

ISOBARIC ROPIVACAINE AND ISOBARIC BUPIVACAINE IN MOTOR BLOCKADE DURING SPINAL ANAESTHESIA

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ABSTRACT

Objective: To compare the mean duration of motor blockade between 0.5% isobaric ropivacaine and 0.5% isobaric bupivacaine after spinal anaesthesia for lower limb surgery.

Material and Methods: This randomized controlled trial study was conducted in main operation theatre of Khyber Teaching Hospital from April 2013 to October 2013. A total of 88 patients were randomly allocated in two groups by lottery method, patients in group A (N=44) received ropivacaine 15 mg of 0.5% and patients in group B (N=44) received 15 mg of 0.5% bupivacaine. Spinal anaesthesia was given after preloading with 1000 ml of lactated ringers. The duration of motor blockade was assessed by modified Bromage scale.

Results: There was significant difference between the two groups in the mean-time of duration of motor block. Mean duration of motor blockade in group A was found to be 123.98 ± 9.24 minutes and in group B it was 183.40 ± 11.14 minute. This was clinically and statistically highly significant.

Conclusion: Fifteen mg isobaric Ropivacaine provided significantly shorter duration of motor block compared to 15 mg isobaric bupivacaine for lower limb surgeries by spinal anaesthesia.

Key Words: Isobaric, Bupivacaine, Motor block, Ropivacaine, spinal, anaesthesia.

INTRODUCTION

Subarachnoid block is a commonly employed anaesthetic technique for performing lower abdominal and lower limb surgeries¹. It is a safe, inexpensive and easy to administer technique which also offers a high level of post anaesthesia satisfaction for patients. Spinal anaesthesia has a fast onset and provides effective sensory and motor blockade². Administration of the appropriate choice and dose of local anaesthetic into the subarachnoid space results in rapid onset of dense surgical anaesthesia with a high degree of success. The risks of general anaesthesia including mishaps due to airway management are avoided like failed intubation, aspiration, venous thrombosis and pulmonary embolism³.

Bupivacaine, levobupivacaine and ropivacaine have all been used as intrathecal drugs⁴. Bupivacaine is the most commonly used long acting local anaesthetic agent for spinal anaesthesia⁵. Apart from its common undesirable side effects as hypotension, bradycardia,

urinary retention⁶, its more serious cardiotoxicity and central nervous system toxicity led to identification of Ropivacaine⁷. Both are amino-amide local anaesthetics. Structurally they belong to the family of n-alkyl substituted pipercoloxylidide⁸. But Ropivacaine has propyl group and Bupivacaine has a butyl group on the amine portion of pipercoloxylidide⁹. Ropivacaine shares many physiochemical properties with Bupivacaine. Onset time and duration of action are similar but Ropivacaine produces less motor block when injected at the same volume and concentration¹⁰. This is due to lower potency of Ropivacaine compared with Bupivacaine¹¹. Ropivacaine is less lipophilic than bupivacaine and less likely to penetrate large myelinated motor fibers, resulting in a relatively reduced motor blockade. Thus ropivacaine has a greater degree of motor sensory differentiation with hemodynamic stability¹².

Since Ropivacaine seems to have a shorter duration of action compared with bupivacaine¹³. Therefore its use would mean early mobilization, shorter time to first micturation and faster discharge¹⁴.

MATERIAL AND METHODS

With the approval of institutional ethical committee this comparative randomized clinical controlled trial study was undertaken to compare the duration of motor block between ropivacaine and bupivacaine. It

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was conducted in the main operation theatre of Khyber Teaching Hospital, Peshawar from April 2013 to October 2013. After taking written informed consent of the patients, a total of 88 patients scheduled for lower limb surgeries belonging to American Society of Anaesthesiologists (ASA) class I and II between age group 18-40 years with no gender discrimination were included. Those patients falling into ASA class III and IV or with history of hypertension, cardiovascular disease, cerebrovascular disease, diabetes, musculoskeletal disease were excluded. Patient's demographics (including age, gender) and outcome in terms of duration of motor blockade were recorded on a standardized proforma. Duration of motor blockade was determined in minutes using a standard stop watch using modified bromage scale. Duration of motor blockade was taken as the time interval between grade 3 until patient resumed grade 0 on bromage scale. Assessments of motor block scores were made at 5 minute intervals during the first 30 minutes, then 15 minute intervals until complete recovery.

Bromage Scale

Grade 0 – No block

Grade 1 – Unable to flex the hip

Grade 2 – Unable to flex the hip and unable to extend the leg with hip passively flexed

Grade 3 – Unable to flex the ankle

RESULTS

The data was analyzed using SPSS version 16 with proportions and mean \pm SD calculated for categorical and continuous variables, respectively. Probability ≤ 0.05 was taken as significant. Comparison is given for variables like sex and age in Table 1 and Table 2 respectively.

Duration of motor blockade ranged from 105 minutes to 140 minutes in group A whereas it ranged from 155 minutes to 210 minutes in group B. At 100th minute none of the patients recovered from motor block in both groups. Mean duration of motor blockade in group A was found to be 123.98 ± 9.24 minutes and group B it was 183.40 ± 11.14 minute. The mean duration of motor block was significantly shorter in group A as compared to group B suggesting that group A provides rapid recovery (p -value < 0.001) (Table 3).

DISCUSSION

Ropivacaine is a new local anaesthetic with duration of 2-3 hours and can be used for intrathecal administration¹⁵. Ropivacaine as compared to Bupivacaine has reduced risk of central nervous system and cardiac

Table 1: Sex distribution

Sex	Group A N (%)	Group B N (%)	Total N (%)
Male	21 (47.7)	27 (61.4)	48 (54.5)
Female	23 (52.3)	17 (38.6)	40 (45.5)
Total	44 (100)	44 (100)	88 (100)

P=0.199

Table 2: Age distribution in years

Group	Mean	Std. Deviation	N
A	30.4091	7.35580	44
B	32.8182	5.37554	44
Total	31.6136	6.51864	88

P=0.083

Table 3: Duration of Motor blockade between ropivacaine and bupivacaine

Group	Range (min)	Mean (min)	SD \pm
A (ropivacaine)	105 to 140 minutes	123.98	9.24974
B (bupivacaine)	155 to 210 minutes	183.41	11.14246

P value < 0.001

toxicity^{16,17}. Moreover due to shorter duration of motor blockade there is early ambulation and discharge with good quality of postoperative analgesia. Therefore it is gaining increasing popularity and studies are going on to improve regional anaesthesia with less cardiotoxic and neurotoxic effects^{18,19}.

Duration of motor blockade was measured by using bromage scale and it was ranging from 105 minutes to 140 minutes in group A whereas it ranged from 155 minutes to 210 minutes in group B. In a study conducted by Bhat SN et al comparing efficacy and safety of Ropivacaine with bupivacaine for intrathecal anaesthesia for lower abdominal and lower limb surgeries. The mean duration of blockade in ropivacaine group was 153.57 ± 15.65 minutes and in bupivacaine group was 211 ± 11.29 minutes²⁰. Girich KJ compared 0.5% isobaric ropivacaine and 0.5% isobaric bupivacaine in spinal anaesthesia for endoscopic urological surgeries. Mean duration of motor blockade in ropivacaine group was 106.71 ± 10.85 minutes and in bupivacaine group was 168.82 ± 17.90 minutes²¹. These results were consistent with our findings. Chari VRR²², McNamee et al²³ and Marret et al²⁴ also showed similar results of less duration of motor blockade with ropivacaine as compared to bupivacaine.

Kleef JWW et al compared efficacy and safety of 0.5% and 0.75% ropivacaine for lower limb surgeries, found inadequate motor blockade with 0.5% ropivacaine indicating quick recovery with 0.5% ropivacaine compared to 0.75% ropivacaine²⁵. However, Varun S et al conducted a study comparing intrathecal isobaric bupivacaine – fentanyl and isobaric ropivacaine – fentanyl for lower abdominal and lower limb surgeries. Duration of motor blockade was comparable (P value 0.294) in their study which may be attributed to the addition of fentanyl to the local anaesthetics²⁶.

CONCLUSION

0.5%, Ropivacaine 15 mg can be used successfully for lower limb surgeries where early motor recovery is required and well appreciated by the patients too.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- Naz U:** Idea and operating surgeon.
- Aziz N:** Data collection and typing.
- Haider T:** Bibliography.
- Aurangzeb:** Statistics.
- Khan P:** Follow up.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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