

COMPARISON BETWEEN INTERSCALENE AND SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK: A CADAVERIC STUDYSuvalagna Chatterjee¹, Sudipto Konar², Arpan Dey³, Arun Kr. Ghosh⁴, Tapas Ghosh⁵, Sumohan Biswas⁶**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: INTRODUCTION: Without mastery of the anatomy, luck rather than skill becomes the primary determinant of successful neural blockade. In this educational study our intent was to compare the level of nerve roots blocked by these two techniques of peripheral nerve block, widely used in clinical anesthesia practice. **AIMS:** To have a three dimensional view of nerve plexus involvement in inter scalene and supraclavicular techniques of brachial plexus block and compare in between them. **MATERIAL AND METHOD:** 6 recently deceased cadavers preserved in formalin were used. In both the techniques the classical methods usually pursued in daily clinical practice were followed. Dyes used were methylene blue and tartrazine of same dilution. **RESULTS:** Careful dissection showed that in all cases of inter scalene approach the dye was more concentrated in upper and middle trunk than in lower trunk of brachial plexus. In contrast in supraclavicular approach dye concentration was more in lower and middle trunk and less in upper trunk. **DISCUSSION:** After reviewing the anatomy it can be concluded that injection of local anesthetic at the interscalene level tends to produce a block that is most intense at the C5-C7 distribution and injection at supraclavicular level provide more compact anesthesia in C8-T1 distribution. **CONCLUSION:** Supraclavicular block is preferable for operations on the elbow, forearm, and hand and inter scalene block for shoulder.

KEYWORDS: Brachial plexus, regional anesthesia, interscalene block, supraclavicular block.

INTRODUCTION: Success in regional anesthesia is dependent upon three-dimensional insight and well developed eye-hand coordination, in order to place a needle accurately into the proximity of unseen nerves or nerve plexuses. Reliable delivery of local anesthetics to target nerves requires thorough understanding of the involved anatomic structures. Successful regional anesthesia of the upper extremity requires knowledge of brachial plexus anatomy from its origin, where the nerves emerge from the intervertebral foramina, to its termination in the peripheral nerves.

Detailed anatomical knowledge enables the anesthesiologists to choose the appropriate technique for the intended surgical procedure and to salvage inadequate blocks by supplementation with local anesthetic. Without mastery of the anatomy, luck rather than skill becomes the primary determinant of successful neural blockade.¹

The principal indication for an interscalene block is surgery on or manipulation of the shoulder. Blockade occurs at the level of the upper and middle trunks. Although this approach can also be used for forearm and hand surgery, blockade of the inferior trunk (C8, T1) is often incomplete and requires supplementation at the ulnar nerve for adequate surgical anesthesia in that distribution,² whereas the indications for a supraclavicular block are operations on the elbow, forearm, and hand. Blockade occurs at the distal trunk-proximal division level. At this point, the brachial plexus is

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compact and a small volume of solution produces rapid onset of reliable blockade of the brachial plexus.

In this educational study our intent was to compare the level of nerve roots blocked by these two techniques of peripheral nerve block widely used in clinical anesthesia practice.

MATERIAL AND METHODS: After institutional ethics committee permission this educational study has been performed in Burdwan Medical College with the joint collaboration of Department of Anesthesiology and Department of Anatomy from June, 2011 to December, 2011. Six preserved recently deceased cadavers preserved with formalin were used. Cadavers with injury to the trachea, the cervical spine, the clavicle and the sternum were excluded.

For inter scalene approach of brachial plexus block the followed technique was the classical technique that are followed in the daily practice that is – the cadaver was placed in supine position with the head turned away from the side to be blocked with the hands by the side of the cadaver. The posterior border of the sternocleidomastoid muscle palpated. The interscalene groove was then palpated by rolling the fingers posterolaterally from this border over the belly of the anterior scalene muscle into the groove.

A line extended laterally from the cricoid cartilage and intersecting the interscalene groove indicates the level of the transverse process of C6 that is the site of injection. After the landmark had been identified a 22-gauge, 1.5-in B-bevel needle is introduced nearly perpendicular to the skin and advanced in slightly medial and caudal directions and 10ml undiluted methylene blue dye was injected.

For supraclavicular technique the same classical approach had been undertaken – the cadaver was placed in supine position with the head turned away from the side to be blocked with the hands by the side of the cadaver. The inter scalene groove was palpated at its most inferior point, where a mark was made approximately 1.5 to 2.0 cm posterior to the midpoint of the clavicle. A 22-gauge, 4-cm needle is directed in a caudal, slightly medial, and posterior direction until it contacted the plexus sheath.

If the plexus sheath could not be felt, the needle was advanced until it contacted the first rib. Then the needle was withdrawn for 2-3 mm and 10 ml of tartrazine was injected. Both sides of the shoulders of cadavers were then dissected to identify the brachial plexus, composed of three nerve trunks (superior, medial and inferior nerve trunk), and the dye staining on the nerve trunks was observed. The staining of dye on each nerve trunk was defined as the success rate of nerve localization. If the dye stained on all three nerve trunks, it was defined as a complete block.

RESULTS: Careful dissection showed that in all cases of inter scalene approach the dye was more concentrated in upper and middle trunk but far less in lower trunk. Injection of local anesthetic at the interscalene level tends to produce a block that is most intense at the C5–C7 dermatomes and least intense in the C8–T1 dermatomes. The inter scalene approach may therefore not provide optimal surgical anesthesia for procedures in the ulnar nerve distribution.³ On the contrary in supraclavicular approach dye concentration is more in lower and middle trunk and less in upper trunk. That is why indications for a supraclavicular block are operations on the elbow, forearm, and hand.

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DISCUSSION: The brachial plexus is formed by the union of the anterior primary divisions (ventral rami) of the fifth to the eighth cervical nerves and the first thoracic nerve. Contributions from C4 and T2 are often minor or absent. As the nerve roots leave the intervertebral foramina, they converge, forming trunks, divisions, cords, and then finally terminal nerves. Three distinct trunks are formed between the anterior and middle scalene muscles.

Because they are vertically arranged, they are termed superior, middle, and inferior. The superior trunk is predominantly derived from C5–6, the middle trunk from C7, and the inferior trunk from C8–T1. As the trunks pass over the lateral border of the first rib and under the clavicle, each trunk divides into anterior and posterior divisions. As the brachial plexus emerges below the clavicle, the fibers combine again to form three cords that are named according to their relationship to the axillary artery: lateral, medial, and posterior.

The lateral cord is the union of the anterior divisions of the superior and middle trunks; the medial cord is the continuation of the anterior division of the inferior trunk; and the posterior cord is formed by the posterior division of all three trunks. At the lateral border of the pectoralis minor muscle, each cord gives off a large branch before terminating as a major terminal nerve.

The lateral cord gives off the lateral branch of the median nerve and terminates as the musculocutaneous nerve; the medial cord gives off the medial branch of the median nerve and terminates as the ulnar nerve; and the posterior cord gives off the axillary nerve and terminates as the radial nerve.

After reviewing the anatomy it can be concluded that injection of local anesthetic at the inter scalene level tends to produce a block that is most intense at the C5–C7 dermatomes and least intense in the C8–T1 dermatomes and injection at supraclavicular level provide compact anesthesia of brachial plexus but not optimal for shoulder surgery. Steven L. Orebaugh, Assistant Professor Anesthesiology from University Of Pittsburg instituted cadaver dissection laboratory in their residency programme and found that there is significant short-term enhancement of anatomy knowledge after participation in the one-day exercise.⁴

Pat M. Mc Quillen et al. use plastinated human anatomical preparations for use in teaching regional anesthetic techniques are presently playing a key role in anesthesia education and will have increasing application in the future. Wanna Srirojanakul et al. done cadaver study to compare the lower inter scalene versus classical approach for supraclavicular block and recommend lower inter scalene approach for more success rate.⁵

REFERENCES:

1. Ronald D. Miller editor. Miller's Anaesthesia, 7th Edition. Elsevier Churchill Livingstone Section IV Chapter 52 Nerve Blocks Denise J. Wedel, Terese T. Horlocker Page no 1640.
2. Lanz E, Theiss D, Jankovic D. The extent of blockade following various techniques of brachial plexus block. *Anesth Analg* 1983; 62:55.
3. Morgan GE Jr, Mikhail MS, Murray MJ, Larson CP Jr. editors. *Clinical Anaesthesiology* 4th ed. New York: Lange; 2002.
4. Steven L. Orebaugh. A Regional Anesthesia Cadaver Dissection Laboratory. *JEPM*, Vol. 8 No. 1, Jan.-June 2006.

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5. Wanna Srirojanakul, Supawon Srettabunjong et al. Lower inter scalene approach, the novel landmark for more success rate of supraclavicular block: a comparison with the classical approach in fresh cadavers. Siriraj Medical Journal, volume 60, number 5, 2008.

Fig. 1: Dissection of post triangle showing supraclavicular approach (yellow dye).



Figure 1

Fig. 2: Dissection of post. Triangle showing interscalene approach (blue dye)



Figure 2

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