Original Article

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Comparison of the Coracoid and Retroclavicular Approaches for Ultrasound-Guided Infraclavicular Brachial Plexus Block

Sunil Bablu Pulla, Mohd. Abdul Moiz

Associate Professor, Department of Anaesthesiology, Bhaskar Medical College, Yenkapally, Moinabad, Ranga Reddy, Telangana, India.

Abstract

Background: The infrastructural brachial plexus block has a less possible risk of tourniquet pain during the surgery and a greater blocking of musculocutaneous and axillary nerves than the axillary block with one injection. If enough time is given for block start, the efficacy of the infra-clavicular brachial block can be increased. The objective is to Comparing the coracoid and retro clavicular approaches with an ultrasound brachial plexus block. **Subjects and Methods :** A total of One Hundred patients receiving IBPB block were randomly assigned into two groups, Coracoid-based group C and retro clavicular-based Group R. **Results:** Group R has greatly increased visibility of the needle tip compared with group C. Group R had a better view of the needle shaft than group C. In group R, block output time (2.8±1.48 minutes) was statistically lower than in group C (5.7±1.19 minutes). Anesthesia duration in group R (17.6 ± 1.3) vs (21.2±2.0) was statistically shorter. The needle passes in group R were much less. **Conclusion:** The results of this study indicate that the ultrasound-guided ICB approach correlates with a higher needle tip and shaft vision, shorter periods of time and anesthesia, and with fewer needle passes than the coracoid approach. But in terms of success rates and patient satisfaction, the retro clavicular approach was identical to the coracoid technique.

Keywords: Anaesthesia, Infraclavicular, Brachial plexus, Retroclavicular

Corresponding Author: Mohd. Abdul Moiz, Associate Professor, Department of Anaesthesiology, Bhaskar Medical College, Yenkapally, Moinabad, Ranga Reddy, Telangana, India.
E-mail: drmdabdulmoiz15@gmail.com

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Introduction

Ultrasound- guided peripheral nerve block:

Increasingly, ultrasound imaging is used to guide peripheral blocks. Ultrasound feedback helps the nerves, surrounding anatomy, and needle tip to be visualized in real-time to optimize block success and eliminate complications. In comparison to other imaging techniques (i.e., CT and MRI), ultrasound technology is compact and bears no chance of ionizing radiation.

Infraclavicular Brachial Plexus Block (IBPB):

In 1914, Brazy et al. first described and in 1973, it was updated by Raj et al.[1] Hebbard and Royce have first documented the posterior approach to the infraclavicular plexus block.[2,3] Depending on the surface area, needle entrance, and needle direction there are various approaches with this block. Lateral, Vertical, Sagittal, and Coracoid approaches are the most common methods. The coracoid is the most commonly used of all of these approaches.[4,5]

Anaesthetic technique for IBPB:

USG IBPB was done with:

- Depth configuration - 3cms to 7 cms
- High-frequency linear transducer.
- The transducer is situated beneath the clavicle's lateral end. Along the short axis, the axillary artery and vein occur as hypoechoic structures behind the major and minor pectoralis muscles.
- Around the axillary artery, 3 brachial plexus cords are defined as hyperechoic or hypo-echoic. In the IN-PLANE procedure, the needle is transferred to the posterior axillary artery where the posterior cord of the brachial plexus is located.
- A single injection is given in the axillary artery.6
- Electric stimulation is used to ensure that the needle is near to the nerves during the infraclavicular approach to the brachial plexus block. The efficacy of this approach

requires a good knowledge of anatomy and emphasis on landmarks that may be blurred by obesity or variations. The key benefits of the brachial plexus infraclavicular block consist of fewer complications and the placement of a catheter. However, in the infraclavicular area, the location of the brachial plexus is deeper.

Subjects and Methods

This is a prospective randomized double-blinded case-control study conducted in the Bhaskar Medical College.

A total of 100 patients were randomly branched into two groups receiving an IBPB Block for Upper Limb Surgery:

- GROUP C with the Coracoid approach
- GROUP R with Retro clavicular approach

After describing the procedure before including it in this study, written informed consent was obtained from each patient.

Inclusion Criteria :

- Patients more than 18 years of age
- Patients with a BMI of less than 35 were included in our study

Exclusion Criteria:

- A patient who does not want to participate in the study.
- Those undergoing anticoagulant treatment or have a history of bleeding disorders
- Local inflammation / documented local anesthetic drug allergies were excluded from our study.

Results

A total of 100 random patients in the two groups have been recorded. The two groups were R with a retro clavicular approach and C with a coracoid approach.

In terms of age, weight, height, BMI and ASA, there was no substantial difference between the classes. Both men and women were spread between the two groups almost uniformly. Males were predominant in both the groups comprising 54% in Group C and 52% in Group R.

Group R has greatly increased visibility of the needle tip compared with group C. Group R had a better view of the needle shaft than group C. In group R, block output time (2.8±1.48 minutes) was statistically lower than in group C (5.7±1.19 minutes). Anaesthesia duration in group R (17.6 ± 1.3) vs (21.2±2.0) was statistically shorter. The needle passes in group R were much less.

Four patients in group R and five patients in group C reported mild discomfort after skin incision, which required that these patients were administered with supplementary intravenous pain reliefs and with 3–5 ml additional 1 percent lidocaine infiltration. Because of the amount of discomfort suffered, three patients in group R did not tolerate surgery, despite additional analgesic and local anaesthesia.

The efficacy of the sensory block, the success of motor blocks, the success of surgery, the length, the pain block, and the patient's comfort between the two groups were not statistically significant.

Discussion

We found that in Group R's technique for infraclavicular brachial plexus, needle tip and shaft visibility were considerably better than in group C. Further, block and anesthetic times were much shorter, and the number of needles passes in Group R, was marginally higher, while sensory and motor block performance was identical in both methods. The inability to accurately keep track of the needle tip may be a contributing factor to procedural complications.

The needle direction is paralleled with the probe and the needle shaft is positioned perpendicular to the ultrasonic beam in Group R. This improves the exposure of the tip of the needle and shaft. Better visibility of needles ensures the orientation of the needle and thereby prevents damage to certain vital neurovascular structures. The cephalic vein and acromial branch of the thoracoacromial artery during the coracoid approach are subjected to needle traumatization when they meet the needle path. The Group R method holds the needle well away from these neurovascular systems.[6,7] Consequently, the Group - R approach will cause a lower rate of needle trauma and paresthesia during block efficiency.

In the Group-R method, the needle direction theoretically prevents the piercing of the main and minor pectorals, which leads to less discomfort during the procedure. The procedural discomfort has been seen in our study. In block-related pain, both retro clavicular and coracoid methods were found to be identical. This similarity may have to do with local anesthesia or with the sedation offered in both groups before block results. Patient satisfaction in both categories was high due to the less invasive treatment.[8]

The space between the skin and the brachial plexus is reduced by the abduction of the upper arm at 90 degrees with outward shoulder movement, so this location is often preferred with the coracoid approach.[9] While arm abduction decreases the depth of the brachial plexus, the location of the axillary artery relative to the coracoid or pleural process does not alter. The retro clavicular block is carried out without the need for upper arm abduction. Upper arm adduction is advantageous in patients with reduced arm or shoulder function or discomfort.[10]

Table 1: Distribution based on Various Demographic Characteristics

Characteristics	Group C	Group R
Age	41 ± 14.7	41.67 ± 13.7
Gender		
Male	27	26
Female	23	24
Height (in mts)	1.58±0.10	1.51±0.12
Weight	60.14±8.5	65.15±9.5
BMI (kg/m^2)	24.99±4.5	26.99±6.5
ASA		
I	24	25
II	22	19
III	4	6
IV	0	0

Table 2: Characteristics across groups

Characteristics Median	Group C (N=50)	Median Range	Group R (N=50)	Median Range	P-value
Needle tip visibility	3.0	1-5	4.0	3-5	0.0001
Needle shaft visibility	2.0	1-5	4.0	3-5	0.0001
Number of needles passes	3.0	2-4	1.0	1-2	0.0001
Block related pain, median (range)	3.0	2-3	2.5	2-3	0.55
Patient satisfaction, Median (range)	3.0	3-4	3.0	2-4	0.40

Table 3: Distribution based on Various Characteristics

Characteristics Median	Group C(N=50)	Percentage	Group R(N=50)	Percentage	P-value
Sensory block	5	10%	4	8%	0.30
Number	45	90%	46	92%	
Motor block	5	10%	4	8%	0.50
Number	45	90%	46	92%	
Surgical success	5	10%	4	8%	0.30
Number	45	90%	46	92%	
Supplement LA	5	10%	4	8%	0.30
Use of analgesic Number	45	90%	46	92%	
Onset time	18.1±2.05		17.36±2.6		0.0735
Block performance time	5.7±1.19		2.8 ±1.48		0.0001
Total anesthesia-related time	21.2±2.0		17.6±1.3		0.0001

Table 4: Sensory block success rate

Sensory Block	Group C		Group R		P-Value
	Number	Percentage	Number	Percentage	
5	0	0%	3	6	0.15
10	5	10%	5	10%	1.0
15	20	40%	25	50%	0.55
20	32	64%	35	70%	0.82
25	40	8%	45	90%	0.12
30	46	92%	48	96%	0.10

Table 5: Motor block success rate

Motor Block Success	Group C		Group R		P-Value
	Number	Percentage	Number	Percentage	
5	0	0%	0	0%	1.0
10	5	10%	5	10%	1.0
15	11	22%	11	22%	1.0
20	26	52%	20	40%	0.88
25	40	80%	42	84%	0.10
30	45	90%	45	90%	1.0

Although the sample size is enough for predicting the visibility of the needle, the unusual effects and injuries, such as vascular puncture, Horner syndrome, pneumothorax, or neurological postoperative defects, may not be detected. Secondly, patients had normal BMIs during the study. A study sample of obese patients may yield different outcomes.

Conclusion

The results of this study indicate that the ultrasound-guided ICB approach correlates with a higher needle tip and shaft vision, shorter periods of time and anaesthesia, and with fewer needle passes than the coracoid approach. But in terms of success rates and patient satisfaction, the retro clavicular approach was identical to the coracoid technique.

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