ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

*International Journal of Medical Science and Innovative Research (IJMSIR)*
*IJMSIR : A Medical Publication Hub*
*Available Online at: www.ijmsir.com*
*Volume – 7, Issue – 1, February – 2022 , Page No. : 238 - 244*

# Comparision between 0.75% ropivacaine vs 0.50% ropivacaine in patients undergoing forearm surgeries under axillary brachial plexus block: A prospective randomized study

[1]Dr. Mukesh Shivran, PG. Resident, Jhalawar Medical College, Jhalawar, Rajasthan, India.

[2]Dr. Adhokshaj Joshi, Associate Professor, Jhalawar Medical College, Jhalawar, Rajasthan, India.

[3]Dr. S.P Chittora, Head of department, Jhalawar Medical College, Jhalawar, Rajasthan, India.

**Corresponding Author:** Dr. Mukesh Shivran, PG. Resident, Jhalawar Medical College, Jhalawar, Rajasthan, India.

**Citation this Article:** Dr. Mukesh Shivran, Dr. Adhokshaj Joshi, Dr. S.P Chittora, "Comparision Between 0.75% Ropivacaine Vs 0.50% Ropivacaine in Patients Undergoing Forearm Surgeries Under Axillary Brachial Plexus Block: A Prospective Randomized Study", IJMSIR- February - 2022, Vol – 7, Issue - 1, P. No. 238 – 244.

**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

## Abstract

**Background and objectives:** To compare the effect of 30ml of 0.5% and 0.75% ropivacaine in axillary brachial plexus block with respect to onset time of sensory blockade, onset time of motor blockade, duration of sensory blockade, duration of motor blockade, duration of analgesia and any side effects.

**Materials and Methods:** Patients of ASA-I and ASA-II grade, undergoing forearm and hand surgeries were randomized and prospectively divided into Group I and Group II (n= 30 per group), which received 30 ml of 0.5% and 0.75% ropivacaine respectively, by performing axillary brachial plexus block using trans-arterial approach.

**Results:** The rate of complete sensory and motor block observed with 0.75% ropivacaine was higher when compared with 0.5% ropivacaine ($P < .001$). The mean onset time for sensory block was shorter with ropivacaine than with bupivacaine (Group I = 18.10 minutes, Group II = 16.01 minutes, $P < .05$). The quality of the anesthesia was higher with 0.75% ropivacaine, as measured by the intraoperative needs for opioids and the overall patient's satisfaction ($P < .05$). No significant differences were noted with all the other studied parameters.

**Conclusion:** 0.75% ropivacaine showed advantages over 0.5% ropivacaine for axillary brachial plexus block in reducing the onset time and improving the duration of block, without any significant side-effects.

**Keywords:** Axillary block, Ropivacaine, Analgesia.

## Introduction

Brachial plexus block has a long history existing till date, providing surgical anaesthesia and postoperative analgesia [1]. Axillary brachial plexus block is most effective for surgical procedures distal to the elbow. Some anaesthesiologists find the axillary block suitable for elbow surgical procedures, and continuous axillary catheter techniques may be indicated for postoperative analgesia because this block is carried out distant from both the neuraxial structures and the lung, complications associated with those areas are avoided. Axillary nerve block provide intra operative anaesthesia but also extend analgesia in the post operative period without major systemic side effects by reducing stress response and using minimal anaesthetic drug. However, these

advantages are short lived, depending on the relatively brief duration of action of local anaesthesia. In order to increase duration of analgesia, we require to increase volume of local anaesthetic agent which in turn also increase the risk of LA systemic toxicity[2].

Because hand and wrist procedures often require less motor blockade than procedures in the shoulder, the concentration of local anesthetic needed for axillary block can usually be slightly less than that needed for supraclavicular or interscalene block[2]. Ropivacaine is a long-acting amide local anaesthetic with a potentially improved safety profile when compared to bupivacaine [3]. Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibres, resulting in a relatively reduced motor blockade. Ropivacaine has a greater degree of motor sensory differentiation. It has selective action on the pain- transmitting Aβ and C nerves rather than Aβ fibres, which are involved in motor function. Numerous comparative studies suggested that ropivacaine produces less cardiac as well as central nervous system toxic effects, less motor block and a similar duration of action of sensory analgesia as bupivacaine [4,5].

This study is designed to compare onset and duration of both motor and sensory blockade along with total duration of analgesia, by 0.75% Ropivacaine and 0.50% Ropivacaine in axillary bracial plexus block by trans arterial approach, in patients undergoing forearm and hand surgery.

**Materials and methods**

After ethical committee approval and written informed consent from patients and/or attendant, the present study was carried out in 60 adult patients of American Society of Anesthesiologist (ASA) grade I and II between the age of 20-60 year, undergoing elective upper limb surgeries in orthopedic patients under axillary brachial plexus block in Department of Anesthesiology, Jhalawar Medical College and SRG Hospital, Jhalawar.

Patients with significant cardiovascular disease, hypertension, renal failure, hepatic dysfunction, diabetes and chronic pulmonary disease, neuromuscular disorder, morbid obesity, bleeding disorders, infection at the local site, patients with history of hypersensitivity with LA, patient on prolonged drug therapy, and uncooperative patients were excluded from study.

**The patients were randomly divided into two groups:**

**a) Group I (n=30):** Patients undergoing upper limb surgery under Axillary brachial plexus block were given 30 ml of 0.5% Ropivacaine.

**b) Group II (n=30):** Patients undergoing upper limb surgery under brachial plexus block were given 30 ml of 0.75% Ropivacaine.

Informed consent was obtained from all the patients enrolled in the study. All the patients were asked to remain nil by mouth 6-8 h prior to surgery. After receiving in the operating room all the patients were explained about the procedure and basics vital parameters were connected and base line readings were noted. Patients were premedicated with 1 mg of Midazolam intravenously. The operative arm was positioned to expose the axilla. The axilla was prepared using aseptic technique and then axillary artery was identified by palpation.

All patients were placed supine, with the arm forming a 90-degree angle with the trunk, and the forearm forming a 90-degree angle with the upper arm. The skin was anaesthetized with 1ml of 1% lidocaine solution. A 11/4 inch 22 G needle was inserted through the area of anesthetized skin into and through the axillary artery until

it is noted that no blood could be aspirated through the needle. This negative aspiration indicated that needle was positioned beyond the posterior wall of the artery and in the brachial plexus sheath, 1ml of test solution was injected to rule out possible intravascular placement of the needle. All subjects were observed for possible intravascular placement of the needle for approx. 1min following the injection of test solution and then the remaining 30ml of the solution was administered in 7.5ml dose in all 4 quadrants following aspiration. The needle was removed and firm digital compression with gauze piece was held at the site for 5min to assist in proximal spread of the anaesthetic solution.

Sensory and motor block were evaluated preoperatively to determine a baseline and every 5 min for 30 min or until onset of blockade was noted and thereafter patient was handed over to surgeon. Then patient was assessed in postoperative care unit every 60 minutes, till patient complain of pain and demand for rescue analgesia. Sensory block was assessed by the pinprick method (22G hypodermic needle). Assessment of sensory block was done in the dermatomal areas corresponding to median nerve, radial nerve, ulnar nerve and musculocutaneous nerve till complete sensory blockade was achieved. Sensory onset was considered when there was a dull sensation to pinprick along the distribution of any of the above-mentioned nerves. Complete sensory block was considered when there was complete loss of sensation to pinprick [6]. Sensory block was graded as; Grade 0- normal sensation (feeling of pain), Grade 1 - loss of sensation of pinprick (analgesia), Grade 2 –loss of sensation of touch (anesthesia).

A modified Bromage Scale [7] for the upper extremity was used to assess motor function. This scale consists of the following four scores: Grade 0- Normal motor function with full flexion and extension of elbow, wrist and finger, Grade 1- Decreased motor strength with ability to move finger only and Grade 2- Complete motor block with inability to move fingers. Onset of motor blockade was considered when there was Grade 1 motor blockade. Peak motor block was considered when there was Grade 2 motor blockade. Block was considered to have failed when sensory anaesthesia was not achieved within 30 min. General anaesthesia was given subsequently to these patients who were then excluded from the study. Haemodynamic parameters and vitals (Blood pressure, Heart rate, Respiratory rate and Oxygen saturation) were also monitored during the procedure. Duration of analgesia was assessed by using a 10 point Visual Analogue Scale (VAS) [8] in which a score of “0” indicates “no pain” and a score of “10” “worst pain imaginable”. The VAS measurements were obtained every 60 mins till the score of 5. The rescue analgesia in the form of inj. Diclofenac sodium (1.5 mg/kg) intramuscularly was administered at the Visual Analogue Scale score of 6. Duration of sensory block was determined by noting the time when there was return of dull sensation to pin prick and duration of motor blockade was determined by noting the time the patients could first move their fingers [9]. Side effects such as bradycardia, hypotension, headache and convulsions were looked for.

**Constrain of study**

Nonavailability of the nerve locator, the study was carried out with Nerve Block using the Trans arterial Technique.

**Results**

A total of 60 patients consented to participate in the study that were randomly allocated into groups with 30 in each group. Group I received 30mL of 0.5% Ropivacaine. Group II received 30mL of 0.75% Ropivacaine for Axillary Brachial plexus block.

Demographic profiles were almost similar in both the groups.

Table 1: Age distribution of the patients.

| Age(years) | Group I | | Group II | |
|---|---|---|---|---|
| | N | % | N | % |
| 20-29 | 10 | 33.3 | 10 | 33.3 |
| 30-39 | 7 | 23.3 | 9 | 30 |
| 40-49 | 6 | 20 | 7 | 23.3 |
| 50-60 | 7 | 23.3 | 4 | 13.3 |
| Mean | 38.33 | | 37.00 | |
| SD | 13.50 | | 10.74 | |

Table no 1 demonstrate of patient in two groups. In both groups, most of patients belonged to age group of 20-29 years (33.3% and 33.3% in the group I and II respectively) and age group of 30-39years (23.3% and 30% in the group I and II respectively). Mean age in the group I and II group was 38.33 ± 13.5 and 37.00 ± 10.74. Data were analysed statistically and results were comparable with no significant difference (p=0.6744).

Table 2: Weight distribution of the patients.

| Weight (kgs) | Group I (n=30) | | Group II (n=30) | |
|---|---|---|---|---|
| | N | % | N | % |
| 51-60 | 10 | 33.3 | 8 | 26.7 |
| 61-70 | 14 | 46.7 | 15 | 50.0 |
| 71-80 | 6 | 20.0 | 7 | 23.3 |
| Mean | 63.67 | | 64.67 | |
| SD | 6.49 | | 7.89 | |

Table no 2 depicts distribution of patients according to weight in two groups. In both groups, most of patients belonged to weight group of 61-70 years (46.7% and 50% in the group I and II respectively). Mean weight in the group I and II was 63.67 ± 6.49 and 64.67 ± 7.89. Data were analysed statistically and results were comparable with no significant difference (p=0.5939).

Table 3: Sex index.

| Sex of patient | Group I (n=30) | | Group II (n=30) | |
|---|---|---|---|---|
| | N | % | N | % |
| Male | 24 | 80 | 22 | 73.3 |
| Female | 6 | 20 | 8 | 26.7 |

Table no 3 show that majority of patients were male 80% and 73.3% in group I and II respectively. Data were analysed statistically and results were comparable with no significant difference**.**

Table 4: Comparison of Group I and Group II on The Basis of Onset Time of Sensory and Motor Blockade.

| Study variables | Group I | Group II | P value |
|---|---|---|---|
| Sensory onset Time | 18.10±2.29 | 16.01±3.11 | 0.0044 |
| Motor onset time | 25.50±2.30 | 24.01±1.90 | 0.0082 |

In Group I, the mean onset time of Sensory blockade and Motor blockade was 18.10 ± 2.29 min and 25.50 ± 2.30 min respectively when compared to Group II having Onset time of sensory blockade and Motor blockade of 16.01 ± 3.11 min and 24.01 ± 1.90 min respectively.

**Comparison of Mean Onset Time between the groups**

Onset time of Sensory and Motor blockade was earlier in Group II when compared with Group I. The p value was <0.05, which is statistically significant.

Table 5: Comparison of Group I and Group II on the Basis of Duration of Sensory and Motor Blockade.

| Study Variables | Group I | Group II | P value |
|---|---|---|---|
| Duration of sensory blockade | 340.44±46.88 | 390.42±44.26 | 001 |
| Duration of motor blockade | 359.12±42.14 | 428.11±36.88 | 001 |

In Group I, the Mean Duration of Sensory blockade and Motor blockade was 340.44±46.88 min and 359.12±42.14 min respectively when compared to Group II having Mean Duration of sensory blockade and Motor blockade of 390.42±44.26 min and 428.11±36.88 min respectively.

**Comparison of Mean Duration time of sensory and motor blockade between the groups:**

Duration of Sensory and Motor blockade was prolonged in Group II when compared with Group I. The p value was =0.0001, which is statistically highly significant.

Table 6: Comparison of Group I and Group II on the Basis of Duration of Analgesia.

| Study Variables | Group I | Group II | P value |
|---|---|---|---|
| Duration of analgesia | 369.12±41.64 | 440.24±38.34 | 0.0001 |

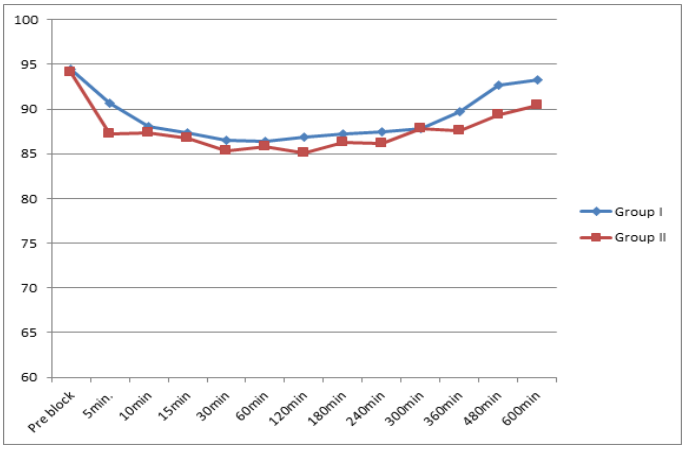
In Group I, the Mean Duration of Analgesia was 369.12±41.64 min when compared to Group II having Mean Duration of Analgesia of 440.24±38.34 min.

**Comparison of Mean Duration time of Analgesia between the groups**

Duration of Analgesia was prolonged in Group II when compared to Group I. The p value was < 0.0001, which is statistically highly significant.

**Comparison Of Mean Arterial Pressure (MAP) and Pulse Rate.**

Graph 1: Pulse Rate (Beats per minutes).




Graph 2:Mean Arterial Pressure (mmHg).

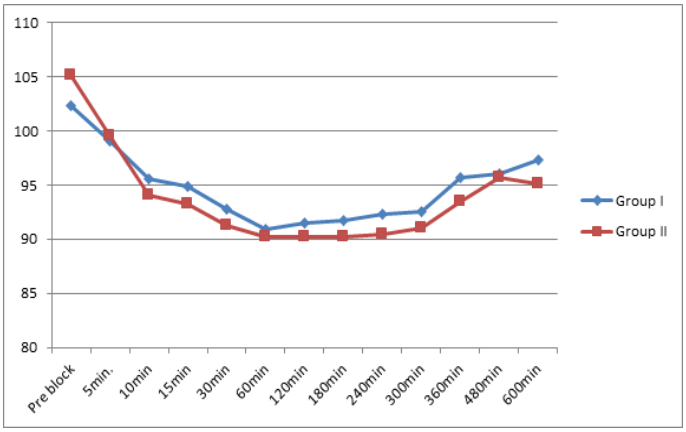



Table 7: Comparison of side effects between both the groups.

| Complication & Side effects | Group I (n=30) | | Group II (n=30) | |
|---|---|---|---|---|
| | No | % | No | % |
| Hematoma | 1 | 3.3 | 2 | 6.6 |
| Bradycardia | 0 | 0 | 0 | 0 |
| Hypotension | 0 | 0 | 0 | 0 |
| Allergic reaction | 0 | 0 | 0 | 0 |
| Nausea & Vomiting | 0 | 0 | 1 | 3.3 |

**Discussion**

Peripheral nerve blocks have become important in clinical practice because of their role in post-operative pain relief, shortening of patient recovery time and avoiding risks and adverse effects of General Anesthesia. Patient demographic profiles with respect to age, sex, or weight were almost similar. The type and duration of surgeries performed were almost identical in both the groups (Statistically not significant). In our study, we observed that onset time of sensory block was faster in Group II compared to Group I having a mean value of 16.01±3.11 minutes and 18.10±2.29 minutes respectively. Similarly the onset time of Motor block was faster in Group II compared to Group I having a mean value of 24.01±1.90 minutes and 25.50±2.30 minutes

respectively. The onset of sensory block and motor block are statistically significant. Hence, we conclude that Ropivacaine 0.75% has an advantage of early onset of Sensory and Motor blockade when compared to Ropivacaine 0.5% for Axillary brachial plexus block at equal volume.

Duration of sensory block Group I and Group II were 340.44 ±46.88 minutes 390.42±44.26 minutes respectively. The Duration of Motor block Group I and Group II were 359.12±42.14 minutes 428.11±36.88 minutes respectively. Both duration of sensory and motor blockade were higher in Group II as compared to Group I and this difference was statistically significant. In our study at concentration of 0.75% the duration of blockade was prolonged compared to 0.5% at equal volumes, albeit the quality appears similar.

The Duration of Analgesia with Group I and Group II were 369.12±41.64 minutes and 440.24±38.34 minutes respectively. The time for demand of analgesics was prolonged in Group II compared to Group I and the difference was statistically significant.

There were no significant changes in mean pulse rate and mean arterial pressure perioperatively between two groups in present study. No other significant side effects were observed in both the groups.

**Conclusion**

On the basis of our study, we can draw the conclusion that at equal volumes Ropivacaine 0.75% has an advantage over Ropivacaine 0.5% for axillary brachial plexus block in terms of early onset of both sensory and motor blockade, prolonged duration of both motor and sensory blockade, prolonged duration of analgesia. Both the drugs maintain stable hemodynamic profile perioperatively and are devoid of any side effects at the concentration and volumes used for the study.

**References**

1. Bertini L, Tagariello V, Mancini S. 0.75% and 0.5% Ropivacaine for axillary brachial plexus block; A clinical comparison with 0.5% bupivacaine. Reg Anesth Pain Med. 1999;24:514-18.

2. Wael Ali Sakr Esa and David L. Brown; Axillary Block Anatomy: Brown's Atlas Of Regional Anesthesia. Ed 5th;2017;Ch8:69-74.

3. Arthur GR, Feldman HS, Covino BG. Comparative pharmacokinetics of bupivacaine and ropivacaine, a new amide local anesthetic. Anesth Analg. 1988;67:1053-58.

4. Mc Glade DP, Kalpokas MV, Mooney PH, Chamley D, Mark AH. A comparison of 0.5%Ropivacaine and 0.5% Bupivacaine for axillary brachial plexus anaesthesia. Anaesth Intensive care. 1998;26:515-20.

5. Thornton KL, Sacks MD, Hall R, Bingham R. Comparison of 0.2% Ropivacaine and 0.25% Bupivacaine for axillary brachial plexus blocks in paediatric hand surgery. Paediatr Anaesth. 2003;13:409-12.

6. Swami SS, Keniya VM, Ladi SD, Rao R. Comparison of dexmedetomidine and clonidine as an adjuvant to local anaesthesia in supraclavicular brachial plexus block. A randomised double-blind prospective study. Indian J Anaesth. 2012;56:243-49.

7. Cline E, Franz D,.Polley RD, Maye J, Burard J, Pellegrini J. Analgesia and effectiveness of Levobupivacaine compared with Ropivacaine in patients undergoing an axillary brachial plexus block. AANA Journal. 2004;72:339-44.

8. Junca A , Marret E, Goursot G, Mazoit X, Bonnet F. A comparision of ropivacaine and Bupivacaine for cervical plexus block. Anesth Analg. 2001;92:720-24.

9. Crews JC, Weller RS, Moss J, James RL. Levobupivacaine for Axillary Brachial Plexus Block: A

Pharmacokinetic and Clinical Comparison in Patients with Normal Renal Function or Renal Disease. Anesth Analg. 2002;95:219–23.

10. Klein SM, Greengrass RA, Steele SM, D'Ercole FJ, Speer KP, Gleason DH, et al. A comparison of 0.5% bupivacaine, 0.5% ropivacaine, and 0.75% ropivacaine for interscalene brachial plexus block. Anesth Analg. 1998;87:1316-19.