



MULTIPLE VARIATIONS OF UPPERLIMB MUSCULATURE IN ADULT POPULATION OF TELANGANA REGION.

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ABSTRACT

Introduction: The muscular variations of upper limb are not uncommon. Their importance becomes apparent with regard to surgical approaches for various clinical conditions. The aim of this study is to determine the incidence and to procure the knowledge of these muscular variations in Telangana population. **Materials and Methods:** The study was done on 40 adult human cadavers in 2yrs duration in our routine cadaveric dissection for 1st MBBS students in the Department of Anatomy, Kakatiya Medical College, Warangal and Government medical college, Nalgonda, Telangana state. **Results:** The muscular variations of upper limb, observed in our routine cadaveric dissection are reported in this study. We found a variant muscle on the dorsum of hand, (the extensor digitorum brevis manus), an uncommon variation on dorsum of both hands in 50 yrs old male cadaver. In another body we found other variations of muscles of anterior compartment of arm and fore arm. Those are the presence of 3rd head of Biceps brachii (accessory belly) and presence of accessory belly (Gantzer's muscle) for FDP muscle along with another extra belly to PFL in the forearm. The combination of three variations occurring in a 55yrs old male cadaver in both upper limbs is a rare phenomenon. The presence of such variations in upper limb musculature and their clinical significance and literature has been reviewed. **Conclusion:** This helps in add up knowledge to anatomists and clinicians for their clinical implications.

KEYWORDS : Muscular variations, Extensor digitorum brevis manus , Biceps brachii muscle (accessory belly), Gantzer's muscle, Flexor digitorum Profundus (FDP), Flexor Pollicis longus (PFL).

INTRODUCTION:

The muscular variations of upper limb are not uncommon. Their importance becomes apparent with regard to surgical approaches for various clinical conditions and for comparative anatomy involving the upper limb. The aim of this study was to determine the incidence and types of these multiple variations in upper limb musculature in Telangana population.

MATERIALS AND METHODS:

The study was conducted on a sample of 40 adult human cadavers in 2yrs duration in our routine cadaveric dissection for 1st MBBS students in Department of Anatomy, Kakatiya Medical College, Warangal and Government medical college, Nalgonda, Telangana.

OBSERVATIONS & RESULTS:

Observation 1-- During routine dissection of upper limb for first year medical students, we observed presence of a small muscular belly on dorsum of both hands in a 55 year old male cadaver.(figure 1). These muscle bellies were found to be present under the tendons of Extensor digitorum and Extensor indicis. They were originated from the anterior border of lower end of radius and intercarpal ligaments. Insertion of this muscle on left side was between the index and middle fingers passing along with tendon of Indicis merging with dorsal digital expansion of index finger. On right side it was seen merging with dorsal digital expansion of middle finger. The nerve supply is from posterior interosseous nerve on both sides in 4th space of extensor retinaculum.

In normal anatomy no muscles are seen on the dorsum of the hand except for the long extensor tendons of digits. This small muscle belly was seen on the dorsum, which is named as "extensor digitorum brevis manus" is an uncommon variation. The incidence of present muscle according to our study was 2.5%. The presence of such variant muscle on dorsum of hand, their clinical significance and literature has been reviewed.

Observation 2-- In another body we found variations of muscles of anterior compartment of arm and fore arm. Presence of 3rd head of Biceps brachii (accessory belly) and presence of accessory belly (Gantzer's muscle) for FDP muscle along with presence of another extra belly to FPL in the forearm. The combination of these variations observed in a 55yrs old male cadaver in both upper limbs

was a rare phenomenon.

(i) In the present study 3rd head of biceps brachii was seen in both arms originating from the antero medial surface and anterior border of shaft of humerus below the insertion of coracobrachialis (CB) and just above the origin of Brachialis muscle. The lower end was seen merging into bicipital tendon above the elbow [Figure-2]. Nerve supply by musculo cutaneous nerve was observed in both arms.

(ii) In the present study, an accessory muscle (Gantzer's muscle) was seen attached to FDP along with another slender muscle belly (accessory belly to FPL) which was joined with FPL. In both forearms these accessory bellies [Figure-3] were seen originated from common flexor origin that was medial epicondyle of humerus along with FDS. Both these muscles were innervated by median nerve by separate slender branches.

Insertion of this accessory muscle (Gantzer's) muscle- on right side it was merged into the profundus tendon which was going to middle finger (proximal to flexor retinaculum). On left side it was seen merging into the tendon of ring finger (proximal to flexor retinaculum) and ulnar nerve and artery are seen passing between this accessory muscle (Gantzer's) and FDP.

An extra muscle belly (accessory belly to FPL) was seen arising same as above along with FDS and was inserted into main belly of Flexor Pollicis Longus in the upper 1/3rd of fore arm passing below the median nerve, Ulnar artery and ulnar nerve passing between this belly and FDP.

DISCUSSION:

Several muscular variations have been reported in literature. Anomalous extensor muscles of the hand are not uncommon. The anomalous muscle encountered in this cadaver is usually described as the extensor digitorum brevis manus. It has also been called the "m.extensor anomalous" [1] and "le muscle manieux" [2].

Vast majority of variant muscles are asymptomatic throughout the life of the individual. Some, however, may be associated with dorsal wrist pain, particularly if the extensor digitorum brevis manus (EDBM) arises from the distal radius close to the fourth dorsal compartment of the wrist as reported in the present case, the "fourth compartment" syndrome may develop, which consists of pain produced by the

increase of pressure in the fourth compartment, which leads to a direct or indirect compression of the posterior interosseous nerve [3].

There are some cases reported in literature about EDBM. They describe an origin from the dorsal metacarpal surface or from the extensor tendons [4]. Its insertion has been described as being into the extensor hood of the index, middle, ring or little finger as well as combined insertions into more than one finger [5]. Depending on where it inserted, EDBM has also been named extensor indicis brevis [6], extensor digiti III brevis [7], extensor medii brevis, extensor brevis digiti indicis vel medii, extensor medii and annularis brevis [8]. The EDBM has been found with other muscular variations such as extensor pollicis et indicis communis; extensor indicis radialis [9].

According to the above description the EDBM we observed can be described as Extensor indicis brevis on left side and Extensor medii brevis on right side.

The EDBM has been proposed as a source for tendon transfer to restore malfunctioning muscles such as a damaged extensor pollicis longus [10]. Finally, it is noteworthy that the EDBM has also been observed with pathological findings such as capitate-hamate synostosis and extensor synovitis as well as with a ganglion [11]. In amphibia, the digits are controlled solely by intrinsic muscles, an EDBM muscle being situated on the dorsum of the manus. In humans, however, this muscle has disappeared in the upper limbs, its function being taken over by forearm muscles with long tendons to the digits. Most investigators believe that the EDBM is atavistic, representing parts of the old extensor brevis, a throwback to the intrinsic amphibian extensor due to failure of proximal migration of the ulnocarpal elements of the antibrachial muscle mass [12].

Muscles of front of arm develop from myogenic precursor cells that arise from ventral dermo-myotome of somites. Molecular changes occurring in these precursor cells induce muscle development. Muscle regulatory genes like Pax 3 and Myf 5 are activated and transcription factors like Myo D, myogenin and myogenic regulatory factors are expressed. Further growth of muscle occurs by fusion of myoblasts and myotubes and later are invested by connective tissue [13]. Variation of muscle patterns may be a result of altered signaling or stimulus between mesenchymal cells.

Different views exist for the presence of supernumerary heads of biceps brachii especially the infero-medial type. One school of thought is that these accessory heads of biceps may be due to the musculocutaneous nerve that pierces biceps and cause a longitudinal splitting of myotubules which get a covering of connective tissue and becomes a separate belly.

The most common type of third head is described as the inferomedial type that arises from the anterior surface of humerus between the insertion of coracobrachialis and origin of brachialis (Figure-2). Biceps brachii muscle is most variable in terms of number and morphology of its heads of origin. Previous studies show that the incidence of accessory heads of biceps to be rare in Indian population. It is found to be 2% in Indians according to Vollala [14], 5% in South Indians as reported by Lokanadham [15], 3.7% in Sri Lankan population as reported by Ilayperuma [16].

The biceps brachii is a large fusiform muscle deriving its name by its 2 proximally attached parts. There are reports describing supernumerary bicipital heads ranging from 3 to 7 in different population groups. The 3 headed variant is the most common type with prevalence ranging between 7.5–18.3% [16, 17].

In the present study, 3rd head of biceps brachii was seen originating below the insertion of coracobrachialis (CB), from the anteromedial surface and anterior border of shaft of humerus just above the origin of Brachialis muscle in both arms and it is seen merging into bicipital tendon above the elbow. Nerve supply by musculocutaneous nerve in both arms.

Previous studies show that the 3rd head of biceps brachii is seen in about 8% of Chinese [13,14], 10% of Europeans, 12% of Black Africans, 18% of Japanese, 20.5% of South Africans blacks, 8.3% of South Africans whites [17].

It is reported that human lack long head of CB, in cases where third head arises at the insertion of CB, it represents the remnant of long head of CB, an ancestral hominoid muscle [17].

In the cercopithecus, long head of CB may find insertion into radial tuberosity in common with biceps brachii [17]. The third head may provide additional strength to biceps during supination of forearm and elbow flexion irrespective of shoulder position [17, 18].

The presence of fusiform muscle belly or accessory muscle (Gantzer's) was reported back 1813 by Gantzer, and this muscle has been reported with variable attachments. These accessory heads of forearm muscles had been reported to insert into FPL or FDP [19].

The presence of Gantzer's muscle (also called accessory head of flexor muscles) have been described in primates and other mammals (pigs, foxes and marmots). It is the muscle belly that connects the medial epicondyle origin of FDS with more or less differentiated deep flexor muscles [19].

The flexors of forearm that develop from flexor mass are divided into two layers as superficial and deep. The FDS, FDP, FPL originate from deep layer. The existence of accessory muscles connecting the flexor muscle groups could be explained by incomplete cleavage of deep layer of flexor mass during development which represents an "atavistic character" [19].

We thus conclude that the present case is unique by retainment of ancestral character in each of the limb. It is "retrogressive" as the variations has occurred in lower forms of animals or in the embryonic life, later disappeared and again makes its presence in humans [20].

CONCLUSION:

This adds up to the present knowledge and also helps anatomists and clinicians for future references.

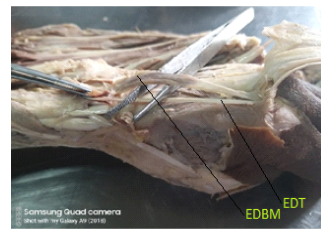


Figure 1: Extensor digitorum brevis manus (EDBM) muscle arising from fourth compartment of the extensor retinaculum. EDT- extensor digitorum tendon.



Figure - 2 : Photograph of right arm of an adult showing three heads of biceps brachii joining with each other to form the tendon. LH-- long head of biceps, SH short head, AH-Accessory head of biceps

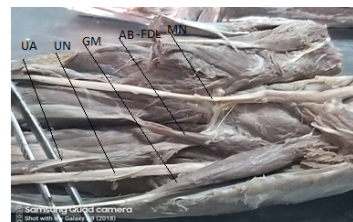


Figure -3: Photograph showing the Gantzer's muscle (GM) innervated by median nerve (n) (nerve to Gantzer's muscle) Unulnar nerve, UA- ulnar artery, MN- median nerve, AB- Abductor belly

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