

## COMPARATIVE CLINICAL EVALUATION OF 0.5% ROPIVACAINE AND 0.5% BUPIVACAINE FOR BRACHIAL PLEXUS BLOCK VIA SUPRACLAVICULAR APPROACH FOR UPPER LIMB SURGERIES.

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**ABSTRACT:** Ropivacaine, a local anesthetic agent with similar pharmacological profile to that of bupivacaine has lower potential for toxic effect. The aim of our study is to compare the anesthetic characteristics of ropivacaine and bupivacaine when used for supraclavicular brachial plexus blockade in upper limb surgeries. Fifty patients were grouped equally and one group R received 0.5% ropivacaine (100mg) 20ml and another group B received 0.5% bupivacaine (100mg) 20ml. onset & duration of sensory and motor blockade, duration of analgesia and associated complications & side effects were recorded. It was found that there were no significant differences in duration of sensory & motor blockade, in complications or any other side effects in both the groups. But ropivacaine provided rapid onset of action and better quality of surgical anesthesia than bupivacaine when used in supraclavicular brachial plexus blockade.

**KEY WORDS:** supraclavicular brachial plexus blockade, ropivacaine, bupivacaine

**INTRODUCTION:** Bupivacaine is used widely for regional blockade because of its long duration of action. But evidences of greater risk of cardiac toxicity after bupivacaine use.

Ropivacaine on the other hand is a new long acting local anesthetic agent with similar structure, pharmacology & pharmacokinetics to that of bupivacaine but has lower potential for toxic effect. The fact that ropivacaine may offer less cardiac and neurological toxicity with intravascular injection suggests a potential clinical advantage of this drug during neural blockade when large volume is required. This property may also enable the use of solution with higher concentration to enhance the speed of onset, time & to prolong duration. Here we used minimum concentration with minimal volume of drug to assess the effectiveness of both the drug.

The aim of our study is to compare the anesthetic characteristics of ropivacaine & bupivacaine when used for supraclavicular brachial plexus blockade in upper limb surgeries.

**METHOD:** After obtaining ethics committee permission & informed consent from all of the patients. Fifty patients of ASA I & II of age group 15 – 45 yrs of either sex included in our study. These patients were equally divided into two groups 25 each. Group R received 20ml of 0.5% ropivacaine and group B received 20ml of 0.5% bupivacaine. Patients with history of cardiovascular, neurological, active hepatic, renal diseases & psychiatric disorder, pregnant & lactating women, contraindication of brachial plexus blockade, sensitivity to local anesthetics, patients who were not willing for brachial plexus blockade, and failure of blockade were not included in our study.

All patients underwent thorough general clinical examination prior to starting the procedure. All patients were kept nil orally for at least 6 hours prior to the procedure. Pulse rate, BP, respiratory rate, ECG, SpO<sub>2</sub> were recorded preoperatively. I V line was established on the contra

lateral limb. Whole procedure was explained to all patients in their own language for their complete cooperation. Patient was kept in supine position with head turned to opposite side and arm pulled down gently. A small pillow or folded sheet was placed below the shoulder to make the field more prominent. A point 1 cm above the clavicle at junction of inner 2/3rd and outer 1/3rd of clavicle was chosen for the block.

Under all aseptic precaution, an intradermal wheal with 2% lignocaine plane at the selected point raised. A needle of 22G inserted through the wheal directed medially and inward at the angle of 20 degree to the skin until the paresthesia elicited in the hand. After negative aspiration, 20 ml of drug injected slowly. A gentle massage of the area was to do with an idea to make uniform spread. Pulse rate, blood pressure, respiratory rate, oxygen saturation , ECG , sensory and motor blockade monitored in every 5 minutes up to first 30 minutes, then every 15 minutes up to 1 hr and then at hourly interval up to 6 hrs , then 2nd hourly up to 12 hrs . Complications and side effects of local anesthetic closely observed.

## ASSESSMENT OF SENSORY BLOCKADE

- **Sensory block** assessed in C4 through T2 dermatomes by using following grades.
  - 0 = No loss of sensation to pinprick
  - 1 = Analgesia (patient feel touch but no pain on pinprick)
  - 2 = Anesthesia (patient even not feel touch sensation on pin prick)
- **Onset of sensory** = Time taken from drug injection to complete ablation of sensation (sensory score 2).
- **Duration of sensory blockade** = Time of onset of block to complete return of parasthesia, (sensory score 0).

## ASSESSMENT OF MOTOR BLOCKADE

- By asking the patient to elevate the arm while keeping elbow straight (superior trunk) and at the hand by grip strength (middle and inferior trunk) which were graded as follows:-
  - 0 = No weakness
  - 1 = Paresis
  - 2 = Paralysis
- Onset of motor blockade – Time taken from drug injection to complete motor block (motor grade score 2)
- Duration of motor blockade – Time taken from complete motor blockade to restoration of movements of forearm (grade 0)

## Postoperative observations:

- At the end of surgery, the residual effect and duration of surgery noted and after shifting of patient to the ward, patient 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.
- Visual analogue scale –
  - 0 = No pain
  - 10 = Worst pain
- **Duration of postoperative analgesia** = Time from onset of sensory blockade to time when patient VAS score >five.

## COMPLICATIONS AND SIDE EFFECTS ASSESSMENT

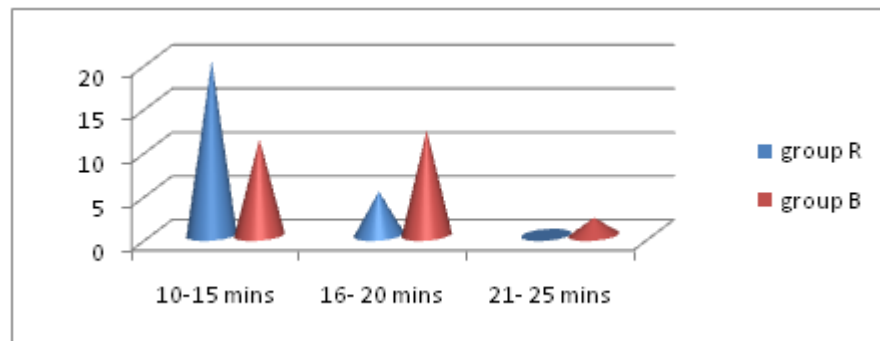
- A careful watch was kept for the complication such as –
  - Respiratory system - Respiration insufficiency, Pneumothorax, Diaphragmatic paralysis
  - Cardiovascular system - Bradycardia and hypotension
  - Central nervous system – Headache, Convulsion
  - Gastrointestinal system - Nausea & Vomiting
  - Local complications - Hematomas
  - Allergic complications – Pruritus, itching etc.

**RESULTS:** We used 20 ml of 0.5% of Ropivacaine (100mg) and 0.5% of bupivacaine (100 mg) for supraclavicular brachial plexus blockade; so that the effectiveness of both the drugs can be assessed with minimum volume and concentration.

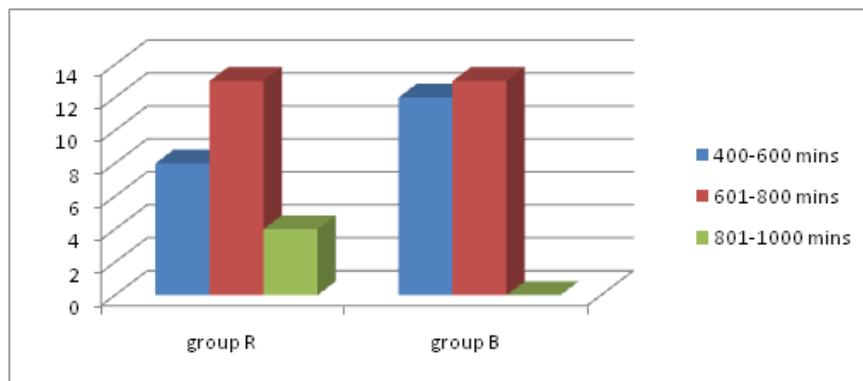
This was also helpful in reducing the chances of cardiovascular and central nervous system toxicity. However, in our study we did not observe any major complications or side effects due to drugs or procedure. There were no differences in distribution of patients regarding age, sex & surgical procedures. Onset of sensory & motor blockade was  $12.9 \pm 2.8$  minutes and  $13.2 \pm 1.99$  minutes in group R and for group B it was  $15.9 \pm 2.8$  minutes and  $20.2 \pm 3.22$  minutes which was found to be significant for group R ( $p < 0.05$ ). This concluded that Ropivacaine provided short onset time for surgical anesthesia. The other parameters that were observed in the study like duration of sensory blockade in which group R showed mean time interval of  $664.8 \pm 10.61$  minutes and that of for group B was  $605 \pm 116.4$  minutes with  $p > 0.05$  i.e. not significant. Duration of motor blockade for group R was  $656.2 \pm 112.2$  minutes and for group B was  $599.4 \pm 97.8$  minutes with  $P > 0.05$  also not significant. Complications & side effects (nausea and vomiting, hematoma etc) ( $P > 0.05$ ) and not significant for the groups. Various vital parameters (HR, BP, SPO2 and RR) also did not show significant differences in the both the groups. Duration of analgesia for group R ( $682.8 \pm 152.4$  minutes) and group B ( $641.8 \pm 76.6$  minutes) were not different significantly in both the groups ( $p > 0.05$ ). However, the requirement of analgesia in 24 hrs was less in-group R than group B; which concluded the better quality of blockade with Ropivacaine.

|  | Group R         | Group B         |
|--|-----------------|-----------------|
| Age distribution(yrs)<br>Mean $\pm$ SD | 32.8 $\pm$ 7.86 | 35.2 $\pm$ 7.58 |
| Gender distribution                    |                 |                 |
| Males                                  | 88%             | 72%             |
| females                                | 12%             | 28%             |
| TABLE NO. 1: Age & sex distribution    |                 |                 |

| Sensory blockade  | Group R           | Group B           |
|---|-------------------|-------------------|
| Onset ( mins)<br>Mean $\pm$ SD                                  | 12.9 $\pm$ 2.18   | 15.9 $\pm$ 2.8    |
| Duration(mins)<br>Mean $\pm$ SD                                 | 664.8 $\pm$ 106.1 | 664.8 $\pm$ 106.1 |
| TABLE NO. 2: Assessment of onset & duration of sensory blockade |                   |                   |



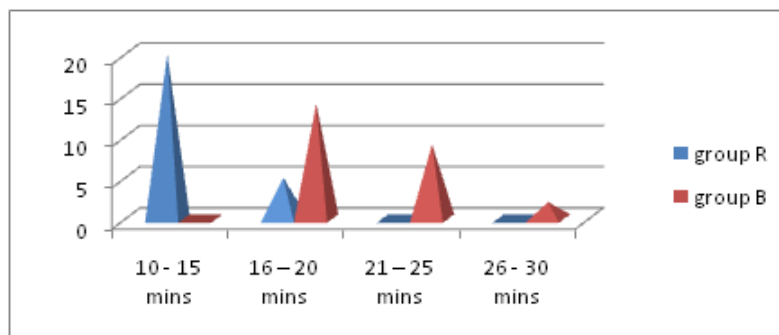
Onset of sensory blockade



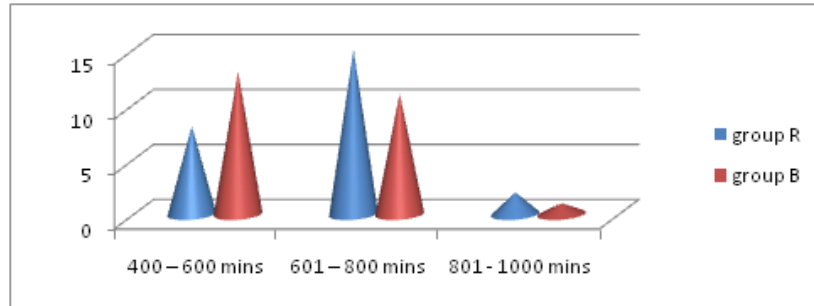
Duration of sensory blockade

| Motor blockade               | Group R       | Group B      |
|------------------------------|---------------|--------------|
| Onset (mins)<br>Mean ± SD    | 13.2 ± 1.99   | 20.2 ± 3.22  |
| Duration (mins)<br>Mean ± SD | 656.2 ± 112.2 | 599.4 ± 97.8 |

Table No. 3: Assessment of onset & duration of motor blockade



Onset of motor blockade



Duration of motor blockade

| No. of analgesic required | Group R | Group B |
|---------------------------|---------|---------|
| Not required              | 36%     | 16 %    |
| I <sup>st</sup> dosage    | 64%     | 24%     |
| II <sup>nd</sup> dosage   | 0 %     | 60%     |

Table No. 3: Post operative analgesic consumption in 12 hrs

| S No.         | Time ( mins)    | Group R           |       | Group B        |       |
|---------------|-----------------|-------------------|-------|----------------|-------|
|               |                 | No.               | %     | No.            | %     |
| 1             | 400 – 600 mins  | 9                 | 36%   | 14             | 56 %  |
| 2             | 601 – 800 mins  | 11                | 44 %  | 11             | 44 %  |
| 3             | 801 – 1000 mins | 5                 | 20 %  | 0              | 0     |
| Total         |                 | 25                | 100 % | 25             | 100 % |
| Mean $\pm$ SD |                 | 682.8 $\pm$ 152.4 |       | 641 $\pm$ 76.6 |       |

Table No. 4: Assessment of duration of analgesia

**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 study we used 0.5% ropivacaine & 0.5% bupivacaine for supraclavicular brachial blockade and we found there were no significant difference in duration of sensory & motor blockade as well as no significant complication & side effects were recorded. Various vitals during peri-operative period were stable and no significant postoperative complications were noted.

In our study, we used 20 ml of 0.5% of Ropivacaine (100mg) and 0.5% of bupivacaine (100 mg) for supraclavicular brachial plexus blockade; so that the effectiveness of both the drugs can be assessed with minimum volume and concentration. This was also helpful in reducing the chances of cardiovascular and central nervous system toxicity.

Hickey R, candido KD(1990) used 0.5% concentration of ropivacaine & bupivacaine for found that ropivacaine had initial rapid onset of sensory & motor blockade ( less than 4 minutes). Casati A, Fanelli G (2000) found that readiness for surgery was obtained in mean time of 22 $\pm$ 8 minutes with ropivacaine where as with bupivacaine it was 28 $\pm$ 15 minutes when used for brachial plexus blockade. In our study we found mean onset time for sensory blockade was 12.9 $\pm$ 2.18 minutes & mean onset time for motor blockade 13.2 $\pm$ 1.99 minutes was with ropivacaine and with

bupivacaine sensory onset was  $15.9 \pm 2.8$  minutes and motor onset was  $20.2 \pm 3.22$  minutes and the P value  $< 0.05$  which showed that there was significant difference in mean time of onset of sensory and motor blockade. Duration of sensory & motor blockade of group R was 9 - 12hrs and that of group B was 9 - 11 hrs which was not statistically significant. Hickey R, Hoffman J (1991) also found duration of blockade (sensory & motor) 9 - 11 hrs when 0.5% ropivacaine & 0.5% bupivacaine used for brachial plexus blockade, but Mc glade D P (1998) found that duration of motor blockade was 6.5 - 7.5 hrs & duration of sensory blockade was 5.3 - 8.7 hrs with ropivacaine and duration of motor blockade was 6.0 - 9.0 hrs & sensory blockade was 6.9 - 20.3 hrs with bupivacaine. Duration of analgesia in our study with ropivacaine was  $11.38 \pm 2.54$  hrs and that of with bupivacaine was  $10.69 \pm 1.27$  hrs. Studied done by Hickey R, Candido (1990), Casati A, Fanelli G (1999) also showed duration of analgesia with ropivacaine was 11- 14 hrs while with bupivacaine it was 10 - 12hrs which was not statistically significant. The difference in the mean VAS score used to assess analgesia in both the group was not significant up to 8 - 10 hrs; but the requirement of rescue analgesia in-group B was more than in-group R .which indicated the quality of analgesia was better in-group R than group B.

Thus we concluded that ropivacaine 0.5% 20 ml when used for supraclavicular brachial plexus blockade provided rapid onset of action and better quality of analgesia than 0.5% bupivacaine for upper limb surgeries. However, there were no significant difference in duration of sensory & motor blockade, any complication or side effects and vital parameter changes were also be found insignificant.

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# ORIGINAL ARTICLE

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