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# Variations of Musculocutaneous Nerve- A Case Report

**Sharma M[1], Prashar R[2]**
[1]Associate Professor, Department of Anatomy, Punjab Institute of Medical Sciences Jalandhar, Punjab, India
[2]Department of Surgery, Civil Hospital, Kapurthala, Punjab, India

***Corresponding author**
Dr Mamta Sharma
Email: rprashardr1195@rediffmail.com

**Abstract:** Musculocutaneous nerve (MCN) arises from the lateral cord (C5-C7)of the brachial plexus. It is the nerve of the anterior compartment of arm. The median nerve (MN) has two roots from the medial (C8,T1)and lateral (C5,C6,C7) cords of the brachial plexus. During routine dissection of upper limb for medical undergraduates, the arm was dissected in a 86 years old embalmed female cadaver in the department of Anatomy, Punjab Institute of Medical sciences Jalandhar. During study of brachial plexus, variations concerned with musculocutaneous nerve were observed . The musculocutaneous nerve was arising from lateral cord of brachial plexus and it was not piercing coracobrachialis muscle. At the junction of upper and middle third of arm it gave one branch supplying bicep brachii and brachialis . The second branch coursed downward and contnuied as lateral cutaneous branch of forearm. And after that it joined the median nerve. Knowledge of such anatomical variations is of interest to the anatomists and clinician alike. Variations assume significance during surgical exploration to avoid unwanted outcomes.
**Keywords:** Brachial Plexus, Musculocutaneous nerve, Median nerve ,Communication, Lateral cord, Coracobrachialis.

## INTRODUCTION

The Brachial plexus is formed by ventral rami of C5-T1 cervical nerves. Musculocutaneous nerve (MCN) arises from the lateral cord (C5-C7) of the brachial plexus. It is the nerve of the anterior compartment of arm. The nerve piercesthe coracobrachialis muscle, and then passes downwards between the biceps brachii and brachialis to the lateral side of the arm. Just below the elbow it pierces the deep fascia lateral to the tendon of biceps and continues as the lateral cutaneous nerve of the forearm. It supplies coracobrachialis, both the heads of biceps and most of brachialis. The branch to coracobrachialis is given off 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 the elbow joint. The median nerve (MN) has two roots from the medial (C8,T1) and lateral (C5,C6,C7) cords of the brachial plexus which embrace the third part of axillary artery and unite anterior or lateral to it then passes through the anterior compartment of arm crossing the brachial artery from lateral to medial side enters into the cubital fossa where it is posterior to the bicipital aponeurosis and anterior to brachialis, separated by the latter from the elbow joint[1].

## CASE REPORT

During routine dissection of upper limb for medicalundergraduates, the arm was dissected in a 86 years old embalmed female cadaver in the department of Anatomy, Punjab Institute of Medical sciences Jalandhar. During study of brachial plexus, variations concerned with musculocutaneous nerve were observed . The musculocutaneous nerve was arising from lateral cord of brachial plexus. This nerve was not piercing coracobrachialis but was giving branch to this muscle close to its origin. At the junction of upper and middle third of arm it gave one branch supplying bicep brachii and brachialis. The second branch coursed downward and continued as lateral cutaneous branch of forearm. After that it joined the median nerve (Fig1). This variation was bilateral.

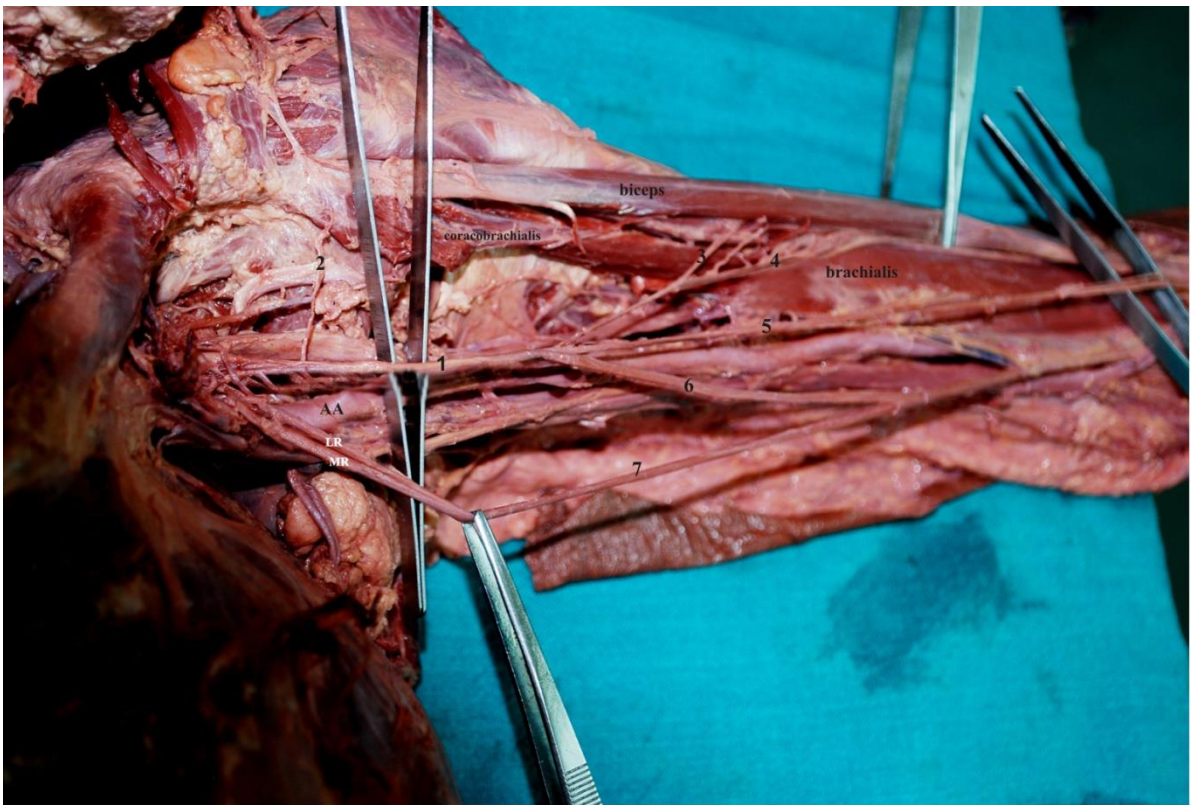


**Fig 1-Showing:**
**1-Musculocutaneous nerve ,**
**2-Nerve to coracobrachialis,**
**3-Nerve to biceps brachii,**
**4- Nerve to brachialis,**
**5-Lateral cutaneous nerve of forearm,**
**6-Communication to median nerve,**
**7-Median nerve, AA-Axillary Artery, LR-Lateral root of median nerve, MR-Medial root of median nerve**

## DISCUSSION

Three cases have been reported by Nakatani[2] where the musculocutaneous nerve did not pierce the coracobrachialis while Mohamad Bilal Delvi[3] cautioned to be vigilant of the variations in the course of the musculocutaneous nerve during the performance of Axillary block under the guidance of Ultrasound scan.

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 sight specific formation of the brachial plexus usually occurring during $4^{th}$ to $7^{th}$ week of intrauterine life. The motor axons arrive at the base of developing limb buds in the fifth week of intrauterine life[4]. The guidance of the developing axon is regulated by expression of chemoattractants and chemorepulsants in a highly coordinated site specific fashion, any alteration in signaling between mesenchymal cells and neuronal growth cones can lead to significant variations[5].The median ,musculocutaneous and ulnar nerves after their origin from the brachial plexus, pass through the anterior compartment of the arm without receiving any branch from any nerve in the neighbourhood[6]. Anastomosis between the musculocutaneous nerve and the median nerve is by far the most common and frequent of all the variations that are observed amongst the branches of the brachial plexus. The communication between the musculocutaneous and median nerves have been classified in different types[7,8,9].

1) The communications between median nerve and musculocutaneous nerve have been classified into five types[7]:

**Type 1**-There is no communication between the median nerve and the musculocutaneous nerve

**Type 2**-The fibres of medial root of the median nerve pass through the musculocutaneous nerve and join the median nerve in the middle of the arm.

**Type 3**-The lateral root fibres of the median nerve pass along the musculocutaneous and

after some distance,leave it to form the lateral root of the median nerve.

**Type 4**- The musculocutaneous fibres join the lateral root of the median nerve and after some distance the musculocutaneous nerve arises from the median nerve.

**Type 5**- The musculocutaneous nerve is absent and the entire fibres of the musculocutaneous pass through the lateral root and fibres to the muscles supplied by musculocutaneous nerve branch out directly from the median nerve. Present findings do not fall in any category mentioned above. In the present case musculocutaneous nerve in other words ends by making communication with median nerve and before its termination it gives muscular branch supplying bicep bracchii and brachialis muscles and one cutaneous branch as lateral cutaneous nerve of forearm.

2) The communication was classified into three types, considering the coracobrachialis muscle as the reference point[8].

**Type I**: the communication is proximal to the entrance of the musculocutaneous nerve in to the coracobrachialis muscle.
**Type II**: the communication is distal to the muscle.
**Type III**: the nerve and the communicating branch do not pierce the muscle.

According to this classification present findings fall in Type III category

3) Later on these communication are classified into three types in a study on 138 cadavers [9].

1. Fusion of both nerves(19.2%)
2. Presence of one supplementary branch between both nerves (72.6%)
   2a- Single root from musculocutaneous nerve, contributes to the connection (69.9%)
   2b- There are two roots from musculocutaneous nerve (2.7%).
3. Presence of two branches between both nerves (6.8%)

According to this classification present findings fall in Type 1 category.

The communicating branch usually joins the median nerve in the lower third of the upper arm.If it joins the median nerve in the upper third of the upper arm, it is generally considered as the third (double lateral) root of the median nerve [10]. In the present case it was observed in the upper third of the arm, it can be considered as the double lateral root of the median nerve or in other words the median nerve can be said to be formed by three roots(1) one from lateral cord (2) one from the the medial cord (3) the third from musculocutaneous nerve .

Similar variation was observed earlier by different authors-

1. The median nerve, instead of having two roots may have three roots-either one each from lateral cord, medial cord and musculocutaneous nerve[11,12].
2. Two from lateral cord and one from medial cord[13,14].
3. It may have even four roots- three from the lateral cord and one from the medial cord[15]. The communication between the musculocutaneous nerve and median nerve is considered as a ramnant from the phylogenetic or comparative point of view. It is reported that there is only one trunk equivalent to the median nerve in the thoracic limb of the lower vertebrates (amphibians, reptiles and birds) and independent musculocutaneous nerve is absent[16,17,18].Studies of comparative anatomy have observed the existence of such connections in monkeys and in some apes, the connection may represent the primitive nerve supply of the anterior arm muscles[19]. In the context that ontogeny recapitulates the phylogeny ,the variations seen in present study are possibly the result of developmental anamoly. Similarly Chauhan and Roy[11] strongly recommended the consideration of the phylogeny and the development of the nerves of the upper limb for the interpretation of the nerve anomalies of the arm.

These may be due to circulatory factors at the time of fusion of the brachial plexus cords[16]. The human brachial plexus appear as a single radicular cone in the upper limb bud, which divides longitudinally into ventral and dorsal segments. The ventral segments give rise to the median and ulnar nerves with musculocutaneous nerve arising from the median nerve. There may be failure of differentiation as a cause for some of the fibres taking an aberrant course as a communicating branch[20].

Knowledge of anatomical variations of these nerves at the level of upper arm is essential in light of the frequency with which surgery is performed in the axilla and the surgical neck of the humerus[21].

The lesion of the communicating nerve may give rise to pattern of weakness that may impose difficulty in diagnosis. Clinical implication of this could be that injury of musculocutaneous nerve proximal to the anastomotic branch between musculocutaneous and median nerve may lead to unexpected presentation of weakness of forearm flexors and thenar muscles[22].

The value of knowledge of communicating branch between the musculocutaneous and the median nerve is important in traumatology of the shoulder joint as well as in relation to repair operations[23,24,25].

Though the variations mentioned may not alter the normal functioning of the limb of the individual, but knowledge of the variations is of prime importance to be kept in mind during clinical evaluation and surgical procedure.

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