Unusual Unilateral Muscular Variations Of The Flexor Compartment Of Forearm And Hand- A Case Report

*K. Kalyan Chakravarthi
Lecturer, Department of Anatomy,
Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation,
Chinnaoutpalli, Gannavaram Mandal, Krishna District (AP), INDIA, 521286.

ABSTRACT:
The muscular variations of upper limb are not uncommon. Their importance becomes apparent with regard to surgical approaches for various clinical conditions involving the upper limb. During routine dissection classes to undergraduate medical students, we came across one additional muscle in the deep flexor compartment of the right forearm of a middle aged male cadaver. It was located on the ventral aspect of the proximal forearm, in a plane deep to the flexor digitorum superficialis (FDS). Surprisingly the FDS tendon of the little finger was inserted to the flexor digitorum profundus (FDP) tendon of the same. It was observed that, the origin of all lumbricals was high up in the carpal tunnel with anomalous origin. The combination of these unilateral muscular variations in a single cadaver has not been cited in the recent medical literature. The anatomical aspects of these variations have been discussed in detail. Awareness of these variations is necessary to avoid complications during radiodiagnostic procedures or surgeries in the upper limb.

KEY WORDS: Flexor digitorum profundus, Flexor digitorum superficialis, Flexor pollicis longus, Gantzer’s muscle, lumbricals.

INTRODUCTION
A large part of hand and finger movement is governed by muscles and tendons originating in the in the forearm. Muscular variations of the flexor compartment of forearm and hand are usual and can result in multiple clinical conditions limiting the functions of forearm and hand. The variations of the muscles, especially accessory muscles may simulate soft tissue tumors and can result in nerve compressions. Flexor digitorum superficialis (FDS), which is often described as
intermediate layer of flexor compartment of the forearm. It splits into 4 tendons and insert to the sides of the middle phalange of the four fingers. These tendons have a split at the end of them through which the tendons of flexor digitorum profundus pass.

The primary function of flexor digitorum superficialis is flexion of the middle phalanges of the fingers at the proximal interphalangeal joints. It also flexes the metacarpophalangeal joints and wrist joint. Sometimes a muscular slip derived but separated from the flexor digitorum superficialis (FDP), or on a tendon that joins one of the tendons of the flexor digitorum profundus or flexor pollicis longus (Gantzer’s muscle) is found. The Gantzer’s muscle present in a higher percentage, 50%–66 % [1, 2]. Although the Gantzer’s muscle present in the present case, FDS tendon for the little finger inserted in to the flexor digitorum profundus tendon of the little finger is unique in this case.

Lumbricals are the four small intrinsic muscles of the hand. They arise from the four tendons of flexor digitorum profundus (FDP) in the hand and are inserted into the dorsal digital expansion of the medial four fingers. They are numbered from the lateral to the medial side. The first and second lumbrical muscles originate from the radial sides and palmar surfaces of the FDP of the index and middle finger, the third lumbrical from the adjacent sides of the FDP tendons of the middle and ring finger and the fourth lumbrical from the adjacent sides of the tendons of the ring and little finger. Knowledge of the existence of muscle anomalies as well as the location of compression is useful in determining the pathology and appropriate treatment for compressive neuropathies [3]. The origin of all lumbricals was placed in the carpal tunnel with anomalous origin makes the present case more interesting.

CASE REPORT:

During a routine cadaveric dissection for the undergraduate students at Pinnamaneni Siddhartha institute of medical sciences & research foundation Gannavaram; Krishna Dist; A.P (INDIA), we found an unusual muscular variations of the flexor compartment of forearm, carpal tunnel and hand.

OBSERVATION

We observed unusual unilateral muscular variations in the flexor compartment of forearm, carpal tunnel and hand.

In the flexor compartment of forearm:

The anomalous muscle was located on the ventral aspect of the proximal forearm, in a plane deep to the flexor digitorum superficialis (FDS). It was inserted into the tendon of the flexor pollicis longus (FPL). Surprisingly the FDS tendon of the little finger inserted in to the flexor digitorum profundus tendon of the little finger (Fig 1 & 2)

In the carpal tunnel and hand:

It was observed that the origin of all lumbricals was placed in the carpal tunnel with anomalous origin. First lumbrical arose from the ulnar side of the FDP tendon for the index finger. Third and fourth lumbricals were unipennate. Third lumbrical arose from the radial side of FDP tendon of the ring finger. Fourth lumbrical arose from the radial side of the flexor tendon formed by the union of the FDS and FDP of the little finger. The fourth lumbrical showed split insertion. (Fig -3)
Fig 1: Showing Muscular Variations in flexor compartment of forearm in right upper limb.

FDS - Flexor digitorum superficialis; FDP - Flexor digitorum profundus;
1 - Flexor digitorum superficialis tendon of little finger; 2 - Flexor digitorum profundus tendon of little finger;
3 - Tendon formed by the union of Flexor digitorum superficialis and Flexor digitorum profundus of little finger.

Fig 2: Showing Muscular Variations in flexor compartment of forearm in right upper limb.

FDS - Flexor digitorum superficialis; FDP - Flexor digitorum profundus; FPL - Flexor pollicis longus;
1, 2 & 3 - Flexor digitorum superficialis tendons for index, middle and ring fingers;
4 - Fourth tendon of Flexor digitorum superficialis unites with the Flexor digitorum profundus for little finger;
5 - Fifth tendon of Flexor digitorum superficialis (Gantzer’s muscle) unites with the Flexor pollicis longus.
Fig -3: Showing Muscular Variations of hand in right upper limb

A, B & C - Tendons of Flexor digitorum profundus; D - Tendon formed by the union of Flexor digitorum superficialis and Flexor digitorum profundus of little finger; 1 - First lumbrical originated from the ulnar side of the FDP tendon for the index finger; 2 - Second lumbrical; 3 and 4 - Unipennated 3rd and 4th lumbricals; a and b - The fourth lumbrical showing split insertion.

DISCUSSION

Anomalous muscles in the flexor compartment of the forearm are quite common, different anomalies of flexor muscles of forearm have also been described. The FDP may be joined by accessory slips from the radius, from FDS, FPL (Flexor pollicis longus), medial epicondyle or coronoid process of the ulna [4]. But in this case the FDS tendon for the little finger inserted into the flexor digitorum profundus tendon of the same in the lower part of forearm (Fig- 1 & 2), has not been reported in modern literature.

Accessory muscles or tendons in the forearm may lead to confusion during surgical procedures or cause compression of neurovascular structures. Degroef and Smet (2004) reported a case where an older female patient with paralysis of the anterior interosseous nerve is reported. During exploration of an accessory muscle slip running from the coronoid process of the ulna towards the flexor pollicis longus (Gantzer’s muscle) was found compressing the nerve [5]. In the present case we observed an additional muscle originated from the deep surface of the FDS was a Gantzer's muscle as it was inserted into the tendon of the flexor pollicis longus (Fig-1 & 2).

The lumbricals of the upper limb are four small muscles resembling the shape of earthworms and hence they are named so. Variations in the attachments of the lumbricals are common. In a study which was conducted by Mehta HJ (1961), it was noted that the lumbricals had an occasional origin in the forearm or from a metacarpal or from the superficial instead of the deep flexor tendons and that the third and fourth lumbricals originated from a single tendon instead of two [6]. Another study which was done by Kurzumi M (2002) revealed that the lumbrical muscles originated from the intermediate tendon of the deep layer of
the flexor digitorum superficialis of the index finger [7]. Lumbricals often show split insertions. Basu S reported that, the lumbrical tendon split to go to the adjacent sides of the two fingers, or less frequently inserted entirely on the ulnar side of the adjacent digit [8].

But in this case first lumbrical originated from the ulnar side of the FDP tendon of the index finger. Third and fourth lumbricals are unipennate. Third lumbrical originated from the radial side of FDP tendon for the ring finger. Fourth lumbrical originated from the radial side of the flexor tendon formed by the union of the FDS and FDP of the little finger. The fourth lumbrical showed split insertion (Fig- 3). These types of variations are interesting not only to anatomists, but also to orthopedic surgeons, physiotherapists and radiologists. Hence the clinician must be aware constantly of such possibilities, although preoperative diagnosis may be difficult. Structural compression of the median nerve can cause carpal tunnel syndrome. Possible causes of such a compression include: synovitis and ganglions, [9] lumbrical muscles originating from the distal part of the forearm, [10] aberrant muscles and tumours, [11] as well as anatomical anomalies, such as a persistent median artery [12]. Entin grouped causes of carpal tunnel syndrome into three categories: those reducing the capacity of the tunnel; those increasing the volume of its contents; and those that form part of a systemic condition [13]. All the lumbrical muscles found in the carpal tunnel in the present case increase the volume of the carpal tunnel and may cause carpal tunnel syndrome.

We believe that the anatomical muscular variations found in this case may be significant in preoperative diagnosis and in the hand during surgery. Awareness of these variations is necessary to avoid complications during radiodiagnostic procedures or surgeries in the antebrachial and hand regions of upper limb.

REFERENCES


*Corresponding author: K. Kalyan Chakravarthi
E-mail: kalyankosuric@gmail.com