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A Prospective Comparative Study of 0.5% Levobupivacaine versus 0.5% Ropivacaine in Supraclavicular Brachial Plexus Block

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Abstract

Background: Levobupivacaine is a s enantiomer of bupivacaine has been introduced in clinical practise in India, with lower cardio toxicity and neurotoxicity in comparison to bupivacaine [7,8]. We have designed present study as a prospective comparative study with an aim evaluate the onset and duration of sensory and motor block when0.5% Levobupivacaine and 0.5% ropivacaine are used for supraclavicular brachial plexus anaesthesia. *Material and Method:* Present study is a randomised prospective comparative study conducted in the dept. of anaesthesia Konaseema institute of medical science Amalapuram from Sept 2015 to Feb 2018. Patients were allocated randomly into two groups using computer generated block randomization. Group A (n=40) received 30ml of 0.5% Levobupivacaine and Group B(n=40) received 30ml of 0.5% Ropivacaine. Parameters observed were onset-of sensory and motor block, duration of analgesia andrequirement of opioid supplementation. *Result:* Mean sensory onset time in group A (Levobupivacaine) was 14.065 min in comparison to 16.829+5.01 mins in group B, with P value 0.172372. Mean time required for the onset of motor blocks in group A was 18.0225+6.33 min but in group B it was 21.35+5.49 with P value 0.007096. Out of forty patients four patients in group A require opioid supplementation and eight patients out of 40 patients in group B required opioid supplementation with p value 0.210406. *Discussion and Conclusion*: From present study we would like to conclude that the onset of sensory and motor block was earlier in Levobupivacaine group than ropivacaine. The duration of sensory and motor block was also longer in Levobupivacaine group then ropivacaine.

Keywords: Ropivacaine; Levobupivacaine; Supraclavicular Brachial Plexus Block.

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Introduction

The first edition of Heinrich Braun manual "local anaesthesia-scientific basis and medical practice" was published in 1905, and later Kulenkampff and M.A. persky published techniques, indications and dangers of brachial plexus block anaesthesia [1,2]. After that brachial plexus block has become an alternative to general anaesthesia in upper limb surgery. Among all type of blocks of brachial plexus, supraclavicular block is common and with the use of ultrasound its successrate, safety and efficacy increased.

Among all local anaesthetic drugs bupivacaine is used most commonly in brachial plexus block. It has long duration of action and ability to provide more sensory than motor block which has made it more popular. But it is more cardiotoxic which is clinically

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manifested as severe ventricular arrhythmias, myocardial depression. This is because of its slow dissociation from cardiac Na^+ channel during diastole [3,4] some of its toxicity is mediated centrally also [5]. Bupivacaine is a mixture of two stereo enantiomers dextro bupivacaine, and Levo-bupivacaine

Limitation with the use of bupivacaine leads to development of less toxic ropivacaine, which was slightly less potent but more motor sparing then Bupivacaine [6].

Levobupivacaine is a senantiomer of bupivacaine has been introduced in clinical practise in India, with lower cardio toxicity and neurotoxicity in comparison to bupivacaine [7,8]. But it retains the prolonged sensory and motor analgesia associated with Bupivacaine.

Various studies have been conducted regarding comparison of ropivacaine, Levobupivacaine and Bupivacaine, but there are few studied conducted on comparison of efficacy of ropivacaine versus Levobupivacaine in brachial plexus blocks. So, we have designed present study as a prospective comparative study with anaim evaluate the onset and duration of sensory and motor block when 0.5% Levobupivacaine and 0.5% ropivacaine are used for supraclavicular brachial plexus anaesthesia.

Material and Method

Present study is a randomised prospective comparative study conducted in the dept. of anaesthesia, Konaseema institute of medical science, Amalapuram from Sept 2015 to Feb 2018.

Selection of Subject

Patients included in this group were selected on the basis of inclusion and exclusion criteria–

Inclusion Criteria

- Age 14 to 60yrs.
- Both sex
- ASA class I and Class II

Exclusion Criteria

- Cardiac arrhythmia
- Uncontrolled DM
- COPD
- Pregnancy
- Coagulopathies

Sample Size

Based on the finding of previous studies, assuming or α- error 0.05 , power of 80% the sample size was calculated to be 40. Clicalc.com sample size calculator was used for sample size calculation [9].

Method

In two years and five months of study period eighty patients were enrolled for this study based on inclusion and exclusion criteria. One day before surgery pre anaesthetic assessment was done and all basic laboratory investigation was also done. Same premedication and standard fasting instructions as per ASA guide line were given to all patients.

Patients were allocated randomly into two groups using computer generated blockrandomization. Group A (n=40) received 30ml of 0.5% Levobupivacaine and Group B (n=40) received 30ml of 0.5% Ropivacaine. Once patient were inside the operation theatre electro cardiogram, non-invasive blood pressuremonitor and pulse oximetre were applied, and base line vital parameter were noted. Drug solution was prepared by same individual who was not the part of study. Intravenous access was secured by 18G cannula in opposite limb, and fluids were administrated based on the Holliday- segar rule [10].

Supraclavicular block was performed under all aseptic conditions using Sonosite m turbo ultrasound with linear probe. The patient was evaluated at 1, 5, 10, 15, 20, 30, 40, and 45min. to access the onset of sensory and motor block before surgery and post operatively 2hr, 6hr, 8hr, 12hr, and 24hr for duration of post operative analgesia. Parameters observed were onset-of sensory and motor block, duration of analgesia and requirement of opioid supplementation. The completion of drug administration was considered to be time zero, for evaluation of block. The onset timeof sensory block and motor block was calculated as time between the end of the drug administration and noresponse to the pin prick test and complete paralysis.

Duration of sensory block was defined as from the time of onset of sensory blocked till the time at which pin prick sensation returned at the three terminal nerves that is ulnar, radial and median nerves. Similar duration of motor block was calculated from the, time of onset of motor block till the time at which the patients were able to move fingers. Sensory block was accessed by using pin prick method with the help of blunt 23 g needle in the distribution of all four nerves and grading was done by Hollmen score: 1= normal sensation, 2= weaker in comparison to the

opposite side, 3= prick recognised as blunt touch as other side 4= no sensation [11].

Motor block was evaluated by thumb adduction for ulnar nerve, thumb opposition for medium nerve, thumb abduction for radial nerve and pronation of arm for evaluation of motor block modified Bromage score was used [12].

Post operatively pain scores were recorded by visual Analogue score between 0 to 10. (0= no pain, 1=mild annoying pain, 4= nagging uncomfortable troublesome pain, 8= intense dreadful pain, 10=worst possible pain) [13]. Rescue analgesia was given, once VAS was more than 4 and was provided in the form of inj tramadol 2mg/kg intravenously.

Ethics

Before start of this study permission of institutional ethics committee was obtained and a written informed consent was also obtained from patients before enrolling then for study. The patients were explained in detail regarding the study and the procedure that would be performed.

Statistics

The data was analysed using the software SPSS 16.0.The mean and SD was used to describe the block characteristics and duration of analgesia. The statistical significance was analysed by t-test. For Age, sex and ASA grades chi-square test was used.

Result

Total 80 patients were included in present study, divided into two groups. There was no statistically significant difference between two groups, regarding demography, duration and type of surgery and ASA score (Table 1).

As per Table 2 it is clear that mean sensory onset time in group A (Levobupivacaine) was 14.065 min in comparison to 16.829+5.01 mins in group B, with p value 0.172372. Mean time required for the onset of motor blocks in group A was 18.0225+6.33 min but in group B it was 21.35+5.49 with p value 0.007096.

The duration of motor block was 951.05+100.45 in group A and 653.54+179.056 min in group B with p value 0.00001. Similarly the duration of sensory block was 705.825+112.37 min in group A and the duration of sensory block in group B was 522.05+68.28 with p value 0.0001.

The duration of analgesia in group A was 734.825 min and in group B it was 638.65min with P value 0.00001.

Table 1: Demography of patients

Variables	Group A	Group B	P value
Age (yrs)	31.175+8.877	30.3+9.147	0 3355
Sex			
M	20	30	Chi square statistics 0.2508
F	12	10	P=0.6165
Site of surgery			
Arm	12	10	Chi square statistics =.9661 P= 0.6168
Forearm	18	16	
Hard			
10	14		Chi square statistics 2.2571 P value 0.133007
II	14	8	

Table 2: Comparison between block characteristic of patients in two groups

Variables	Group A	Group B	P value
Onset of sensory block (min)	14.065±17.91	16.829±5.01	0.172372
Onset of motor block (min)	18.0225±6.33	21.35±5.49	0.007096
Duration of motor block (min)	951.05±100.45	653.54±179.052	0.00001
Duration of sensory block (min)	705.825±112.37	522.025±68.28	0.0001
Requirement of opioid supplementation			
yes	4	8	Chi squre start 1.5686 P value
No	36	32	0.210406

Out of forty patients four patients in group A require opioid supplementation and eight patients out of 40 patients in group B required opioid supplementation with p value 0.210406.

Discussion

The most commonly used local anaesthetic drugs for peripheral nerve lock is bupivacaine. Major limitation for the use of bupivacaine is its neurological and cardiovascular toxicity in the form of fatal arrhythmia.

Ropivacaine an s-enantiomers searched as alternative to bupivacaine which is less toxic then bupivacaine, and Levobupivacaine is new in this group a Levoenantiomers with very less affinity for cardiac sodium channels, and proved to be safe in clinical practise [6,8].

Various studies has been conducted regarding comparative efficacy of Levobupivacaine versus ropivacaine, but there are few studies are available on supraclavicular brachial plexus block, for this reason we decided to compare 0.5% Levobupivacaine with 0.5% ropivacaine on quality of block in upper limb sensory.

The selection of volume and concentration of both drugs were based on the outcome of various studies. Margeswarn et al and Nodulus et al.[14,15].

In our study both the group are comparable to each other as the patients age, sex, weight, site of surgery, duration of surgery and ASA grade are equally distributed.

The mean onset of sensory block was 14.065+17.91 in comparison to 16.829+5.01 in group B that means, it was 2.8min earlier in Levobupivacaine than ropivacaine but it was not significant statistically with P value 0.172372. But onset of motor block was significantly early in Levobupivacaine then ropivacain group (18.0225+6.33 minvs 21.35+5.49 min).

As perthe study of mageswaran et al the onset of sensory block was earlier in levobupovacain group which corroborate with our study but the onset of motor block is not supporting our finding as it is early in ropivacaine group inmageswaran et al study [14].

But as per the study of Kulkarni SB et al. the duration of onset of sensory and motor both the block was higher in Levobupivacaine group which support our study [16].

In our study we have found that duration of sensory and motor block was significantly earlier in Levobupivacaine group then ropivacaine group, which is supported by the study of Indira gurjala et al. [17].

Various studies has been conducted regarding duration of analgesia and requirement of postoperative supplementary analgesia. As per the study of Casati et al., Gonzalez et al. and Fournier et al. the duration of analgesia was significantly [18,19,20] high in Levobupivacaine group then ropivacaine group similarly the requirement of opioid supplementation was significantly low in Levobupivacaine group then ropivacaine, these findings support our study, the requirement of opioid in Levobupivacaine group waslower than ropivacaine but to not significant statistic ally. This finding corroborates with the finding of Phamdang Charles et al [21].

Conclusion

From present study we would like to conclude that the onset of sensory and motor block was earlier in Levobupivacaine group than ropivacaine. The duration of sensory and motor block was also longer in Levobupivacaine group then ropivacaine, we have also found that duration of analgesia was longer in Levobupivacaine group and requirement of supplementation analgesic was less in Levobupivacaine group then ropivacaine group.

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