

A Study on Variations of Musculocutaneous Nerve in Adult Cadavers

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Abstract: The musculocutaneous nerve arises from the lateral cord of the brachial plexus, passes inferolaterally and then pierces through the coracobrachialis after supplying it, descends between the biceps and the brachialis, sending branches to both and continues as the lateral cutaneous nerve of the forearm. Variations in the origin, course, branching pattern, termination and the connections of the musculocutaneous nerve are not uncommon. These variations have clinical significance during surgical procedures, in the brachial plexus block and in diagnostic clinical neurophysiology.

Methods: A detailed study was carried out on 50 upper limbs by using 25 embalmed cadavers. Dissection of the infraclavicular part of the brachial plexus was done. The variations in the origin, number and course, and their correlations to the coracobrachialis were noted.

Results: The nerve was found to be not piercing coracobrachialis in 2 of the limbs.

Keywords: Musculocutaneous nerve, Median nerve, Coracobrachialis, Axillary artery.

I. Introduction

The musculocutaneous nerve arises from the lateral cord (C5-C7), opposite the lower border of pectoralis minor. It pierces coracobrachialis and descends laterally between biceps and brachialis to the lateral side of the arm. It pierces the deep fascia lateral to the tendon of biceps, and continues as lateral cutaneous nerve of the forearm. It supplies coracobrachialis, both heads of biceps and most of brachialis. The branch to coracobrachialis is given before the musculocutaneous nerve enters the muscle, branches to biceps and brachialis leave after the musculocutaneous has pierced coracobrachialis: The branch to brachialis also supplies elbow joint. The musculocutaneous nerve supplies a small branch to the humerus, which enters the shaft with the nutrient artery. An isolated lesion of the musculocutaneous nerve is rare, but may occur in injuries to the upper arm and shoulder(1).

II. Material And Methods

Fifty upper limbs from 25 adult cadavers were utilised during study period of 3 years. The pectoral region, axilla and the arm were dissected. The cords and branches of the brachial plexus were dissected. The variations of the musculocutaneous nerve were noted. The origin, branches and relation with coracobrachialis were noted.

III. Observations

Musculocutaneous nerve not piercing coracobrachialis was noted in two cases, formation of median nerve medial to 3rd part of axillary artery in one case was observed. In first case variation was noted in right upper limb, musculocutaneous nerve arises from the lateral cord at the middle of coracobrachialis muscle, and it divides into two branches, one branch as a common trunk given branches to coracobrachialis, biceps and brachialis, and other branch continues as lateral cutaneous nerve of forearm. (fig-1) The musculocutaneous nerve did not pierce the coracobrachialis and it passes between biceps and brachialis. (fig-2)

In second case variation of both musculocutaneous nerve and median nerve was noted in right upper limb, the lateral cord after giving a small trunk as lateral root of median nerve, continued as musculocutaneous nerve as a large trunk and it did not pierce the coracobrachialis muscle, branch to coracobrachialis was given as a twig from it (fig-3), it continues as lateral cutaneous nerve of forearm passing between brachialis and biceps muscle. There is no communication noted between median nerve and musculocutaneous nerve.

The lateral root of median nerve is small and it crosses the axillary artery anteriorly and united with medial root of median cord to form median nerve. The median nerve formed medial to axillary artery and continues downwards in the forearm medial to brachial artery (fig-3).

IV. Discussion

The musculocutaneous nerve (C4–C6), a mixed peripheral nerve, arising from the lateral cord of the brachial plexus in the axilla, usually innervates the muscles of the anterior compartment of the arm and then continues as the lateral cutaneous nerve of the forearm.

The musculocutaneous nerve has frequent variations. It may run behind coracobrachialis or adhere for some distance to the median nerve and pass behind biceps. (1) It is not particularly uncommon to find a nerve trunk of considerable size leaving the musculocutaneous nerve to join the median nerve.

Very occasionally, the musculocutaneous nerve fails to separate from the median nerve, and the latter therefore gives off the branches that should arise from the musculocutaneous.

Another variation in which the musculocutaneous nerve did not pierce the coracobrachialis, but rather pass between it and the biceps, and in some cases the nerve split, one part going superficial to the muscle and the other through the muscle. (2)

In present study 4% of the cases, the musculocutaneous nerve did not pierce the coracobrachialis muscle. The present variation coincides with (Jamuna, Chitra, Girish, Nayak, Krishnendu, Nakatani, Apurva, Mostafa, Lemnora Patel, et al.) (3,4,5,6,7,8,9,10,11,12) table: 1.

Nayak (6) reported that in one limb, the musculocutaneous nerve had a low origin and that the nerve was found to not pierce the coracobrachialis.

Jamuna (3) the musculocutaneous nerve was found to be absent completely in 3 limbs, but the nerve was found to be not piercing the coracobrachialis in 3 specimens.

In some cases, instead of the whole trunk of the nerve piercing the coracobrachialis, only its muscular branch or only its cutaneous branch was found to pierce the muscle. Instead of penetrating the coracobrachialis, the nerve may pass behind it or between it and the short head of the biceps muscle. Occasionally, the nerve perforates not only the coracobrachialis, but also the brachialis or the short head of the biceps muscle [13]

In present cases, the muscular branches to anterior compartment of arm was given as a common trunk in one case, and in second case the branch to coracobrachialis is given as a twig. Only the muscular branches pierced the coracobrachialis, and rest of the nerve trunk passes between the biceps and brachialis.

Variation in the formation of median nerve was observed in right upper limb. Median nerve is related medially to axillary artery, this variation correlates with (Satanarayana, Amritha Bharti, et al.) (14,15)

The musculocutaneous nerve innervates the muscles of the flexor compartment of arm and skin of lateral side of the forearm. The variations in the course and innervations of the nerve is due to developmental inconsistency. In human the upper limb develops from paraxial mesoderm and the axons of spinal nerve grow distally to reach the muscles and skin during 5th week of intrauterine life under the influence of five Hox D genes. The lack of co-ordination between the two processes due to altered signalling leads to variation in the course and supply (16)

Over or under expression of one or multiple transcription factors as mentioned above have been found to be responsible for the variations in the formation, relation and distribution of the motor nerve fibers. (17)

Table 1: comparative study : variation of musculocutaneous nerve not piercing coracobrachialis

S.no	Study done by	Percentage of cases observed
1	Jamuna et.al	6%
2	Chitra et.al	4%
3	Nayak et.al	1.66%
4	Patel et.al	2.5%
5	Present study	4%

V. Conclusion

The observations show that the musculocutaneous nerve has significant variations and that these variations have clinical significance in post traumatic evaluations and in the exploratory interventions of the arm for peripheral nerve repair. During shoulder surgery, it is important to identify or palpate the musculocutaneous nerve, as it is vulnerable to injury from retractors which are placed under the coracoid process. (3)

During the coracoid process grafting, shoulder dislocations and frequent arthroscopies may damage the muscle as well as the nerve [18]

Though rare, the musculocutaneous nerve is prone to injury in its upper course, as it lies on the subscapularis muscle, its entry point into the coracobrachialis muscle is variable, and also because the nerve occasionally bifurcates(19).

The variations in the formation and relations of median nerve in the arm bear remarkable clinical significance. Clinicians and surgeons should be aware of such variations while performing surgical procedure in this region. (20) The knowledge of such rare median nerve variations is thus important for anatomists, anesthetists, surgeons and radiologists.



Fig1: musculocutaneous nerve showing two divisions
MCN- Musculocutaneous nerve

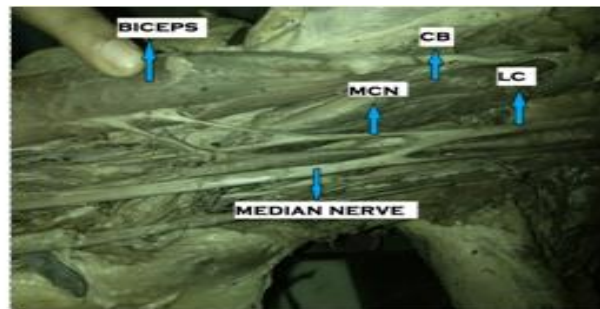


Fig2: Musculocutaneous nerve not piercing coracobrachialis
MCN: Musculocutaneous nerve
, CB: Coracobrachialis muscle, LC: lateral cord

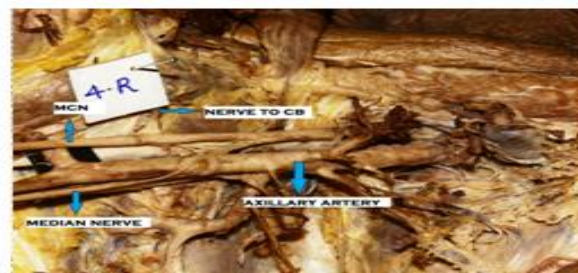


Fig 3: Showing large musculocutaneous nerve trunk,
and formation of median nerve medial to axillary artery
CB- Coracobrachialis, MCN- Musculocutaneous
nerve

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