

Original article:

Variations of brachial plexus in cadaveric study

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Abstract:

Introduction: Anomalies of the brachial plexus are of interest to clinicians. The present study provides an assessment concerning the present classification criteria of median & musculocutaneous nerve among the Indian population. The related causative factors, developmental background and clinical relevance have also been elaborated.

Methods: Meticulous dissection of brachial plexus was performed bilaterally on 40 embalmed adult human cadavers in selected Medical colleges as a part of the undergraduate medical curriculum. Results: Among 30male cadavers, 27 cases were found on the right side and 3 cases on the left side. Among the females, only 1 case was found on the right side.

Conclusion: The median & musculocutaneous nerves as well as their different muscular branches in the arm vary considerably in levels of origin, location and course which have paramount clinical significance. The prevalent classification system may be revised in the background of distinctive new pattern of anomalies.

Key words: Brachial Plexus, Median Nerve

Introduction:

The median nerve is formed in the axilla by the union of lateral and medial roots. The medial root originates from the medial cord of the brachial plexus. The lateral cord of the brachial plexus divides into the lateral root of the median nerve and the musculocutaneous nerve.^{1,2} After their origin from the brachial plexus, the median and musculocutaneous nerves pass through the anterior compartment of the arm without receiving any branch from any nerve in the neighbourhood. In the arm, the musculocutaneous nerve passes through the coracobrachialis muscle and innervates the coracobrachialis, biceps brachii and brachialis muscles and continues as the lateral cutaneous nerve of the forearm without any communication with the median or other nerves.^{1, 2}

This work has been designed to obtain data on the prevalence and pattern of anomalies from the native population of West Bengal, India. Though several isolated case reports have been presented earlier, no comprehensive analytical study has been so far undertaken in this unmapped population to explore the anatomical variations of median and musculocutaneous nerves with respect to their classification criterion, point of formation, course and entrance into brachial musculature, relation to axillary artery as well as gender and side predisposition. The developmental background, causative factors and clinical significance have also been elaborated in details.^{3,4,5}

Material & Methods:

The brachial plexuses were dissected bilaterally and examined for any anatomical variations of the median nerve and musculocutaneous nerve formation. The gender and side of occurrence of the variations were carefully recorded. Level of formation and course of the median and musculocutaneous nerve with branches were dissected meticulously, traced and photographed. The point of entrance of nerve to coracobrachialis, biceps brachii and brachialis were measured from the tip of coracoid process. The site of formation of median nerve was also measured separately from the tip of the coracoid process and from the midpoint of a line joining the epicondyles of humerus. To obtain an accurate measurement of the topographical variation of the nerves, the two designated points were marked by two pins and connected by a thread. The distance between the two pins were precisely measured along that thread with a metric scale to the nearest millimeter. The obtained data was methodically charted in a Microsoft Excel worksheet and evaluated by standard statistical methods. Moreover, the relationship with the axillary artery and intercommunications between the two nerves were also documented. According to Standring S et al., the lateral or anterior position of the median nerve in relation to the axillary artery is usually considered a normal anatomical entity.¹ Consequently, the formation of median nerve at the medial side of the axillary artery was only considered as an anomalous case.

Results:

Among 30 male cadavers, 27 cases were found on the right side and 3 cases on the left side. Among the females, only 1 case was found on the right side.

Discussion:

Multiple neurovascular abnormalities were encountered on the right upper limb of a 65 years old male cadaver. Formations of upper, middle and lower trunks were normal (from C5-T1). Anterior division of the upper trunk continued as the musculocutaneous nerve distally. The lateral root of the median nerve was formed from the anterior division of the middle trunk instead of arising from the lateral cord. Anterior division of the lower trunk continued as medial cord which contributed to the formation of the medial root of the median nerve as usual but at a much higher level. Posterior divisions of all three trunks united to form the posterior cord which continued as radial nerve as usual. The median nerve of right upper limb was formed at an unusual high level. Union of the lateral and medial root of the median nerve was found just below and behind the clavicle. At the level of formation, both the roots of median nerve and the nerve itself were medial to the first part of the axillary artery. Median nerve in its subsequent course was also medial to axillary artery. About 1.5 cm distal to its formation, the median nerve gave a branch which crossed the second part of the axillary artery and innervated the coracobrachialis muscle from its proximal part. The branch of the median nerve supplying coracobrachialis was dissected very carefully with removal of epineurium and it was found that both roots of the median nerve contributed fibres for its formation though major part of the contribution was from the lateral root of the median nerve. So, the coracobrachialis muscle was supplied by the musculocutaneous nerve and supplemented by an additional branch from the median nerve carrying fibres from C7, C8, and T1. Other branches of different cords were normal.^{6,7}

Case 2: Routine undergraduate dissection of a 50 years male revealed a right sided anomaly of the musculocutaneous and the median nerve. The median nerve was joined by an intercommunicating branch from the musculocutaneous nerve about 9.8cm above the midpoint of a line passing through the epicondyles of humerus. Biceps brachii and brachialis muscles were supplied by the musculocutaneous nerve before its communication with the median nerve. [Fig-4]However, coracobrachialis was not pierced by the musculocutaneous nerve and was supplied by an unusual twig from the musculocutaneous nerve.

Case 3: An exceptional neurovascular anomaly was observed during routine cadaveric dissection of a 62 years old female cadaver. Median nerve was formed by union of two roots at the medial side of axillary artery. The musculocutaneous nerve was seen to be absent in the right upper arm, associated with an

unusual high origin of the radial artery 15.7cm from the midpoint of the same line passing through the epicondyles of humerus and unilateral anomalous bifurcation of the brachial artery into an ulnar branch and a prominent aberrant artery entering the brachioradialis in the forearm. The lateral cutaneous nerve of the forearm also arose from the median nerve in the forearm.⁸

Case 4: A similar anomaly was observed during routine cadaveric dissection of a 70 years old male cadaver in which the musculocutaneous nerve was absent in the right upper arm and the median nerve formed the stand in supply of the flexors of the arm and forearm, as well as for the lateral cutaneous nerve of forearm.

The result is depicted in Table-II according to gender and side. A significant difference was observed in the mean distance of origin of the musculocutaneous nerve among males & females .

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