

Variations in the Musculocutaneous and Median Nerves in a Single Cadaver

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ABSTRACT

Anomalies of the brachial plexus are of interest to academicians and clinicians. The Musculocutaneous Nerve (MCN) and the Median Nerve - the two branches of the brachial plexus may have several connections between them. The reported variations of musculocutaneous nerve in literature includes its total absence, communications with the median nerve at various levels or coracobrachialis muscle not pierced by it. While doing the routine dissection for MBBS students, in the Department of Anatomy, NRS Medical College, Kolkata, in April, 2014, few variations were found in the musculocutaneous and median nerves

of the right arm of a seventy-five year old male cadaver. The right musculocutaneous nerve separated from the lateral root of the median nerve at the junction of upper one-fourth and lower three-fourth of arm and did not pierce the coracobrachialis muscle, but the latter had triple nerve supply. The musculocutaneous nerve gave three branches to the coracobrachialis muscle at different levels of the right arm. These anatomical variations have several clinical and surgical implications. This case report may enhance our knowledge in gross anatomy and clinical anatomy.

Keywords: Brachial plexus and variations in its branches, Coracobrachialis muscle

CASE REPORT

While doing the routine dissection for the undergraduate students in the Department of Anatomy, NRS Medical College, Kolkata, India, few variations were found in two branches of the brachial plexus in right superior extremity of a seventy-five years old male cadaver in April, 2014. Dissection was done properly in both upper limbs of the cadaver concerned. All the structures were observed carefully and relevant photographs were taken.

The two roots of the right median nerve joined with each other to form the median nerve trunk in the axilla. From the lateral root of the median nerve, the musculocutaneous nerve separated at a lower level (at the junction of upper one-fourth and lower three-fourth of right arm) and did not pierce the coracobrachialis muscle. But the muscle had triple nerve supply coming from the musculocutaneous nerve at different levels. Just after its emergence from lateral root of the median nerve, the musculocutaneous nerve gave one branch to supply the coracobrachialis muscle. At the junction of upper one-third and lower two-third of arm and in the middle of arm, that nerve gave two other twigs separately to the same muscle. Then the nerve supplied the biceps brachii & brachialis muscles running distally between them [Table/Fig-1,2].

In the left superior extremity no anatomical variation was found.

DISCUSSION

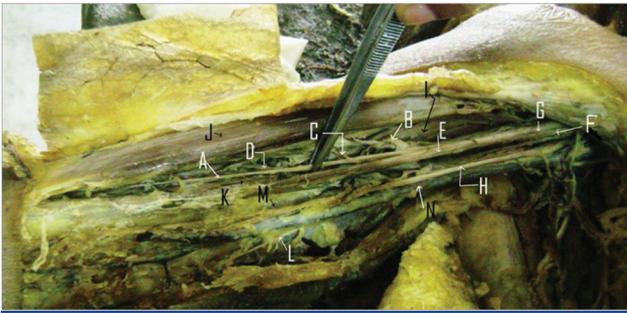
The musculocutaneous nerve arises from the lateral cord (C5

-7) of brachial plexus and usually pierces the coracobrachialis muscle. It descends between the biceps brachii and brachialis muscles and gives branches to them [1]. The median nerve has two roots (lateral and medial) arising from the lateral cord (C5,6,7) and the medial cord (C8,T1) of brachial plexus respectively, which unite antero-lateral to the third part of the axillary artery [1].

Nayak et al., (2006) described a case with a musculocutaneous nerve (MCN) of low origin which did not pierce the coracobrachialis muscle; the latter was supplied by a direct branch from the lateral cord of brachial plexus [2]. The other reported variations of MCN include its total absence and communications with the median nerve at various levels [2,3].

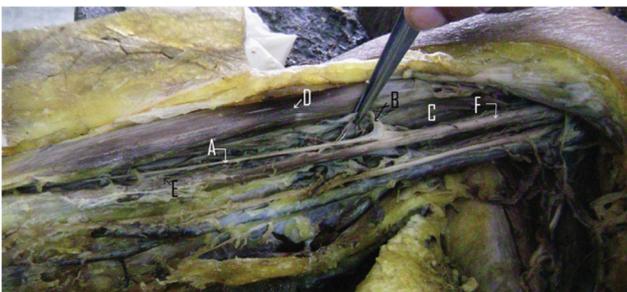
Gupta et al., found five cases in their study where MCN arose from the lateral root of the median nerve at a lower level in the arm [4]. This variation belongs to the Type IV variety of the communications between median and the musculocutaneous nerves according to Le Minor [5]. Moreover, in those five cases, MCN did not pierce the coracobrachialis muscle.

Out of 108 upper limbs in 54 cadavers, Ray et al also found three cases where the coracobrachialis was not pierced by the MCN [6]. This is the Type III variety of communications between the musculocutaneous and median nerves in relation to coracobrachialis muscle, according to Veneirators and Anagnastopoulou [7]. Among those three cases, in the first case MCN gave an unusual twig to the coracobrachialis, in



[Table/Fig-1]: The musculocutaneous nerve (A) (held with forceps), separated from the lateral root of the median nerve (G) at a lower level in right arm without piercing the coracobrachialis muscle (I) and ran distally between the biceps brachii (J) and brachialis (K). Three branches of musculocutaneous nerve (B, C and D) supplied the coracobrachialis muscle at different levels.

Index: A -musculocutaneous nerve; B, C, D -triple nerve supply to coracobrachialis muscle. E -Trunk of the Median Nerve, F & G- Medial & lateral roots of the median nerve respectively, H -Medial cutaneous nerve of the of the forearm, J-Biceps brachii & K-brachialis muscles, L -Medial cutaneous nerve of the of the arm, M- One brachial vein, N- Axillary vein



[Table/Fig-2]: 1st twig (B) of the musculocutaneous nerve (A) to the coracobrachialis muscle (C) has been held with forceps. The musculocutaneous nerve (A) arose from the lateral root of the median nerve (F) and ran between the biceps brachii (D) and brachialis (E) distally

the second case MCN originated from the lateral cord of brachial plexus (and joined with the median nerve), in the third case it arose from the median nerve [6].

Patel et al., found that the musculocutaneous nerve (MCN) did not pierce the coracobrachialis muscle and merged with the median nerve in one upper limb among 40 cadavers [8]. In a case described by Durgesh et al., the MCN arising from the lateal cord of brachial plexus parallel to the medial border of the coracobrachialis muscle without piercing it at any point. The motor branch to the coracobrachialis arose from the lateral cord directly to the upper one third of the muscle closer to its origin. Branches to the biceps brachii and brachialis were given off by MCN lower down in its course. The nerve then continued its further course as the lateral cutaneous nerve of the forearm [9]. These cases have similarity with the present case.

Phylogenetically, communication between median and musculocutaneous nerve was observed in monkeys and in some apes, representing the primitive nerve supply of anterior

arm (brachial) muscles and it has a developmental cause [10]. It is reported from comparative studies that there was only one trunk equivalent to the median nerve in the thoracic limb of the lower vertebrates (amphibians, reptiles and birds). In the context that ontogeny recapitulates phylogeny, it is possible that the cords of the brachial plexus in higher vertebrates originated from a single mother trunk and hence aberrant intercommunications involving the daughter branches are encountered in variable degrees [6,10].

The embryological development of the upper limb may help in explaining neurological variations [8]. The Brachial plexus is formed by the lower four cervical ventral rami with a variable contribution from C4 and T2. In humans, the forelimb muscles develop from the mesenchyme of the paraxial mesoderm during the fifth week of intrauterine life [11]. Mesenchyme, which comes from the dorsolateral part of the somites, migrates and forms the muscles into the limb bud. At the same time, the mesenchyme is penetrated by the ventral primary rami of the appropriate spinal nerves, located opposite to the bud. Contact between nerves and muscle cells are necessary to provide mesenchymal condensation to form muscles. Nerves supplying the limbs are joined by connecting loops of nerve fibres to form plexuses. The median nerve is formed by a combination of ventral segmental branches and the musculocutaneous nerve arises from it [8]. The existence of variations described may be due to altered signaling between mesenchymal cells and normal growth cones or circulatory factors at the time of gene controlled site specific formation of the cords of the brachial plexus usually during 4th to 7th week of intrauterine life [9,11].

An isolated injury to the musculocutaneous nerve is rare, but may occur during injuries to the upper arm and shoulder, e.g. fracture of the humerus and in patients with neuralgic amyotrophy. There is much weakness of the elbow flexion as biceps brachii and much of the brachialis are paralysed with sensory impairment on the extensor aspect of forearm in the distribution of the lateral cutaneous nerve of the forearm [1].

Hence, a knowledge of such variation is important for surgeons to be aware of possible anatomical variations to avoid unexpected complications, especially in post-traumatic evaluations and exploratory interventions of the arm for peripheral nerve repair, during flap dissections by plastic surgeons or during the performance of axillary blocks by anaesthetists [6,9,12].

CONCLUSION

This case report will be of help for the general and plastic surgeons, anaesthetists and anatomists regarding gross anatomy; moreover, the variations can be explained embryologically.

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