



## BRACHIAL PLEXUS BLOCK FOR UPPER LIMB ORTHOPAEDIC SURGERIES- A COMPARISON BETWEEN SUPRACLAVICULAR AND INFRACLAVICULAR APPROACHES

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### ABSTRACT

This research was done to study the quality and efficacy of brachial plexus block through supraclavicular versus infraclavicular approach in upper limb orthopaedic surgeries. **Methodology:** This study was a prospective observational study done in a tertiary medical college in central India from 1st May 2021 to December 2022 on 60 patients, 30 patients in each group (S and I) admitted for upper limb orthopaedic surgery. **Observation And Results:** In our study we observed that the time required for onset of sensory block in group S ( $6.13 \pm 0.89$  min) was not statistically significant (p value 0.222) when compared with onset of sensory block in group I ( $6.16 \pm 1.48$  min). The time required for onset of motor block in group S ( $13.16 \pm 0.83$  min) was not statistically significant (p value 0.908) when compared with onset of motor block in group I ( $13.26 \pm 1.5$  min). The quality of block in 2 groups, Group S and Group I were 1 and 1, 1 and 2, and 28 and 27 respectively. P value was 0.839 which is not significant.

**KEYWORDS :** supraclavicular, infraclavicular, orthopaedic surgery.

### INTRODUCTION:

Brachial plexus regional anaesthesia nerve blockade is a time-tested technique for upper limb surgeries has become a mainstay of the anesthesiologists' armamentarium. German surgeon Kulenkampff (1) in 1912 performed the first supraclavicular brachial plexus block.

Among brachial plexus blocks, interscalene, supraclavicular and axillary blocks have been routinely used for many years in our institute. Infraclavicular block has gained interest in recent times. In the past few years infraclavicular block has become a method of increased interest.

This block targets the musculocutaneous and axillary nerves at the level of the cords before these nerves leave the brachial plexus sheath.

Infra clavicular brachial plexus block was first described by Bazy in the early 20<sup>th</sup> century and was even included in LABAT's textbook: regional anesthesia in 19221. In 1977, RAJ7 and associates modified the infraclavicular technique by a lateral direction of the needle; thus, avoiding pneumothorax, and using the nerve stimulator to make the technique of locating the plexus more acceptable to the patients. (2,3,4).

In 1998 WILSON et al (5) described an infraclavicular coracoid technique – which was adopted in this study, was undertaken to evaluate the sensory distribution and its clinical efficacy.

This study attempts to compare the clinical efficacy of infraclavicular and supraclavicular approach of brachial plexus block by using peripheral nerve stimulator with respect to time of onset of sensory and motor block and quality of block.

### Methodology:

This study was a prospective observational study done in a tertiary medical college in central India from 1<sup>st</sup> May 2021 to December 2022 on 60 patients, 30 patients in 2 groups (S and I) admitted for upper limb orthopaedic surgery.

### Inclusion criteria:

Adult patients of age 18-60 years, ASA grade 1 or 2 and weighing between 45 to 70kg posted for undergoing upper limb orthopaedic surgery and giving consent for the procedure will be included in our study.

### Exclusion criteria:

Patients with mental incapacity or language barrier, BMI over 35, anatomical variations, coagulopathy, allergy to amide local anaesthetics and Pregnant Women.

### Sample size:

The study of Timsi R. Satan, et al (6) observed that duration of motor block in supraclavicular approach was  $768 \pm 232$  minutes and in infraclavicular approach was  $822 \pm 224$  minutes.

Taking these values as reference, the minimum required sample size with 80% power of study and 5% level of significance is 280 patients in each study group. For finite sample size taking population as 60, total sample size calculated is 55. To reduce margin of error, total sample size taken is 60 (30 each group).

Patients were divided into 2 groups alternatively with 30 patients in each group:

**GROUP S:** Supraclavicular –subclavian perivascular approach

**Group I:** Surgery performed under Infraclavicular- coracoid approach

The onset of sensory block was defined as the time elapsed between injection of drug and complete loss of pinprick sensation. Onset of motor blockade was outlined as the time elapsed from injection of drug to complete motor block.

The quality of the block was evaluated in the intraoperative time as shown below:

Score 3- satisfactory block i.e; Complete sensory and motor

blockade & no need for supplementation

Score 2- unsatisfactory block - a sensory region involved in the surgery was not completely anesthetized and no complete relaxation achieved. The block was supplemented by inj propofol at 0.5 to 1 mg/kg or inj ketamine 0.5 to 1 mg/kg or fentanyl 0.5-1 µg/kg IV

Score 1-complete failure - if the patient still experienced pain despite supplementation, general anaesthesia was induced by the attending anesthesiologist using his/her preferred technique.

Drugs used in the study: 15ml of 0.5% bupivacaine, 15 ml of 2% lignocaine + adrenaline Statistical analysis was done using Microsoft excel and appropriate statistical tests were applied.

**OBSERVATION AND RESULTS:**

In our study the mean age of patients in 2 groups, Group S and Group I were 29.8 and 34.9 years with SD of 12.41 and 12.48 respectively. P value was 0.118.

Males out-numbered females in our study. The mean time of onset of sensory block in 2 groups, Group S and Group I was 6.68 mins and 6.2 mins with SD of 1.03 and 1.26 respectively. P value was 0.117 which is not significant.

The mean time of onset of motor block in 2 groups, Group S and Group I was 13.17 mins and 13.20 mins with SD of 1.68 and 1.5 respectively. P value was 0.914 which is not significant. The quality of block in 2 groups, Group S and Group I as per scoring of 1, 2 and 3 were 1 and 1, 1 and 2, and 28 and 27 respectively. P value was 0.839 which is not significant.

**DISCUSSION:**

Among the various approaches to brachial plexus blockade, Supraclavicular block (subclavian perivascular) as described by Winne and Collins (5) in 1980, has been a very widely used approach due its rapid onset, dense blockade and high success rate. The risks of complication are rare with experienced hands, especially when a nerve locator is used.

Several modifications of the original infraclavicular approach to the brachial plexus –Raj et al (7), Sims, and whiffler suggest that the perivascular sheath may be injected in this area as an alternative to other approaches.

The infraclavicular approach was developed in the hope to overcome these limitations, but widespread use of Raj's infraclavicular brachial approach has not gained popularity, since most believe it requires the use of a nerve stimulator and a long needle able to penetrate both the pectoralis major and minor muscles, which can cause greater patient discomfort. It has recently gained favor for use with patients in whom the continuous block technique is desired, because maintaining an aseptic dressing at this site is more practical than at one in the axilla.

There have been numerous descriptions of the new infraclavicular approaches varying in their site of the needle insertion, success, and complication rate.

Wilson et al (10). Described in 1998 an infraclavicular coracoid technique that is adopted in this study, which was undertaken to evaluate the sensory distribution of the infraclavicular brachial plexus block by the coracoid approach and its clinical efficacy.

In our study we found that the observed difference between the 2 study groups with respect to mean onset of time of sensory block, motor block and quality of block was found to be statistically not significant.

Siddharth S et al (7) in 2019 conducted a study where they found mean onset of sensory block in group S was 6.9 ± 1.58 min mean and in group I, it was 7.6 ± 1.34 min. The difference between the two groups was statistically significant with a p value of 0.019 (p<0.05). Also, mean onset of motor blockade in group S was 9.08 ± 1.96 min and in group I, it was 9.2 ± 1.69 min. The difference between the two groups was statistically not significant with a p value of 0.745 (p>0.05).

Ranganathan et al (8) in 2017 conducted a study where they found mean onset of sensory block in group S was 8.45 ± 2.87 min mean and in group I, it was 6.43 ± 2.61 min.

The difference between the two groups was statistically significant with a p value of 0.006 (p<0.05). Also, mean onset of motor blockade in group S was 8.68 ± 3.50 min and in group I, it was 7.32 ± 2.90 min. The difference between the two groups was statistically not significant with a p value of 0.121 (p>0.05).

Our study yielded divergent outcomes in mean onset of sensory block from those of Siddharth S et al (7) (2019) and Ranganathan et al (8) (2017), emphasizing the importance of considering the potential impact of varying factors such as sample size, methodology, and statistical analysis in comparative studies while our study findings with respect to mean onset of motor block were consistent with the above 2 studies.

The quality of the block was evaluated in the intraoperative time. The quality of block achieved by brachial plexus block using either the supraclavicular or infraclavicular approach was compared, and a Chi-square test was performed. The results showed that there was no statistically significant difference between the two approaches, as indicated by a non-significant p-value.

Therefore, it can be concluded that both approaches are equally effective in achieving the desired block quality. The results of our study are in concordance with study done by Ranganathan et al (8), Siddharth S et al (7) and Chin Woo Yang et al (9).

**CONCLUSION:**

Our study has found that using a peripheral nerve stimulator to guide an infraclavicular block of the brachial plexus via the coracoid approach results in a comparable onset time for sensory and motor blockade as the peripheral nerve stimulator guided supraclavicular approach. Moreover, the success rate for achieving surgical anaesthesia was similar between the two approaches.

However, the study identified that only two patients in the peripheral nerve stimulator guided supraclavicular block group experienced vessel puncture. This could be attributed to the learning curve of residents with minimal experience in performing the block. To minimize or prevent such complications, the use of ultrasound could be helpful, but further research is necessary to explore this possibility.

**Table 1 Showing age and gender-wise distribution of patients in 2 groups**

Characteristic	Group S	Group I	P value
Age			0.118
Mean age	29.8	34.9	(NOT SIGNIFICANT)
S.D.	12.41	12.48	
Gender			0.371
Males	24	21	(NOT SIGNIFICANT)
Females	6	9	

**Table 2 showing time of onset of sensory and motor block in 2 groups in minutes**

Characteristic	Group S	Group I	P value
Time for onset of sensory block			0.117 (NOT SIGNIFICANT)
5 to 7 min	21	21	
7.1 to 9 min	8	7	
>9 min	1	2	
Range	5-10 mins	5-10 mins	
Mean	6.68 min	6.2 min	
S.D.	1.03	1.26	
Time for onset of motor block			0.914 (NOT SIGNIFICANT)
12 to 13 min	18	17	
13.1 to 14 min	10	4	
14.1 to 15 min	1	7	
> 15 min	0	1	
Failed block	1	1	
Mean	13.17 min	13.20 min	
S.D.	1.68	1.5	

**Table 3 showing quality of block in 2 groups.**

Quality score	Group S	Group I	Chi square value	P value
Score 1	1	1	0.351	0.839 (NOT SIGNIFICANT)
Score 2	1	2		
Score 3	28	27		

**REFERENCES:**

1. Kulenkampff D, Persky M. Brachial plexus anesthesia. Its indications, technique and dangers. *Ann Surg* 1928;87:883-91
2. Raj PP, Montgomery SJ, Nettles D, Jenkins MT: Infraclavicular brachial plexus block: A new approach. *Anesth Analg* 1973; 52:897
3. Raj PP: Infraclavicular approaches to brachial plexus Anesthesia. *Techniques in Reg Anesth and Pain Management* 1997; 1:169-77 91
4. Raj PP, Pai U, Rawal N: Techniques of regional anesthesia in adults. In *Clinica Practice of Regional Anesthesia* Edited by Raj New York, Churchill Livingstone, 1991, pp 276-300.
5. Wilson JL, Brown DL, Wong GY, et al: Infraclavicular brachial plexus block: Parasagittal anatomy important to the coracoid technique. *Anesth Analg* 1998; 87:870q.
6. Timsi R. Satan, et al: A comparative observational study of infraclavicular and supraclavicular brachial plexus blockage using neurostimulation and ultrasound as an additional too. *IJ Clin Anaesth* 2020; 7(2): 308-312.
7. Sarkar S, Doshi SM. A comparative observational study of infraclavicular and supraclavicular brachial plexus block for upper limb orthopaedic surgeries: *Bali J anaesthesiol* 2019; 3:82-87
8. Abhinaya RJ, Venkatraman R, Matheswaran P, Sivarajan G. A randomised comparative evaluation of supraclavicular and infraclavicular approaches to brachial plexus block for upper limb surgeries using both ultrasound and nerve stimulator. *Indian J Anaesth.* 2017 Jul;61(7):581586.
9. Yang CW, Kwon HU, Cho CK, et al. A comparison of infraclavicular and supraclavicular approaches to the brachial plexus using neurostimulation. *Korean J Anesthesiol.* 2010;58(3):260-266.