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A COMPARISON OF 0.5% ROPIVACAINE AND 0.5% BUPIVACAINE IN BRACHIAL PLEXUS BLOCK THROUGH SUPRACLAVICULAR APPROACH

Dr Jyothsnarani Paruvada* (Fianl year PG) Department Of Anaesthesiology , Great Eastern Medical School And Hospital, SRIKAKULAM. *Corresponding Author

Dr Kalyan Chakravarthy P Professor And Hod Department Of Anaesthesiology, Great Eastern Medical School And Hospital, SRIKAKULAM

Dr Hemnath Babu K Associate Professor, Department of Anaesthesiology, Great Eastern Medical School and Hospital, SRIKAKULAM.

ABSTRACT **INTRODUCTION:** Most commonly performed peripheral nerve blockade for upper extremity surgeries is Brachial plexus block in clinical practice.Present study evaluates the clinical efficacy of 0.5% ropivacaine and comparing it with 0.5% bupivacaine in terms of characteristics of the supraclavicular blockade and side effects. **MATERIALS AND METHODS:** This is a comparative study where cases were randomly divided into two groups(GroupR- Ropivacaine and GroupB- Bupivacaine)and administered the drug. 60 patients belonging to ASA Grade 1 and 2 between 20 and 60 years of age of both sexes were included in this study. Pulse,BP, sensory and motor blockade were monitored, and complications of brachial plexus block and side effects of local anesthetics used were also noted. **RESULTS:**Mean onset time for sensory block was significantly shorter in ropivacaine group(9.27±1.52 min) than bupivacaine group(13.2±1.78min). Mean duration of sensory block was significantly lengthier in group B(520.32±44.50min) as compared to group R(478.20±40.82 min)(p=0.001). Mean onset time for motor block was significantly shorter in the ropivacaine group(16.72±4.20 min) as compared to bupivacaine group(23.45±4.82 min), duration of motor block was significantly longer in bupivacaine group(452.80.40±42.52 min) as compared to ropivacaine group(410.75±30.48 min). **CONCLUSION:** The onset of sensory, motor block were early in the Ropivacaine group with faster recovery of motor functions as compared to Bupivacaine group. No adverse effects were noted in both groups. This study suggests Ropivacaine is a suitable alternative to Bupivacaine for forearm surgeries under Brachial Plexus Block.

KEYWORDS : Supraclavicular Approach, Bupivacaine, Ropivacaine

INTRODUCTION:

Brachial plexus block provides anesthesia of the entire upper extremity in the most consistent and time-efficient manner and also provides both intraoperative anesthesia and postoperative analgesia without any systemic side effects.[1]

The supraclavicular approach to blockade offers several advantages over other routes because of its ease, reliability, and high success rate. Compared with the axillary approach, it does not cause sparing of the musculocutaneous or axillary nerves.

Different local anesthetics can be used to perform an ideal and complete block. Among them, Bupivacaine provides a longer duration of action, but at high doses, it may lead to cardiotoxicity and neurotoxicity.[2] Hence, there is a need for a drug that can have all the advantages of Bupivacaine without its cardiotoxicity.

Ropivacaine is a new amide local anaesthetic that has been shown in animal studies to be similar to Bupivacaine in terms of onset and duration of brachial plexus block.[3]

In human brachial plexus studies, Ropivacaine 0.5% has been shown to provide effective sensory and motor block of prolonged duration.[4]

The toxicity of Ropivacaine has been reported to be less than that of Bupivacaine.

Mean dose of Ropivacaine shows maximum tolerable central nervous system(CNS) effect, maximum tolerable total venous plasma concentration, and higher arterial unbound plasma concentration of Ropivacaine when compared to Bupivacaine.[5]

The present study was done to compare the clinical characteristics of Ropivacaine 0.5% and bupivacaine 0.5% when used for supraclavicular brachial plexus block.

MATERIALS&METHODS:

The present study was carried out in the Department of Anaesthesiology, GEMS Hospital, SRIKAKULAM, from January 2019 to Dec 2019. The total duration was 12 months. All the subjects undergoing surgery for upper extremity using brachial plexus block and fulfilling the following inclusion criteria were included.

Inclusion Criteria: 60 patients belonging to ASA Grades 1 and 2 between 20 and 60 years of age of either sexes were included in the study, scheduled for various surgical procedures of below elbow, fore arm and hand.

Exclusion Criteria: Include patients with local infection, pneumothorax, peripheral neuropathy, severe liver or kidney disease,previous history of adverse reactions to local anesthetics and coagulopathy.

After explaining the details of the procedure, written informed consent was taken from each patient. The pre-operative assessment was carried out in every patient one day before surgery. All the patients were premeditated with Tab Alprazolam 0.5mg the night before surgery and Tab Ranitidine 150 mg in the morning of surgery.

The patients were divided into two groups using a computerized randomization table.

a) Group B(n=30): Patients proposed to undergo upper limb surgery under brachial plexus block using 30 ml of 0.5% bupivacaine.

b) Group R(n=30): Patients proposed to undergo upper limb surgery under brachial plexus block using 30 ml of 0.5% ropivacaine.

As early as the block was given, the patient was kept with the arm by the side comfortably. Electrocardiogram, BP,PR,RR, and SPO_2 were noted every 5 min. Signs of drug toxicity were observed.

The onset of sensory & motor blocks was tested every 1 min interval for a maximum of 35 min. All the patients were observed for 24 hrs. All the observed characteristics were noted and analyzed.

RESULTS:

Total of 60 patients who underwent both elective and emergency surgical procedures were included in the study and randomly allocated into two groups of 30 patients each.The patients' demographic profile and the mean duration of surgical procedures were comparable between the two groups, and the difference was statistically not significant(Table 1)

Table 1: Demographic data and duration of surgery.

Characteristic	Group R	Group B	P-value
Mean Age±SD in years	42.75+ 11.08	43.80+10.82	0.76
Male:Female	18:12	21:9	
Bodyweight(Mean± SD)in kg	55.42±5.80	57.72±4.22	0.17
Duration of surgery(MIN)	232.5±40.80	243.80±52.42	0.38

Observations regarding nerve blockade were made and compared between the two groups.

The onset of sensory block was measured from the commencement of the injection of the anesthetic solution until the loss of pinprick sensation. The onset of motor blockade was measured from the commencement of the injection of the anesthetic solution until the loss of finger movements.

Table-2: Comparison of meantime for onset and duration of sensory and motor blocks

Time(min)	Group R(Mean±SD)	Group B(Mean±SD)	p-value
The onset of sensory block	9.27±1.52	13.20±1.78	< 0.001
Duration of sensory block	478.20±40.82	520.32±44.50	0.0003
The onset of motor block	16.72±4.20	23.45±4.82	< 0.0001
Duration of motor block	410.75±30.48	452.80±42.52	<0.0001

The mean onset of time for initiation of sensory block was significantly lower in Group R(9.27±1.52min) as compared to Group B(13.20±1.78min)(p<0.001).However, the duration of sensory block was significantly higher in Group B(520.32±44.5min) as compared to Group R(478.20±40.82min)(p=0.001)[Table-2].

The mean onset time for initiation of motor block was significantly lower in Group R(16.72±4.20min) as compared to Group B(23.45±4.82min)(p<0.001). However, the duration of the motor block was significantly higher in Group B(452.80±42.52 min) as compared to Group R(410.75±30.48 min)(p=0.001)[Table-2].

There was no statistically significant difference between the two groups in terms of hemodynamic parameters at different time intervals till 12 hours of administration of brachial plexus block.

There was no evidence of any side effects or any signs of CNS toxicity, CVS toxicity, or any allergic drug reactions.

DISCUSSION:

In the present study use of brachial plexus was preferred to block for the patients undergoing upper extremity surgeries. Anaesthesiologists opt for familiar approaches of brachial plexus anaesthesia such as interscalene, supraclavicular and axillary. However, each has its limitations and complications. But the supraclavicular approach has been considered the most efficacious approach to brachial plexus block because, in this approach, we block the trunks of brachial plexus[6]. It is often called as spinal anesthesia for upper extremity because of its ubiquitous application for upper extremity surgery characteristically associated with a rapid onset of anesthesia, high success rate, complete and predictable anesthesia for the entire upper extremity. The patient's cooperation is very much essential for appreciating paresthesia to locate the nerve plexus. False appreciation of paresthesia may lead to failure of the technique. The use of a nerve stimulator for nerve localization is simple and is also expected to help in accurate placement of the local anesthetic agents in close proximity to the nerve and reduces the rate of failure and complications too.

In the present study the onset of sensory and motor blocks were earlier with 0.5% of Ropivacaine when compared to 0.5% Bupivacaine. Duration of sensory and motor blockade is lower with 0.5% ropivacaine when compared to 0.5% Bupivacaine.

Few studies, such as Raeder et al[7] McCrae et al[8] documented that the onset time for both sensory and motor blockade between 11,20 min respectively for Ropivacaine. Klein et al[9] observed the mean onset time of both motor and sensory blockade was <6 min in all ropivacaine groups. These differences may be attributed to the anatomic location of the different nerve blocks (supraclavicular, interscalene, and subclavicular) and the technical procedure used.

Akerman et al[10] ropivacaine is longer acting than Bupivacaine upon infiltration, equally effective in peripheral nerve blocks and slightly shorter acting in subarachnoid and epidural anesthesia.

The mean onset of sensory block was significantly lower in the Ropivacaine group(9.27±1.52mins) as compared to the bupivacaine group(13.2±1.78mins). These results were comparable to those obtained by Bertini et al.[11]

Comparison of duration of sensory and motor blocks in the present study showed the mean duration of motor and sensory blocks to be significantly longer in the bupivacaine group as compared to the ropivacaine group, which is similar to the findings of Mc Glade et al, who found that shorter duration of the blockade in ropivacaine group as compared to bupivacaine group while using the axillary approach.[12] Thus, in general, Ropivacaine showed a better quality of analgesia with a shorter onset and recovery time for both sensory and motor blockade in comparison to Bupivacaine.

CONCLUSION:

On the basis of the present study, conclusions were drawn that the onset of action of sensory and motor block was early in the Ropivacaine group with faster recovery of motor functions as compared to the Bupivacaine group. No adverse effects were found in either groups.

Ropivacaine at the concentration of 0.5% can be safely used as an alternative to Bupivacaine as a long-acting local anesthetic in supraclavicular brachial plexus block. The study suggests that 0.5% ropivacaine, because of its structural properties, was associated with less CNS, CVS toxicity, local neurotoxicity, faster onset of sensory and motor blockade, with similar quality of block as 0.5% bupivacaine.

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