

Comparative Study of Intrathecal 0.5% Isobaric Versus 0.5% Hyperbaric Bupivacaine in Same Volume and Dose to Assess the Quality of Spinal Anaesthesia and Haemodynamic Changes Occurring During Cesarean Section

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ABSTRACT

Aim: To compare the efficacy of 0.5% hyperbaric bupivacaine with isobaric bupivacaine and observe haemodynamic changes occurring in patients undergoing lower segment cesarean section.

Methods: A prospective randomized double blind study in 60 patients of ASA 1 and ASA II undergoing lower segment cesarean section was designed to compare the efficacy of hyperbaric with isobaric bupivacaine. The patients were randomly divided into two groups. Group I received 0.5% hyperbaric bupivacaine 2.5ml (12.5mg) and Group II received isobaric 0.5% bupivacaine 2.5ml (12.5mg) intrathecally. Sensory block was assessed by pinprick and modified bromage scale was used to assess motor block.

Results: Significant difference was found between the two groups at 3min regarding the sensory block. T6 level reached in 10(37%) patients in group I and 17(77%) patients in group II. However no significant difference was found between the two groups at 5min regarding the sensory and motor block. The rapid onset of sensory block with 0.5% isobaric bupivacaine in group II produced more decrease in systolic and mean blood pressure when compared with 0.5% hyperbaric bupivacaine in group I at 5min but after 45min it was not statistically significant. Ephedrine was given to 7 patients in group I and 11 patients in group II to treat hypotension.

Conclusion: The results of our study suggest that 0.5% isobaric bupivacaine was more predictable for sensory block level when compared with 0.5% hyperbaric bupivacaine in cesarean section under spinal anaesthesia. Although the rapid onset of sensory block with isobaric bupivacaine produced more hypotension when compared with its hyperbaric form but it was not statistically significant.

Keywords: Spinal anaesthesia, cesarean section, hyperbaric, isobaric bupivacaine.

INTRODUCTION

Spinal anaesthesia is a common technique used for patients undergoing lower abdominal surgery. It is also popular and safe technique to provide anaesthesia for cesarean delivery if no contraindication exists¹. Various preparations of bupivacaine with or without glucose are being used in clinical practice. Physiological changes in pregnancy decreases the dose of local anaesthetic and can also cause unpredictable extension of sensory block². Baricity of local anaesthetic used is one of the major factors that determines the dispersion of anaesthetic in subarachnoid space and thus the level of block^{2,3}.

An increasing number of studies compared isobaric bupivacaine with hyperbaric bupivacaine for obstetrics, orthopedics, herniorrhaphy and transurethral surgeries^{4,5,6}. However there is no conclusive data yet, whether one form is superior to the other, especially in lower abdominal surgery^{7,8,9}. Recently with the availability of 0.5% hyperbaric bupivacaine in our setup, this study was undertaken to compare its anaesthetic effects with 0.5% isobaric bupivacaine in same dose and volume in patients undergoing cesarean section.

METHODS

After approval by the Ethical Committee of Sir Ganga Ram Hospital, Lahore, 60 ASA Grade I & II patients were included in this prospective randomized study after written informed consent. Patients with

contraindications for spinal anaesthesia, ASA Grade III & IV, hypertensive, hypotensive and eclamptic were excluded from the study. The patients were explained about the procedure at the pre-anaesthetic visit. Patients were randomized into two groups (n=30 in each group) using a computer generated random number table. Group I received 0.5% hyperbaric bupivacaine and Group II was given 0.5% isobaric bupivacaine. Under standard monitoring all patients received 15ml/kg of Ringers lactate solution intravenously. Baseline Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were recorded. Sensory and Motor assessment methods were described in all patients before the start of anaesthesia. Spinal anaesthesia was performed using 25G spinal needle in sitting position at L3-L4 interspace. Patients in group I received 2.5ml (12.5mg) of 0.5% hyperbaric bupivacaine and group II received 2.5ml (12.5mg) of 0.5% isobaric bupivacaine. Both groups received equal volume and dose of bupivacaine having different baricities. The time of finishing the injection was considered "time zero". The patient was immediately turned supine with 15 degree left lateral tilt. Non-invasive BP and HR, height of block and motor power in legs were assessed. The sensory block was checked by pinprick along the mid clavicular line till the block reached T6 level and then the surgical incision was allowed. Motor block was evaluated, using a modified bromage scale 0 – 3 (0=no motor block; 1 = unable to raised extended legs, able to move knees and feet; 2 = unable to raise extended legs and flex knees, but able to move feet; 3= complete motor block of the lower limbs). A score score >2 was taken as adequate motor block. Assessments were made at 1, 2, 3 and 5 minutes initially and then at 5 minutes interval until the end of procedure and every 15 minutes until recovery of block in postanaesthesia care unit. Hypotension (defined as systolic arterial pressure falling more than 20% from baseline) was treated with injection ephedrine 6mg in bolus doses and heart rate <55 beats/min was treated with 0.4mg injection atropine.

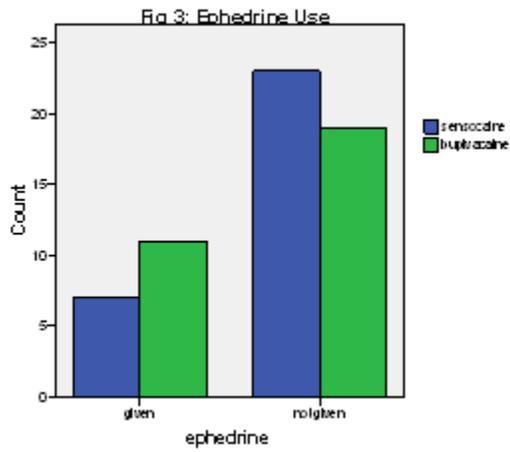
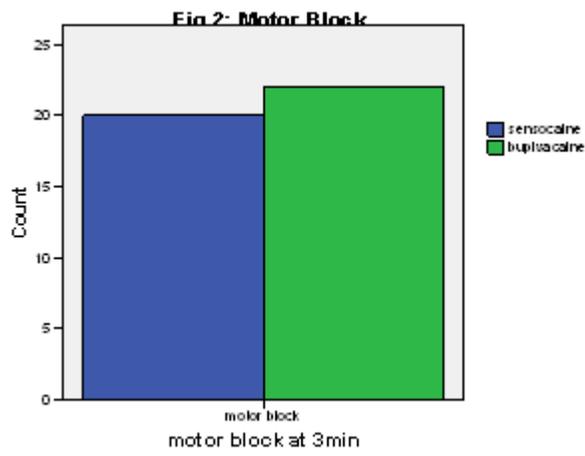
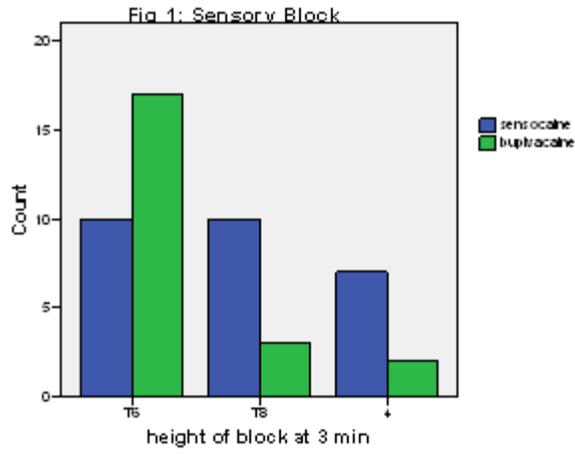
Statistical analysis: The collected data was entered into SPSS version 15 and was analysed through its statistical package. Demographic data which includes age, weight and height was expressed as mean±SD. Haemodynamic variables were analysed statistically by repeated measures ANOVA. Categorical variables such as height of block, onset of sensory and motor block were compared using "chi square" test. A p value of <0.05 was considered statistically significant.

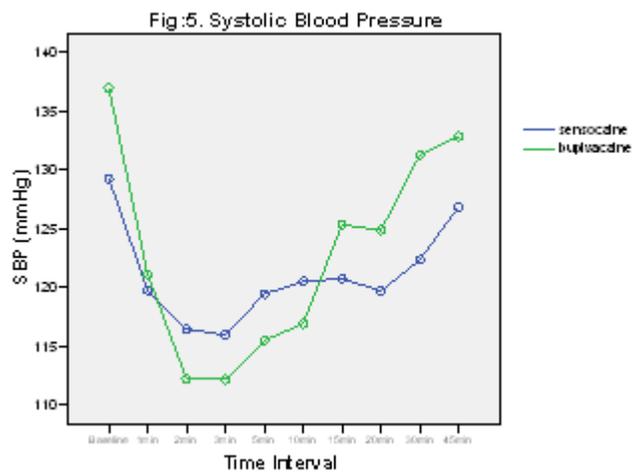
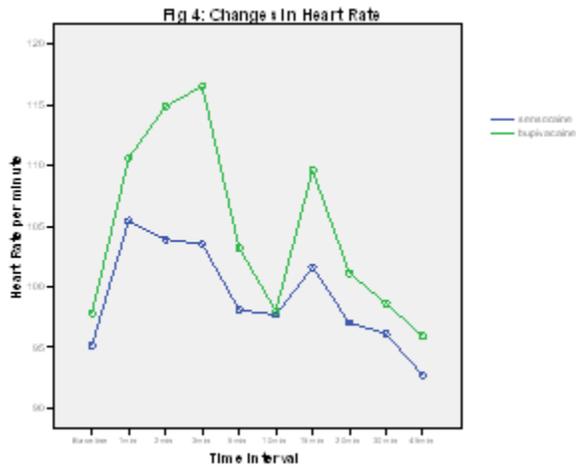
RESULTS

The groups were comparable with respect to age, weight and ASA status. No significant difference was seen in sensory block at 1 min ($p=0.435$) as it occurred in 6 patients in Group II and 4 patients in Group I. At 3min significant difference was seen among groups ($p=0.019$). 17 patients achieved a level of T6 in Group II whereas 10 patients in group I reached this level. T8 level was seen in 10 patients in group I and 3 in group II. T10 level was reached in 7 patients in group I and 2 patients in group II. At 5min no difference $p=0.801$ as 6 patients achieved a sensory block in Group I out of which 2 reached a level of T6. In Group II only 1 patient reached level of T6 and 1 a level of T8.

Motor block: Motor block occurred in 4 patients in Group I and in 6 patients in Group II after 1 min. After 5 min motor block was seen in 20 patients in Group I and 22 patients in Group II. There was no significant difference $p=0.343$. One patient was given GA due to failure of block in Group I (Fig:2).

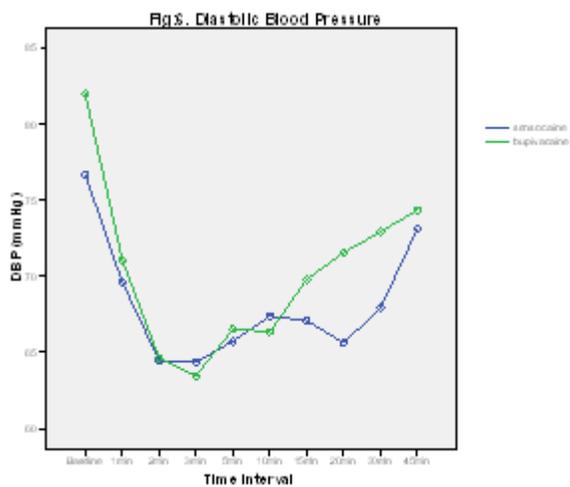
The use of ephedrine did not show any significant difference among groups ($p=0.260$) (Fig. 3). Changes in HR showed no significant difference among groups after 45min ($p=0.399$) (Fig. 4). Systolic blood pressure showed a significant drop in group II within 5 min ($p=0.010$) but after 45 min there was no significant difference among groups ($p=0.086$) (Fig. 5). Changes in Diastolic blood pressure (DBP) did not show any significant difference within 5min ($p=0.118$) and after 45 min among groups ($p=0.585$) (Fig.6). No significant difference was seen in Mean arterial pressure after 45min ($p=0.457$) (Fig. 7).

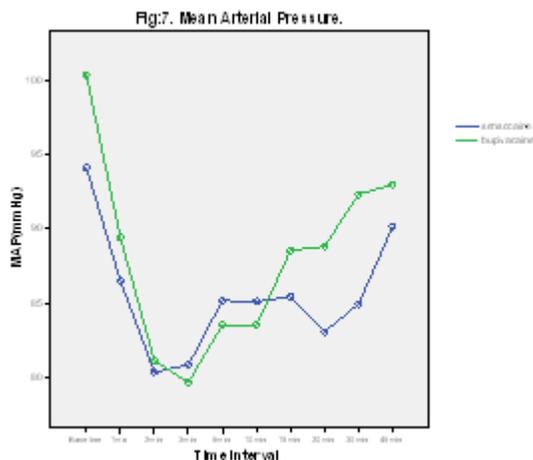




Descriptive statistics

| | N | Mini. | Maxi. | Mean | Std. Deviation |
|------------|----|-------|-------|-------|----------------|
| Age (Yrs) | 60 | 21 | 40 | 28.47 | 4.098 |
| Weight(kg) | 60 | 50 | 80 | 69.52 | 7.347 |





DISCUSSION

Spinal Anesthesia is a popular and most frequently used technique for lower segment cesarean section.

Baricity of a solution determines the duration and extent of spread of local anaesthetic used in spinal anaesthesia. In obstetrics hyperbaric solutions are preferred because of their inability to reach higher thoracic dermatomes as compared to isobaric that produces a higher sensory level¹⁰.

This study was conducted to assess whether the choice of bupivacaine could affect the quality of spinal anesthesia and hemodynamic changes occurring during cesarean section. Comparing two different baricities of bupivacaine in same volume and dose i.e., 2.5ml (12.5mg) of both isobaric and hyperbaric 0.5% of bupivacaine, we observed that sensory block (T6 level) developed more rapidly in isobaric group II at 3min that showed significant difference among groups ($p=0.019$). At 5min no statistically significant difference was observed. Motor block developed at 5min in both groups and there was no significant difference ($p=0.343$). These observations are different from the study performed by solakovic¹¹. They reported patients undergoing orthopedic, urologic and gynecologic surgery who received spinal anesthesia with either hyperbaric or isobaric bupivacaine (15mg.0.5%). In their study the hyperbaric bupivacaine had a higher sensory block level at T5 compared with T10 in the isobaric group and led to a high block with hemodynamic instability in some patients. Xu et al¹² also reported shorter onset time of peak sensory block in hyperbaric group when compared with isobaric group.

In our study we observed no significant difference in decrease in heart rate among groups after 45min ($p=0.399$). However there was greater drop in SBP and MAP in group II within 5min ($p=0.010$ and $p=0.028$) when compared with group I. However no significant difference was found in SBP and MAP after 45min ($p=0.086$ and $p=0.457$ respectively) there was no significant decrease in DBP at 5min ($p=0.118$) and 45min ($p=0.585$) in both groups. Ephedrine was given to 7(23.3%) patients in group I and 11(36.6%) patients in isobaric group to treat hypotension but the difference was not statistically significant ($p=0.260$). Rene Martin conducted a study in 2000 (13). The results of their study are similar to the result of our study. They concluded that motor and sensory block developed more rapidly (5min) in the isobaric group ($p<0.05$). However they reported hemodynamic changes different than in our study. In their study significant drop in MAP was observed in both groups being more severe in hyperbaric group when compared with isobaric group whereas greater drop in SBP and MAP was seen in isobaric group in our study. 33.3% of patients required treatment with ephedrine in group I and 66.6% patients in group II to treat hypotension.

A local study conducted by Aftab et al 2007¹⁴. They observed rapid onset of hemodynamics and sensory changes when using hyperbaric bupivacaine as compared to isobaric bupivacaine for elective cesarean section.

CONCLUSION

The results of our study suggest that 0.5% isobaric bupivacaine was more predictable for sensory block level after spinal anesthesia when compared with 0.5% hyperbaric bupivacaine in patients undergoing lower segment cesarean section. Although the rapid onset of sensory block with isobaric bupivacaine

produced more hypotension when compared with hyperbaric bupivacaine but it was not statistically significant.

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