

## Multiple Anatomical variations in an upper limb – a case report



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### Abstract

Emergence of various case reports are being a significant key in many circumstances for medical professionals. In this case report, the anomalous variations in a single female cadaver of an upper limb is highlighted. On left side of a limb, Medial cutaneous nerve of arm was absent; instead the nerve supply was reinforced by the extended extra thoracic intercostobrachial nerve. Supernumerary head of biceps were originated from the anteromedial surface of humerus and inserted into radial tuberosity as a common variation was noted. This muscle was innervated by communicated twigs between median and musculocutaneous nerve. In forearm Palmaris longus was absent and in palm the third lumbrical muscle was supplied by branches of Median nerve. On right side of the upper limb no significant variations as like left sided was not noticed, but in the pectoral region presence of recti sternalis was observed and it was innervated by intercostals nerve fibres. The reason may be evolutionary and phylogenetically signified.

### Key words

Upper limb, Medial cutaneous nerve, Median cutaneous nerve, median nerve and musculocutaneous nerve, Recti Sternalis, Palmaris Longus



## Background

Neurovascular and muscular variations in an upper limb are clinically significant to be considered. Ample studies has been reported which differs from each case reports. Discrete cases may pay attention to the surgeons and clinicians. As such the mode of variations and embryological reasons may shift from each case; however the peculiar characterizations of the reports are being notified frequently. One such distinct variant case was noted in the present case. Substantial evolutionary reasons of such uncommon variations are scantily reported.

## Case Report

During upper limb dissection of a female cadaver in Chettinad Hospital and Research Institute, the following variations were observed. The approximate age of the cadaver was 45 years. On the left side of an upper limb, in arm, medial brachial cutaneous nerve was absent, instead cutaneous innervations for the medial aspect of arm was reinforced by intercostobrachial nerve associated with the communication between musculocutaneous and median nerve was also observed, and supplied the third head of biceps brachii. In forearm, palmaris longus was absent and in palm 3rd lumbrical muscle was innervated by median nerve. On the Right side, no variations were noticed expect for the presence of Recti sternalis.

## Discussion

### Left sided upper limb

#### Variant 1 & 2 (Fig.1)

Medial cutaneous nerve of arm (MCN) being the smallest branch from the medial cord of brachial plexus, innervates the skin of the medial side of arm. The lateral cutaneous branch of the second intercostal nerve also known as intercostobrachial nerve generally sends a communicating branch to the MCN. More often the MCN is entirely replaced by intercostobrachial nerve if the latter is reinforced by lateral cutaneous branch of the third intercostal nerve [1].

In this Case Medial cutaneous nerve of arm was absent and extrathoracic intercostobrachial nerve (ICBN) emerged from the lateral thoracic wall of the 2nd intercostal space crossed the floor of axilla and extended medial to brachial artery and innervates the medial aspect of arm till above the medial epicondyle (Fig.1) and no communications were observed between the extrathoracic course of intercostobrachial nerve and any other branches of brachial plexuses. Sectioning of intercostobrachial nerve during breast surgery

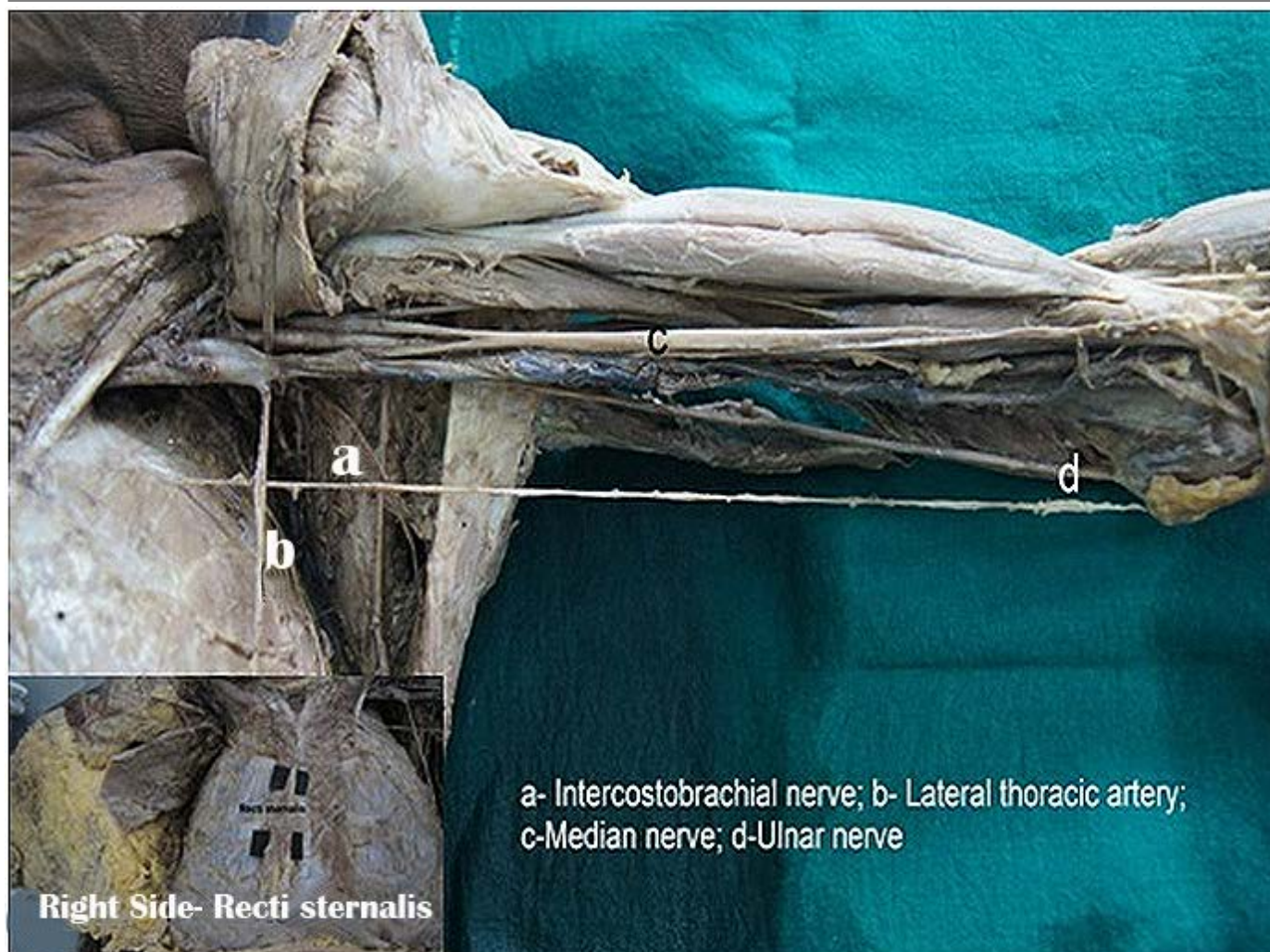
for cancer can cause intercostobrachial neuralgia or post-mastectomy pain syndrome (PMPS) that leads to pain, phantom sensations and sensory loss in the axilla, medial upper arm, and/or the anterior chest wall on the affected side [2]. Knowledge regarding the above described variation of intercostobrachial nerve could help the surgeons to preserve this nerve. Anatomical variant reports as like in this case may help surgeons to preserve intercostobrachial nerve during surgeries to decrease the morbidity of postoperative sensory disturbances in the arm. Variation of ICBN of this type of case were not noticed in the classifications proposed by Cunnick et al and Loukas et al [3,4].

#### Variant 3 & 4 (Fig.2).

#### Supernumerary head of biceps & communication of median nerve and musculocutaneous nerve

In this case, the origin of supernumerary head of biceps was located in between the insertion of coracobrachialis and origin of brachialis, from the anteromedial surface of humerus and medial intermuscular septum. Inserted as a common tendon with long and short head of biceps into radial tuberosity. Supernumerary head of biceps were classified on the basis of the origin by Reodriguez et al and this presenting variation of biceps is the most common type which is documented in many case reports and articles [5]. In this case the muscle was innervated by the branches from musculocutaneous nerve and communicating fibers between the median and musculocutaneous nerve and vascularized by branches from brachial artery. The percentage incidence of previous reports from different regions varies in Chinese 8%, European white 10%, African black 12%, Japenese 18%, South African black 20.55%, South African white 8.35%, Colombians 37.5% and in Indian 2% [6]. Supernumerary head of biceps developed from the part of brachialis and insertion may shift from ulna to the radius. Myotomes develop from the influence of vascularization and innervations of the surrounding mesoderm so bicepsbrachii muscle is likely to influence the course and the branching pattern of the musculocutaneous nerve [7].

Phylogenetically, communication between median and musculocutaneous nerve was observed in monkeys and apes, representing the primitive nerve supply of anterior arm muscles and it's a developmental cause [8]. No similar variants to the one reported in the study were observed previously and does not seem to fit in with any classifications. In the present study, the median nerve formed anterior to the third part of axillary artery as seen normally. The musculocutaneous nerve was seen piercing the coracobrachialis muscle. However, a communicating branch arose from the median nerve to the musculocutaneous nerve.



**Figure 1 - Left side - Variation of Intercostobrachial nerve, Right side- Recti Sternalis**

A small twig arose from this communicating branch which supplied the third head of biceps brachii from the inferior aspect of the muscle. Afterwards this branch joined and continued downwards with the musculocutaneous nerve and the nerve formed by the union of median and musculocutaneous nerves as the lateral cutaneous nerve of forearm or lateral antebrachial cutaneous nerve. The supply to the brachialis was however only by the musculocutaneous nerve.

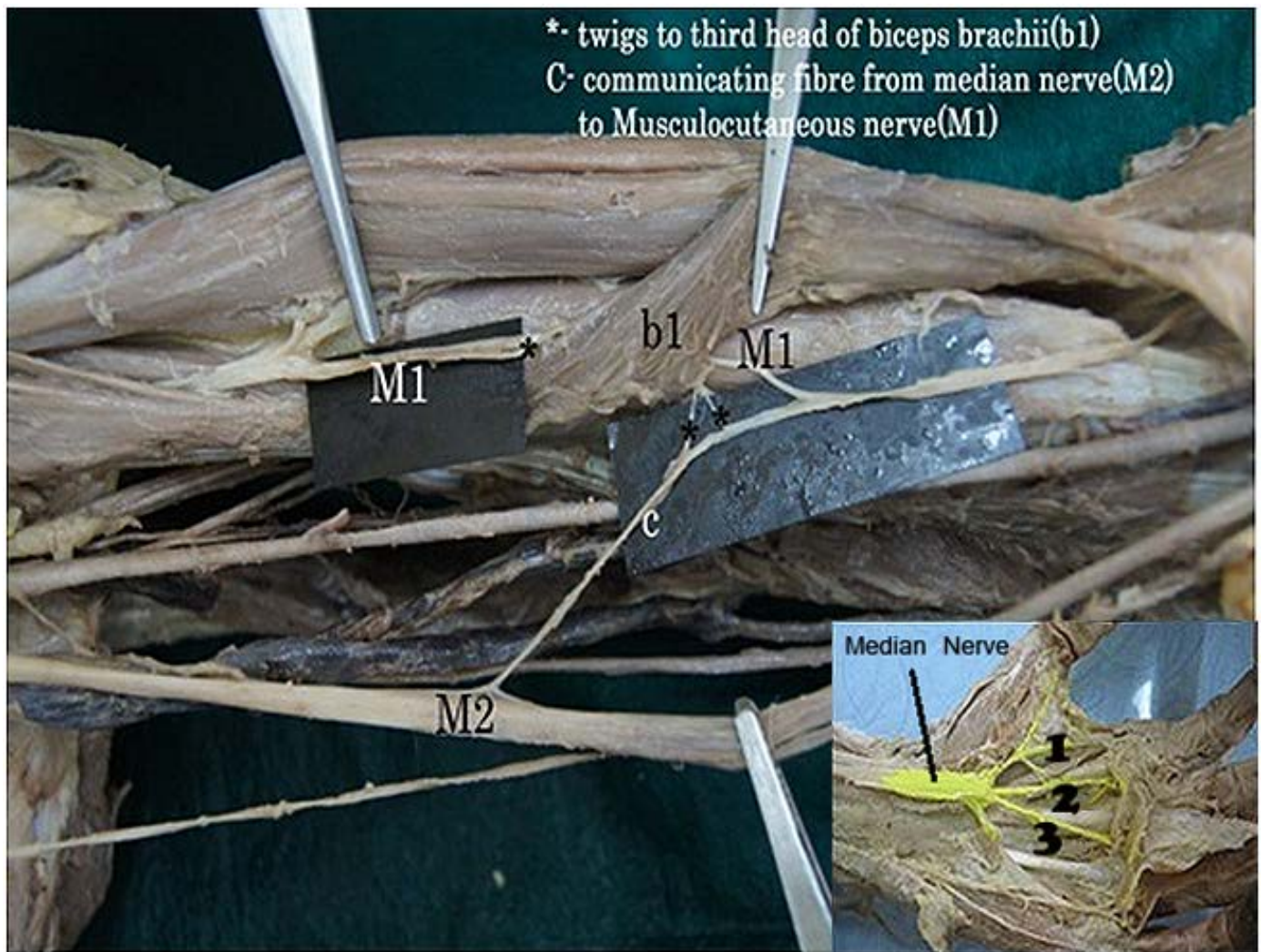
#### **Variant 5 Absence of Palmaris Longus**

Reptiles like lizards and turtles do have Palmaris Longus [9]. From the viewpoint of phylogeny, this muscle is absent in lower mammals, and probably not homologous with the palmaris longus of higher mammals [10]. However Haines, 1950 suggested that the reptilian 'Palmaris Longus' and the mammalian Palmaris Longus may be homologous, i.e. that

the last common ancestor of mammals and reptiles probably had a Palmaris Longus [11]. Among the vertebrates it is found only in mammals. Palmaris Longus is well constructed and developed in those who walk from place to place, to be clearer forelimb is used for ambulation. A very interesting fact about Palmaris Longus is that, it is present in the orangutan but is absent in higher apes like chimpanzees and gorillas [12]. In human beings, palmaris longus is absent around 15% of population, which is considered as hereditary influence but the role of genetics to strengthen this fact remains unclear. Dominant character related to its ososomal gene and so it may depend on the gender [13].

#### **Variant 6 Median nerve innervates the 3rd lumbrical (Fig.2).**

Messrs Young and Robinson suggested that two alternative explanations; either (a) that the myotomes concerned in the formation of a muscle have varied, the change being accompanied by a corresponding change in the nerve-supply; or (b) that a different path is chosen by the nerve-fibres in the case of an anomalous innervations [14].



**Figure 2 - Left side- Communication between Median nerve and Musculocutaneous nerve & In Palm- Median nerve innervating 3rd Lumbrical**

**Right side pectoral region  
 Variant 7**

**Presence of Recti Sternalis (Fig.1).**

Originated as three tendinous slip from the 7th costal cartilage and inserted in the manubrium of sternum.

Considering this strange location and course of fibers, it may be possible that recti sternalis plays an active role in the elevation of lower chest wall. primitive ventral longitudinal muscle sheet, which may be the origin of Sternalis, also generate rectus abdominis, sternocleidomastoid muscles. A number of literatures suggested that sternalis muscle fibres are continuous with either sternocleidomastoid or rectus abdominis or both. Sternalis could be separated from Pectoralis fibres by Pectoral nerve supply, which provides the connection in both of them [15].

b - Prominence of partial deficiency of pectoral major muscle accompanying with the Sternalis muscle. Presence of Sternalis signifies the remnants of panniculus carnosus, a sheath of skin muscle, which is supported by its position with a number of associated structures, namely pectoral fascia, anterior Cutaneous branches of intercostal nerves. A Pioneering research by Eisler on anencephalic fetuses documented the presence (48%) of sternalis muscle. So, the explanations for this sternalis muscle could be neurological or embryological [16].

**Clinical implications**

These anomalies are incredibly important for hand surgeons. In spite of being a number of landmarks to the structures of the upperlimb, these variations could create certain confusions, which is true, even an experienced surgeon. The risk of damage to the intercostobrachial nerve in breast-conserving surgery is important in his context. The clinician also should be careful of an abnormal swelling in the distal forearm.



## Conclusion

In this case, possibilities for entrapment of communicating branch within the third heads of biceps and variation in ICBN and median nerve to be noted that may guide surgeons. Clinicians should be aware of this sort of case reports during their practice.

## Abbreviations

Medial cutaneous nerve of arm (MCN), extrathoracic intercostobrachial nerve (ICBN), post-mastectomy pain syndrome (PMPS).

## Competing interests

The authors declare that they have no competing interests.

## Authors' contribution

All Authors have contributed equally.

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