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ORIGINAL RESEARCH

A comparative study of effect of intrathecal hyperbaric 0.75% ropivacaine versus hyperbaric 0.5% bupivacaine for lower limb surgeries

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ABSTRACT

Introduction: Intrathecal bupivacaine heavy is routinely used for spinal anaesthesia for various below umbilical surgeries. Newer stereoselective, single enantiomer amide local anaesthetic agents, ropivacaine and levobupivacaine, which have lower cardiac toxicity are studied for intrathecal use. Ropivacaine is well tolerated after intrathecal use. To begin with it was available in isobaric preparation and earlier studies had to prepare the hyperbaric solution. But now hyperbaric preparations are readily available. We aimed to study and compare efficacy, characteristic and hemodynamic effects of hyperbaric 0.75%ropivacaine versus hyperbaric 0.5%bupivacaine for lower limb surgeries. **Methodology:** Prospective randomised control study, included 80 patients (40 in each group) aged 18 to 60 years of either sex belonging to ASA-Grade I&II scheduled for elective lower limb surgeries under spinal anaesthesia. Patients were randomly allocated into two groups. GroupR-3ml of hyperbaric 0.75% ropivacaine& GroupB-3ml of hyperbaric 0.5% bupivacaine. Variables like time taken for onset of sensory and motor blockade, duration of action and hemodynamic parameters of both drugs were compared. **Results:** Mean age and gender of two groups were statistically insignificant (p value 0.618). Hyperbaric ropivacaine exhibited significantly slower onset of sensory and shorter duration of sensory and motor blockade compared to hyperbaric bupivacaine (p value <0.001). Group-R demonstrated better hemodynamic stability compared to Group-B (p value<0.05). **Conclusion:** Hyperbaric ropivacaine provides late onset and short duration of sensory & motor blockade with better hemodynamic stability in comparison to hyperbaric bupivacaine. Ropivacaine facilitates early ambulation, enhances patient satisfaction, and is more efficient and can be used as alternative to bupivacaine.

Keywords: Ropivacaine, Bupivacaine, Sensory block, Motor Block

INTRODUCTION

Bupivacainehas been used as the drug of choice for spinal anaesthesia since its introduction in 1956, due to its longer duration of action, producing profound sensory and motor blockade.[1] Ropivacaine structurally resembles bupivacaine with similar anaesthetic properties.[2]It has reduced potential for cardiotoxicity and neurotoxicity with improved relative sensory and motor block profile.[3,4] Ropivacaine, being a pure S-enantiomer, has low lipid solubility and blocks nerve fibers involved in pain transmission to a greater degree than those involved in motor function and has been used extensively for local infiltration, epidural, and peripheral nerve block.[5] Considering these relative advantages and disadvantages of both the drugs, an endeavour was made to compare the effects of intrathecal hyperbaric ropivacaine versus hyperbaric bupivacaine for lower limb surgery. Our primary objective was to compare the duration of analgesiabetweenhyperbaric 0.75% ropivacaine andhyperbaric 0.5% bupivacaine. Secondary objective was to study the characteristics of spinal blockade and hemodynamic effects of

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hyperbaric 0.75% ropivacaine with hyperbaric 0.5% bupivacaine.

METHODOLOGY

A prospective randomised control study was conducted. Sample size of 80 was estimated based on the study by Cappelleri Get al.[6]considering the difference in mean duration of postoperative analgesia of about 1.81±0.13hrs between levobupivacaine(H) and ropivacaine(H) groups in patients receiving spinal anaesthesia amounting to prevalence of 10%, and expected alpha error of 10%, to obtain the power of study of study to be >80. After obtaining institutional ethical committee approval and written inform consent, 80 patients aged 18 to 60 years of either sex belonging to ASA-Grade I&II scheduled for elective lower limb surgeries under spinal anaesthesia were enrolled for the study. Patients with uncontrolled comorbidities and coagulopathies were excluded from the study. Patients were randomly allocated equally into two groups. After thorough preanesthetic evaluation and conforming the nil-per-oral status patients were taken to operation theatre. An anaesthetist who is not involved in patients' data collection loaded the studied drug under sterile precautions. Patient and the assessor do not know to which group the patient belongs to. After recording of baseline vitals and preloading with 15ml/kg of ringer lactate, spinal anaesthesia was performed under sterile precautions. Group-R patients were given 0.75% ropivacaine heavy 3ml and Group-B patients were given 0.5% bupivacaine heavy 3ml intrathecally. Sensory blockade was assessed by pinprick method with 23G hypodermic needle every 2min till 10min followed by every 5min till 30min. Motor block was also recorded at the same time interval using Modified Bromage Scale. Pulse rate, blood pressure, SpO2, and respiratory rate were recorded at spinal anaesthesia and every 5min for 30min then every 15min till the end of surgery. Variables like time taken for onset of sensory and motor blockade, duration of action were noted. Onset of sensory block defined as time taken to reach T10 level sensory loss from intrathecal injection of drug. Duration of sensory block is the time gap between injection of spinal anaesthetic until the first request for analgesic by the patient. Pain was assessed by Visual Analogue Score (VAS). Duration of motor block is the time of intrathecal injection to reach Bromage scale 0. Side effects life hypotension, bradycardia, nausea and vomiting were noted and treated. Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 26.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square test. Comparison of Mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not. Descriptive statistics of each variable was presented in terms of Mean, Standard deviation, Standard error of mean. P value < 0.05 will be considered for statistically significant.

RESULTS

Demographic profiles (age, gender) were comparable between the two groups.

Table-1 describes various characteristics of spinal blockade. Onset of sensory block was faster in group-B which was statistically significant. Duration of sensory and motor blockade were prolonged in group-B which was statistically significant.

Table 1: Characteristics of Spinal Blockade

Characteristic	Group-B (n=40)	Group-R (n=40)	P value
Time of onset of sensory block (Mean ± SD) min	2.81 ± 0.27	3.18 ± 0.4	<.001
Duration of sensory block (Mean ± SD) min	194.2 ± 10.01	154.38 ± 9.97	<.001
Duration of motor block (Mean ± SD) hr	4.05 ± 0.57	6.1 ± 0.67	<.001

The were no much changes in the pulse rate, respiratory rate, and systolic blood pressure (SBP) in both the study groups at all time intervals and remained statistically insignificant. Diastolic blood pressure (DBP) and Mean blood pressures decreased significantly after the spinal anaesthesia in group-B compared to group-R.

DISCUSSION

The pure S (−) enantiomer of Propivacaine is known as Ropivacaine. It is claimed to be safer than the racemic formulation Bupivacaine as it has a lower propensity for cardiotoxicity and neurotoxicity.[7] Compared to Bupivacaine, Ropivacaine has a lower lipid solubility. Because of this, it causes less motor blockade than a sensory block and has less penetration into myelinated motor fibres.[8]In our study the time of onset of sensory blockwas found to be shorter with group-B, and it was statistically significant. The duration of sensory block and motor block were noted to be significantly higher in Group B. These findings of our study are similar to Chatterjee et al who noted that the onset of sensory and motor block were found to be significantly faster in bupivacaine group than in ropivacaine group (P < 0.001). Additionally, duration of sensory and motor block were prolonged in bupivacaine group.[9] Similarly, Mahajan et al noted that the sensory block onset was significantly delayed in Group R as compared to Group B. In addition, time required for peak sensory level was significantly delayed in group R as compared to group B. However, the time required for two-segment sensory regression was comparable in both groups. Furthermore, the maximum sensory level achieved (T6) in both groups

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was comparable in both groups.[10] The motor block onset up to L1 by Bromage scale of 3 that is inability to flex thigh, knee, and ankle was delayed in Group R as compared to Group B with highly significant difference.[10]

In our study haemodynamic parameters such as pulse rate and systolic blood pressure were comparable between two groups. Whereas diastolic and mean blood pressure were significantly lowered after spinal anaesthesia in group-B. Unlike our study, Mahajan et al noted that Intraoperative hemodynamic parameters were comparable in both groups.[10] Chatterjee et al noted that there was statistically significant difference noted in heart rate and mean arterial pressure at different time points during our assessment period.[9]

CONCLUSION

Ropivacaine is a safer alternative to bupivacaine as it provides adequate analgesia and better haemodynamic profile. But duration of analgesia is for shorter duration with ropivacaine, hence rescue analgesic must be administered at right time. Due to shorter duration of motor blockade, patients can be ambulated early.

REFERENCES

1. Beilin Y, Halpern S. Focused review: Ropivacaine versus bupivacaine for epidural labor analgesia. Anesth Analg. 2010;111:482–7
2. McClure JH. Ropivacaine. Br J Anaesth. 1996;76:300–7.
3. Simpson D, Curran MP, Oldfield V, Keating GM. Ropivacaine: A review of its use in regional anaesthesia and acute pain management. Drugs. 2005;65:2675–717.
4. Nakamura G, Ganem EM, Rugolo LM, Castiglia YM. Effects on mother and fetus of epidural and combined spinal-epidural techniques for labor analgesia. Rev Assoc Med Bras. 2009;55:405–9.
5. McClellan KJ, Faulds D. Ropivacaine: An update of its use in regional anaesthesia. Drugs. 2000;60:1065–93.
6. Cappelleri G, Aldegheri G, Danelli G, Marchetti C, Nuzzi M, Iannandrea G, Casati A. Spinal anesthesia with hyperbaric levobupivacaine and ropivacaine for outpatient knee arthroscopy: a prospective, randomized, double-blind study. Anesthesia & Analgesia. 2005 Jul 1;101(1):77-82.
7. Mohta M. Ropivacaine: Is it a good choice for spinal anesthesia? J Anaesthesiol Clin Pharmacol. 2015;31(4):457-458.
8. Vasudha J, Jadhav R and Diwanmal BM. Ropivacaine a review of its use in regional anaesthesia, choric pain management and in patients with cardiac diseases in non cardiac surgeries. IOSR J Pharm Biol Sci (IOSR-JPBS). 2015;10(1):43-47.
9. Chatterjee S, Bisui B, Mandal A, Sheet J, Sengupta S, Majumdar S, Swaika S. Effects of intrathecal hyperbaric ropivacaine versus hyperbaric bupivacaine for lower limb orthopedic surgery. Anesthesia Essays and Researches. 2014 Sep 1;8(3):349-53.
10. Mahajan HM, Patel SJ. To compare the efficacy of intrathecal 0.75% heavy ropivacaine and 0.5% heavy bupivacaine for lower abdominal and lower limb surgery. Asian Journal of Medical Sciences. 2023 Sep 1;14(9):58-63.