

## Unusual Findings during Upper Limb Dissection

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Human anatomy is a fundamental subject of medical curriculum. Teaching normality is not always easy and persuasive, especially when variations appear in gross anatomy lab. The knowledge of the 'full' anatomy though neglected and is important for the future practice of the undergraduates from first and second year. In an unforced study we describe a number of varieties on upper limbs found during limb dissection in the first semester at anatomy department. Two out of ten limbs showed unusual pattern of an artery, a nerve and a muscle. The first case was an upper limb with a superficial ulnar artery in the forearm. In the second case a third head of biceps brachii muscle coexists associated to communication of musculocutaneous with median nerve. The morphological features and the prevalence of these cases are presented, besides the discussion of its clinical significance.

*Key words:* human anatomy variation, musculocutaneous nerve, third head of biceps brachii, superficial ulnar artery

### Introduction

It is known that anatomy is an ancient science. It is not only part of the base and the beginning of the medicine but it comes before it in searching the knowledge of human morphology [11]. The Latin word *normalis* means conforming to the rule or pattern. *Norma* is the Latin name for a carpenter's square; it is used in descriptive anatomy to indicate the standard or normal appearance of a structure [9]. In anatomy, normal are the structures which are most common but not infrequently there are others called variations which are less common but not considered abnormal. Variations ranging from subtle to remarkable change the anatomy of the known human body. They may have important influences on predisposition to illness, symptomatology, clinical examination and investigation, and patient management including operative surgery. Though most of university students should have been familiar with the variabilities met in human morphology from the early stage of their study many of them approach their anatomy studies in expectation that all human beings should be identical [21].

The studies in the field of human anatomy variations reveal that there is difference in their frequency by system. Most usual are the vascular variations followed by muscular and least are those of viscera and nervous system [2, 11]. Usually the ulnar artery is

the principal source of blood supply to the forearm while radial is for the hand [18]. The variation of superficial course of the ulnar artery has its prevalence of 0.7-9.4% of the population [19]. The standard two headed biceps brachii muscle may have supernumerary heads [17]. A coexistence of third head of the muscle and variation of musculocutaneous nerve communicating with median is reported [4].

## Materials and Methods

Five upper and five lower limbs were dissected for the need of teaching process in the department of anatomy. The separated limbs from previously embalmed cadavers were used. Standard anatomy dissection technique was made. During the procedure the limbs were examined for the course, availability and branching of the vessels as well as for the position and morphology of the muscles, nerves and the rest of the structures.

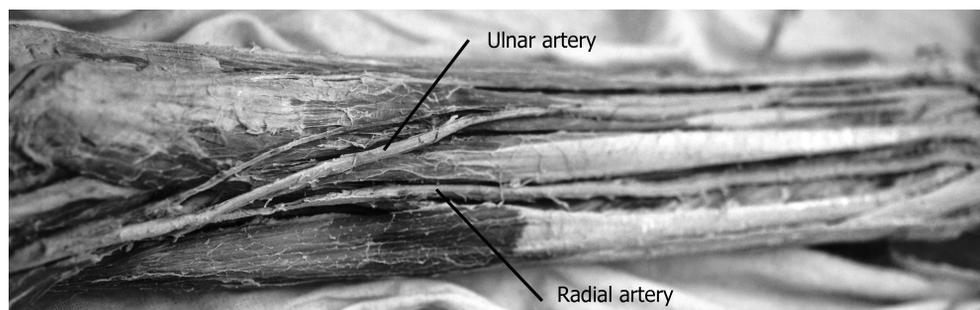
## Results

Two of the upper limbs were identified as variable.

Case no.1. - A spatial variation of ulnar artery was found on a separate right upper limb. The brachial artery was 5mm in diameter and in the cubital fossa bifurcated into radial and ulnar branch. The former was 4.5 mm wide and after 12 mm of length released common interosseous artery – diameter was 3.5 mm. Anterior interosseous artery was 3mm wide and bigger than usual, while posterior interosseous was normal. The ulnar artery (3 mm wide) originated as a terminal branch of the brachial artery in the cubital fossa. This beginning was standard but the course of the vessel was different from the one described in the anatomy books. On the forearm it passed superficial to all flexor muscles, which originate from the front of the medial epicondyle of the humerus (**Fig. 1**).

As it descended into the lower third of the forearm, it followed the lateral border of the flexor carpi ulnaris muscle and then proceeded into the Guyon's canal and on the hand formed the superficial palmar arch together with the superficial branch of radial artery (**Fig. 2**).

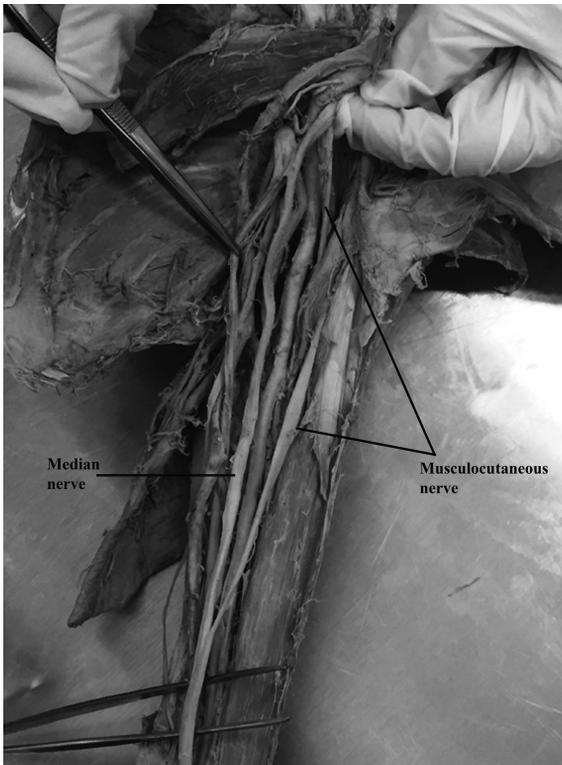
Case no. 2. - During the dissection of a left upper limb we found two significant variations in the axillary fossa and brachial region. The musculocutaneous nerve originated from the lateral cord and after 60mm it pierced the coracobrachialis muscle. The length of this part of the nerve was in the reported norm, which according to Flatow et al. is from 3 to 12.5 cm [7, 13]. Distally to coracobrachialis its position between biceps brachii and brachialis was typical and several muscular branches were released for the



**Fig. 1.** Right upper limb. Cubital fossa and forearm. Superficial ulnar artery



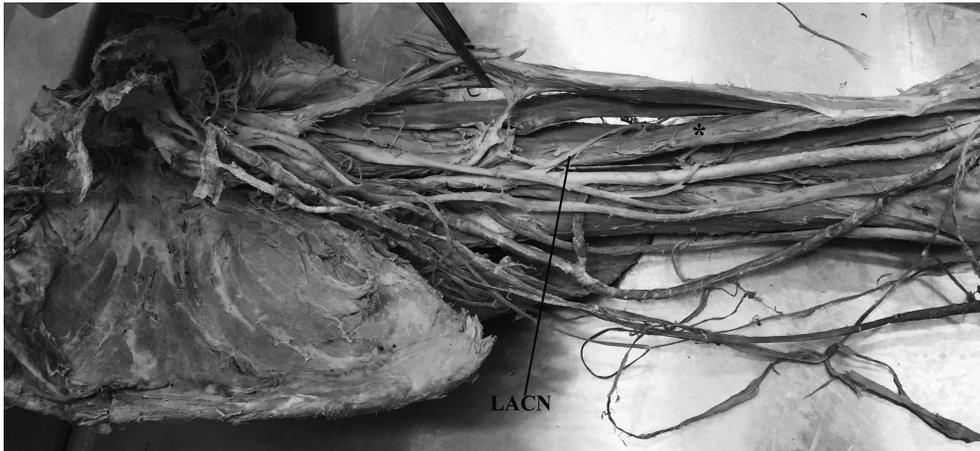
**Fig. 2.** Right upper limb. Carpal region and Guyon's canal with the superficial ulnar artery.



**Fig. 3.** Left upper limb. Unusual anastomosis between musculocutaneous and median nerves

two muscles after that it joined the median nerve. This part of the nerve is 130 mm or the communicating branch originated 19 cm from the coracoid process. The lateral cutaneous nerve of the forearm was a branch of the musculocutaneous and passed between the body and the third head of the biceps brachii as it appeared on the lateral border of the muscle and descended on the forearm (**Fig. 3**).

The supernumerary third head of biceps brachii muscle was observed during the dissection. The origin of the variable head was at the humeral medial face, at the level of the middle third of the arm, between coracobrachialis insertion and brachialis muscle origin. It was 13.8 cm in length and joined the biceps brachii at the lower third of the arm (**Fig. 4**).



**Fig. 4.** Left upper limb. Third head of biceps brachii  
\* - third head, LACN - lateral antebrachial cutaneous nerve

## Discussion

The presence of human anatomy variations in the gross anatomy teaching lab is undisputable. They are found in each stage of the teaching process and it is hard to neglect their existence and to escape discussion of their impact on the future clinical work [11].

The anatomical variations of the upper extremity are significant, especially with increasing use of imaging techniques like computed tomography and magnetic resonance imaging [3]. Variations of the arterial pattern of the upper limb are reported in the available literature including axillary artery, brachial artery and ulnar and radial arteries [12]. Superficial ulnar artery is a very common variety with a prevalence of 0.7-9.4% in some studies [19] and 4.2% in others [6]. A high proximal origin of the ulnar artery from axillary, brachial or superficial brachial is termed as “superficial ulnar artery” [14]. The appearance of this variation, when coming from brachial artery, is most often from the lower third, often from the upper and infrequently from the middle one. In these cases the arteries of the forearm are usually more superficial and are lying under the antebrachial fascia or very rarely subcutaneously [2]. Ulnar artery could pass superficial to the superficial muscles of the anterior group of the forearm [16]. In the presented case No1 ulnar artery arises on its usual place from the brachial artery and passes superficial to the flexors of the forearm. Here no prominent branches are given off the main artery. This pattern doesn't correspond to any of the 5 types presented by Latarjet [8].

In case no. 2 the concomitant multiple variations of musculocutaneous and biceps brachii are reported in the literature. The existence of the extra heads of the biceps bra-

chii has been associated with variabilities of musculocutaneous nerve and even more it has been associated with presence of communicating branches between the latter and the median nerve [17]. The embryological development of the upper limbs may help in explaining the upper mentioned variations. During the 5th week of the development, mesoderm invades the upper limb bud to further condense into ventral and dorsal muscle masses [10]. The mesenchyme of these muscles is penetrated by the ventral primary branches of the appropriate spinal nerves. Contact between nerves and a muscle is necessary to provide mesenchymal condensation to form muscles [4]. So the development of the biceps brachii third head and the course and branching of musculocutaneous nerve could be influenced by each other, which may explain the coexistence of the reported neuromuscular variation [1]. From the supernumerary heads of biceps brachii the one with three heads is most common and frequently reported [1, 27] but variable muscle with four or even seven heads was also presented [3]. The multiple varieties of this muscle have resulted on a large number of reports with different classifications [17]. According to Rodríguez-Niedenführ et al. there are three types of variants of the third head of biceps brachii considering its attachment to the humerus: superior humeral head; inferomedial and inferolateral heads [4]. In our case no. 2 we have the inferomedial position of the third head, which originates from the anteromedial surface of the humerus between insertion of the coracobrachialis proximally and the origin of brachialis muscle distally. The coexisting variation of musculocutaneous nerve in our case cannot be categorized in the 5 types presented by Le Minor which classification is the most detailed one from several others based on the anastomoses of the nerve and its relation to coracobrachialis. It is similar to type 2 where fibers from medial root of median nerve join musculocutaneous nerve and return back to the former in the mid-arm. In our case fibers are from the lateral cord and they all join the median nerve in the distal third of the arm.

The clinical significance of the reported variations is specific for each one of them. The superficial position of the ulnar artery in our case could be a reason for unintentionally penetrating the artery during attempts of venipuncture of median cubital vein [5]. This arterial variation is increasing the chance of iatrogenic injury occurring during surgery [14]. The third head of biceps might be misinterpreted with soft tissue tumor [20]. A nerve or artery compression (median nerve or brachial artery) is possible produced by the extra head [15]. Another impact of this variety is the role of biceps brachii in flap surgery and probable unusual bone displacement subsequent to fracture. Clinically, the musculocutaneous nerve variations may be related to entrapment syndrome. If the entrapment of the musculocutaneous nerve coexists with a communicating branch between the musculocutaneous and median nerve may lead symptoms of median nerve neuropathy [4]. The knowledge of the last condition could help differential diagnosis and avoid unnecessary operative treatment of carpal tunnel syndrome [22].

## Conclusion

The variations are part of the normal anatomy of human body. Surgeons, radiologists and anatomist are the specialists that can refute the assertion that normality is the only state of human body. The aberrations in position, number and presence of the structures in anatomy are something that they find very often. A new concept of teaching and interpreting anatomy is necessary to have more impact of modern normal morphology on the clinical process of diagnosis and treatment of the diseases especially with surgical procedures.

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