Fischer exact continuity was employed, wherever applicable to categorical variables (intra-operative analgesic supplementation, complications).

RESULTS

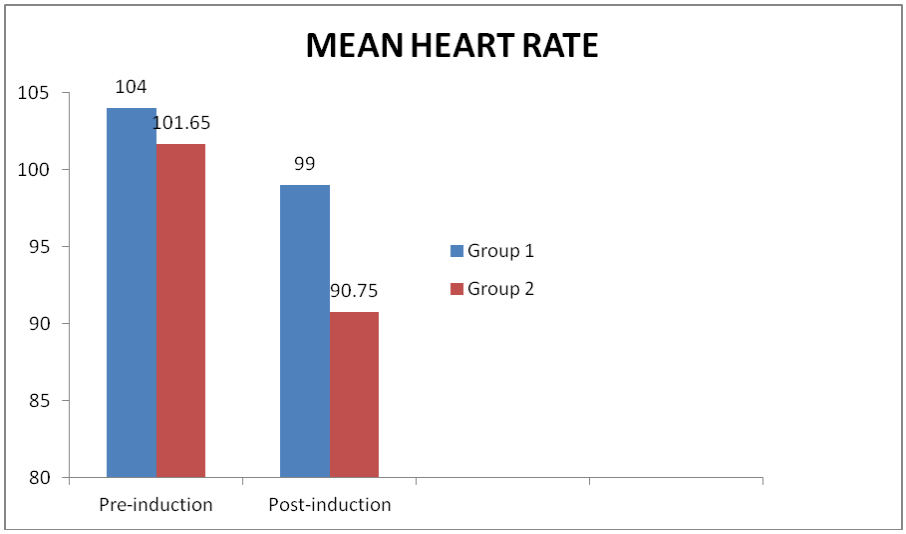
PREOPERATIVE

Demographic data in terms of age, weight and height were compared in both the groups. Mean age of parturients in Group-1 and 2 were 27.25 + 4.75 yr. 27.6 + 4.72 yr. respectively. Their weights in group-1 and 2 were 61.25+ 5.55 kg and 62.15+5.46 kg respectively. Their mean height was 155.85+ 3.51 cm in group-1 and 156.25 + 2.91 cm in group-2. There was no statistically significant difference between the demographic data of the two groups.

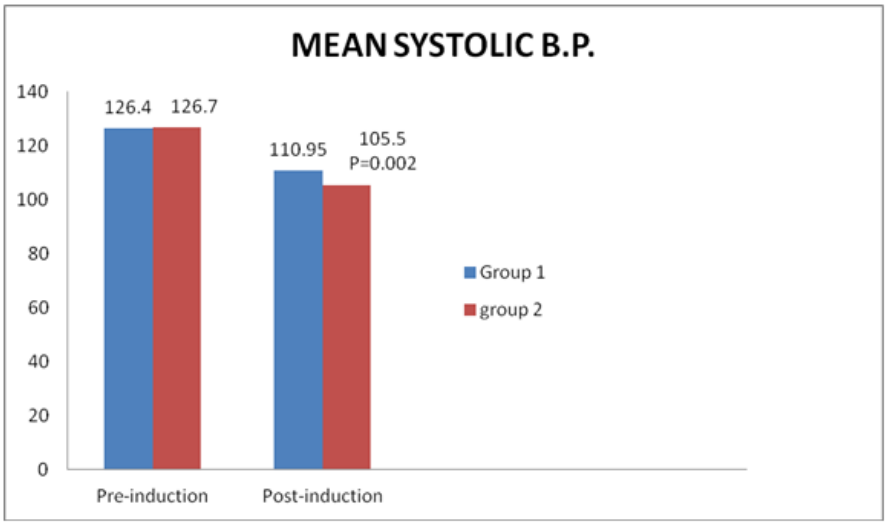
PRE INDUCTION HAEMODYNAMIC PARAMETERS

Baseline HR an NIBP were recorded before positioning the parturient for subarachnoid block induction. In group-1, mean HR and BP were 99.0 + 8.32 per min and 110.95 + 5.463 (SBP), 65.5 + 7.20 (DBP) mmHg respectively. In group-2 parturients had a mean HR and BP of 90.75 + 6.008 per minute and 105.5 + 4.78(SBP), 65.15 + 4.82 (DBP) respectively. There was no significant difference in haemodynamic parameters of the two groups.

Graph 1: Mean HR



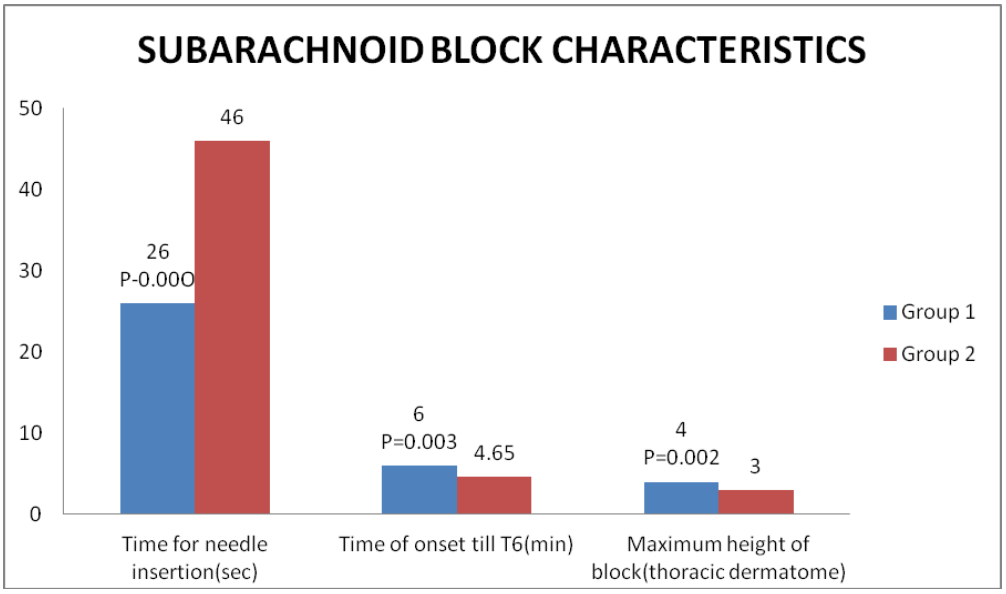
Graph 2: Mean systolic blood pressure



INTRAOPERATIVE

Subarachnoid block was instituted either in sitting or left lateral position. Time taken to place the spinal needle in subarachnoid space was the time taken from the skin puncture till CSF was observed at the hub of needle. The mean time for group 1 was 26.00 + 9.67 and 46.00 + 16.82 seconds for group 2. This difference between the two groups was statistically significant p value (0.000). After obtaining a free flow of CSF through spinal needle, 2.2 ml of 0.5% hyperbaric bupivacaine was injected and patient was turned supine immediately, maintaining a left lateral tilt of 20- degree using a wedge under their right hip. Ascent of block was assessed at intervals of 2 minutes till it had reached T6 dermatomal level. Mean time taken to reach T6 level was 6.00 +1.55 minutes in group-1 and 4.65 +1.08 minutes in group 2. The difference in the time taken for sensory anesthetic level to reach T6 dermatome was observed to be statistically significant (p- value 0.003). The dermatomal level where block remained static for at least 10 minutes was recorded as maximum height of block. Median maximum levels were T4 (T3-T7) and T3 (T3-T5) for group 1 and 2 respectively. This was also statistically significant (p-value: 0.002).

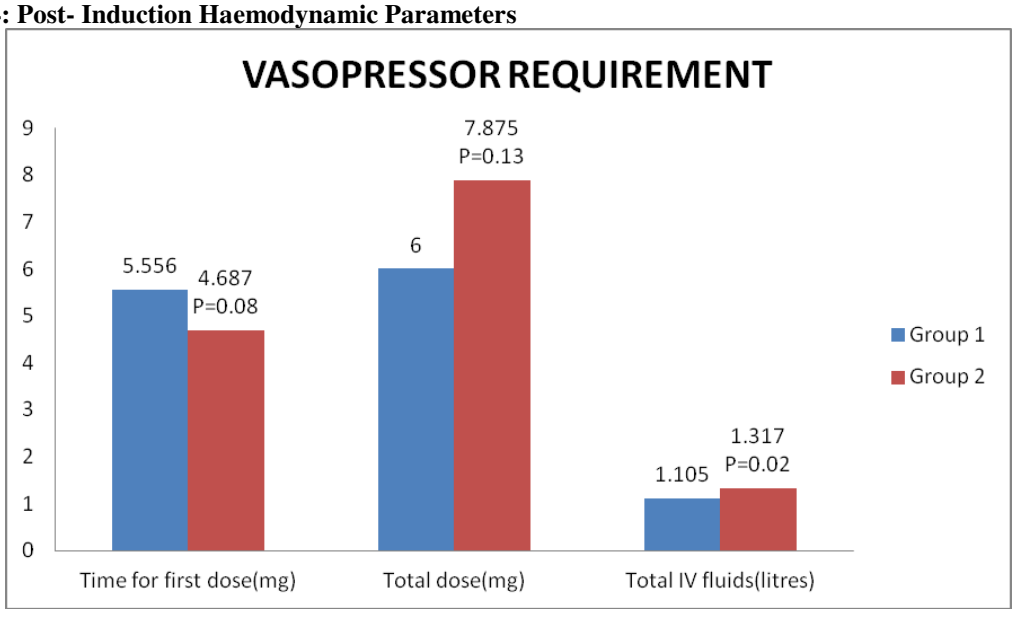
Graph 3: Subarachnoid Block Characteristics



POST- INDUCTION HAEMODYNAMIC PARAMETERS

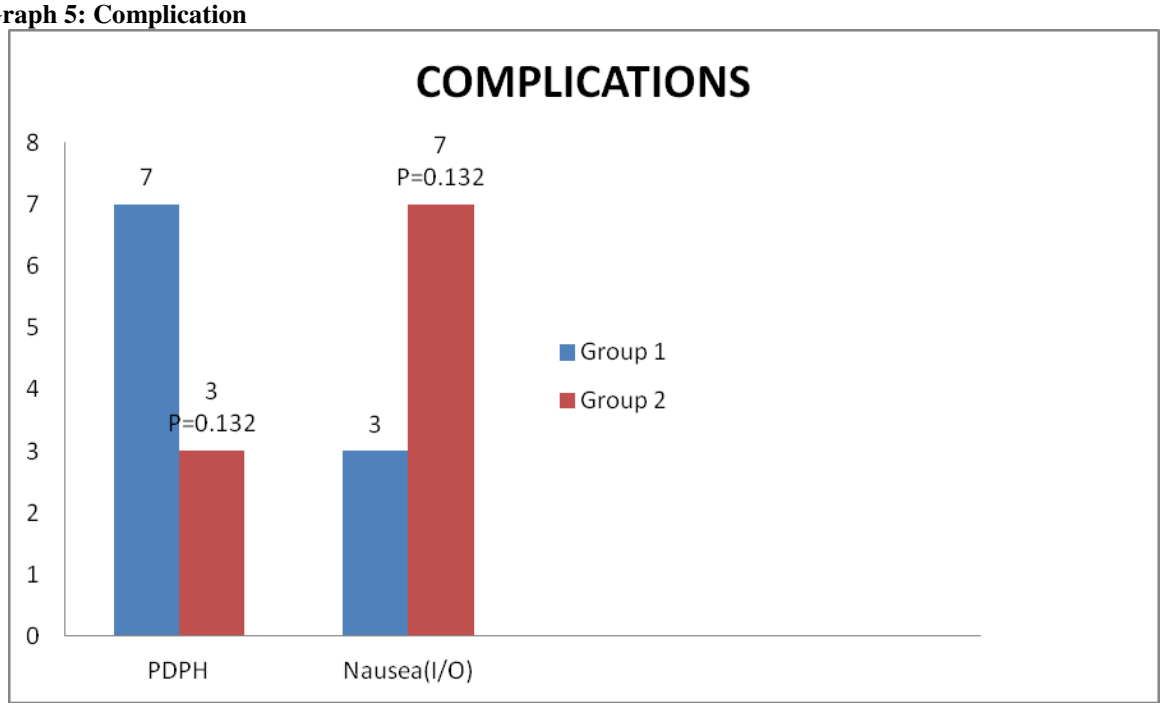
HR and NIBP of the patients were continuously monitored after subarachnoid injection of hyperbaric bupivacaine. Mean values of HR and SBP during first 10 minutes after subarachnoid injection were Group-1: 99+8.32; Group-2: 90.75+6.00 per min. and Group-1: 110.95+5.46; Group-2: 105.50+4.785 mmHg respectively. The difference was found to be statistically significant (p- value<0.05).

Graph 4: Post- Induction Haemodynamic Parameters



Mephentermine 3 mg IV increments were given if systolic blood pressure fell either below 100 mmHg or 20% from the baseline values, to maintain the normotension. The time lapse between subarachnoid block institution and first injection of vasopressor and the total amount of vasopressor required to maintain the normotension, was recorded. Mean time interval for first dose of vasopressor was 4.68 + 1.19 for sitting group and 5.55 + 1.13 minutes for left lateral group. Total dose requirement in group-1 and group-2 were 6.00 + 2.59 and 7.87 + 3.07 mg respectively. There was no statistically significant difference between these two parameters. The amount of IV fluids infused in left lateral and sitting positions was 1317.00 + 206.01 and 1105.26 + 199.23 ml respectively (p-value : 0.002). This difference was statistically significant.

Graph 5: Complication



DURATION OF SURGERY

Mean duration of surgery in Group-1 and 2 were 68.78 + 6.99 and 71.5 + 7.69 minutes respectively (p value: 0.258). There was no statistically significant difference found in duration of surgery.

INTRAOPERATIVE COMPLICATIONS

Ten patients had nausea of which seven patients were in left lateral and three were in sitting group. Comparison of the incidence of nausea in the two groups revealed no statistically significant difference (p-value: 0.132). No other complications were observed during intraoperative period.

POSTOPERATIVE

At the end of surgery, patients were shifted to recovery room .The level of comfort after surgery was assessed using an 11- point visual analogue scale (VAS 0-10). VAS score for both groups were comparable. Median VAS scores from Group-1 was 0 (0-1) and for Group-2 was 0 (0-3). There was no statistically significant difference (Table -1). Time taken for complete motor recovery was assessed using modified Bromage scale (0-3). Mean time for motor recovery for Group-1 and 2 were (171.9 + 9.74 min) and (180 + 10.83 min respectively. No significant difference was found between the two groups.

Table-1: Post operative parameters

N= 50	Group 1 (N=25)	Group 2 (N=25)	P- VALUE
Duration ofSurgery (min)	68.78 + 6.99	71.50 + 7.69	0.25
Time Taken For Motor Recovery (min)	171.9 + 9.74	180 + 10.83	0.32
Vas Score (0-10)	0	1.5	0.07

DISCUSSION

We conducted this study to evaluate the various subarachnoid block characteristics like, time taken for spinal needle insertion in subarachnoid space; time taken to reach T6 dermatomal level; maximum height of block, incidence of hypotension and vasopressor requirement; patient's satisfaction; and incidence of complications after subarachnoid block with a single injection of 2.2 ml of 0.5% hyperbaric bupivacaine in sitting and left lateral positions.

Table 2: Time taken to locate subarachnoid space

	Our study	Inglis et al[18]
Sitting	26 sec	115 sec
Lateral	46 sec	240 sec

We observed that identification of subarachnoid space was easier and faster in sitting position, as depicted by a significantly shorter time taken for spinal needle insertion in sitting group as compared to left lateral group (Mean times- sitting: 26 s; left lateral: 46s; p value: 0.000) which may be attributed to a better identification of anatomical landmarks of vertebral column in this position as compared to left lateral position[4]. This finding of our study corroborates the observation of Inglis et al who had compared the sitting and right lateral positions for induction of spinal anesthesia, with 2.5 ml of 0.5% hyperbaric bupivacaine, for caesarean section[18]. However, in their study the time taken for spinal needle insertion was relatively longer (sitting group: 115s; right lateral: 240s) as compared to our study, in both the positions (Table 2). This may be due to differences in the technique of spinal needle insertion and definition of insertion time. Ingles et al used a 24G Sprotte type of needle and they inserted it in the subarachnoid space through an introducer. Moreover, they defined spinal needle insertion time as time interval from the insertion of the introducer to withdrawal of the spinal needle whereas we measured it from the time of skin puncture to appearance of CSF at the hub of needle.

Table 3: Time of onset of block till T6

	Our study	Inglis et al[18]
Sitting	6 min	10 min
Lateral	4.6 min	8 min

Although, in left lateral position, a longer time was taken for needle insertion, the onset of block to T6 dermatomal level was significantly faster in this group as compared to sitting group (left lateral: 4.6 min; sitting: 6.0 min; p value: 0.003). This difference was statistically significant. Inglis et al observed similar results in their study[18] (Table 3). According to them, time taken for ascent of block to T6 dermatomal level in right lateral group was significantly less as compared to sitting group but times for ascent to T4 and T5 dermatomal level were comparable for two groups. A possible explanation of the above findings is that injection of local anesthetic at the L2-3 space deposits the drug at the cephalic end of the lumbar curvature, as the peak of the lumbar curvature is at the L3 space[17]. If, therefore, injection is made at the L2-3 space with the parturient in the left lateral position, the hyperbaric solution will gravitate around the L2-3 interspace on the dependent side. When the parturient is turned to supine position, the local anesthetic will be pooled mainly around the peak and the cephalic portion of the lumbar curvature. The hyperbaric solution at the peak will then move in both cephalic and caudal directions under the influence of gravity. However, there will be greater flow in the cephalic direction as the bulk of the solution will be in the cephalic portion of the lumbar curvature. Moreover, in lateral position vertebral column is tilted towards the head-end, due to larger size of buttocks as compared to shoulders in women, facilitating the cephalad spread of hyperbaric local an anesthetic solution[4].

Table 4: Maximum height of block

	Our study	Inglis[18]	Bembridge[16]
Sitting	T4	T4	T4
Lateral	T3	T4	T4

Highest level of block achieved was also significantly higher in the left lateral group [median maximum height of sensory block- lateral group: T3 (T3 – T5); Sitting group: T4 (T3-T7); p value: 0.002], even though the difference between the two groups was of only one dermatome. This is in contrast to findings of A. Inglis and co- workers, that although the spread of block was initially faster in right lateral group yet maximum height of block was similar in both groups[18]. Bembridge et al, who had compared sitting and left lateral posture using 5% hyperbaric lignocaine, also observed that lateral group had significantly faster onset of block to T6 dermatomal level but maximum height of block was not significantly different for the two positions[16](Table 4).

Table 5: Intra-operative analgesic supplementation

	Our study	Inglis [18]
Sitting	20%	35%
Lateral	8%	35%

Despite achieving maximum level of block to T4 in sitting group, anaesthesia was not adequate for caesarean section. Five patients in sitting group, as compared to two patients in the left lateral group, required intra- operative analgesic supplementation of spinal anaesthesia with 50% nitrous oxide in oxygen, even though none of our patients required general anaesthesia for completion of surgery. This difference was not statistically significant. In a study by lnglis et al, a total number of 14 patients required intra operative supplementation of the block (right lateral: 7; sitting: 7), a number higher as compared to our study[18] (Table 5). This was quite surprising as they had used a higher dose of 0.5% hyperbaric bupivacaine as compared to our study (2.5 ml vs 2.2) The most probable reasons for this difference in intra-operative supplementation may be because of two reasons- 1) The difference In physical characteristics of India and western population, western population being taller resulting in increased length of effective subarachnoid space and 2) the use of Sprotte needle in their study. Compared to other spinal needles, the hole in the side of the Sprotte is much further back from the tip and which is also long. So that, the distal end can reach the CSF, yet the proximal end may still remain in the epidural or subdural space. Any injection of local anaesthetic will distribute itself between various spaces(e.g. epidural, subarachnoid and possibly subdural) traversed by the opening in the needle according to the relative pressure gradients thus leading to injection in inadequate dose of local anaesthetic into subarachnoid space and hence resulted to failed or poor spinal anaesthesia. In this clinical trial, seven patients (14% of total) required analgesic supplementation for completion of surgery,[sitting group: 5 (20%); left lateral 2(8%); p value: 0.117]. Even though this difference is not statistically significant we consider it to be clinically significant, as 20% of the patients in sitting group required supplementation which is itself very high. If a larger clinical trial is conducted, this difference may become statistically significant. Few studies conducted earlier, have also shown the same results[17-18]. Visual analogue scores were also comparable between the two groups taken immediately after surgery [Median VAS Score: sitting 0 (0-3); left lateral 0 (0-1);p value: 0.079].

The incidence of hypotension was much higher in our trial as compared to a study by Patel et al (67% vs 37%)[17]. The possible reasons for this difference may be, as no vasopressor prophylaxis was given to patients in our study to maintain normotension; a higher dose of hyperbaric bupivacaine was used in our as compared to trial of Patel and co- workers (2.2 ml vs 2.0 ml); Moreover, 20% of the patients in study of Patel et al had an inadequate block as compared to 14% in our study which suggests lesser degree of sympathetic blockade and hence lesser incidence of hypotension. They observed that patients in left lateral group had a higher incidence of hypotension as compared to sitting group, which is in conformity with our results. lnglis et al observed no significant difference in the incidence of hypotension between the two group[19]. In contrast, a recent study, by Yun et al, has shown that though incidence of hypotension was similar in lateral and sitting groups yet severity of hypotension was significantly greater in sitting group[20]. No explanation was given for this observation. Yun et al compared effect of maternal posture on injection of combined spinal – epidural anesthesia using 0.75% hyperbaric bupivacaine 12 mg with fentanyl 10mcg.

During intra- operative period, 20% of the patients (left lateral: 28%; sitting: 12%; p value: 0.132) complained of nausea which was mild in nature and subsided with use of vasopressor and antiemetics. This is in conformity with previous studies which demonstrated that maternal nausea and vomiting were significantly reduced if hypotension was avoided with use of ephedrine. The difference in nausea, between the two groups, was not statistically significant.

Yun et al observed 50% incidence of nausea in both groups which was quite high as compared to our study (20%)[20]. Patel et al noticed 40% incidence of nausea and it was significantly higher in left lateral group as compared to sitting group in conformity with our study[17]. The higher incidence of nausea, in left lateral group in our study, can be explained on the basis of a higher level of block achieved in this position leading to gastro-intestinal hyperperistalsis due to unopposed vagal activity and hypotension- related cerebral hypoxia.

Post- dural puncture headache is frequently seen in obstetric patients after spinal anaesthesia[2]. Its incidence varies from 6-16% in obstetric population[21]. The total incidence of PDPH was 20% in our study group which is higher as compared to few studies[16,17]. This incidence was even greater in sitting group, though not statistically significant (sitting:28%; left lateral: 12%; p value: 0.132). We attribute this high incidence of PDPH in our study to the gauge and type of the needle (25-gauge; Quincke) used in our trial as demonstrated by few clinical investigations done earlier[22-25] (Table 6).

Table 6: Incidence of PDPH after spinal anesthesia

Our study	Sitting- 28% Left lateral- 12%
Naulty etal[21]	Lidocaine glucose group- 9.54%Bupivacaine glucose- 7.64% Tetracaine-procaine- 5.85%
Hafer et al[22]	Overall incidence- 9.4% -Highest with 26G Quincke type (17.6%) when compared to

	27GQuincke, 26G Atraucan & 27G Whitacre needles -Recumbancy group- 9.4% -Early ambulatory group- 8.8%
Lambert etal[23]	25G whitacre-1.2%26G Quincke- 5.2% 27G Quincke- 2.7%
Cesarini etal [24]	25G diamond tipped needle- 14.5% 24G Sprotte needle- nil
Mayer etal [25]	27G Quincke-3.5% 24G Sprotte-0.7% Overall incidence- 2%

CONCLUSION

We concluded that left lateral position is better than sitting position for induction of subarachnoid block for parturients undergoing elective caesarean section because of early onset and better intraoperative analgesia than sitting position. Hence we recommend induction of subarachnoid block in left lateral position for elective caesarean section patients.

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