Original Research Paper

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A COMPARATIVE STUDY OF INTRATHECAL HYPERBARIC LEVOBUPIVACAINE(0.5%) WITH HYPERBARIC BUPIVACAINE(0.5%) FOR SPINAL ANAESTHESIA IN LOWER SEGMENT CAESAREAN SECTION.

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ABSTRACT **Introduction:** Spinal anaesthesia is widely used anaesthesia for patients undergoing lower segmet caesarean section as it avoids a general anaesthesia and risk of aspiration. Levobupivacaine is S(-) enantiomer of bupivacaine having lower cardiotoxicity and neurotoxicity and shorter motor duration. The aim of this study is to compare effectiveness of these two local anesthetics with regards to onset and duration of sensory and motor block, hemodynamic profile and side effects if any. **Material and Methods:** 28 parturients (ASA grade I and II, aged between 18-40 yr) undergoing elective lower segment caesarean section were divided in 2 group. Group L received 2.5 ml (12.5 mg) of 0.5% hyperbaric levobupivacaine intrathecally and Group B received 2.5 ml (12.5 mg) of 0.5% hyperbaric bupivacaine intrathecally. Parameters like Time for onset of sensory block, peak sensory level, time to reach maximum sensory level, time to regression by two dermatomes were observed. Time to reach modified bromage 1 and 3, total duration of motor block were compared between two groups. Side effects like hypotension, tachycardia , bradycardia, nausea, vomiting were noted if any. **Results :** Time for onset of sensory block, time to achieve highest level of sensory block and time to achieve modified bromage score 1 and 3 were prolonged in group L compared to group B ($P<0.05$). Duration of sensory block and duration of analgesia was longer in group L($P=0.0031$) as compared to group B. Total duration of motor block was less in group L as compared to group B($P=0.0001$). Hypotension was less pronounced in group L as compared to group B. **Conclusion :** Hyperbaric levobupivacaine provides longer duration of analgesia and shorter duration of motor block as compared to hyperbaric bupivacaine. Hemodynamic stability is better with levobupivacaine as compared to bupivacaine.

KEYWORDS : Lower segment caesarean section, Spinal anaesthesia, Hyperbaric Levobupivacaine

Introduction

Caesarean births are among the surgical intervention requiring very close team work between anaesthetist and surgeon. Regional techniques are commonly used anaesthesia methods and neuraxial block are the gold standard for caesarean surgery. It is used for both elective and emergency caesarean section.

For local anesthetic selection; onset and duration of action, sensory and motor block level and cardiac toxicity of agent should be considered.[4] An overall 0.5% heavy bupivacaine is more commonly used for spinal anaesthesia for caesarean section. Nowadays, apart from lignocaine and bupivacaine, Levobupivacaine and Ropivacaine are commonly being used for neuraxial anaesthesia.[2]

Levobupivacaine, a pure S(-) enantiomer of bupivacaine was approved by the United States Food and Drug Administration in 1997. It is less cardiotoxic, neurotoxic and equally potent local anesthetic compared to it's racemate. It is known to cause less depression of myocardial contractility. Levobupivacaine causes fewer side effects such as hypotension, bradycardia and nausea.

The objectives of this study are to compare efficacy of hyperbaric levobupivacaine and bupivacaine for intrathecal anaesthesia in view of onset and duration of sensory and motor block, hemodynamic changes intraoperatively, duration of analgesia and side effects and complications (if any).

Materials and Methods

A prospective study was performed after obtaining the informed, written consent from the patients undergoing elective caesarean section. A 28 parturients of ASA (American Society of Anaesthesia) I & II, aged between 18-40 years scheduled for elective caesarean section were included in this study. Patients refusing regional anaesthesia, known contraindications to spinal anaesthesia (sepsis, local infection, coagulopathy or on potent antiplatelets and anticoagulants, spine deformity or space occupying lesion in brain), maternal hypotension and hypovolemia, under ASA III or more were excluded from the study.

They were randomly divided in two group: Group L(Levobupivacaine) and Group B(Bupivacaine)**.** Patients in Group L received 12.5 mg hyperbaric levobupivacaine 0.5% intrathecally and patients in Group B received 12.5 mg hyperbaric bupivacaine 0.5% intrathecally. Preanesthetic evaluation was done for every parurients. A suitable 18-20 G IV cannula was placed peripherally. Preloading was done with ringer lactate solution 10 ml/kg before 30 minutes of spinal anaesthesia. In operation theater, baseline hemodynamic parameters like heart rate, non-invasive blood pressure, pulse oximetry, electrocardiogram were recorded in supine position. Patient was premedicated with inj. Glycopyrrolate 0.01 mg/kg IV and inj. Ondancetron 0.1-0.2 mg/kg IV.

Under strict aseptic and antiseptic precaution, standard subarchnoid block was performed in sitting position, with midline approach in L3-L4 intervertebral space with 25 G quincke spinal needle. Depending on group assigned, inj. Levobupivacaine heavy (0.5%) 2.5 ml (12.5 mg) or inj. Bupivacaine heavy (0.5%) 2.5 ml (12.5 mg) was given intrathecally after free flow of clear CSF. Time for intrathecal injection was taken as 0 min. patient was put in supine position immediately after giving block.

Hemodynamic parameters were recorded for every 1 min for 3 min, then every 5 min up to 15 min and then every 15 min interval throughout the surgery. Sensation was checked using pinprick method. Sensory onset time(seconds) as taken as first complain of tingling and numbness in lower limb. Time for sensory block up to T_{10} level and up to highest sensory level, as well as time for sensory regression by two dermatomes and regression up to T_{12} level were recorded. Motor block was assessed using modified bromage scale (**0** = no paralysis, able to flex hips/knees/ankles, **1** = able to move knees; unable to raise extended legs, **2** = able to flex ankle; inability to flex knees, **3** = unable to move any part of lower limb)

Hypotension (fall in BP >20% from baseline) was treated with inj. ephedrine 6 mg iv increments doses. Bradycardia is defined as HR<50/min and treated with atropine. Other side effects like nausea, vomiting were recorded. Inadequate analgesia was treated with 0.5 mg/kg IV Ketamine , increased up to 1mg/kg IV, this dose is not harmful to fetus.

Observations and Results

All the patients belonged to ASA I or II. Other dermographic variable are also comparable.

Table 1 : Dermographic profile

Characteristic	Group L (mean±SD)	Group B (mean±SD)
No. of patients	14	14
Age(year)	27.5 ±3.4	28.7 ±3.5
Weight(kg)	61.20 ± 4.17	61.48 ± 4.08

We observed that sensory block onset time and time to achieve highest level of sensory block were prolonged in group L (levobupivcaine) compared to group B (bupivacaine) with P value <0.05(significant). Time to achieve modified bromage score 1 and 3 was prolonged in levobupivacaine group and it was statistically very significant (p value 0.0025 and 0.0214 respectively). There was no statistically significant difference in terms of two segment regression time in both group (P > 0.05). Duration of motor block was significantly lower in Levobupivacaine group as compared to Bupivacaine group (P value 0.0001) and duration of analgesia was significantly prolonged in Levobupivacaine group (p value 0.0031). T6 was the highest level of sensory block achieved in majority of patients in both groups.

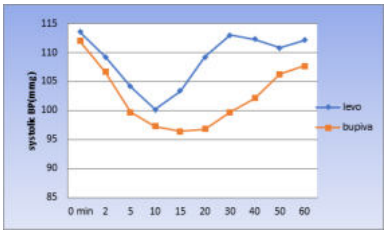
Table 2 : characteristic of spinal anaesthesia

Characteristic	Group L	Group B	P value
Sensory onset T10 (min)	2.77 ± 0.68	1.58 ± 1.1	0.0020
Time to reach sensory level T6 (min)	6.66 ± 3.07	4.5 ± 2.16	0.0408
Time to achieve modified bromage score 1 (min)	2.85 ± 2.20	0.85 ± 0.42	0.0025
Time to achieve modified bromage score 3 (min)	9.93 ± 5.98	5.41 ± 3.46	0.0214
Time to two segment regression	89.81 ± 16.73	86.28 ± 16.73	0.8677
Duration of motor block	92.36 ±12.33	132.71 ± 24.15	0.0001
Duration of Analgesia	204.78 ± 22.11	178.35 ± 20.69	0.0031

Values are expressed as mean ± SD. P<0.05 is considered significant. SD: standard Deviation.

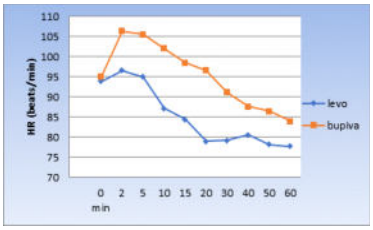
Levobupivacaine seems to provide more hemodynamic stability than Bupivacaine. 1 out of 14 patients in group L developed hypotension(7.14%) where as 3 out of 14 patients in group B developed hypotension (21.42%). None of parturients required injection atropine for significant bradycardia.

Figure 1 : Trend of systolic blood pressure(in mmHg) over different time intervals



Changes in two groups with same domain in X-axis against the time in minutes in Y-axis

Figure 2 : Trends of pulse rate over different time intervals.



Discussion

This study was done to compare efficacy of hyperbaric levobupivacaine with that of hyperbaric bupivacaine in patients undergoing elective caesarean sections. In our study, 14 patients in each group were statistically comparable with respect to age and weight. We have studied two different drugs with same dose in same intrathecal space. We observed that patients who received 2.5 ml of 0.5% hyperbaric levobupivacaine in spinal anaesthesia had adequate sensory block , longer duration of analgesia, early recovery from motor block and stable hemodynamic profiles.

This study demonstrate longer onset time of sensory and motor block , longer duration of analgesia and shorter duration of motor block in group L than group B(P <0.05). Time to reach sensory level up to T_{10} and T_6 was higher and time to reach motor block up to modified bromage scale 1 and 3 was also longer in group L compared to group B (P<0.05). These finding are consistent with study done by Thakore S in 2018[3] ,where they evaluated efficacy of low dose hyperbaric levobupivacaine versus bupivacaine with fentanyl for subarcnoid block in patients undergoing MTP and sterilization. They also observed longer duration of analgesia with hyperbaric levobupivacaine and this result is consistent with our study.

In 2019, Ayman Esmail at el [4] studied effect of hyperbaric bupivacaine with fentanyl and levobupivacaie with fentanyl for knee arthroscopy. They observed no difference in onset of motor block time, time to maximum block , first analgesic need between two groups. These findings are inconsistent with our study. They also observed maximum motor block level and time to end motor block level was higher in bupivacaine group (P<0.05), these findings are consistent with our study. They observed statistically significant difference in heart rate between two groups, this is also consistent with our study.

In 2017, Biswarjit Debbarma at el[1] studied hyperbaric bupivacaine(0.5%) with hyperbaric levobupivacaine for spinal anaesthesia in caesarean section. They observed time to onset of sensory block was faster in 0.5% hyperbaric levobupivacaine. No significant difference was found in time to reach maximum block level. The degree of motor block and motor block regression was similar in all group. All these findings are inconsistent with our study. They observed that at a higher dose (10 mg in L_{3-4} space) levobupivacaine provide more hemodynamic stability than bupivacaine, this result is consistent with our study.

Conclusion

To conclude, 2.5 ml of 0.5% hyperbaric levobupivacaine provides adequate level of sensory blockade, significantly lesser duration of motor blockade and longer duration of analgesia compared with similar doses of hyperbaric bupivacaine in caesarean section. Only disadvantage is of delayed onset of sensory block. Levobupivacaine also provides better hemodynamic stability. Thus, levobupivacaine is better alternative to bupivacaine because of its longer duration of analgesia, shorter duration of motor block and lower incidence of hypotension and it allows early ambulation.

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