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Comparison of Efficacy of 0.5% Ropivacaine And 0.5% Bupivacaine in Supraclavicular Brachial Plexus Block For Forearm and Hand Surgeries: A Randomised Control Double Blind Study

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Abstract

Background: Studies shows that Ropivacaine 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. Hence here is an attempt through the study to compare Bupivacaine with Ropivacaine in supraclavicular brachial plexus block. This study is designed to compare 30 ml of Bupivacaine 0.5% and 30 ml of Ropivacaine 0.5 % for supraclavicular brachial plexus block by perivascular approach.

Methods: The present study was conducted on 60 consenting patients aged between 18-60 years. Group B received 30ml of 0.5% Bupivacaine. Group R received 30ml of 0.5% Ropivacaine for Brachial plexus block by supraclavicular approach

Results: We found that Bupivacaine 0.5% has Early onset of Sensory blockade, Early onset of Motor blockade, Prolonged Duration of Sensory blockade, Prolonged Duration of Motor blockade, Prolonged Duration of Analgesia when compared to Ropivacaine 0.5 % at equal volumes. Both the drugs maintain stable hemodynamic profile perioperatively and are devoid of any side effects at the concentration and volumes used for the study.

Conclusion: We conclude that the side effects / complication rate are almost negligible with both Bupivacaine and Ropivacaine if right doses are used and properly deposited avoiding intravascular injection

Keywords: Bupivacaine, Ropivacaine, Sensory, Motor

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 .[1]

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.[2]

Ropivacaine is a newer, long acting local anaesthetic whose neuronal blocking potential used in peripheral nerve blockade seems to be equal or superior to Bupivacaine . [3]

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. Hence here is an attempt through the study to compare Bupivacaine with Ropivacaine in supraclavicular brachial plexus block. This study is designed to compare 30 ml of Bupivacaine 0.5 % and 30 ml of Ropivacaine 0.5 % for supraclavicular brachial plexus block by perivascular approach.

Materials and Methods

Source of data: Present study entitled " A comparative study of Bupivacaine 0.5% and Ropivacaine 0.5% for supraclavicular Brachial plexus block (Perivascular approach)" was carried out in the Department of Anaesthesiology Jhalawar Medical College Jhalawar.

Study design: Comparative randomized study.

Sample size: Two groups of 30 each.

Sampling method: Simple random sampling.

Statistical analysis: Student's t-test .

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 college ethical committee. Each patient were visited pre-operatively and the procedure explained and written and informed consent was obtained. Complete blood count, Blood grouping, Blood sugars, Bleeding time, Clotting time, Blood urea, Serum Creatinine, serum electrolytes (sodium, potassium, chloride) chest x-ray , ECG were done. All the patients were pre-medicated with tablet alprazolam 0.5 mg overnight and the morning of surgery.

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.

Each patient was randomly allocated to one of the two groups of 30 patients each.

Group B – i.e Bupivacaine group receives 30 ml Bupivacaine 0.5% (5 mg/ml)

Group R – i.e Ropivacaine group receives 30 ml Ropivacaine 0.5% (5 mg/ml)

All the necessary equipments and drugs needed for administration of general anaesthesia were kept ready in order to manage failure of block.

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

A two tailed p value of > 0.05 was considered to be statistically not significant, a p value of < 0.05 as statistically significant, a p value of of < 0.01 as statistically highly significant & a p value of < 0.001 as statistically very highly significant.

Results

The present study was conducted on 60 consenting patients aged between 18-60 years. Group B received 30ml of 0.5% Bupivacaine .Group R received 30ml of

0.5% Ropivacaine for Brachial plexus block by supraclavicular approach

Table 1: General characteristics

Variable	Group B	Group R	p-value
Age in yrs	39.47±9.12	39.23±9.09	0.921
Male : Female	23:7	21:9	0.236
Duration of surgery in mint.	123.50±31.87	114.67±25.43	0.24
Sensory Onset Time	17.70±2.35	22.13±3.05	<0.001
Motor Onset Time	25.43±2.22	27.90±1.88	<0.001
Duration of Sensory Blockade	342.0±47.66	302±42.38	<0.001
Duration of Motor Blockade	369.0±41.05	336±37.29	<0.002
Duration of Analgesia	372.0±42.86	341±36.52	0.004

In Group B, the mean onset time of Sensory blockade and Motor blockade was 17.70 ± 2.35 min and 25.43 ± 2.22 min Respectively when compared to Group R having Onset time of sensory blockade and Motor blockade of 22.13 ± 3.05 min and 27.90 ± 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 significant. In Group B , the Mean Duration of Sensory blockade and Motor blockade was 342.00 ± 47.66 min and 369.00 ± 41.05 min Respectively when compared to Group R having Mean Duration of sensory blockade and Motor blockade of 302.00 ± 42.38 min and 336.00 ± 37.29 min Respectively. Comparision of Mean Duration time of sensory and Motor blockade between the groups 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. In Group B , the Mean Duration of Analgesia was 372.00 ± 42.86 min when compared to Group R having Mean Duration of Analgesia of 341.00 ± 36.52 min. Comparision of Mean Duration time of ANALGESIA between the groups Duration of Analgesia was prolonged in Group B when compared with Group R.

Table 2: Complications / Side Effects

Complication	Group B		Group R	
	No.	%	No.	%
Nil	28	93.3	30	100
Vomiting	2	6.7	0	0
Total	30	100	30	100

The side effects / complication rate are almost negligible if right dose is used and properly deposited.

Discussion

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±2.35 minutes in comparison with Ropivacaine group (Group R) having a mean value of 22.13±3.05 minutes , which is statistically significant

In our study, we observed that onset time of Motor block was earlier in Bupivacaine group (Group B) having a mean value of 25.43±2.22 minutes in comparision with Ropivacaine group (Group R) having a mean value of 27.90±1.88 minutes which is statistically significant . In the study conducted by K Shaw and D Tripathi et al 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 ($P < 0.05$).[4]

Singelyn FJ12[5] in his study "Clinical application of ropivacaine for the upper extremity", found that Ropivacaine is at least as efficient as bupivacaine in terms of quality, duration of analgesia, anaesthesia , and motor block. It could have some advantages over bupivacaine in terms of onset time of sensory and motor block, but this remains controversial.

The above observations were similar to our study results . Hence, we conclude that Bupivacaine 0.5 % has an advantage of Early onset of Sensory and Motor blockade when compared to Ropivacaine 0.5% for Supraclavicular brachial plexus block at equal volume.

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

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

In the study conducted by *Sreeharsha Sirigeri Vinuta V. Patil et* al[6] 2016 comparing 0.5% Ropivacaine and 0.5% Bupivacaine for brachial plexus block they noted that the quality of anaesthesia was similar , however the motor blockade lasted significantly longer when Bupivacaine was used

In the study conducted by Mclellankj, Faulds D in 2000[7] "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

The above observations were similar to our study results. Hence, we conclude that Bupivacaine 0.5 % has an advantage of prolonged Duration of Sensory and Motor blockade when compared to Ropivacaine 0.5% for Supraclavicular brachial plexus block at equal volume

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 Bupivaine group compared with Ropivacaine group ,which is statistically significant.

Shailendra Modak, Shakuntala Basantwani et al 2016[8] 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 97 block for upper extremity surgeries. One group received (n=24) 0.5% Ropivacaine and second group received (n=24) 0.5% Bupivacaine both without epinephrine. 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

No patient in our study developed any significant Side effects.

In our study 2 patients in the Bupivacaine group complained of Nausea and had vomiting compared to none of the patients in Ropivacaine group .

This signifies that adverse effects were not significant in both the groups .

Balwinderjit Singh Iqbal Singh et al 2019[9] in his study Clinical application of Ropivacaine for the upper extremity concluded that Ropivacaine is at least as efficient as bupivacaine in terms of quality, duration of analgesia, anesthesia, and motor block. Because of lower CNS and cardiac toxicity, ropivacaine is safer than bupivacaine

Conclusion

We conclude that the side effects / complication rate are almost negligible with both Bupivacaine and Ropivacaine if right doses are used and properly deposited avoiding intravascular injection.

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