

“A Comparative Study Of Effect Of Two Different Doses Of Spinal Anesthesia On Hemodynamic Parameters For Lower Segment Cesarean Section”

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Abstract

Background: The purpose of our study was to compare the level of adequate block and haemodynamic stability with two different doses of hyperbaric bupivacaine in spinal anaesthesia for patients undergoing lower segment caesarean section.

Materials And Methods: 60 pregnant patients belonging to ASA I & II undergoing elective caesarean section under spinal anaesthesia were studied in this prospective study. First group A (n=30) was given inj. Hyperbaric Bupivacaine 15mg & group B (n=30) was given inj. Hyperbaric Bupivacaine 10 mg. Parameters like time for adequate level of analgesia, peak sensory and motor level reached, duration of sensory, motor block and incidence of complications were noted in both groups.

Result: The time of onset of adequate level of sensory block (T10) and motor block was longer for group B than group A. Duration of sensory block and motor block was slightly more for group A but the duration was sufficient to conclude the surgery.

Conclusion: It is concluded that subarachnoid block with inj. Hyperbaric Bupivacaine 10 mg is more hemodynamically stable and better option for pregnant patients undergoing lower segment caesarean section under spinal anaesthesia.

Keywords: Bupivacaine, spinal anaesthesia, caesarean section.

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I. Introduction

Professor August Bier performed the first surgical operation using spinal anaesthesia at the Royal Surgical Hospital of the University of Kiel, Germany on August 16, 1898.¹ Attenuation of Intraoperative anxiety and stress always remains a challenge in the practice of anaesthesia and it also has several detrimental effects on different systems of human body. Neuraxial anaesthesia techniques have several advantages, including a decreased risk of failed intubation and aspiration of gastric contents, avoidance of depressant agents, decreased blood loss, ability of remaining awake and enjoying the birthing experience. Single shot spinal anaesthesia has been found to be faster, provides a superior block, and more cost effective as compared with epidural anaesthesia. Subarachnoid block is easier to perform, has a more rapid predictable onset and may produce more intense block and does not have potential for serious systemic drug toxicity, because of smaller dose of local anaesthetic employed.^{2,3,4} Degree of arterial hypotension correlate with the level of sympathetic block which is 2-4 segment higher than level of anaesthesia.⁵ Again spread of LA in Subarachnoid space depends on dose, volume, position of patient, site of injection, speed of injection, baricity of the drug, direction of needle and barbotage. Pregnancy is known to cause higher cephalad spread of analgesia. Level of anaesthesia and haemodynamic instability are more in LSCS due to more sensitivity of nerve fibre to local anaesthetic for hormonal influence of pregnancy.⁶ There is also an increased risk due to compression of the aorta and inferior vena cava by gravid uterus often leads to decreased cardiac output, which may precipitate hypotension. Surgical anaesthesia upto T4 is sufficient for lower uterine caesarian section.⁷ Surgical anaesthesia to T4 – T6 obtained within 5-15 minutes with hyperbaric bupivacaine 15-20mg in non pregnant patient.⁸ In LSCS required dose reduced to 30% of normal patient.

10-14mg of Hyperbaric bupivacaine is the required dose. Hyperbaric bupivacaine is recommended because of its reliability of spread to the mid thoracic level and appropriate duration of action. Hyperbaric L.A descend downward when sitting and toward T4 when supine.

The purpose of our study was to compare the level of adequate block and haemodynamic stability with two different doses of Hyperbaric bupivacaine in lower segment caesarean section.

II. Materials And Methods

After approval of institutional ethical committee and informed consent for spinal anaesthesia, 60 pregnant patients were randomly divided into 2 equal groups, belonging to ASA I & II, aged 20 to 35 years undergoing elective caesarean section under spinal anaesthesia were studied. Patients with history of allergy to local anaesthetics, any contraindication to subarachnoid block, requiring any intraoperative added general anaesthetic aid, deaf, mentally retarded patient/dementia or with psychiatric disorder were excluded from the study.

Patients were kept fasted for solid food for at least 8 hours before the operation and clear water till 2 hours before operation. Intravenous access was obtained in the upper limb with 18 G cannula and aspiration prophylaxis was given in the form of intravenous pantoprazole 40 mg and Ondansetron 4 mg 30 minutes prior to the surgery. Baseline parameters: Pulse, blood pressure, SpO₂ were recorded. Under all aseptic precautions lumbar puncture was performed in sitting position in L3-L4 space by 27 Gauge Quincke point needle. First group A (n=30) was given inj.Hyperbaric Bupivacaine 15mg & group B (n=30) was given inj. Hyperbaric Bupivacaine 10 mg and sensory level of T6-T8 was achieved. Patients were given oxygen by mask at 6 L/minute.

Continuous Electrocardiography in lead II, Systolic blood pressure, Diastolic blood pressure, Mean Arterial Pressure, Heart rate, Respiratory rate, SpO₂ were recorded 15 minutes before and at the time of spinal anaesthesia, then at 1 minute, at 3 minutes, at 5 minutes, thereafter at 5 minutes interval throughout the entire surgical procedure and at 15 minutes interval during first 60 minutes of post-operative period.

Hypotension was defined as SBP of < 90 mm of Hg or a decrease of more than 30% from baseline mean arterial pressure which was treated with an incremental IV bolus of Mephentermine 6 mg. Bradycardia (heart rate < 60bpm) was treated with IV atropine. Inj Paracetamol infusion was given intravenously at 15mg/ kg body weight dosage over 15 minutes duration when patient first complained of pain. Parameters like time for adequate level of analgesia, peak sensory and motor level reached, duration of sensory, motor block, time when first rescue analgesic given and incidence of complications were noted in both groups.

Motor block was assessed using modified Bromage scale.

- 0 -- No paresis – full movements of lower limbs
- 1 – Partial paresis – flex knees and ankles
- 2 – Partial paresis – flex ankles
- 3 – Partial paresis – flex toes only
- 4 – Full paresis – no movement

III. Results:

All the statistical analysis was carried out using Microsoft Excel, 2013 and STATA 14 software. Student's t-test was used to test the null hypothesis that the mean of the two groups are same at 5% level of significance. The demographic data (age, weight, sex & ASA grading) were comparable and statistically non significant (Table- 1). Average duration of surgery was 75 minutes.

- **(Table-2)T1:** onset of sensory block: The Group B has a mean onset time of sensory block of 6.54 minutes whereas the, Group A has an onset time of 4.33 minutes. The difference in mean is of 2.21 minutes which is significant at 5% level of significance.
- **T2:** onset of motor block: The Group B has a mean onset of 8.68 minutes whereas the, Group A has onset of 8.83 minutes. The difference in mean is of -0.15 minutes which is not significant at 5% level of significance with a p-value of 0.52. The difference is low in respect to magnitude and statistically insignificant.
- **T3:** time to reach peak sensory level: The Group B has a mean time to reach the peak sensory level of 9.53 minutes whereas the Group A has the mean time of 8.06 minutes. The difference in mean is of 1.47 minutes which is significant at 5% level of significance with a p-value of 0.00.
- **T4:** the duration of sensory block: The Group B has a mean duration of 96.14 minutes whereas the Group A has duration of 121.81 minutes. The difference in mean is of -25.67 minutes which is significant at 5% level of significance with a p-value of 0.00. Though, the duration of sensory block is 96.14 which is lower than the Normal group but the duration is sufficient to conclude the surgery. This is because the mean required duration for a surgery is 75 minutes.
- **T5:** duration of motor block: The Group B has a mean duration of 195.86 minutes whereas the Group A has duration of 231.5 minutes. The difference in mean is of -35.64 minutes which is significant at 5% level of significance with a p-value of 0.00. Though, the duration of motor block is 195.86 minutes which is lower than

the groupA but the duration is sufficient to conclude the surgery.

- **T6:** duration of spinal anaesthesia: The Group B has a mean duration of spinal anaesthesia 225.96 minutes whereas the Group A has duration of 261.84 minutes. The difference in mean is of - 35.88 minutes which is significant at 5% level of significance with a p-value of 0.00. Though, the duration of spinal anaesthesia is 225.96 minutes which is lower than the groupA but the duration is sufficient to conclude the surgery.
- **T7:** time when first rescue analgesia was given: The Group B has a mean time of 311.90 minutes when the first rescue analgesia was given whereas the Group A has duration of 397.32 minutes. The difference in mean is of - 85.42 minutes which is significant at 5% level of significance with a p-value of 0.00. Though, the time when first rescue analgesia was given is 311.9 minutes which is lower than the groupA but the duration is sufficient to conclude the surgery.
- Incidence of hypotension and bradycardia was more in group A and was found to be statistically significant (Graph-1,2,3).
- None of the patients had nausea, vomiting, respiratory depression or shivering.

TABLE 1: DEMOGRAPHICS

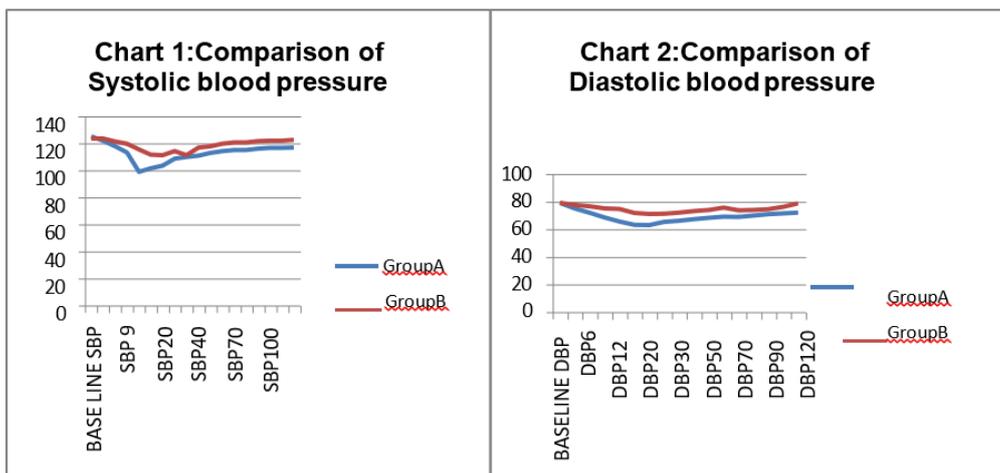
Parameters	Group A	Group B
Age (yrs)	25.5 ± 2.55	46.54 ± 12.26
Height (cms)	63.02 ± 2.21	63.66 ± 2.39
Weight (kgs)	58.52 ± 4.90	62.72 ± 5.84
Duration of Surgery (mins.)	78 ± 25.71	75 ± 24.72
Male : Female	31 : 19	28 : 22
ASA PS Grade I : II	28 : 22	25 : 25

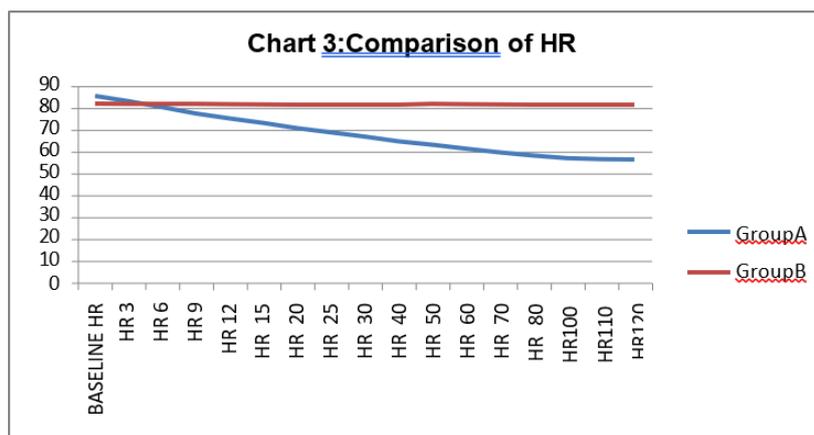
Values are reported in the form of Mean ± Standard deviation

TABLE 2: CHARACTERISTICS OF SPINAL BLOCK

Parameters	Group A	Group B
ONSET OF SENSORY BLOCK	4.33 ± 0.43	6.54 ± 0.66
ONSET OF MOTOR BLOCK	8.83 ± 1.08	8.68 ± 1.27
TIME TO REACH PEAK SENSORY LEVEL	8.06 ± 0.34	9.53 ± 0.70
THE DURATION OF SENSORY BLOCK	121.81 ± 8.14	96.14 ± 5.20
DURATION OF MOTOR BLOCK	231.5 ± 8.57	195.86 ± 9.10
DURATION OF SPINAL ANAESTHESIA	261.84 ± 10.78	225.96 ± 7.19
TIME WHEN FIRST RESCUE ANALGESIA WAS GIVEN	397.32 ± 21.51	311.9 ± 16.06

Values are reported in the form of Mean ± Standard deviation





IV. Discussion

Maintenance of body physiology as near normal as possible during anaesthesia is one of the primary goals of anaesthesiologist. Marked hemodynamic derangements are often seen following subarachnoid block especially in pregnant, trauma and elderly patients. Hyperbaric bupivacaine is recommended because of its reliability of spread to the mid thoracic level and appropriate duration of action. Hyperbaric L.A descend downward when sitting and toward T4 when supine.

In our present study, the goal was to compare the level of adequate block with haemodynamic stability like blood pressure, heart rate changes, and motor and sensory profiles of block with dose of 0.5 % Hyperbaric bupivacaine (15mg) compared to dose(10mg) in lower segment caesarean section in sitting position. Incidence of hypotension and bradycardia group A and was found to be statistically significant (Graph-1,2,3).

The Group B has a mean onset time of sensory block of 6.54 minutes whereas the Group A has an onset time of 4.33 minutes. The difference in mean is of 2.21 minutes which is significant at 5% level of significance. The Group B has a mean duration of 96.14 minutes whereas the Group A has duration of 121.81 minutes. The difference in mean is of -25.67 minutes which is significant at 5% level of significance with a p- value of 0.00. Though, the duration of sensory block is 96.14 which is lower than the groupA but the duration is sufficient to conclude the surgery. This is because the mean required duration for a surgery is 75 minutes.(Table-2)

In the study by Russel and Holm Quist⁹ injection of Hyperbaric 0.5% bupivacaine 2.5ml (12.5mg) with the patient in the lateral position produced maximum analgesia greater than in the present study. With block rising to the cervical dermatomes in 25% of patients.

In the present study we used 15mg and 10mg of hyperbaric bupivacaine. This study differs from that of Russel in dose and volume. In the study of MA Karim¹⁰ showed that dose, volume and the position of the patient when hyperbaric local anaesthetic solution was injected in subarachnoid space for LUCS are significant factor. reliable in achieving bilateral spread than of 15 mgin sitting position.

V. Conclusion

From current study, it was concluded that the onset of sensory block and the time to reach the peak sensory level is significantly lower for the GroupA as compared to the GroupB. The duration of sensory and motor block is significantly lower for the GroupB than the GroupA but the duration is sufficient to conclude the surgery. The incidence of hypotension and bradycardia was significantly higher for the GroupA as compared to the GroupB

Hence subarachnoid block with 10 mg Hyperbaric bupivacaine 0.5% is more safer and better option, than dose of 15mg Hyperbaric 0.5% Bupivacaine , both in terms of maintaining hemodynamic stability and lower incidence of complications without compromising the surgical condition for pregnant patients undergoing lower segment caesarean section under spinal anaesthesia. The conventional(10mg) of 0.5% bupivacaine dose can be considered to be a safer alternative forpregnant patients, which can reduce the rate of hypotension, bradycardia or other complications.

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