

Comparison of the Effect of Duration Spent in Sitting Position on the Level of Block, Heart Rate and Blood Pressure with Hyperbaric Bupivacaine (0.75%) During Spinal Anaesthesia

Muzamil Hussain¹ and Nasreen Ishaque²

¹Department of Anesthesia, King Edward Medical University, Lahore.

²Shaikh Zayed Medical & Dental College, Lahore

ABSTRACT

Objectives: To compare the influences of different periods of sitting position on spread of analgesia, heart rate and blood pressure following subarachnoid administration of hyperbaric bupivacaine (0.75%) in elderly patients. **Material and methods:** Ninety patients were selected for this study and randomly allotted into three groups. Then each patient was preloaded with N/S 10ml/kg body weight which was given 15 minute before spinal anaesthesia. The hyperbaric bupivacaine (0.75%) was injected intrathecally through lumbar puncture needle G=23 in the space between L-3 and L-4 vertebrae. Each patient was given 10mg of 0.75% hyperbaric bupivacaine in sitting position. **Results:** There was insignificant difference in the onset of increase and the extent of increase of heart rate between the three study groups. It was observed that in group 1, the highest analgesia level achieved by the maximum percentage (30%) of the patients was T7 soon after supine position. In group 2, the highest analgesia level achieved by maximum percentage (23%) of the patients were T9 soon after supine position. In group 3, the highest analgesia level achieved by the maximum percentage (20%) was T9 soon after the patients were put in supine position. **Conclusions:** This study has shown that during spinal anesthesia with hyperbaric bupivacaine solution, the duration of sitting has very little and insignificant influence in final analgesia level and haemodynamic changes in elderly patients undergoing minor urological procedures.

Keywords: Spinal anesthesia, hyperbaric bupivacaine (0.75%), hemodynamic changes.

INTRODUCTION

Spinal anesthesia has remained the gold standard for the surgical procedures like lower abdominal surgery, lower limb surgery and obstetrical surgery etc. It has got many advantages over general anesthesia like relief of pain during and after surgery, avoidance of airway instrumentation, avoidance of polypharmacy used during general anesthesia, suppression of stress responses to surgery and increased blood flow to lower extremity. It also provides the relaxation of abdominal musculature without the use of muscle

relaxants. Although spinal anesthesia has been considered a safe technique, it has got many complications like hypotension, headache, nausea, vomiting, severe bradycardia, dysarrhythmia and cardiac arrest. Although incidence of these events is not well established^{1,2}. Studies have shown that in elective caesarian section, 3 minute delay before adopting supine position does not influence the incidence of maternal hypotension after induction of spinal anesthesia in sitting position with 2.8ml of bupivacaine 0.5% with 8% dextrose³. A study proved that both isobaric and hyperbaric solutions injected in lateral position produced adequate

analgesia. The only difference between the two was that the onset of sensory block was quicker with isobaric solution and the onset of motor block was earlier with hyperbaric solution.⁴ Clinical studies have shown that profile of spinal anesthesia after subarachnoid administration of bupivacaine changes with increasing age⁵. The cardiovascular effects are proportional to the height of block and result from denervation of sympathetic outflow tracts⁸. The degree of hypotension correlates with the level of sympathetic block which is generally two segments higher than the level of analgesia. A spinal technique that limits the unnecessary high level of analgesia and sympathetic block in elderly patients is therefore recommended. One of the benefits of using hyperbaric bupivacaine is that its spread can be controlled by posture of the patient.⁹ The position of patient at the time of injection may affect the direction of subarachnoid distribution at least initially. However, still there is a discussion about the duration of sitting position which is needed to limit the spread of analgesia. Povey et al showed that hyperbaric bupivacaine injected in sitting position produced a saddle block which is restricted to lumbar region as long as the subject remained in sitting position. However, even 60 minutes after bupivacaine injection, the block spread to mid thoracic region after patients were turned supine.¹⁰ Similarly Bodily et al found that hypobaric lidocaine in jack knife position raised as many as six dermatomes when patients were allowed to sit in upright position.¹¹ Cardiovascular side effects principally hypotension and bradycardia are the most important and common physiological changes during spinal anesthesia. Blockade of the sympathetic efferent is the principal mechanism by which spinal anesthesia produces cardiovascular changes. The incidence of significant hypotension (fall of more than 25% in blood pressure or bradycardia (less than 60 beats/ min) is generally related to the extent of sympathetic block, which in turn parallels the block height.^{12,13} One important factor is the Baricity of local anesthetic solution.¹⁶ The present study is designed to see the influence of different periods of sitting before patient is placed in supine position on spread of analgesia, heart rate and blood pressure following subarachnoid administration of hyperbaric bupivacaine.

MATERIAL AND METHODS

This Quasi experimental study was carried out in the Department of Urology, Mayo Hospital, Lahore on 90 patients. Sampling technique was convenient and sequential sampling. All male and female patients with age range between 55-70 years with ASA 1 or 2, undergoing minor urological procedure under spinal anesthesia were included in this study. Patients with history of allergy to bupivacaine, any neurological deficits, having any spinal surgery or spinal deformity, any valvular heart disease, coagulopathy and on NSAIDs, heparin and warfarin were excluded.

Ninety patients were selected during preoperative visits. Patients were allotted randomly to one of the three study groups. The groups differed with respect to the time during which the patient remained in sitting position after the spinal injection. A randomization table was made before the start of the study. Their detailed, history physical examination and laboratory examinations were reviewed out for evaluation and a proforma was filled. Patients were asked to become NPO for at least six hours before coming to operation theatre where informed consent for spinal anesthesia was taken. Equipment and drugs necessary for resuscitation measures were made available.

An 18G I/V cannula was inserted on the dorsum of right hand of each patient. Monitoring equipment was applied to the patient. I recorded the baseline blood pressure, heart rate and ECG rhythm of the patient. Then each patient was preloaded with N/S 10ml/kg body weight which was given 15 minute before spinal anaesthesia. The patient was put on the operation table in sitting position with his back exposed. I scrubbed my both forearms and hands with pyodine scrub. Then I put on gown and gloves. Aseptically I painted the back of the patient with pyodine solution. The hyperbaric bupivacaine (0.75%) was injected intrathecally through lumbar puncture needle G=23 in the space between L-3 and L-4 vertebrae. Each patient was given 10mg of 0.75% hyperbaric bupivacaine in sitting position. As mentioned earlier, the patients were divided into three groups. Each group contained 30 patients. In group 1, the patients were put in supine position after 5 minutes after spinal anesthesia. In group 2,

the patients were put in supine position after 10 minute after spinal anesthesia. In group 3, the patients were put in supine position after 20 minute after spinal anesthesia. Blood pressure of the every patient was recorded after every 5 minutes for 30 minutes. After putting the patient in supine position following parameters were checked.

- Haemodynamic changes were assessed by ECG monitor and blood pressure apparatus.
- Level of sensory block was assessed by ice cubes.
- Level of motor block was assessed by Bromage scale.

Data analysis

The data analysis was done on SPSS version II. Changes in heart, changes in systolic blood pressure and changes in diastolic blood pressure were compared within groups. P value ≤ 0.05 was considered as significant. Level of sensory block soon after supine position at different time intervals was assessed in three groups presented as percentages. Similarly Bromage scale after position was recorded in three groups as frequency and percentages.

RESULTS

There was insignificant difference in the onset of increase and the extent of increase of heart

rate between the three study groups. It was observed that in group 1, the highest analgesia level achieved by the maximum percentage (30%) of the patients was T7 soon after supine position. In group 2, the highest analgesia level achieved by maximum percentage (23%) of the patients were T9 soon after supine position. In group 3, the highest analgesia level achieved by the maximum percentage (20%) was T9 soon after the patients were put in supine position.

DISCUSSION

This study was carried out to observe the influence of different periods of sitting before placing the patients in supine position after subarachnoid injection of 0.75% hyperbaric bupivacaine. The influence on height of block and on hemodynamic was studied. Changes in the blood pressure and heart rate are directly related to the level of sympathetic block, which are usually 2 segments higher than sensory block which is two segments higher than the level of motor block. As far as the height of block is concerned there are many factors *e.g.* Baricity of the anesthetic solutions, positioning of the patient after subarachnoid block, Dosage of the drug and Site of the injection. In this study patients, aged 55-70 years

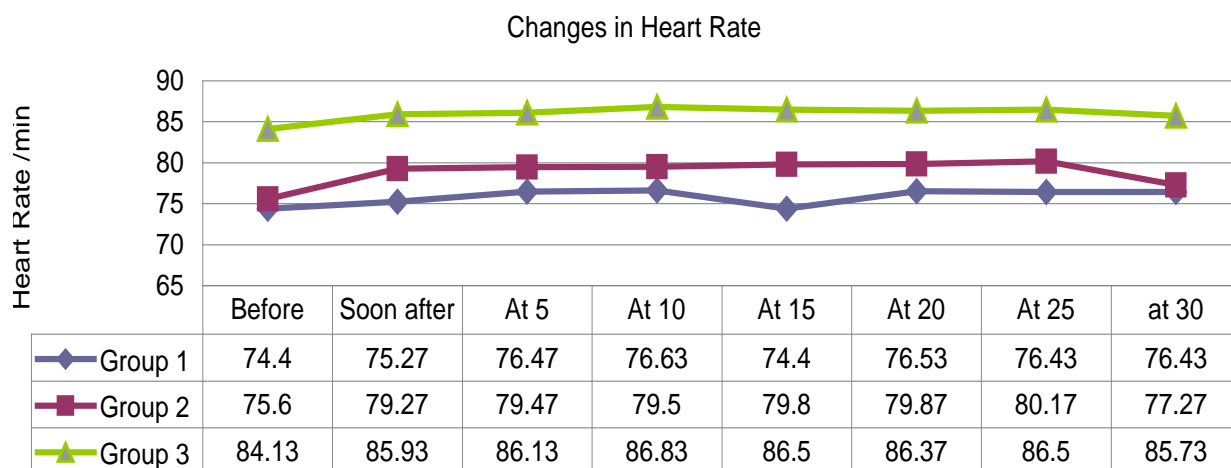


Fig. 1: Changes in heart rate Comparison of Pre-spinal anaesthesia values with, after spinal anaesthesia, at soon after supine position, 5 min, 10 min, 15 min, 20 min, 25 min and 30 min

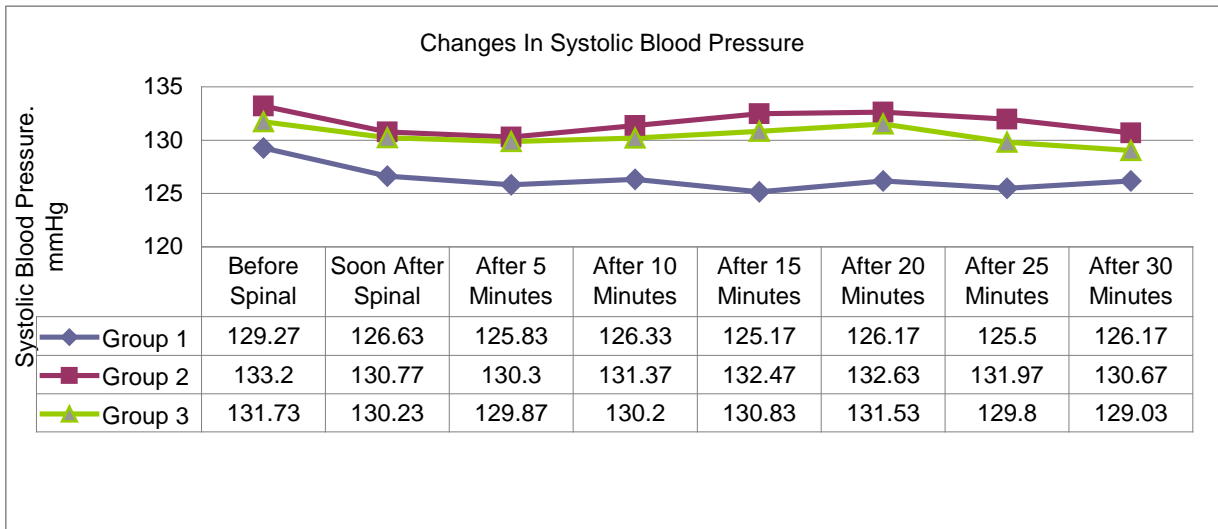


Fig. 2: Changes in systolic blood pressure. Comparison of Pre-spinal anaesthesia values with, after spinal anaesthesia, at soon after supine position 5 min, 10 min, 15 min, 20 min, 25 min and 30 min.

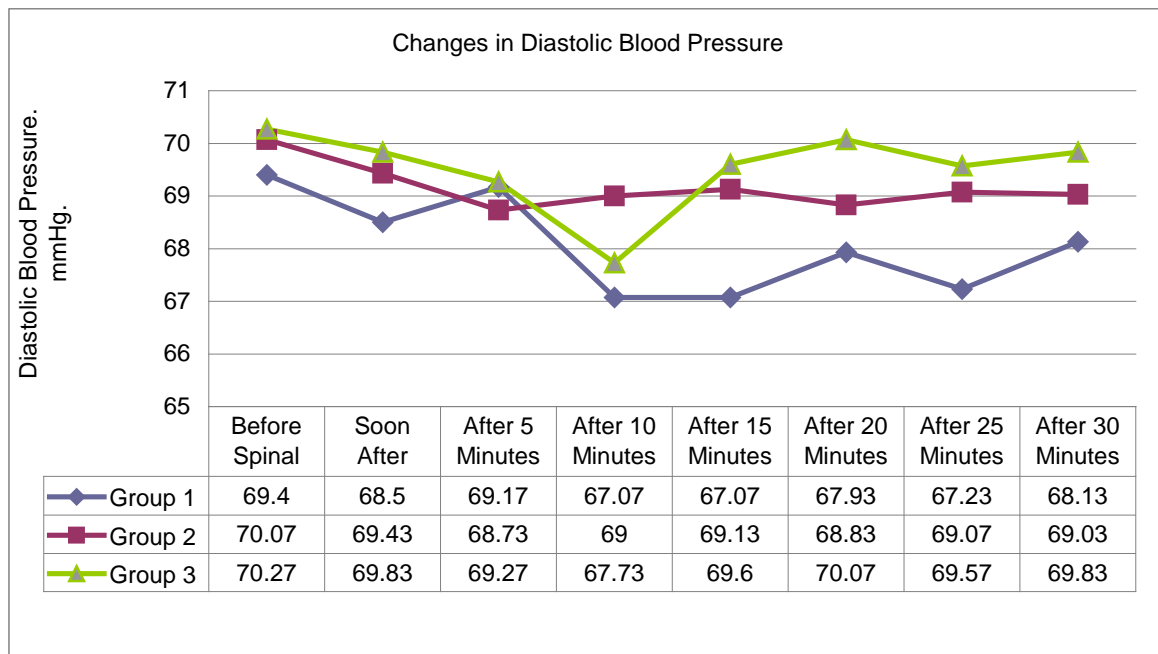


Fig. 3: Changes in diastolic blood pressure. Comparison of Pre-spinal anaesthesia values with, after spinal anaesthesia, at soon after supine position, 5 min, 10 min, 15 min, 20 min, 25 min and 30 min.

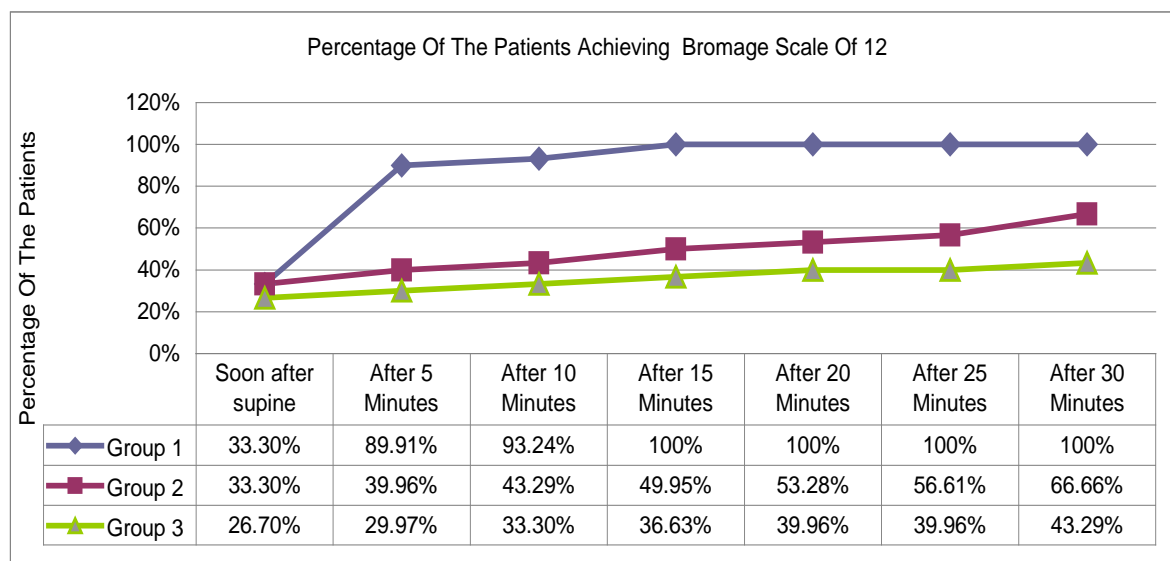


Fig. 4: Percentage of the patients receiving Bromage scale of 12 after 30 minutes of administration of spinal anesthesia.

undergoing minor urological surgery under spinal anaesthesia remained sitting for 5 minutes (group-1, n=30), 10 minutes (Group-2, n=30) and 20 minutes (group-3, n=30) after completions of the subarachnoid administration of 10 mg of 0.75% hyperbaric bupivacaine solution. They were put to supine positions, analgesia levels were assessed bilaterally using ice cubes, and motor block was scored using 12-point Bromage scale. Systolic and diastolic arterial pressure and heart rate were also recorded, 20 minute after the injection upper analgesia level were lower (T11, 43% of patients) in group-3 than group-1 (T6, 50% patients) and group 2 (T8, 86% of the patients). The highest obtained level was a bit higher (T6) in group-1 than in group-2 (T8) and group-3 (T9). But as this difference in the upper analgesia level between the three study groups did not disturb significantly the hemodynamic of these patients, so this difference is insignificant. It clearly suggests that the period of sitting has got insignificant effect on the ultimate upper analgesia level and hemodynamic in elderly patients. In other words, it would be appropriate to say that the upward spread of local anesthetics through the CSF occurs when the patient is repositioned from the sitting to supine position even after prolong period of sitting after subarachnoid block. It is evident from this study that with shorter

periods of sitting less than 10 minutes in group 1 and group 2. The upper analgesia level (T6) was three segments higher than upper analgesia level (T9) in group 3 with longer period of sitting i.e. 20 minutes. It suggests that with passage of time less local anesthetic is available for cephalad spread. This would be the result of binding of local anesthetic to the tissue structures in the spinal cord. The effect of different periods of sitting on hemodynamic and height of block after subarachnoid injections of hyperbaric bupivacaine in elderly patients has been studied previously by Veering and colleagues.⁹ their study showed that irrespective of the period of sitting (2-20 minutes), there was insignificant difference in the ultimate upper analgesia level and changes in hemodynamic. The effect of period of sitting on the spread of sensory block following subarachnoid administration of hyperbaric solutions has been studied previously by Povey and colleagues.¹⁹ their study showed that in different periods of sitting position (2-25 min) the analgesia level increased several segments after the patient had been put in supine position. Subsequent positioning in 15° head down position resulted in a further increase of analgesia level by approximately 2-3 segments. But in my study the final analgesia levels did not differ a great deal among the groups irrespective of different periods of sitting. Reason

for this difference could be the 15° head down position of the patients in their study that was a limitation in my study because in my study the patients were put to supine position after spinal anesthesia. Sinclair and colleagues²⁰ reported that a 15° head down tilt had minimal effect on the cephalad spread of analgesia and in that study however the patients were positioned in the head down position immediately after injection and were maintained in that position for only 10 minutes before being placed into supine position.

So, it is clear from the above mentioned three studies that the ultimately achieved upper analgesia level is mainly dependent upon the final position of the patient. This was further supported by another study of Povey and colleagues.¹⁰ The same holds for the level of sympathetic block that are associated with analgesia level, but are generally two to four segments higher. Consequently the highest level of sympathetic block are often in the upper thoracic region in elderly patients which may explain the higher frequency of cardiovascular side effects in elderly compared with young adult patients.^{7,25} In a more recent study, Veering and colleagues found that injecting hyperbaric bupivacaine solution at a lower space (L4-L5) than the usual space (L3-L4) did not reduce cephalic spread of local anesthetic and did not limit the highest analgesia level.³⁰ Gudaityle et al tried to find out the minimal effective dose of hyperbaric bupivacaine when used for spinal anesthesia in anorectal surgery. They found that a minimal recommended dose of spinal hyperbaric bupivacaine for anorectal surgery is 4-5mg, a dose of 7.5mg was excessive due to prolong sensory and motor block.³² In my study, I used 10mg of hyperbaric bupivacaine that not only provided the adequate analgesia level for minor urological procedures but also haemodynamic stability and post operative pain relief. Hallworth and colleagues studied the effect of posture and baricity on the spread of intrathecal bupivacaine for elective caesarean section delivery.³³ They found that in the lateral position the baricity had not effect on the spread of sensory levels for bupivacaine as compared to the sitting position where there was a statistically significant difference in spread with the hypobaric solution producing higher level of analgesia than the hyperbaric solutions ($p = 0.002$).

CONCLUSION

This study has shown that during spinal anesthesia with hyperbaric bupivacaine solution, the period of sitting has little and insignificant influence in final analgesia level and hemodynamic changes in elderly patients undergoing minor urological procedures. So, it can be said that a minimum of 5 minutes of sitting is sufficient to obtain upper analgesia level quite sufficient for minor urological procedures without affecting the hemodynamic stability of the elderly patients.

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The Authors:

Muzamil Hussain,
Assistant Professor
Department of Anaesthesia
King Edward Medical College,
Lahore

Nasreen Ishaque,
Assistant professor
Department of forensic medicine
Sheikh Zaid Medical &Dental College
Lahore.

Correspondence Author:

Dr. Muzamil Hussain,
Assistant Professor
Department of Anaesthesia
King Edward Medical College,
Lahore
Email: muzamilhussain540@yahoo.com
+923004247012.