

A CROSS SECTIONAL STUDY: BRANCHING PATTERN AND VARIATIONS OF AXILLARY NERVE IN CADAVERIC UPPER LIMBS

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Abstract

Background: Injuries to the Axillary nerve make up 6% of all brachial plexus injuries. Injury to the anterior trunk of the axillary nerve, as it passes around the humerus and innervates the anterior and middle deltoid, results in the devastating loss of upper arm flexion power. The current study attempts to furnish morphometric data of the branches of the axillary nerve, and its common variations that could be applied during surgical procedures over shoulder, and reduce the incidence of iatrogenic nerve damage. **Objectives:** The aim of this study was to determine the distribution patterns of the axillary nerve. **Materials and Methods:** A cross sectional analytical study was done on sixty cadaveric upper limbs from Departments of Anatomy, St. St John's Medical College, Bangalore. The cadavers were dissected and the required observations were made. **Results:** The anterior division in all 60 limbs (100%) innervated the capsule of shoulder joint, clavicular and acromial fibres of deltoid muscle. The posterior division gave off the nerve to teres minor and the upper lateral cutaneous nerve of the arm in all the 60 limbs (100% of cases). The branch to teres minor presented a pseudo ganglion in almost all limbs. It was accompanied by the posterior circumflex humeral artery in all limbs. The posterior part of deltoid muscle showed three variations in its innervation. In 78.33% (47) of limbs it was supplied only by the posterior division, in 15% (9) of limbs by both the divisions and in 6.7% (4) of limbs only by the anterior division. **Conclusion:** Variation that the axillary nerve can supply motor branch to long head of triceps and dual innervation of posterior fibers of deltoid should be considered, while examining a patient for axillary nerve injury or during re innervation procedures for the same.

INTRODUCTION

Injuries to the Axillary nerve make up 6% of all brachial plexus injuries.^[1] Injury to the anterior trunk of the axillary nerve, as it passes around the humerus and innervates the anterior and middle deltoid, results in the devastating loss of upper arm flexion power.^[2,3] The current study attempts to furnish morphometric data of the branches of the axillary nerve, and its common variations that could be applied during surgical procedures over shoulder, and reduce the incidence of iatrogenic nerve damage.

Normal Anatomy

The axillary nerve is the last but one branch of the posterior cord (C5, 6) of brachial plexus, before it continues as the radial nerve. It deviates laterally at the lower border of subscapularis muscle, curves

back inferior to the humeroscapular articular capsule and traverses the quadrangular space. It divides in the space into anterior and posterior branches. The axillary trunk supplies a branch to the shoulder joint. The posterior branch is intimately related to the inferior aspects of the glenoid and shoulder joint capsule. The anterior branch curves round the neck of the humerus with the posterior circumflex humeral vessels, deep to deltoid. It reaches the anterior border of the muscle and supplies it. The posterior branch courses medially and posteriorly along the attachment of the lateral head of triceps. It usually lies medial to the anterior branch in the quadrangular space. It gives off the nerve to teres minor and the upper lateral cutaneous nerve of the arm. There is often an enlargement or pseudo ganglion on the branch to teres minor.^[4]

MATERIALS AND METHODS

The dissection of the axillary nerve deep to the deltoid was performed beginning from its emergence from the quadrangular space. The number of muscular branches and distribution patterns of the trunk and the two divisions were recorded (Fig1&2). Any variation in the branching pattern and course of the nerve were also noted.

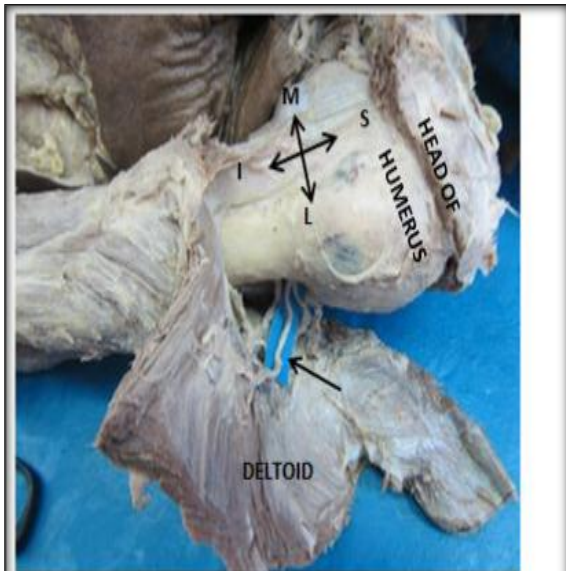


Fig (1): Anterior division of axillary nerve under cover of deltoid

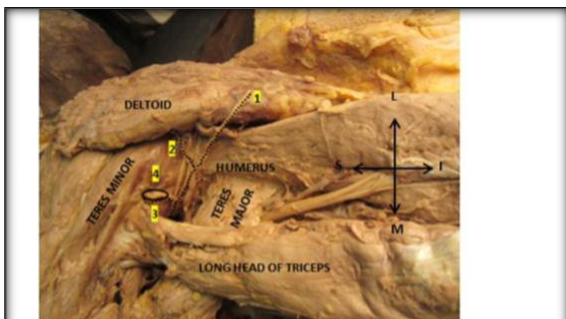


Fig (2): Back of arm in 90° abduction, showing the posterior division of axillary nerve and its branches in quadrangular space. 1-Upper lateral cutaneous nerve of arm, 2-Branch to posterior border of deltoid, 3-Branch to teres minor, 4-Pseudoganglion.

RESULTS

The anterior division in all 60 limbs (100%) innervated the capsule of shoulder joint, clavicular and acromial fibres of deltoid muscle. The posterior division gave off the nerve to teres minor and the upper lateral cutaneous nerve of the arm in all the 60 limbs (100% of cases). The branch to teres minor presented a pseudo ganglion in almost all limbs. It was accompanied by the posterior circumflex humeral artery in all limbs. The posterior part of deltoid muscle showed three variations in its innervation. In 78.33% (47) of limbs it was supplied only by the posterior division, in 15% (9) of limbs

by both the divisions and in 6.7% (4) of limbs only by the anterior division

Variations

- The teres minor branch of posterior division of one cadaveric right limb presented with two pseudo ganglions.
- The posterior division of the nerve in the right side of a female cadaver, in addition to deltoid and teres minor also supplied the long head of triceps muscle (which was also supplied by radial nerve)

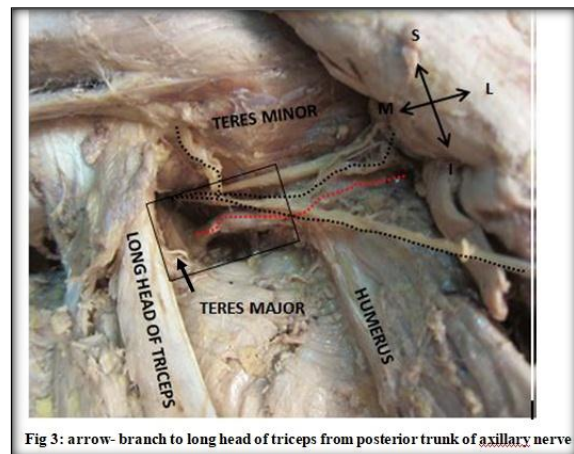


Fig 3: arrow- branch to long head of triceps from posterior trunk of axillary nerve

DISCUSSION

The knowledge of the dual innervation of the posterior fibers of deltoid has important clinical implications in the reinnervation procedures of posterior deltoid. Hence it is advisable to check for dual innervation pattern of the posterior part of the muscle, even though it is seen in little percentage (15%) of cases, in any case of posterior division injury before considering reinnervation procedures for the same.

The posterior division of the nerve supplied the long head of triceps muscle in addition to posterior deltoid and teres minor in one cadaveric limb. Many studies have reported similar variation in the innervation of long head of triceps.^[5,6,7,8,9,10] Hitchhiking of nerve fibers of brachial plexus is also one of the common variations.^[9] The present variation also could be one of these types. This variation has an important clinical implication in predicting the severity of axillary nerve injury. In case of traumatic injury to axillary nerve, associated palsy of long head of the triceps is a sign of severe axillary nerve lesion requiring early repair.^[5,9] Also while examining patients with traumatic injury of the axillary nerve, it is important to look for paralysis of the long head of the triceps. Awareness of such a variation is also important during infra clavicular brachial plexus block, management of axilla and shoulder repair surgeries and nerve transplant procedures.^[9] The results of the study conducted by De Sèze et al in two groups of 36 limbs (Group I included 20 limbs by anatomical

dissection and Group 2 included surgical dissection of posterior cords of 15 patients suffering from C5–C6 injury suggest that the motor branch to the long head of the triceps never originated from the radial nerve. The muscle was either innervated by axillary nerve or by direct branches from the posterior cord.

CONCLUSION

The results of this study provides a database for the axillary nerve morphology in the Indian population. Variation that the axillary nerve can supply motor branch to long head of triceps and dual innervation of posterior fibers of deltoid should be considered while examining a patient for axillary nerve injury or during re innervation procedures for the same.

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