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COMPARISION OF ROPIVACAINE AND BUPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXSUS BLOCK

Anaesthesiology

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ABSTRACT

Background : Regional Anesthesia in the form of supraclavicular approach to the brachial plexus is often used for orthopedic surgeries of the upper limb. It is often used either as an adjuvant to general anesthesia or as the primary anaesthetic. Bupivacaine's cardiac and central nervous system toxic effects in some patients prompted the researchers to develop new local anesthetic agent with a profile similar to Bupivacaine without considerable toxic effects. One such possible replacement for Bupivacaine was Ropivacaine. However Ropivacaine's latency of sensory analgesia was approximately two thirds that of Bupivacaine, therefore it was not as effective in promoting prolonged post-operative analgesia.

Method : This was a prospective randomized double blinded comparative study on all patients of orthopaedic department affiliated with tertiary care centre who was undergoing upper limb surgery during the study period. Patients with higher ASA grade (3 or 4), with severe morbidity conditions and having allergy to local anaesthetic drugs were excluded from study. A total 60 patients were selected and assigned into two groups randomly (30 in each group).Group A received 20ml of 0.75% of Ropivacaine plus Xylocaine 2% 10 ml while Group B received 20ml of 0.5% of Bupivacaine plus Xylocaine 2% 10 ml by supraclavicular route. Intraoperatively all the vital parameter monitored. At the end of surgery, the residual effect and duration of surgery noted and after shifting of patient to the ward, patients visited for the assessment. Postoperative analgesia assessed by 10 point of visual analogue scale.

Results : There was no significant difference regarding age, weight and sex distribution between two groups. The **Onset of sensory block** of Group R is nearly 7.07+/-0.82 minutes while in Group B it is 7.1+/-0.84 minutes and the **Onset of motor block** in Group R is 11.23+/-1 minutes while that in group B is 11.2+/-0.99 minutes. The **duration of sensory block** in Group R is nearly 9.80+/-0.41 hours (548.2 ± 24.62 minutes) while that in Group B is 9.81+/-0.46 hours (589.2 ± 27.74 minutes) and the duration of motor block in Group R is 9.95+/-0.46 hours (534.4 ± 27.65 minutes) while in Group B it is 9.96+/-0.41 hours (596.0 ± 24.70 minutes).

Conclusion : Onset of sensory block and onset of motor block in ropivacaine group andbupivacaine group are similar and there are no clinical and statistical differences in the two groups. Duration of sensory and duration of motor blockade in in ropivacaine group and bupivacaine group are similar and there are no clinical and statistical differences in the two groups. No differences are found in in hemodynamic parameters (HR, BP, SPO2) in the two groups. All the patients in two groups were stable hemodynamically during surgery.

KEYWORDS

Supraclavicular block, Orthopaedic upper limb surgery, Bupivacaine, Ropivacaine.

INTRODUCTION

Regional Anesthesia in the form of supraclavicular approach to the brachial plexus is often used for orthopedic surgeries of the upper limb. It is often used either as an adjuvant to general anesthesia or as the primary anaesthetic(1). The use of supraclavicular block as the primary anesthetic technique avoids the complication associated with general anesthesia, airway instrumentation and decreases immediate post-operative pain. Long acting local anesthetic agent Bupivacaine is frequently used for brachial plexus anesthesia. Its cardiac and central nervous system toxic effects in some patients prompted the researchers to develop new local anesthetic agent with a profile similar to Bupivacaine without considerable toxic effects. One such possible replacement for Bupivacaine was Ropivacaine.

Ropivacaine, an amino-amide, local anesthetic with higher toxic threshold produced less cardiac and central nervous system effects, less motor block and a similar duration of action of sensory analgesia compared to Bupivacaine. This favorable clinical profile has prompted many clinicians to switch from Bupivacaine to Ropivacaine for all types of neural blockade. However with clinical use, it was discovered that Ropivacaine's latency of sensory analgesia was approximately two thirds that of Bupivacaine, therefore it was not as effective in promoting prolonged post-operative analgesia. So here we will study comparison of ropivacaine and bupivacaine in upper limb surgeries under supraclavicular block including onset and duration of sensory block, onset and duration of motor block, duration of post-operative analgesia, hemodynamic changes and any side effects or complications in a centre affiliated with tertiary care centre with respect to the age and gender of the patient.

MATERIALAND METHOD

This prospective randomized double blind comparative study was conducted at a single institute affiliated with tertiary care centre. The study was approved by institute's Ethics Committee. All patients admitted in orthopaedic department undergoing upper limb surgery, age between 18–60 years, with ASA grade 1 & 2, without any known allergy to local anaesthetic drugs and who gave consent were included in this study. Patients of higher ASA grade (3 & 4), below 18 years or above 60 years, having severe morbidity conditions, having known allergy to local anaesthetic drugs and refusal to take participate in this were excluded from study.

We studied 60 patients of Grade-I and Grade -II of American Society of Anesthesiologist's (ASA) classification, we had randomly allocated them in to two groups by simple randomization technique using computer generated randomization table. Senior faculty requested to offer randomization service. The study was prospective and interventional in nature. All the patients participating in the study explained clearly about the purpose and nature of the study in the language they could understand. They included in the study only after obtaining a written informed consent.

All 60 patients divided into two groups of 30 each randomly. Group A: Patients received 20ml of 0.75% of Ropivacaine plus Xylocaine 2% 10 ml by supraclavicular route. Group B: Patients received 20ml of 0.5% of Bupivacaine plus Xylocaine 2% 10 ml by supraclavicular route.

After admission of patient to shifting of patient in OR all standard protocols were followed. With sterile precaution a standard supraclavicular block were given. Intraoperative vitals were monitored. Complications and side effects of local anaesthetic closely observed. At the end of surgery, the residual effect and duration of surgery noted and after shifting of patient to the ward, patients visited for the assessment of postoperative analgesia, any complications and other vital parameters at defined time interval. Postoperative analgesia assessed by 10 point of visual analogue scale. Demographic data was

compared using student t test where appropriate. The influence of age and gender on incidence of PDPH was analysed by using Chi-square test. A p value of <0.05 was considered significant.

Statistical Analysis

Sample size calculation is done considering the study by Chandni M Soni, Hetal Parikh et al(1) in 2013 where mean time for duration of analgesia for sensory block was 548.2 and 589.2 respectively for group R and group B and standard deviation for each is 24.62 and 27.74 respectively. For the purpose of study, the difference of the mean values in the two groups was taken to be 25 minutes and the S.D. for the study group was taken to be 30 minutes. For 90% power of study, the Z beta value is 1.282 and for type 1 error of 5%, the z alpha value is 1.96.[3]

Utilizing these data in the following formula

$$N=\frac{2(Z\ Alpha+Z\ Beta)^2\times s.d.^2}{D^2}$$

$$=\frac{2(1.96+1.28)^2\times 30^2}{25^2}$$

=29.8= approximately 30.So we get a sample size of 30 patients in each group

Demographic data was compared using student t test where appropriate.

The influence of age and gender on incidence of PDPH was analysed by using X^2 test.

A p value of <0.05 was considered significant.

RESULT

There is no statistical difference in age, weight and sex distribution between two groups. Sensory onset of group R is nearly 7.07 ± 0.82minutes while in Group B it is 7.1± 0.84 minutes, (p=0.8892) and motor onset in group R is 11.23 ± 1 minutes while that in Group B is 11.2 ± 0.99 minutes(p=0.9074). The sensory onset was found to be equal in both Group R and Group B while the motor onset was also equal in Group B and Group R and there is no clinical and statistical significant difference between two groups(p>0.05).

There is no significant difference in intraoperative pulse & intraoperative systolic & diastolic blood pressure in Group B and Group R at 15, 30, 45, 60, 90, 120 minutes .

The duration of sensory block in Group R is nearly 9.80 hours while that in Group B is 9.81 hours,(p=0.8799) the duration of motor block in Group R is 9.95 hours while in Group B is 9.96 hours(p=0.8621) and total duration of analgesia in Group R is 9.87 hours while that in Group B is 9.88 hours(p=0.8721). The duration of all sensory block, motor block and analgesia is more in Group B than in Group R but it is statistically not significant.

DISCUSSION

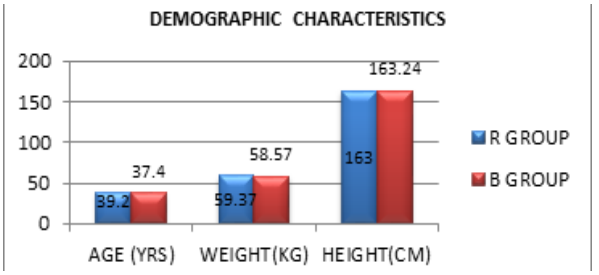
Ropivacaine had already been studied in various regional blockade techniques so that it can be used as an alternative to bupivacaine, as bupivacaine is associated with greater risk of cardiac and neurological toxicity. Here in our prospective randomized double blind clinical study we have compared 0.75% ropivacaine 20 ml plus 10 ml of lignocaine 2% in 30 patients (group R) versus 0.5% bupivacaine 20 ml plus 10 ml of lignocaine 2% in another 30 patients (group B).

Demographic Characteristics

In our study there was no significant difference regarding age, weight and sex distribution between two groups.Onset of sensory block and onset of motor block in ropivacaine group and bupivacaine group are similar and there are no clinical and statistical differences in the two groups.many other studies found similar results with no difference in the two groups.

Table 1 Demographic Characteristic Of Study Population

Variable	R group	B group	P value
Age(years)	39.2 ± 15.41	37.4 ± 13.12	0.6280
Weight(kg)	59.37 ± 5.67	58.57 ± 7.6	0.6457
Height(cm)	163 ± 6.01	163.24 ± 6.1	0.8786



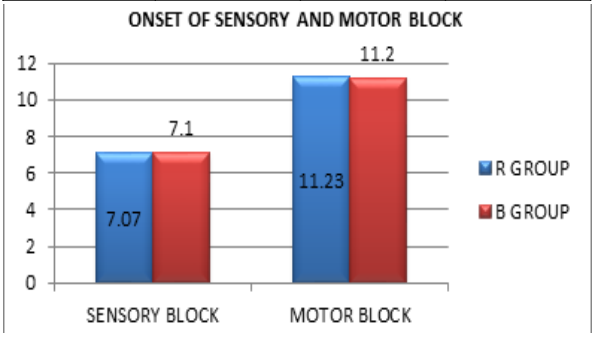
Onset Of Sensory Block And Motor Block

Vaghdia et al(3) found that the onset of sensory and onset of motor blockade was delayed in comparison to onset of onset of sensory and motor blockade in our study the reason behind this could be use of xylocaine in our study compared to use of plain drug concentrations in the above mentioned study. Klein et al.(2), compared 0.5% bupivacaine, 0.5% ropivacaine, and 0.75% ropivacaine for inter-scalene brachial plexus block and observed mean onset time of sensory block to be <6min. This onset time is faster than what we observed in our study. The reason could be the difference in the anatomical level of the nerves to be blocked: in supraclavicular brachial plexus block, local anaesthetic is injected at the level of the nerve trunks, whereas in inter-scalene brachial plexus block drug is injected at the level of the nerve roots.

Kaur et al.(4)compared ropivacaine with bupivacaine for axillary brachial plexus block and found that ropivacaine showed a better quality of analgesia with a shorter onset (5 min vs 20 min for 0.5% ropivacaine compared to 0.5% bupivacaine) and recovery time for both sensory and motor blockade in comparison to bupivacain. Chandani m soni et al (1) also found almost similar onset of sensory and motor blockade and duration of analgesia probable reason behind this could be use of similar drug concentrationsin both the studies.

Table 2 Onset Of Sensory And Motor Block In Two Group (min) (mean ± Sd)

	Group R	Group B	P value
Sensory Block	7.07 ± 0.82	7.1 ± 0.84	0.8892
Motor Block	11.23 ± 1	11.2 ± 0.99	0.9074



Duration Analgesia And Duration Of Of Sensory And Motor Blockade

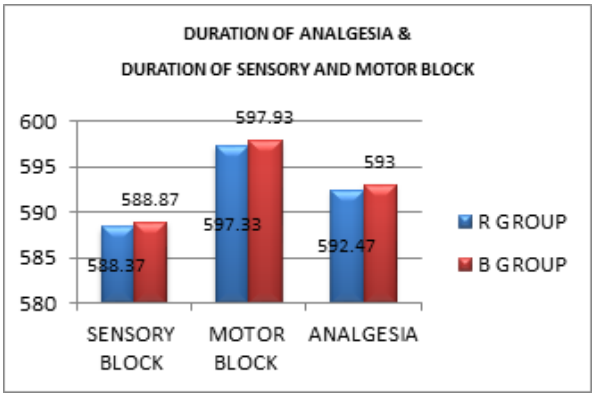
Duration of sensory and duration of motor blockade in ropivacaine group and bupivacaine group are similar and there are no clinical and statistical differences in the two groups. The longer duration of analgesia in the study reported by Stephen m. klein (2)compared to ours may be due to larger volume of study drugs (32 to 40ml) or use of plain ropivacaine and bupivacaine drugs.

The longer duration of motor blockade also reported Venkatesh RR (5) bupivacaine 12.94 hr and with ropivacaine 7.89 hr these different finding can be due to use of 30 ml plain drug concentration as well as due to nerve locator guided technique use by Venkatesh RR (5).

Chatrath et al.(6), compared 0.75% ropivacaine and 0.5% bupivacaine with addition of clonidine in both the groups for infraclavicular block and reported that addition of clonidine to bupivacaine lead to early onset and prolonged duration of sensory and motor block with prolonged analgesia as compared to the addition of clonidine to ropivacaine.

Table 3 Duration Of An Analgesia & Duration Of Sensory And Motor Block In Two Group (min) (mean ± Sd)

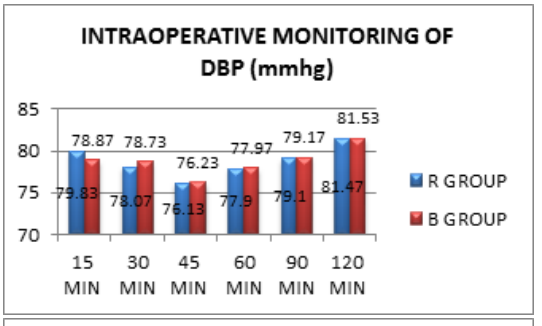
	Group R	Group B	P value
Sensory Block	588.37 ± 12.8	588.87 ± 12.63	0.8799
Motor Block	597.33 ± 13.47	597.93 ± 13.16	0.8621
Analgesia	592.47 ± 12.84	593 ± 12.55	0.8721

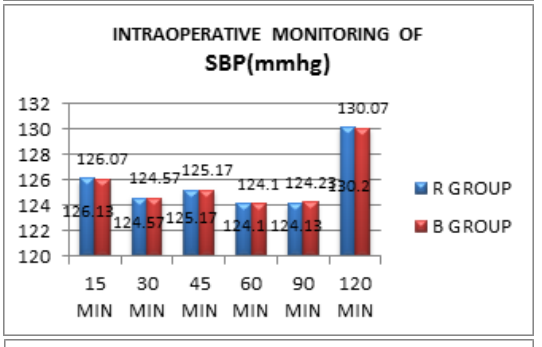


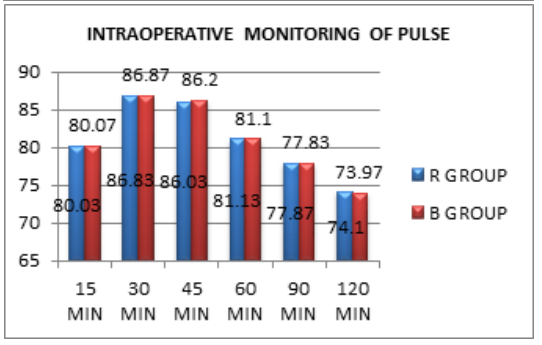
Hemodynamic Parameters

No differences are found in in hemodynamic parameters (HR, BP, SPO2) in the two groups. All the patients in two groups were stable hemodynamically during surgery.There were no significant changes in mean pulse rate and mean arterial pressure perioperatively between two groups in present study, findings shared by other studies.8

In the study of Vaghadia H, et al (3)shreeharshaadverse(7) events like nausea, vomiting were found. In our study no side effect of any drug or procedure found in our study.







CONCLUSION

There is no difference between both the group regarding onset of motor block, onset of sensory block, duration of an analgesia of sensory and motor block, in patients receiving supraclavicular block with bupivacaine or ropivacaine.

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