

COMPARATIVE STUDY OF ANALGESIC EFFICACY OF 0.5% BUPIVACAINE AND 0.75% ROPIVACAINE IN USG GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

Himanshi Gahlot¹, Nidhi Gaur², Salma Shazia³, Mohammad Asad⁴

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Corresponding Author:

Dr. Nidhi Gaur,

Email: nidhisharma20jan@gmail.com

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¹Post Graduate Resident, Department of Anaesthesia, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

²Associate Professor, Department of Anaesthesia, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

³Assistant Professor, Department of Anaesthesia, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

⁴Professor and HOD, Department of Anaesthesia, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Abstract

Background: The supraclavicular approach to brachial plexus block is widely used for surgeries below the shoulder, offering consistent and efficient anaesthesia and postoperative analgesia. Ultrasound assisted supraclavicular brachial plexus block has gained popularity because it allows real time visualization of nerves for the block and lower incidence of complications. The aim is to compare the analgesic efficacy of 0.5% Bupivacaine and 0.75% Ropivacaine in USG guided supraclavicular brachial plexus block. **Materials and Methods:** 60 patients of either sex, age 18 to 60 years belonging to ASA status 1 or 2, were randomly divided into two groups. Group B received 15 ml of 0.5% bupivacaine, Group R received 15 ml of 0.75% ropivacaine. Onset and duration of both sensory and motor block was recorded along with perioperative haemodynamic monitoring and adverse effects, if any. **Result:** The mean onset of sensory block was earlier in Group R (6.7 ± 0.63 mins) than in Group B (7.9 ± 0.76 mins) ($P > 0.05$). The mean onset of motor block was earlier in Group R (7.75 ± 0.5 mins) than in Group B (9.8 ± 0.69 mins) ($P < 0.05$). The mean duration of sensory and motor block was longer in Group B (812.91 ± 84.55 mins) and (738.74 ± 81.32 mins) respectively, than in Group R (745.8 ± 93.26 mins) and (670.63 ± 79.87 mins) respectively ($P < 0.05$). The perioperative heart rate, systolic & diastolic blood pressure were comparable among the study groups ($p > 0.05$). **Conclusion:** Ropivacaine group have an early onset of sensory & motor blockade along with faster recovery of motor functions than the Bupivacaine group. No adverse effect was seen in both the groups.

INTRODUCTION

In regional anaesthesia, anaesthetic agent is infiltrated around a peripheral nerve which blocks the nerve transmission and help in providing analgesia. It is preferred over general anaesthesia because of certain advantages like avoidance of airway manipulation, decrease systemic side effects of the drugs, less effect on patient consciousness and faster recovery time.^[1]

Various approaches to brachial plexus block have been described but supraclavicular approach is widely used and most consistent method for anaesthesia and perioperative pain management in surgery below the shoulder joint.^[2]

The advent of ultrasound has led to a lower incidence of complications as well as the use of the lower volume of local anaesthetic drugs.^[3] The use of ultrasound allows real-time visualization of nerves, with accurately placed local anaesthetic drugs around the nerves for the block.^[4]

MATERIALS AND METHODS

This hospital based observational study was conducted at The Department of Anaesthesiology, Muzaffarnagar Medical College, Uttar Pradesh, after the approval of Institutional Ethical Committee and informed consents from the patients. 60 adults of either sex, posted for elective upper limb surgery under supraclavicular brachial block were included in

the study and randomly allocated into two groups of 30 each (Group I – received 15 ml of 0.5% Bupivacaine and Group II – received – 15 ml of 0.75% Ropivacaine). Patients of ASA grade III or higher, with local skin infections at site of injection or having coagulopathy / bleeding disorder are excluded from the study.

Methodology

On arrival of the patient in the operation theatre, a multi para monitor was attached and base line or pre operative (at 0 minute) Pulse rate (PR), Non-invasive blood pressure (NIBP), oxygen saturation (SpO₂) and Electrocardiography (ECG) were recorded before starting of the procedure. Intravenous access was made, I.V. fluid RL (Ringer Lactate) started and rate adjusted according to Holliday-Segar formula (4:2:1).

The patient was placed in a supine position with arm by the side of patient and head rotated to the contralateral side. After proper positioning a sterile straight USG probe was placed above the clavicle and anatomy of brachial plexus was identified around the subclavian artery. In plane approach was used to block the brachial plexus. All the patients were continuously monitored for HR, SBP, DBP, MAP.

Assessment of the Block

Onset of Sensory and Motor Blockade was monitored every one minute for first 15 minutes then every two minutes till 30 minutes.

Sensory Blockade

- Assessment of Sensory block was done in dermatomal spread of median, ulnar, radial and musculocutaneous nerve.
- Sensory block was evaluated by Hollmen scale measured with pin prick by using a blunt end of a 26-gauge needle.
 - ❖ 0 – Sharp pain
 - ❖ 1 – Dull pain (analgesia)
 - ❖ 2 – No pain (anaesthesia)
- Onset of sensory block was considered when there was complete loss of sensation to pin prick.

Motor Blockade

- Onset of motor blockade was considered from the time of injection to the inability of the patient to move his/her fingers or raise their hand.
- Motor block was evaluated by using Modified Bromage Scale by assessing the following motor functions. Flexion of elbow (musculocutaneous

nerve), extension of elbow and wrist (radial nerve), opposition of thumb and index finger (median nerve), thumb adduction (ulnar nerve).

0 - No block (full muscle activity)

1 – Partial block (decreased muscle activity)

2 – Complete block (no muscle activity)

After completion of the surgery, patients were observed in the recovery room and ward. Cessation of sensory block was considered when the patient started to feel tingling sensation while cessation of motor block was considered when the patient started moving their fingers. Pain was assessed using visual analogue scale (VAS) score where 0 represented no pain and 10 meant worst possible pain. Analgesic inj. Diclofenac sodium was given, since pain is a subjective feeling so the first analgesic after block was given when patients started complaining of pain.

Statistical Analysis: Data collected was tabulated in an excel sheet. The mean and standard deviations were used for statistical analysis. Difference between two groups were determined using student's t-test or chi-square test and the level of statistically significant was set at $p < 0.05$.

RESULTS

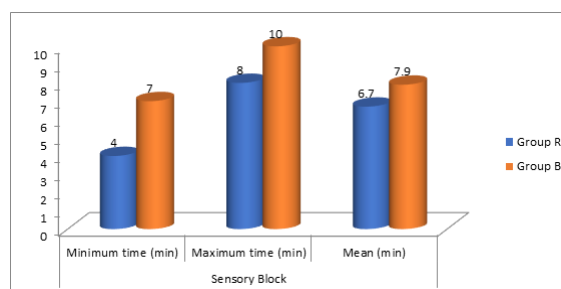


Figure 1: Onset of sensory block

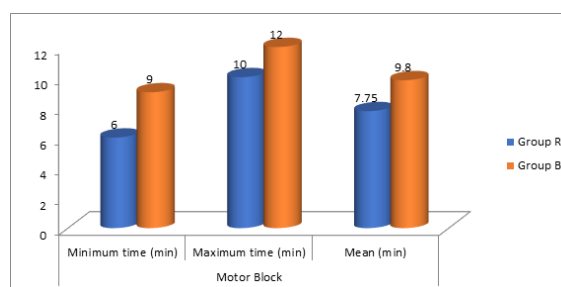


Figure 2: Onset of motor block

Table 1: Onset of sensory block.

Sensory Block	Group R	Group B
Minimum time (min)	4	7
Maximum time (min)	8	10
Mean (min)	6.7	7.9
Standard Deviation	0.63	0.76
t test	2.77	
p value	0.09	

Table 2: Onset of motor block

Motor Block	Group R	Group B
Minimum time (min)	6	9
Maximum time (min)	10	12
Mean (min)	7.75	9.8
Standard Deviation	0.5	0.69

t test	3.06
p value	0.045*

Table 3: Mean Duration of sensory and motor block.

Variables	Group R		Group B		p value
	Mean	SD	Mean	SD	
Duration of Sensory Block (in min)	745.8	93.26	812.91	84.55	0.006*
Duration of Motor Block (in min)	670.63	79.87	738.74	81.32	0.002*

Table 4: Duration of Analgesia.

Duration of Analgesia (minutes)	Group R	Group B
Minimum time (min)	803.61	895.40
Maximum time (min)	951.8	1060.27
Mean (min)	823.5	912.86
Standard Deviation	134.1	149.32
t test	17.2	
p value	0.001*	

*: statistically significant

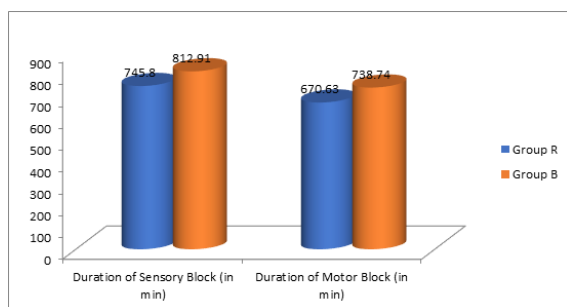


Figure 3: Mean duration of sensory and motor block

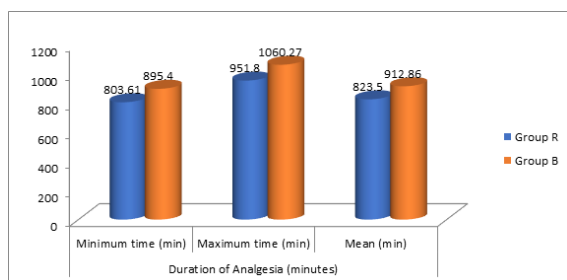


Figure 4: Duration of Analgesia

DISCUSSION

Regional anaesthesia (RA) techniques are gaining importance over general anaesthesia (GA) for upper limb surgeries as it provides excellent pain control, less side effects and lessens the hospital stay.^[1] It maintains perioperative hemodynamics and also provide adequate muscle relaxation and motor blockade.^[1] Ultrasound assistance in supraclavicular brachial plexus block (BPB) is the newer real-time imaging modality which helps in early and better recognition of anatomical structures and needle advancement, enhances the success and quality of block and reduces the complication rate.^[5,6]

Mean onset of sensory block was 6.7 ± 0.63 mins and 7.9 ± 0.76 mins in group R and B respectively. Hence onset of sensory block was earlier in Group R as compared to Group B, though no statistically significant difference was found as p value is 0.09. Similar findings were concluded by Ana A et al,^[7] that the start time of block was significantly lower in

group Ropivacaine with 21.2 minutes as compared to the group Bupivacaine with 28.6 minutes ($p < 0.001$). Gonuguntla SB,^[8] concluded that the onset of sensory block was faster with 0.75% Ropivacaine when compared to 0.5% Bupivacaine. Sehgal A et al,^[9] result showed that the mean onset of sensory and motor block was earlier in Group R (6.6 ± 0.7 , 8.3 ± 0.6 min) than in Group B (7.5 ± 2 , 9.4 ± 2.2 min).

In our study we found that mean onset of motor block was 7.75 ± 0.5 mins and 9.8 ± 0.69 mins in group R and B respectively. Hence onset of motor block was earlier in Group R as compared to Group B, with statistically significant difference as p value was 0.045.

Similar results were observed in a study conducted by Bertini et al,^[10] in which the mean peak time for the complete sensory and motor blockade was found to be shorter in ropivacaine than bupivacaine. Kaur A et al,^[11] concluded that onset of action of sensory, motor block was early in ropivacaine group with faster recovery of motor functions as compared to Bupivacaine group. Modak S et al,^[12] found that onset of sensory block was 4.93 mins in ropivacaine group in comparison with bupivacaine which was 8.47 mins. Motor onset was seen faster in group ropivacaine which was 10.63 mins than in group bupivacaine which was 17.8 mins which was statistically significant. Klein et al,^[13] revealed that there was no clinical difference in time of onset and recovery in the groups when injected in equal volumes.

Mean duration of sensory as well as motor block was shorter in group R (745.8 mins and 670.63 mins respectively) as compared to group B (812.91 mins and 738.74 mins respectively). Which was statistically significant as $p < 0.05$.

McGlade DP et al,^[14] showed that duration of motor block was significantly longer in the 0.75% ropivacaine group as compared to 0.5% bupivacaine. Hickey R et al,^[15] observed that there were no much statistically and clinically differences in onset and duration of block in their study. Venkatesh RR et al,^[16] revealed that there was statistically significant difference in mean duration of sensory and motor

block between Group A (0.5% Bupivacaine) and Group C (0.75% ropivacaine). Chatrath V et al,^[17] found out that in group B, mean duration of sensory block and motor block was significantly prolonged (12.50 ± 1.14 and 10.67 ± 1.18 h respectively) as compared to group R (10.07 ± 0.91 and 9.03 ± 0.89 h respectively) and the difference was highly significant in the two groups ($P < 0.001$). Sehgal A et al,^[7] found that, the mean duration of sensory and motor block were significantly longer in Group B (7.3 ± 0.2 hrs) and (7 ± 0.2 hrs), respectively, than in Group R (5.3 ± 0.1 hrs) and (5 ± 0.1 hrs), respectively ($P < 0.05$).

No side effects were observed in our study and there was no evidence of CNS or CVS toxicity in our study. Hickey et al,^[18] revealed that there were no adverse effects observed in patients in the perioperative period, neither CNS nor CVS adverse effects. Ilham C et al,^[19] observed patients suffered from side effects, such as Horner's syndrome and motor blockage (longer than 24 h). Gonuguntla SB,^[20] and Babu N et al,^[21] also observed adverse effects such as Nausea, vomiting, arterial puncture, tachycardia, seizures, horner's syndrome in their study.

CONCLUSION

In our present study, we found that the Ropivacaine group have an early onset of sensory & motor blockade along with faster recovery of motor functions than the Bupivacaine group. The analgesic duration in the bupivacaine group was longer. No study group experienced any side effects.

The conclusion was thus drawn that, advent of ultrasound has led to a lower incidence of complications and offers the benefit of precision in drug delivery. It will be more beneficial in elderly and obese patients. It is the modality of choice in extracting maximum benefits with lesser volume of drug delivery.

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