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Original Article

Anaesthesia Section

Sitting against Lateral Position for Spinal Anaesthesia in Elderly Patients Undergoing Lower Limb Surgeries: An Observational Study

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ABSTRACT

Introduction: Age-related degenerative anatomical changes may make the spinal anaesthesia difficult. Sitting position is preferable due to easy identification of landmarks whereas lateral position is easy to maintain in case of elderly premedicated patients.

Aim: To compare the effects of spinal anaesthesia position (sitting versus lateral) in the elderly patients on block characteristics (sensory and motor), haemodynamic parameters, patient's comfort and satisfaction.

Materials and Methods: The present prospective observational study was conducted in the Department of Anaesthesiology and Intensive care, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab, India, from November 2021 to May 2022. A total of 116 American Society of Anaesthesiologists (ASA) grade I-II patients of both sexes, age more than 70 years undergoing lower limb surgeries under spinal anaesthesia either sitting or lateral position were included in the study. These patients were divided in to two groups (sitting position-Group SP, lateral position-Group LP). Hyperbaric bupivacaine (0.5%) was injected into the subarachnoid space. After the spinal injection, assessments were made for block characteristics (sensory and motor), haemodynamic parameters and patient's comfort and satisfaction. The discrete and categorical variables were analysed using Chi-square test.

Results: The mean age of participants in group SP and group LP was 77.31±4.015 years and 76.69±4.901 years, respectively. Onset of sensory block after was significantly slower in group SP (75.31±10.384 seconds) as compared to group LP (64.23±7.758 seconds). Time required to achieve maximum level of sensory block was significantly higher in group SP (8.11±1.416 minutes) than group LP (6.67±1.324 minutes). There was no significant difference in Heart Rate (HR) in both groups, but there was significantly lower Systolic Blood Pressure (SBP) in group SP than group LP upto 12 minutes after spinal injection. However, the lateral position appears to be more comfortable for elderly patients as per the comfort score.

Conclusion: Position for spinal anaesthesia, either sitting or lateral, has insignificant effects on block characteristics or on haemodynamic parameters except there was faster onset of sensory and motor block and more comfort in lateral position.

Keywords: Block characteristics, Haemodynamic parameters, Hyperbaric bupivacaine, Patient's satisfaction

INTRODUCTION

Subarachnoid Block (SAB) is the preferred modality of anaesthesia because of its profound analgesic and muscle relaxation effects for surgical procedures below umbilicus. It has got added advantage of decreased operative blood loss, decreased pain mediated stress response to surgery and minimal systemic effects, if executed cautiously. Postoperative complications are also minimal. It maintains consciousness and it is by far the best safeguard against airway obstruction and/or pulmonary aspiration and also known to protect against deep vein thrombosis [1]. General anaesthesia is associated with problems like polypharmacy, airway manipulation and respiratory complications (intraoperatively and postoperatively) and cognitive dysfunction. As there is increase in number of surgeries (lower limb, lower abdominal, pelvic and urological surgeries) in elderly patients, spinal anaesthesia is preferable in elderly patients due to its benefits [2,3].

Both sitting and lateral decubitus position can be used for spinal anaesthesia [4]. There is always long debate that which position is better for a spinal anaesthesia [5]. Position of spinal anaesthesia (sitting or lateral position) has its own advantages and disadvantages [6]. Age-related degenerative anatomical changes results in technically difficult spinal anaesthesia [4]. Sitting position is preferable in elderly patients due to easy identification of bony landmarks of spine but gravity induced peripheral pooling of blood due to sympathetic blockade after spinal anaesthesia results in significant hypotension in the sitting position as compared to lateral position. As compared to sitting position, lateral position is easy to maintain in case of elderly premedicated patients [4,7].

In current practice there is no as such standardisation in the patient's position during the initiation of spinal anaesthesia. There is conflicting evidence regarding effect of spinal position on quality of sensory and motor nerve blockade and haemodynamic parameters in elderly patients and it has not been studied extensively, so more studies are required [4,7,8].

The aim of this study was to compare patient's comfort and satisfaction level, quality of sensory and motor nerve blockade and haemodynamic effects of inducing spinal anaesthesia in lateral or sitting position.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Anaesthesiology and Intensive care, Adesh Institute of Medical Science and Research, Bathinda, Punjab, India, from November 2021 to May 2022. Ethical approval was obtained from Institutional Ethical Committee, (AU/EC/PH/2K21/45) and clinical trial registry of India (CTRI/2021/11/037722). Written informed consent was obtained from patients during the preanaesthetic evaluation.

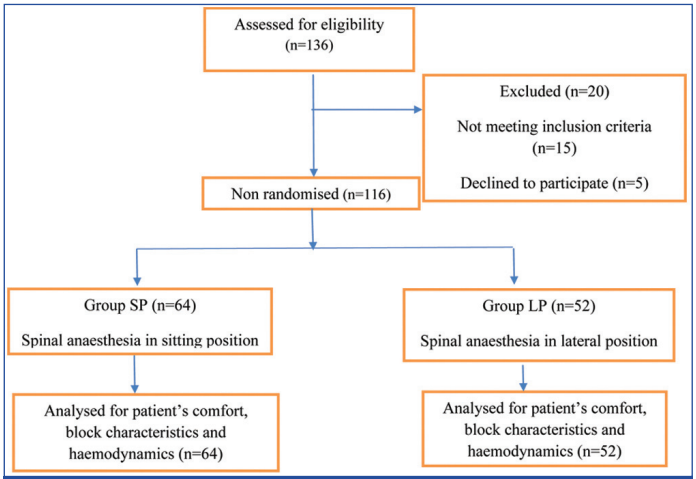
Inclusion criteria: A total of 116 American Society of Anaesthesiologists (ASA) grade I-II patients of both sexes, age range between 70-95 years, weight between 40-70 kg, height between 140-180 cm undergoing lower limb surgeries of expected duration less than 120 minutes under spinal anaesthesia either sitting or lateral position were included in the study.

Exclusion criteria: Patients refusing to give consent, history of hypersensitivity to local anaesthetic, history of neurological disorder, major systemic diseases like liver and cardiovascular disease, coagulopathy or bleeding disorders, patients on anticoagulant therapy, anatomical deformities (spinal congenital anomalies, acquired scoliosis, post-traumatic, postlaminectomy), any haemodynamic instability, patients at risk of developing sepsis, bacterial wound infection were excluded from the study.

Total 136 patients were assessed for eligibility, out of which 20 were excluded (15 patients did not meet the inclusion criteria and 5 patients declined to participate in the study) and rest of the 116 patients divided into two groups:

- Group SP: Patients who were administered spinal anaesthesia in sitting position
- Group LP: Patients who were administered spinal anaesthesia in lateral position

Sample size calculation: To calculate the required sample size the result of previous studies were considered [7]. The formula for hypothesis of two parallel sample means was used to calculate the sample size. Sample size was found 70 (35 patients in each group) with 80% power to detect a mean difference of 1 with 5% level of significance. To cover up for the probable attritions atleast 50 patients were planned to be enrolled in each group [Table/Fig-1].



[Table/Fig-1]: CONSORT diagram.

Study Procedure

All the patients were examined a day before surgery. A detailed preanaesthetic check-up was done. Spine was examined. The protocol and study purpose was explained well to patients in the language they understand and informed written consent was obtained. Patients were given tablet pantaprazole 40 mg on the same day of surgery. Patient was kept Nil By Mouth (NBM) for six hours before surgery, while no premedications were used.

Standard ASA monitors were attached. All equipment and drugs necessary for resuscitation and general anaesthesia were kept ready. Baseline Heart Rate (HR), Oxygen Saturation (SpO_2), and Blood Pressure (BP) were recorded. A wide bore i.v. access was established and in the operating room the patients received preloading of 10 mL/kg of Intravenous (i.v.) ringer lactate solution 15 minutes before the administration of spinal anaesthesia.

For sitting position, the patients were made to sit up from supine position with the legs on the operating table and knees were maximally extended. For lateral position, the patients were made to lie in lateral position on the operating table with the knees and hips in flexion. Position of the table was kept horizontal. Under all aseptic precautions spinal anaesthesia was performed with the patient either in sitting or lateral position at L3-L4 or L4-L5 level via midline approach using a 26 gauge Quincke's spinal needle. After clear and free flow of cerebrospinal fluid 15 mg hyperbaric bupivacaine (0.5%) 3 mL was injected with the speed of 0.5 mL/second with the bevel of the needle facing cephalad. The patients were then placed in supine position.

After the spinal injection, patients were assessed every three minutes for the first 15 minutes, then every five minutes for the following 30 minutes for height of sensory and motor blocks, heart rate, Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and mean arterial pressures and SpO_2.

Sensory level was determined by pinprick method using 22 guage hypodermic needle. Sensations of pinprick were tested every 10 seconds from time '0' that was injection of drug in subarachnoid space. The sensory block onset was defined as the interval from injecting spinal drug in subarachnoid space ('0' time) to the loss of pinprick sensation at the knee joint (L_1). Assessment of height of sensory block was done. Maximum sensory block level was tested by pinprick in midclavicular line every minute until the level had stabilised for two consecutive tests. Time required to achieve maximum sensory block level was also assessed.

The onset of motor block was defined as the time taken from injecting spinal drug in subarachnoid space ('0' time) to the time when patient was able to flex the knee and ankle but unable to lift the extended leg. This was tested every 10 seconds upto the onset. Degree of motor block was assessed using a 4-point Bromage score {0- (no motor block) full flexion of knees and feet, 1-(partial) just able to move knees and feet; hip blocked; 2-(almost complete) able to move feet only; hip and knee blocked; 3-(complete) unable to move knees and feet; hip, knee and ankle blocked}

Hypotension was defined as a decrease in SBP of more than 25% of baseline value. Hypotension was treated with leg elevation, pushing i.v. fluids (200 mL bolus of normal saline over 10 minutes) and injection mephenteramine 3 mg i.v. and repeated every three minutes until fall in SBP was less than 25% of the baseline value. Bradycardia was defined as a decrease in heart rate below 25% of the baseline heart rate, which was treated by giving injection atropine 0.6 mg intravenously. Injection ondansetron 4 mg i.v. was given for nausea and vomiting.

At the end of surgery, the patients were asked about their comfort level and satisfaction for spinal anaesthesia position using a three point scale was used (0=Not comfortable, 1=Comfortable, and 2=Very comfortable).

STATISTICAL ANALYSIS

All the data were recorded in Microsoft excel sheet and analysed using Microsoft excel software. Results were expressed as percentage or mean±Standard Deviation (SD). The discrete and categorical variables were analysed using Chi-square test. Continuous variables were analysed using unpaired t-test. The p-value less than 0.05 was considered statistically significant.

RESULTS

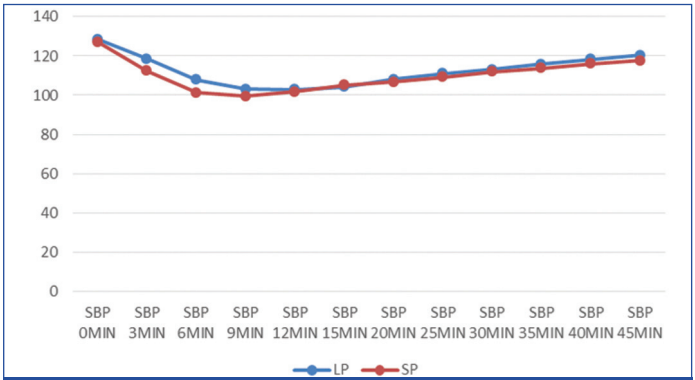
In the present study, 116 patients (Group SP- 64 patients, Group LP- 52 patients) were enrolled and finally analysed. Both the study group patients were comparable with respect to demographic data [Table/Fig-2].

Baseline values of HR and SBP were comparable in both groups. There was no intergroup significant difference in HR after spinal anaesthesia. There was decrease in SBP in both groups but significantly lower SBP in group SP than group LP upto 12 minutes after spinal injection [Table/Fig-3] (p-value <0.001). Onset of sensory block after spinal anaesthesia was significantly slower in group SP.

Variables	Group SP (n=64) (Mean±SD)	Group LP (n=52) (Mean±SD)	p-value
Age (years)	77.31±4.015	76.69±4.901	0.455
Height (cm)	161.61±10.018	161.15±8.428	0.794
Weight (kg)	61.33±7.279	59.88±6.975	0.281
ASA grade I/II	18/46	10/42	0.266

[Table/Fig-2]: Demographic data of both the study groups.
SD: Standard deviation; ASA: American society of anaesthesiologists

Time required to achieve maximum level of sensory block was significantly higher in group SP than group LP [Table/Fig-4]. In the present study, maximum level of sensory block ranged between T_6-T_{10}. The level was comparable in both the groups. However, these differences were statistically not significant.



[Table/Fig-3]: Comparison of systolic blood pressure at various intervals.

Parameters	Group	Mean±SD	t	df	p-value
Sensory block onset (seconds)	Group SP	75.31±10.384	6.573	113.26	<0.001*
	Group LP	64.23±7.758			
Time req. for max. level (minutes)	Group SP	8.11±1.416	5.593	114	<0.001*
	Group LP	6.67±1.324			
Motor block onset (seconds)	Group SP	77.03±11.364	5.923	114	<0.001*
	Group LP	64.42±11.447			

[Table/Fig-4]: Sensory and motor block.
SD: Standard deviation; *p-value <0.05 was considered statistically significant

Onset of motor block after spinal anaesthesia was significantly slower in group SP than group LP [Table/Fig-4]. Degree of motor block was assessed using a 4-point Bromage score and the score was three in all patients in both groups thus findings were statistically non significant.

In the SP group, 89.1% patients did not require any medication for hypotension and bradycardia while 4.7% required injection mephenteramine for hypotension and 6.2% patients required both injection atropine and inj. mephenteramine for bradycardia and hypotension, respectively. While in LP group, 84.6% patients did not require any medication for hypotension or bradycardia. A 5.8% patients required mephenteramine for hypotension and 9.6% patients required both atropine and mephenteramine for bradycardia and hypotension, respectively. However, the difference was statistically not significant [Table/Fig-5].

Medication	Group SP n (%)	Group LP n (%)	p-value
Atropine and mephenteramine	4 (6.2)	5 (9.6)	0.760
Mephenteramine	3 (4.7)	3 (5.8)	
Nil	57 (89.1)	44 (84.6)	

[Table/Fig-5]: Need for medication to treat cardiovascular side-effects.

A 12.5% patients had a comfort score of '2' in sitting position while it was 53.8% in lateral position; 31.2% patients had comfort score of '1' in sitting position as compared to 34.6% in lateral position; 56.2% patients had a comfort score of '0' in sitting position as compared to 11.5% in lateral position [Table/Fig-6].

Comfort score	Group SP n (%)	Group LP n (%)	p-value
0 (not comfortable)	36 (56.2)	6 (11.5)	<0.001*
1 (comfortable)	20 (31.2)	18 (34.6)	
2 (very comfortable)	8 (12.5)	28 (53.8)	

[Table/Fig-6]: Comfort score in both groups.
*p-value <0.05 was considered statistically significant

DISCUSSION

Position for spinal anaesthesia, sitting or lateral is always the topic of interest with lot of controversies. It affects the spread of local anaesthetic drugs which further influences the quality of nerve blockade (sympathetic, sensory and motor) [9,10]. This study was undertaken to compare the effect of spinal anaesthesia position sitting versus lateral in the elderly patients undergoing lower limb surgeries with respect to quality of sensory and motor blockade, haemodynamic effects and patient's comfort and satisfaction with spinal anaesthesia position.

The sitting position is more prone to vasovagal episode as well as orthostatic hypotension due to gravity dependent peripheral pooling [11,12].

In the study of Bhat SA et al., and Kharge ND et al., irrespective of the patient's position (sitting or lateral) it did not affect the mean heart rate, SBP and DBP [7,13]. Role of adequate preloading on haemodynamics was proved in these studies. Obasuyi BI et al., in their study of 100 patients observed less hypotension in lateral position group patients, so mean arterial pressure was greater in lateral than sitting position group [14]. For spinal anaesthesia they used hypobaric bupivacaine.

In the present study, both onset of sensory block after spinal anaesthesia as well as time required to achieve maximum level of sensory block was significantly faster in group LP than group SP [Table/Fig-3].

It can be explained by the fact that hyperbaric bupivacaine was used for spinal anaesthesia which settled down quickly in sitting position than in lateral position. In the present study, maximum level of sensory block ranged between T_6-T_{10}. The level was comparable in both the groups. However, these differences were statistically not significant.

Similar to the present study Bhat SA et al., in their randomised controlled trial reported that the onset of sensory anaesthesia was faster in lateral position group and the higher sensory level was achieved at five minutes and at 10th minute and onward as well [7]. In both groups, maximum sensory level was T6 after 30 minutes which is similar to the present study. Kharge ND et al., studied total 120 patients undergoing caesarean section under spinal anaesthesia either sitting or lateral position by using 0.5% hyperbaric bupivacaine [13]. They observed that there was faster onset of anaesthesia and higher sensory level in lateral position group. Maximum sensory level was T5 in both groups as they used hyperbaric bupivacaine, which is again similar to our study. The study by Laithangbam PK et al., also reported faster onset of anaesthesia and higher sensory level in lateral position group [15].

Obasuyi BI et al., in their study observed slow onset of anaesthesia and lower block in patients with spinal anaesthesia in lateral position [14]. This can be explained by the fact that they used plain bupivacaine which was hypobaric which differs from the present study. Shahzad K and Afshan G observed faster onset of sensory block in the sitting group than lateral group [4]. It is different from the present study, as they used 12.5 mg of 0.5% isobaric bupivacaine for spinal anaesthesia in both positions.

In the present study, onset of motor block after spinal anaesthesia was significantly faster in group LP than group SP. Four-point

Bromage score was 3 in all patients in both groups thus findings were statistically non significant.

Similar to the present study, Bhat SA et al., in their study found that onset of motor blockade was faster in lateral position group [7]. From five minutes and onward, the patients in both the groups had motor level score of 3. Kharge ND et al., observed that onset of motor blockade was faster in lateral position group [13]. Maximum block height or degree of motor block and mean time to achieve the block was same in both groups. Shahzad K and Afshan G and Inglis A et al., also reported faster onset of motor blockade in lateral position group [4,16]. Laithangbam PK et al., in their study found higher block in lateral position [15].

In the present study, authors observed that need of medication like mephenteramine and atropine for treatment of hypotension and bradycardia, respectively was similar in both the positions.

Similar to the present study Bhat SA et al., observed that incidence of hypotension and bradycardia as well as requirement of ephedrine and atropine was same in sitting and lateral position groups [7]. Fredman B et al., and Shahzad K and Afshan G also had similar findings [2,4]. Laithangbam PK et al., investigated patients undergoing caesarean section under spinal anaesthesia either in sitting or lateral position [15]. They observed that incidence of hypotension was more in lateral group and this can be explained by the fact that pregnant women are more prone to develop hypotension in lateral position.

In the study of Kharge ND et al., 18.3% patients in sitting position required ephedrine to treat hypotension and 28.3% patients in lateral position required ephedrine to treat hypotension [13]. This observation was similar with the studies of Ortiz-Gómez JR et al., in which they reported that hypotension was more in lateral position as compared to sitting position [17].

In the present study, lateral position appears to be more comfortable for elderly patients. Similar to the present study Bhat SA et al., also reported lateral position to be comfortable than sitting position for patients [7]. Shahzad K and Afshan G also reported that patients were more comfortable in lateral position than in sitting position [4]. In their study, they used premedication injection midazolam in all patients. Study of Kharge ND et al., also reported that lateral position was more comfortable than sitting position which was similar to the present study [13]. Chevuri SB et al., also had similar findings that lateral position appears to be more comfortable [18]. Fredman B et al., observed that there was no significant difference between sitting and lateral position in terms of patient comfort which differs from the present study [2].

Limitation(s)

The anaesthetist's preference for position in spinal anaesthesia could not be looked into this study. Although sitting position for spinal anaesthesia is perceived to be easier than lateral position but there is no published evidence to prove this.

CONCLUSION(S)

Position of patient for spinal anaesthesia (sitting position vs lateral position) does not affect the quality of block and haemodynamic parameters. Due to administration of hyperbaric bupivacaine, onset of spinal anaesthesia both sensory and motor was faster in lateral group than the sitting group. Spinal anaesthesia in lateral position was technically easier in elderly patients especially undergoing lower limb surgeries. Patients with lateral position were satisfied and more comfortable as compared to sitting position.

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