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"Effects on Hemodynamic Parameters in Patients Undergoing Caesarean Sectionunder Low Dose Spinal Anaesthesia"

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ABSTRACT

BACKGROUND: The purpose of our study was to compare the level of adequate block with haemodynamic stability with low dose of Hyperbaric bupivacaine and conventional dose of bupivacaine in spinal anaesthesia forpatients undergoing lower uterine caesarean section in sitting position. **MATERIALS AND METHODS:** 60 pregnant patients belonging to ASA I & II undergoing elective caesarean section under spinal anaesthesia were studied in this prospective, randomized double blinded study. First group A (n=30) was given inj. Hyperbaric Bupivacaine 12.5mg &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 groupA but the duration was sufficient to conclude the surgery.**CONCLUSION :**It is concluded that subarachnoid block with inj. Hyperbaric Bupivacaine 10 mg is more hemodynamicallystable and better option for pregnant patients undergoing lower uterine caesarean section under spinal anaesthesia.

KEY WORDS: Bupivacaine, spinal anaesthesia, caesarean section, low dose.

I. INTRODUCTION

Professor August Bier performed the first surgical operation using spinal anaesthesia at the Royal Surgical Hospital of the Universityof 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.Neuraxialanaesthesia 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

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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 anesthesia.[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 ofanaesthesia and haemodynamic instability are more in LUCS 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 anaesthesiauptoT4 is sufficient for lower uterine caesarian section.[7]Surgicalanaesthesia to T4 – T6 obtained within 5-15 minutes with hyperbaric bupivacaine 15-20 mg innon pregnantpatient.[8] In LUCS required dose reduced to 30% of normal patient. 9-12 mg 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 with haemodynamic stability with low dose of Hyperbaric bupivacaine in lower uterine caesarean section in sitting position.

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 in this prospective, randomized double blinded trial. 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 Ranitidine 50 mg and Ondansetron 4 mg 30 minutes prior to the operation. Baseline parameters: Pulse, blood pressure, SpO_2 were recorded. Under all aseptic and antiseptic precautions lumbar puncture was performed in sitting position in L3-L4 space by 25 Gauge Quincke point needle. First group A (n=30) was given inj.Hyperbaric Bupivacaine 12.5mg & group B (n=30) was given inj. Hyperbaric Bupivacaine 10 mg and sensory level of T6-T8 was achieved. Patients were given oxygen by nasal cannula at 3 L/minute.

Continuous Electrocardiography in lead II, Systolic blood pressure, Diastolic blood pressure, Mean Arterial Pressure, Heart rate, Respiratory rate, SpO_2 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.InjParacetamol 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 modifiedBromagescale.

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 90 minutes.

- **(Table-2)T1:** onset of sensory block:The 'Low' dose,Group B has a mean onset time of sensory block of 6.54 minutes whereas the 'conventional' dose, Group A has an onsettime 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 'Low' dose,Group B has a mean onset of 8.68

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minutes whereas the 'conventional' dose, 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. Thedifference is low in respect to magnitude and statistically insignificant.

- **T3:** time to reach peak sensory level:The 'Low' dose, Group B has a mean time to reach the peak sensory level of 9.53 minutes whereas the 'conventional' dose, 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 'Low' dose, Group B has a mean duration of 96.14 minutes whereas the 'conventional' dose, 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 90 minutes.
- **T5:** duration of motor block:The 'Low' dose, Group B has a mean duration of 195.86 minutes whereas the 'conventional' dose, 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 195.86minutes which is lower than the conventional group but the duration is sufficient to conclude the surgery.
- **T6:** duration of spinal anaesthesia:The 'Low' dose, Group B has a mean duration ofspinal anaesthesia 225.96 minutes whereas the 'conventional' dose, 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 conventional group but the duration is sufficient to conclude the surgery.
- **T7:** time when first rescue analgesia was given:The 'Low' dose, Group B has a mean time of 311.90 minutes when the first rescue analgesia was given whereas the 'conventional' dose, 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 Normal group 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 : Normal	Group B : Low
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.)	90 ± 25.71	93.6 ± 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 : Normal	Group B : Low
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	121.81 ± 8.14	96.14 ± 5.20

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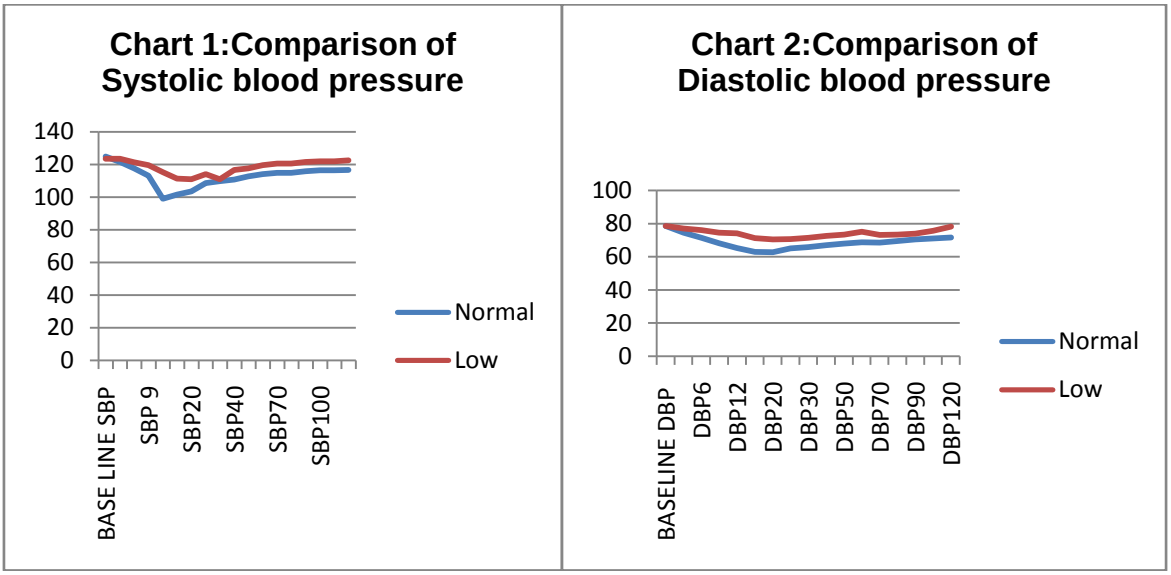
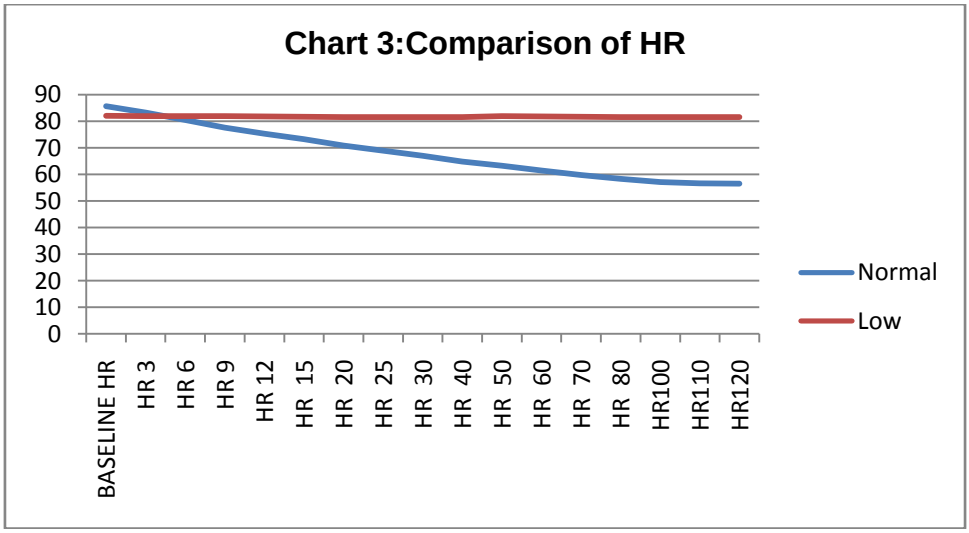
SENSORY BLOCK		
DURATION OF MOTOR BLOCK	231.5 ± 8.57	195.86 ± 9.10
DURATION OF SPINAL ANAESTHESIA	261.84 ± 10.78	225.96 ± 7.19
TIME WHEN FIRST RESCUE ANALGESIA WAS GIVEN	397.32 ± 21.51	311.9 ± 16.06

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 low dose of 0.5 % Hyperbaric bupivacaine (10mg) compared to conventional dose(12.5mg) in lower uterine caesarean section in sitting position. Incidence of hypotension and bradycardia group A and was found to be statistically significant (Graph-1,2,3).

The 'Low' dose,Group B has a mean onset time of sensory block of 6.54 minutes whereas the 'conventional' dose, 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 'Low' dose, Group B has a mean duration of 96.14 minutes whereas the 'Normal' dose, 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 90 minutes.(Table-2)

In the study by Russel and Holm Quist[9] 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 10mg and 12mg of hyperbaric bupivacaine. This study differs from that of Russel in dose and volume. In the study of MA Karim[10] 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.

Robin Russell[11] stated that in LUCS when injected while sitting 10 mg of Hyperbaric bupivacaine produces less satisfactory results than 12.5 mg, while 12 mg in the lateral position is 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 conventional dose as compared to the 'Low' dosage. The duration of sensory and motor block is significantly lower for the 'Low' doses than theconventional dosesbut the duration is sufficient to conclude the surgery. The incidence of hypotension and bradycardia was significantly higher for the conventional dose as compared to the 'Low' dosage.

Hence subarachnoid block with 10 mg Hyperbaric bupivacaine 0.5% is more safer and better option, than conventional dose of 12.5 mg Hyperbaric 0.5% Bupivacaine , both in terms of maintaining hemodynamic stability and lower incidence ofcomplications without compromising the surgical condition for pregnant patients undergoing lower uterine caesarean section under spinal anaesthesia. The lower dose can be considered to be a safer alternative forpregnant patients, which can reduce the rate of hypotension, bradycardia or other complications who may have more hypotension after conventional dose of bupivacaine.

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CONFLICTS OF INTEREST
There are no conflicts of interest.

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