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Effect of Positioning after Induction of Spinal Anaesthesia with 0.5% Hyperbaric Bupivacaine in Orthopedic Procedures

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Abstract

Context: Spinal anesthesia is considered safe over general anesthesia but has some side effects. To overcome its side effects, it can be given in sitting position and after two minutes patient can be kept in supine position. *Aims:* To compare the effect of positioning after induction of spinal anesthesia in orthopedic procedures. *Settings and design:* A Randomized controlled prospective double blind study was undertaken at Shadan Institute of Medical Sciences. *Methods and material:* 50 patients were divided into two groups of 25 each; group L and group S. Both the group patients were ASA 1 and 2 patients aged between 20 to 40 years, posted for lower limb orthopedic surgery. Group L patients were made supine immediately while group S patients were made supine after two minutes of giving anesthesia. *Statistical analysis:* Student's t test was applied to compare the mean values. P value less than 0.05 was taken as statistically significant. *Results:* Both the groups were comparable in baseline characteristics like age, weight, MAP, SBP, DBP. The vasopressor requirement, lowest SBP and DBP were similar in two groups. Group L patients required more fluids, they had more mean fall of SBP, mean heart rate was more and lowest MAP was more compared to group S patients. These differences were statistically significant ($p < 0.05$). *Conclusion:* A 2 minute sitting post spinal anesthesia is a safe, reliable alternative for anesthetic management of orthopedic lower limb fracture surgeries.

Keywords: Orthopedic; Reliable; Fracture; Anesthesia; Surgeries.

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Introduction

In recent times sub arachnoid central neuraxial block technique is gaining popularity for anesthetic management of patients for lower limb orthopedic procedures. Hemodynamic findings are varied and complex in orthopedic procedures because of the nature of illness and stage of presentation to the operating surgeon [1].

In an adequately hydrated patient spinal anesthesia is a fast, reliable and safe procedure. Advantages of spinal anesthesia include avoidance of general anesthesia, deep vein thrombosis prophylaxis, avoidance of poly pharmacy, awake patient with good compliance. Spinal anesthesia is cost effective, reliable and rapid in onset [2].

Spinal anesthesia is very useful especially for patients undergoing orthopedic surgeries of the lower limbs. Bupivacaine is a common agent used for these cases to induce safe and reliable anesthesia. Doses of bupivacaine are dependent on the position adopted like bilateral or unilateral while giving the spinal anesthesia [3].

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This study compares the effect of positioning after induction of spinal anesthesia in orthopedic procedures; early supine positioning versus a 2 minute delay for patients in whom spinal anesthesia was given in sitting position, the hemodynamic alterations, level of sensory and motor blockade, autonomic disturbances are analyzed in this study .

Methods

A Randomized controlled prospective double blind study was undertaken after approval from our hospital ethical committee and written informed consent from the patients was taken. 50 patients were divided into two groups of 25 each group L and group S. Both the group patients were ASA 1 and 2 patients aged between 20 to 40 years, posted for lower limb orthopedic surgery.

Detailed history and clinical examination was done, pre anesthetic assessment and pre operative evaluation was done in all patients.

Exclusion Criteria

- Patients with systolic blood pressure > 160 mmHg and diastolic blood pressure > 110 mmHg.
- Co-morbid conditions such as diabetes mellitus, bronchial asthma, chronic pulmonary obstructive disease, and other systemic diseases.
- ASA grade 3 and grade 4 patients with difficult airway.

Baseline pre operative systolic blood pressure, diastolic blood pressure, pulse rate, arterial oxygen saturation, were recorded in left lateral position in lower arm and in supine position with wedge under right hip.

Intravenous access was secured with a wide bore 18 G intracath.

All patients were preloaded with 20 ml/kg of ringer lactate solution over 30 minutes before the subarachnoid block was given

Patients were reassured and explained about the technique.

In group L, Patients were placed in sitting position with hip extended and knees over the side of OT table resting on a leg rest. After strict aseptic precautions with povidine iodine solution, draped with centrally fenestrated sterile towel. L3 -4 or L2-3 inter-vertebral space was identified. 23 G quincke spinal needle was introduced in midline, dura pierced and free flow of CSF was obtained. After free flow of CSF, 3 ml of hyperbaric bupivacaine 0.5% was injected into subarachnoid space slowly. The patient was then made to lie down in supine position immediately after spinal anesthesia technique.

In group S, Patients were placed in sitting position with hip extended and knees over the side of OT table resting on a leg rest. After strict aseptic precautions with povidine iodine solution, draped with centrally fenestrated sterile towel. L3-4 or L2-3 inter-vertebral space was identified. 23 G quincke spinal needle was introduced in midline, dura pierced and free flow of CSF was obtained. 3 ml of 0.5% hyperbaric bupivacaine was injected into subarachnoid space. The patient was then made to sit in same position for 2 minutes and later made to lie down in supine position after spinal anesthesia technique.

All baseline monitoring including NIBP, pulse-oximetry, were connected to the patient. SBP, DBP and pulse rate and arterial oxygen saturation were recorded every 3 minutes for the first 15 minutes. With the onset of sensory blockade to T 8 level and grade 3 motor blockade (Bromage scale), the surgery was started with tourniquet application and inflated to 80 mm of hg higher than SBP. The level of sensory blockade was assessed with pinprick. The patients in whom the sensory level was above T-4 and below T-12 were excluded from the study.

Equipments Used

Spinal Pack

An autoclaved spinal anesthesia pack consisting of the following:

1. Quincke spinal needle 23 G.
2. Swab holders.
3. Cotton swabs and gauge pieces.
4. Centrally fenestrated towel.
5. Anaesthesia scrubs
6. Disposable syringe of 5 ml.
7. Hyperbaric bupivacaine 0.5% 4 ml ampoule with 5% dextrose.

The following Parameters were noted:

SBP, DBP, MAP, PR, SpO_2, all the parameters were recorded every 3 minutes till 15 minutes after which pneumatic tourniquet was applied and inflated 80 mm of hg greater than SBP.

Dosage of vasopressor required (ephedrine) during the procedure was noted. Intravascular fluid requirement (crystalloid lactated ringers solution)

were noted down. Lowest recorded blood pressure, changes from baseline pressures was noted.

Patients were treated with increase in IV fluid infusion rate and ephedrine 6 mg IV if the systolic BP falls below 90 mm of hg or 30% decrease in MAP.

Statistical Analysis

Data was analyzed using mean values. Student's t test was applied to compare the mean values. p value less than 0.05 was taken as statistically significant. Chi square was used to study difference in the proportions.

Results

Table 1 shows comparison of baseline characteristics in two groups. Both the groups were comparable as the difference in the weight and age of both group patients was statistically not significant. ($p > 0.05$).

Table 2 shows comparison of Mean change of different pressures in two groups. It was found that the mean pressures like MAP, SBP and DBP were not much different in the two groups.

Table 3 shows comparison of Mean vasopressor and fluid requirement in two groups. The vasopressor requirement was almost similar for patients of both the groups. But the fluid requirement was significantly more for group L patients 1631 ml compared to 1492 ml for patients in group S. ($p < 0.05$)

Table 4 shows comparison of Maximum fall of SBP from baseline in two groups. Mean fall of SBP was significantly more for patients in group L i.e. 35.52 mmHg compared to only 17.8 mmHg and this difference was statistically significant ($p < 0.05$).

Table 5 shows comparison of mean change in heart rate in two groups. The mean heart rate was significantly more for patients in group L i.e. 6.54 compared to only 4.1 and this difference was statistically significant ($p < 0.05$).

Table 6 shows comparison of lowest mean arterial pressures in two groups. Mean arterial pressure was significantly more for patients in group L i.e. 84 mmHg compared to only 77.76 mmHg and this difference was statistically significant ($p < 0.05$).

Table 7 shows comparison of lowest SBP and DBP in two groups. The lowest systolic blood pressure as well as DBP did not differ significantly in the two groups ($p > 0.05$).

Discussion

Both the groups were comparable in baseline characteristics like age, weight, MAP, SBP, DBP. The vasopressor requirement, lowest SBP and DBP were similar in two groups. Group L patients required

Table 1: Comparison of baseline characteristics in two groups

Baseline characteristics		Group L		Group S		Chi square	P value
		Number	%	Number	%		
Supine Position	Immediate	25	50	0	0	-	-
	Delayed by 2 min	0	0	25	50		
Age (years)	20-25	15	60	16	64	0.2323	0.89036
	25-35	07	28	07	28		
	35-40	03	12	02	08		
Weight (kg)	40-44	03	12	02	08	3.686	0.450171
	45-49	05	20	08	32		
	50-54	10	40	08	32		
	55-59	05	20	02	08		
	60-70	02	08	05	20		

Table 2: Comparison of Mean change of different pressures in two groups

Mean pressures	Group L Mean±SD	Group S Mean±SD	T test	P value
Mean arterial pressure (MAP)	10.3±5.05	10.4±5.44	0.0674	0.9466
Systolic blood pressure (SBP)	14.8±6.8	12.6±7.44	1.0913	0.2806
Diastolic blood pressure (DBP)	7.23±4.68	6.1±4.61	0.8601	0.3940

Table 3: Comparison of Mean vasopressor and fluid requirement in two groups

Requirement	Group L Mean±SD	Group S Mean±SD	T test	P value
Vasopressor requirement	0.4±0.926	0.28±0.701	0.5166	0.6078
Fluid requirement (ml)	1631±236	1492±101	**2.7074**	**0.0094**

Table 4: Comparison of Maximum fall of SBP from baseline in two groups

Groups	Mean fall of SBP (mmHg)	Standard deviation	T value	P value
Group L	35.52	11.042	6.2279	0.0001
Group S	17.8	8.97		

Table 5: Comparison of mean change in heart rate in two groups

Groups	Mean heart rate	Standard deviation	T value	P value
Group L	6.54	2.69	2.4669	0.0173
Group S	4.1	4.15		

Table 6: Comparison of lowest mean arterial pressures in two groups

Groups	Lowest MAP	Standard deviation	T value	P value
Group L	84	7.76	2.4496	0.0180
Group S	77.76	10.1		

Table 7: Comparison of lowest SBP and lowest DBP in two groups

Requirement	Group L Mean±SD	Group S Mean±SD	T test	P value
Lowest SBP	106±14.7	103±12.6	0.7748	0.4423
Lowest DBP	67.6±8.2	67.9±7.92	0.1316	0.8959

more fluids, they had more mean fall of SBP, mean heart rate was more and lowest MAP was more compared to group S patients. These differences were statistically significant ($p < 0.05$).

In a prospective cohort study done by Aya AGM et al. [2] compared the incidence of the severity of spinal anesthesia associated hypotension in immediately supinated patients versus a 2 minute delay in supination patients, concluded that despite receiving a smaller fluid volume, the delayed supinated patients had a less frequent incidence of significant hypotension, which was less severe and required less ephedrine.

Sensory block level and the dose of local anesthetics are dependent on a number of factors like bevel direction of needles, age, gravity of local anesthetics, posture of patient, concentration of local anesthetics, etc. Fixed proportions should be used while giving local anesthetics to the young adults. Neurologic changes can also affect the sensory block level and dose of local anesthetics [4].

Lee GY et al. [5] found that hypotension was more common in patients who were given spinal anesthesia in supine position i.e. it was 48%. They noted that this difference was statistically significant. This occurrence of hypotension is due to blockage of sympathetic nerve which is 2-4 segments higher. Hence this level is important clinically. Therefore the authors recommended use of hyperbaric solution of local anesthetics.

Racle JP et al. [1] observed that patients in whom hyperbaric bupivacaine was used in immediate supine position, sensory block onset was quick and fast. But at the same time, two segment regression was also quick and motor block duration was short. These findings of short motor block were reversed if the patient was made to sit for five min after giving spinal anesthesia.

Sise LF et al. [6] noted that the diffusion rate of anesthetic was very fast when the patient was given the injection of anesthetic drug in lateral decubitus position. It took only two minutes to start to diffuse

and it took maximum five minutes for complete diffusion. It did not affect the blockade level. But as per Veering BT et al. [7], who studied patients in two groups. One group was given spinal anesthesia in sitting position and were made to sit for two minutes and another group of patients were made to sit for twenty minutes. They observed that there was no statistically significant difference in terms of degree of motor or sensory block. But the authors noted that the statistically significant difference was observed in terms of level of sensory block. Degree of motor block was similar in two groups. Patient satisfaction and surgeon satisfaction did not differ significantly for two groups.

We found that the fall of blood pressure in our sitting position patients group started to reduce five minutes after giving spinal anesthesia. This fall was recorded in comparison to blood pressure just before giving the spinal anesthesia. This was due to the fact that we used bupivacaine in small doses. But Hemmingsen C et al. [8] observed that it took 10-15 minutes for hypotension to occur after giving the spinal anesthesia. This finding was more than the finding of the present study. This difference may be due to doses of bupivacaine used. Critchley LA et al. [9] found that it took 6-9 minutes for hypotension to occur.

Conclusion

The mean of changes in blood pressures and dosage of vasopressor required were similar in those patients who were immediately supinated or were made to sit for 2 minutes after subarachnoid blockade, the significant fall from the baseline pressures were greater in immediately supinated patients, but this never changed the clinical course and outcome and the pressures were easily restored with vasopressors and intravenous fluids. A 2 minute sitting post spinal anesthesia is a safe, reliable alternative for anesthetic management of orthopedic lower limb fracture surgeries.

Key messages

The two minute sitting position can be used for giving spinal anesthesia in case of surgeries of lower limb using spinal anesthesia.

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