

Supraclavicular Block Comparison Between Bupivacaine and Ropivacaine at Equal Concentrations



Anaesthesiology

KEYWORDS : Brachial plexus block, Upper limb surgeries, Bupivacaine, Ropivacaine

Dr. Inturi Ravi Mohan

M.D., D.A Professor, Department of Anaesthesiology Alluri sitarama Raju Academy Of Medical Sciences Eluru-534005, West Godavari, A.P.

*** Dr. Kannaji Siddardha**

Final year post graduate, Department of Anaesthesiology, Alluri sitarama Raju Academy Of Medical Sciences, Eluru-534005, West Godavari, A.P., * Corresponding Author

ABSTRACT

BACKGROUND: For upper limb Surgeries, Brachial plexus block is the preferred Regional anesthesia technique. Local anesthetics administered provides anesthesia for the upper limb surgeries. This study compares the effect of Bupivacaine 0.5% & Ropivacaine 0.5% used for Supraclavicular brachial plexus block.

METHODOLOGY: This comparative randomized study was conducted between 2014-2016. The study subjects were 60 patients of both sexes between 18-60 years of age who were scheduled for elective upper limb surgeries. They were divided into two groups. Group B received 30ml Bupivacaine 0.5% (5mg/ml) and group R received 30ml of Ropivacaine 0.5% (5mg/ml). The outcome measured were onset and duration of sensory and motor block duration of analgesia and complications.

RESULTS: The duration of motor block is higher in group B (Bupivacaine) 369+41 min compared to group R (Ropivacaine) 336+37 min with a p value of 0.002.

CONCLUSION: On the basis of our study, we can draw the conclusion that at equal volumes Bupivacaine 0.5% has an advantage over Ropivacaine 0.5% for Supraclavicular Brachial Plexus block in terms of Early onset of Sensory blockade. Early onset of Motor blockade. Prolonged Duration of Sensory blockade. Prolonged Duration of Motor blockade. Prolonged Duration of Analgesia.

INTRODUCTION:

Peripheral nerve blocks have become important in clinical practice because of their role in post operative pain relief, shortening of patient recovery time & avoiding risks and adverse effects of General anaesthesia. Hence, peripheral nerve blockade is now a well accepted concept for comprehensive anaesthetic care.

Regional nerve blocks are based on the concept that pain is conveyed by nerve fibres, which can be interrupted anywhere along their pathway.

For upper limb Surgeries, Brachial plexus block is the preferred Regional anaesthesia technique. Brachial plexus block at the supraclavicular level provides anaesthesia for the upper limb surgeries by blocking the middle & lower plexus (Median, Radial and Ulnar N).

Local anaesthetics administered as regional nerve blocks provides post-operative pain relief by blocking signal transmission to dorsal horn.

Bupivacaine is a long acting local anaesthetic. Due to its long duration of action and combined with its high quality sensory blockade compared to motor blockade it has been the most commonly used local anaesthetic for peripheral nerve blocks.

Ropivacaine is a newer, long acting local anaesthetic whose neuronal blocking potential used in peripheral nerve blockade seems to be equal or superior to Bupivacaine¹. Studies shows that it has significantly greater safety margin over Bupivacaine because of lower CNS and Cardiac toxicity and hence can be used in higher concentrations. One of the drawbacks of Ropivacaine mentioned is its less intense motor blockade compared to Bupivacaine.

BUPIVACAINE:

INTRODUCTION

Bupivacaine is one of the homologous series synthesized in 1957 by A.F.

Ekenstam to which Mepivacaine belongs. Bupivacaine is three to four times as potent as lignocaine, and considerably long lasting.

Bupivacaine hydrochloride, an amide is readily soluble in water and has good stability. The pH of plain solution is 6.0 to 6.7 and molecular weight is 324.9. It causes reversible blockade of sodium conduction probably by dual actions on cell membrane. They act directly on receptors within sodium channels and produce nonspecific membrane expansion. It is rapidly catabolised like other local anaesthetics and chiefly metabolised in liver, metabolism involves N-dealkylation to pipercolyxylidene (PPX) which is then hydrolysed.

ROPIVACAINE

Ropivacaine is a long-acting regional anaesthetic that is structurally related to Bupivacaine. It is a pure S(-) enantiomer, unlike Bupivacaine, which is a racemate, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles.

The technological advancements have made it possible to develop Ropivacaine as an optically pure S(-) enantiomer from the parent chiral molecule propivacaine. At 25°C ropivacaine HCl has a solubility of 53.8 mg/mL in water, specific gravity of 1.002-1.005. Ropivacaine causes reversible inhibition of sodium ion influx, and thereby blocks impulse conduction in nerve fibres. This action is potentiated by dose-dependent inhibition of potassium channels. Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibres. Therefore, it has selective action on the pain-transmitting A ∞ and C nerves rather than A β fibres, which are involved in motor function.

METHOD OF COLLECTION OF DATA

Sixty patients aged between 18 years and 60 years, of physical status ASA grade 1 and ASA grade 2 undergoing elective upper limb surgeries lasting more than 30 minutes were included in the study after getting ethical clearance from the ethical committee.

Inclusion criteria – patients aged between 18 years to 60 years under physical status ASA grade 1 and ASA grade 2, of weight 50 kg to 80 kg scheduled for elective upper limb surgeries after obtaining written informed consent from patient/ patient attenders.

Exclusion criteria – Known allergy to local anaesthetics ,Patient's refusal , History of Cardiovascular disorders ,Neuromuscular disorders , Bleeding disorders or patient on Anticoagulant therapy , Hepatic failure , Renal failure , pregnancy, Brachial plexus injury , Local infections .

ASSESSMENT OF SENSORY BLOCK

Sensory block was assessed by pin prick with 23g hypodermic needle in skin dermatomes c4-t2 once in every minute for initial 30 minutes and then after every 30 minutes till patient regained normal sensations and graded according to Visual analogue scale (VAS)

ASSESSMENT OF MOTOR BLOCK

Quality of motor block was assessed at the same intervals and graded according to Modified Lovett's Scoring .

All the values were expressed as Mean \pm Standard deviation , statistical comparison was performed by student's t-test & chi-square test .

RESULTS

COMPARISON ON THE BASIS OF ONSET TIME OF SENSORY AND MOTOR BLOCKADE.

Study variables	Group B	Group R	P value
SENSORY ONSET TIME	17.70 \pm 2.35	22.13 \pm 3.05	<0.001
MOTOR ONSET TIME	25.43 \pm 2.22	27.90 \pm 1.88	<0.001

In Group B , the mean onset time of Sensory blockade and Motor blockade was 17.70 \pm 2.35 min and 25.43 \pm 2.22 min Respectively when compared to Group R having Onset time of sensory blockade and Motor blockade of 22.13 \pm 3.05 min and 27.90 \pm 1.88 min Respectively .

Onset time of Sensory and Motor blockade was earlier in Group B when compared with Group R . The p value was < 0.001 which is statistically very highly.

COMPARISON ON THE BASIS OF DURATION OF SENSORY AND MOTOR BLOCKADE.

Study variables	Group B	Group R	P value
DURATION OF SENSORY BLOCKADE	342.00 \pm 47.66	302.00 \pm 42.38	0.001
DURATION OF MOTOR BLOCKADE	369.00 \pm 41.05	336.00 \pm 37.29	0.002

In Group B , the Mean Duration of Sensory blockade and Motor blockade was 342.00 \pm 47.66 min and 369.00 \pm 41.05 min Respectively when compared to Group R having Mean Duration of sensory blockade and Motor blockade of 302.00 \pm 42.38 min and 336.00 \pm 37.29 min Respectively .

Duration of Sensory and Motor blockade was prolonged in Group B when compared with Group R . The p value was 0.001 and 0.002 respectively which is statistically very highly significant .

COMPARISON ON THE BASIS OF DURATION OF ANALGESIA

Study variables	Group B	Group R	P value
DURATION OF ANALGESIA	372.00 \pm 42.86	341.00 \pm 36.52	0.004

In Group B , the Mean Duration of Analgesia was 372.00 \pm

42.86 min when compared to Group R having Mean Duration of Analgesia of 341.00 \pm 36.52 min .

Duration of Analgesia was prolonged in Group B when compared with Group R .The p value was 0.004 which is statistically very highly significant.

DISCUSSION

Brachial plexus blockade for upper limb surgeries is the most common major peripheral nerve block technique .

Group B received supraclavicular Brachial plexus block with 30 ml of 0.5% Bupivacaine . Group R received supraclavicular Brachial plexus block with 30 ml of 0.5% Ropivacaine . Parameters observed included Onset time of sensory block ,Onset time of Motor block , Duration of Sensory block , Duration of Motor block , Duration of Analgesia and Side effects.

Onset time of Sensory and Motor block

In our study , we observed that onset time of sensory block was earlier in Bupivacaine group (Group B) having a mean value of 17.70 \pm 2.35 minutes in comparison with Ropivacaine group (Group R) having a mean value of 22.13 \pm 3.05 minutes , which is statistically significant . Onset time of Motor block was earlier in Bupivacaine group (Group B) having a mean value of 25.43 \pm 2.22 minutes in comparison with Ropivacaine group (Group R) having a mean value of 27.90 \pm 1.88 minutes which is statistically significant .

In the study conducted by K Shaw , D Tripathi et al¹ they found that there was considerable delay in establishing the complete motor blockade and Sensory blockade with Ropivacaine. In contrast to Ropivacaine, the peak effect of sensory and motor blockade established earlier in Bupivacaine group (P < 0.05).

In the study conducted by Himat vaghadia,Vincent chan,Ganapathy,Anne lui et al²in 1999 it was found that Ropivacaine at a concentration of 0.75% (7.5 mg/ml) was required to produce effective and well tolerated brachial plexus block of long duration by the subclavian perivascular route similar to those of 30ml Bupivacaine 0.5%.

Duration of Sensory block and Motor block In our study the Duration of sensory block was 342.00 \pm 47.66 minutes with Bupivacaine group and 302.00 \pm 42.38 minutes with Ropivacaine group . The duration of sensory block was longer in Bupivacaine group compared with Ropivacaine group ,which is statistically significant .

The Duration of Motor block was 369.00 \pm 41.05 minutes with Bupivacaine group and 336.00 \pm 37.29 minutes with Ropivacaine group .The duration of Motor block was longer in Bupivacaine group compared with Ropivacaine group ,which is statistically significant.

the study conducted by Mclellankj, Faulds D³ in 2000 "Ropivacaine, An update of its use in regional anaesthesia" ,They concluded that Ropivacaine is a well tolerated regional anaesthetic with an efficacy broadly similar to that of bupivacaine but has a lower propensity to produce Motor blockade . However, it may be a preferred option because of its reduced Central nervous system and cardiotoxic potential.

Duration of Analgesia

The mean time from onset of block to request of Analgesics was taken as total Duration of Analgesia . The

Duration of Analgesia was 372.00 ± 42.86 minutes with Bupivacaine group (Group B) and 341.00 ± 36.52 minutes with Ropivacaine group (Group R) in our study . The duration of Analgesia was longer in Bupivacaine group compared with Ropivacaine group ,which is statistically significant.

Hickey,R, Rowley,C.L, Ramamurthy,S⁴, et al ., in 1991 conducted study titled "A comparison of ropivacaine 0.5% and Bupivacaine 0.5% for brachial plexus block" .This study compared the effectiveness of 0.5% ropivacaine and 0.5% bupivacaine for brachial plexus block.48 patients received a subclavian perivascular brachial plexus block for upper extremity surgeries. They concluded that Ropivacaine and Bupivacaine 0.5% appeared equally effective in providing brachial plexus anaesthesia. Both were similar in terms of Incidence of analgesia, anaesthesia, paresis, paralysis and the need for supplementation.

CONCLUSION

On the basis of our study, we can draw the conclusion that at equal volumes Bupivacaine 0.5% has an advantage over Ropivacaine 0.5% for Supraclavicular Brachial Plexus block.

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