A Comparative Study between the Performing Spinal Anesthesia in Sitting versus Lateral Position on Patient Hemodynamics

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ABSTRACT

Background: spinal anesthesia is frequently accompanied by hypotension, which may be defined in absolute terms as a systolic blood pressure of 90 or 100 mmHg or in relative terms as a percentage (20% fall from baseline). The severity of hypotension depends on the height of the block, the position of the patient and the volume status. **Aim of the Work:** to compare the effect of performing spinal anesthesia in sitting versus lateral position on patient hemodynamics (blood pressure and heart rate).

Patients and Methods: after approval from departmental ethics committee and written informed consent from the patient, a randomized study was conducted on eighty patients with American society of anesthesiologists physical status I and II aged from 21 to 50 years of both genders. The study conducted from January 2018 to May 2018. Preoperative investigations were done according to the local protocol designed to evaluate the patients.

Results: The onset of sensory block of spinal anesthesia (the time needed to reach the sensory level between T8 & T10) was relatively faster in lateral group (3.93 ± 1.05) than in sitting group (4.40 ± 1.26) but, these differences were statistically not significant.

Conclusion: because we have used hyperbaric bupivacaine, it is more likely that the drug settled down more quickly in the sitting position than in the lateral position.

Keywords: Performing Spinal Anesthesia, Lateral Position, Patient Hemodynamics.

INTRODUCTION

Spinal anesthesia can be initiated with the patient in either the sitting or the lateral position, and each position has its advantages and disadvantages. The sitting position appears to be optimal for the placement of spinal anesthesia as identification of landmark, particularly midline, is much easier. However, maintaining the sitting position is often difficult for patients. On the other hand, the lateral position is generally considered easy to maintain for patients. However, the identification of anatomical landmark is difficult [(1)].

Spinal anesthesia is frequently accompanied by hypotension, which may be defined in absolute terms as a systolic blood pressure of 90 or 100 mmHg or in relative terms as a percentage (20% fall from baseline). The severity of hypotension depends on the height of the block, the position of the patient and the volume status [(2)].

Spinal anesthesia induced hypotension is caused by an increase in venous capacitance because of sympathectomy causing venodilation in the lower part of the body. Hypotension caused by a reducion in systemic vascular resistence is physiologically compensated by an increase in cardiac output. However, a high level of spinal block can inhibit the cardioaccelerator fibers leading to a fall in the heart rate and hence, instead of a compensatory increase, cardiac output usually decreases. The combined effect of reduced cardiac output and decreased systemic vascular resistence accounts for the high incidence of hypotension after spinal anesthesia [(3)].

AIM OF THE WORK

To compare the effect of performing spinal anesthesia in sitting versus lateral position on patient hemodynamics (blood pressure and heart rate).

PATIENTS AND METHODS

After approval from departmental ethics committee and written informed consent from the patient, a randomized study was conducted on eighty patients with American society of anesthesiologists (ASA) physical status I and II aged from 21 to 50 years of both genders, the study conducted from January 2018 to May 2018.

Study design and sampling:

The study was a randomized, prospective, comparative, clinical and single-blinded study.

Inclusion Criteria:

The study was conducted on patients ASA I to II, aging 21-50 years of both genders who were allocated for lower abdominal, urological, pelvic, gynacological or lower limb surgeries under spinal anesthesia.

Exclusion Criteria:

Patients who were ASA III or IV, liver or kidney dysfunction, heart failure or myocardial infarction, uncontrolled hypertension, hemodynamics instability, morbid obese (BMI ≥30) and any contraindication for spinal anesthesia.

Preoperative preparation:

Routine preoperative assessment was done to all patients on the day before operation; including

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history, clinical examination and laboratory investigations. Preoperative investigations were done according to the local protocol designed to evaluate the patients. It included hemoglobin level, hematocrit levels, coagulation profile, blood sugar levels, serum urea and creatinine, serum electrolytes, liver function tests and ECG. All patients were informed about the study design and objectives as well as tools and techniques. Informed consent was signed by every patient prior to inclusion in the study.

The patients were randomly assigned by closed envelops to one of the two groups; the sitting position group (S group) and the lateral position group (L group) for spinal anesthesia. Patients and primary investigator were not be blinded, and data was collected by a trained independent observer to make the study single blinded. Patients were routinely preloaded with 10ml/kg ringer solution 10-15 minutes before giving spinal anesthesia. No sedation was given to any patient. Baseline heart rate and blood pressure were recorded after which the data collector was asked to leave the operating room.

Spinal anesthesia was performed with the patient in sitting or lateral position according to group allocated. In the sitting group, patients were sitting with the feet resting on a stool and back facing towards the anesthetist, while in the lateral group, patients were lying on the operating table with knee and hip joint in flexion position during the initiation of the spinal anesthesia.

Statistical Analysis

Data were analyzed using SPSS 16. Mean + standard deviation was computed for age, weight and height. Chi square test was applied to compare cardiovascular side effects. Repeated measures analysis of variance (ANOVA) was used to compare effects like heart rate, systolic and diastolic blood pressures of the two groups. P-value of 0.05 or less was considered statistically significant.

RESULTS

Table (1): Comparison between the two studied groups as regards age and height of the studied patients.

		Sitting group	Lateral group	Test value•	P-value	Sig.
		No. = 40	No. = 40			
Age	Mean ± SD	37.58 ± 7.97	37.75 ± 8.35	-0.096	0.924	NS
	Range	25 – 50	20 – 50			
Height (Cm)	Mean ± SD	166.6 ± 16.99	169.15 ± 3.34	-0.931	0.355	NS
	Range	165 – 178	161 – 174			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
•: Independent t-test

Table (1) shows that there was no statistically significant difference between the two studied groups as regards age and height of the studied patients.

Table (2): Comparison between the two studied groups as regards the volume of heavy bupivacaine, the sensory level, and baseline SBP & DBP and baseline heart rate.

		Sitting group	Lateral group	Test value•	P-value	Sig.
		No. = 40	No. = 40			
Volume of heavy bupivacaine (Cm)	Mean ± SD	3.66 ± 0.44	3.78 ± 0.36	-1.396	0.167	NS
	Range	3 – 4	3 – 4			
The sensory level	Mean ± SD	8.05 ± 1.47	7.95 ± 1.54	0.298	0.767	NS
	Range	6 – 10	6 – 10			
Baseline SBP (mmHg)	Mean ± SD	123.48 ± 12.63	126.48 ± 10.55	-1.153	0.253	NS
	Range	105 – 150	105 – 140			
Baseline DBP (mmHg)	Mean ± SD	76.95 ± 7.85	78.43 ± 13.81	-0.587	0.559	NS
	Range	60 – 95	5 – 95			
Base line heart rate (b/min)	Mean ± SD	78.83 ± 10.32	75.23 ± 6.89	1.835	0.070	NS
	Range	65 – 112	60 – 90			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
•: Independent t-test

Table (2) indicates that there were no statistically significant differences found between the two studied groups as regards the volume of heavy bupivacaine, the sensory level, and baseline SBP & DBP and baseline heart rate.

Table (3): Comparison between the two studied groups as regards SBP at different times of measurement.

SBP (mmHg)		Sitting group	Lateral group	Test value•	P-value	Sig.
		No. = 40	No. = 40			
SBP after 2 min	Mean ± SD	120.35 ± 12.39	115.28 ± 10.63	1.966	0.053	NS
	Range	100 – 139	90 – 135			
SBP after 4 min	Mean ± SD	110.35 ± 9.88	109.58 ± 13.84	0.288	0.774	NS
	Range	90 – 128	75 – 131			
SBP after 6 min	Mean ± SD	107.25 ± 10.35	109.35 ± 13.15	-0.794	0.430	NS
	Range	80 – 131	80 – 133			
SBP after 8 min	Mean ± SD	104.75 ± 18.24	112.25 ± 8.95	-2.335	0.022	S
	Range	11 – 132	90 – 133			
SBP after 10 min	Mean ± SD	109.6 ± 8.26	113.48 ± 7.85	2.153	0.034	S
	Range	90 – 130	100 – 131			
SBP after 12 min	Mean ± SD	107.23 ± 17.22	113.9 ± 7.53	-2.246	0.028	S
	Range	11 – 130	102 – 131			
SBP after 14 min	Mean ± SD	110.35 ± 7.35	114.1 ± 7.6	-2.244	0.028	S
	Range	95 – 130	102 – 133			
SBP after 16 min	Mean ± SD	110.55 ± 7.19	114.3 ± 7.47	-2.287	0.025	S
	Range	96 – 130	102 – 133			
SBP after 18 min	Mean ± SD	108.08 ± 17.34	114.25 ± 7.41	-2.071	0.042	S
	Range	11 – 130	102 – 133			
SBP after 20 min	Mean ± SD	110.73 ± 7.27	114.08 ± 7.58	-2.018	0.047	S
	Range	97 – 130	102 – 133			
SBP after 25 min	Mean ± SD	110.50 ± 7.20	114.00 ± 7.58	2.117	0.037	S
	Range	95 – 130	100 – 132			
SBP after 30 min	Mean ± SD	111.05 ± 6.55	114.45 ± 7.62	2.140	0.036	S
	Range	97 – 133	100 – 133			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant

•: Independent t-test

Table (3) demonstrates that there was no statistically significant difference between the two studied groups as regards SBP after 2, 4 and 6 minutes from baseline. However, there was statistically significant lower in SBP in the sitting group than in lateral group after 8, 10, 12, 14, 16, 18, 20, 25 and 30 minutes.

Table (4): Comparison between the two studied groups as regards pulse at different times of measurement.

Pulse (BPM)		Sitting group No. = 40	Lateral group No. = 40	Test value•	P-value	Sig.
After 2 min	Mean ± SD Range	77.85 ± 9.53 65 – 105	75.03 ± 6.76 59 – 90	-1.526	0.131	NS
After 4 min	Mean ± SD Range	73.88 ± 9.1 64 – 100	71.3 ± 6.33 60 – 90	-1.472	0.145	NS
After 6 min	Mean ± SD Range	74.18 ± 8.65 63 – 97	71.2 ± 6.45 60 – 90	-1.747	0.085	NS
After 8 min	Mean ± SD Range	73.78 ± 8.45 60 – 95	71.3 ± 6.59 59 – 89	-1.464	0.147	NS
After 10 min	Mean ± SD Range	73.48 ± 8.16 60 – 94	71.18 ± 6.52 59 – 88	-1.393	0.168	NS
After 12 min	Mean ± SD Range	73.58 ± 8.25 61 – 94	71.18 ± 6.49 59 – 88	-1.446	0.152	NS
After 14 min	Mean ± SD Range	73.6 ± 8.06 64 – 94	71.18 ± 6.41 59 – 88	-1.486	0.141	NS
After 16 min	Mean ± SD Range	74.00 ± 8.01 63 – 93	71.15 ± 6.4 59 – 88	-1.758	0.083	NS
After 18 min	Mean ± SD Range	74.33 ± 7.94 63 – 93	71.13 ± 6.43 59 – 88	-1.981	0.051	NS
After 20 min	Mean ± SD Range	74.25 ± 7.89 63 – 93	71.15 ± 6.38 59 – 88	-1.932	0.057	NS
After 25 min	Mean ± SD Range	74.00 ± 7.80 63 – 93	71.16 ± 6.38 59 – 88	-1.782	0.079	NS
After 30 min	Mean ± SD	74.00 ± 7.50 63 – 93	71.17 ± 6.25 59 – 88	-1.833	0.070	NS

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
•: Independent t-test

Table (4) reveals that there was no statistically significant difference between the two studied groups as regards pulse after 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30 min.

DISCUSSION

Spinal anesthesia is preferred for its efficiency, speed, minimal effects on mental state, reduced blood loss, protection against thromboembolic complications, early mobilization after surgery, minimal respiratory complications, analgesia, short hospital stay and the fact that it allows a lower volume and dose of anesthetic to be used reducing the risk of toxicity.

In this study, a total of 80 patients were enrolled and finally analyzed. Each group consisted of 40 patients who were comparable in age, height, the sensory level, baseline blood pressure & heart rate and the changes in the blood pressure and heart rate each 2 minutes for 20 minutes then every 5 minutes.

In the current study, it was found that the onset of sensory block of spinal anesthesia (the time needed to reach the sensory level between T8 & T10) was relatively faster in patients who were given spinal anesthesia in the lateral position (2-5 minutes) than who were given spinal anesthesia in the sitting position (3-7 minutes) but, these differences were statistically not significant.

Because hyperbaric bupivacaine was used, it was more likely that the drug settled down more quickly in the sitting position than in lateral position. Hence we got faster onset of anesthesia and higher sensory level in the lateral position group.

Laithangbam et al. [(4)] reported similar findings.

Shahzad and Afshan [(1)] used isobaric bupivacaine and they observed that the onset of spinal anesthesia was faster in the sitting than in the lateral position (4.5 vs. 5.4 minutes). Although this difference was statistically significant, but apparently would not be much significance clinically as time to achieve T10 level was comparable (8.17 vs. 7.71 minutes). The sympathetic blockade might occur in this study with a great frequency or severity in the sitting position.

Wildsmith et al. [5] demonstrated that 15mg of tetracaine injected with patients in the lateral position and then immediately turned to the supine position resulted in a significantly higher level of anesthesia than when it was injected with patients in a seated position.

The study showed that, during the entire observation period after induction of spinal anesthesia, there was no significant difference between the mean heart rate of patients in sitting and lateral position groups; between the mean diastolic blood pressure of patients in sitting and lateral position groups; and between mean systolic blood pressure after 2, 4 and 6 minutes but, there was statistically significant difference between the two studied groups as regards SBP after 8, 10, 12, 14, 16, 18, 20, 25 and 30 minutes (lateral group > sitting group).

There was a decrease in arterial blood pressure > 25% of the baseline levels in two patients in the sitting position group and five patients in the lateral position group. It was treated by intravenous ringer solution followed by incremental doses of IV ephedrine 5mg to 10mg.

There were no heart rate figures below 50 b/min. so that, no one needs atropine.

Shahzad and Afshan [1] reported that there were no differences between the sitting and lateral groups as regards SBP & DBP and heart rate after induction of the spinal anesthesia.

Obasuyi et al. [6] in their study concluded that the changes in hemodynamic variables were significantly lower in the group lateral versus sitting position in patients undergoing spinal anesthesia with isobaric bupivacine. This means that hypotension occurred less frequently when spinal anesthesia using isobaric bupivacaine was induced with patients in the lateral compared with the sitting position.

This can be explained by the fact that unlike this study, preloading was not performed and the use of hyperbaric bupivacine differs from using isobaric one.

Hideyuki et al. [7] in their study showed that the hemodynamic effects were also greater in the lateral group, resulting in larger ephedrine doses required for the lateral group than for the sitting group. The decrease in hemodynamic response in the sitting group may result from the slower spread of spinal anesthesia.

CONCLUSION

Because we have used hyperbaric bupivacaine, it is more likely that the drug settled down more quickly in the sitting position than in the lateral position. Hence we got faster onset of anesthesia and higher sensory level in the lateral position group but, it is considered statistically insignificant. Also, applying spinal anesthesia in the sitting position involves less hemodynamic variations (BP & HR).

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