Bilateral Variation of Forearm Flexor Muscles – A Case Report and Clinical Significance

1D. Malar, 2Hemamalini
1, 2Assistant Professor, Department of Anatomy, J.S.S. Medical College, Mysore, Karnataka.

ABSTRACT

During routine dissection, bilateral multiple variations of forearm flexor muscles were observed in a male cadaver. The variations were a) an additional belly arising from the coronoid process of ulna, distal to the origin of ulnar head of flexor digitorum superficialis, passing deep to flexor digitorum superficialis and joining the tendon of flexor digitorum profundus to the middle finger; b) an additional belly arising from the distal part of flexor carpi ulnaris and passing superficial to ulnar nerve and ulnar vessels in the Guyon’s canal and c) the origin of second lumbricals from the profundus tendon in the carpal tunnel. An aberrant muscle may stimulate a ganglion or a soft tissue tumor or if in close proximity to a nerve, it may cause pressure neuritis. Identification of these variations is important in defining the anatomical features for clinical diagnosis and surgical procedures.

Key words: Flexor digitorum profundus, Flexor carpi ulnaris, Compression neuropathy.

INTRODUCTION

Forearm flexor muscles are known to exhibit muscular variations. A number of authors have reported different variations of flexor muscles; Accessory heads of deep flexors of the forearm (Gantzzer’s muscles) has been described as two different bellies that inserts either into flexor pollicis longus (FPL) or Flexor digitorum profundus (FDP)1. In a study on forearm flexor muscles the author described two accessory muscles which bears his name3. The ‘accessorius ad pollicem’ found to arise from the coronoid process of ulna, and is inserted into the flexor pollicis longus. The less frequently observed ‘accessories ad flexorem profundum digitorum’ (flexor digitorum profundus accessory head) found to arise from the coronoid process of ulna, and inserted into the flexor digitorum profundus. The incidence of accessory head of FDP has been reported with varying prevalence of 2.9% to 27.5%. The bilateral prevalence was 16.7%2. The flexor digitorum profundus accessory head has been observed to arise from the coronoid process, the medial epicondyle via fibers of the flexor digitorum superficialis or a combination of the two2, 3. In the present study an accessory muscle was observed bilaterally, arising from the coronoid process of ulna, distal to the origin of flexor digitorum superficialis and passing deep to flexor digitorum superficialis. The tendon of the accessory muscle passed superficial to the flexor digitorum profundus and joined with tendon of profundus for the middle finger. The muscle was supplied by a branch from the median nerve.

Not many variations of flexor carpi ulnaris are reported in the literature. Anatomical variations of the flexor carpi ulnaris that have been reported previously are (a) variations in musculotendinous junction of the flexor carpi ulnaris muscle (b) variant flexor carpi ulnaris causing ulnar nerve compression (c) an additional slip of flexor carpi ulnaris4 (d) Accessory flexor carpi ulnaris5. The accessory flexor carpi ulnaris has been previously described by a few authors. In the present case we report an additional slip of flexor carpi ulnaris. The muscle was bilaterally symmetrical.

The lumbricals are four small muscles arising from the tendons of flexor digitorum profundus in the palm. The first and second are unipennate arising from the anterolateral surfaces of tendon of flexor digitorum
profundus to index & middle finger, whilst the third and fourth are bipennate and arise from the adjoining sides of two adjacent tendons of flexor digitorum profundus to middle, ring & little finger. In the present study the second lumbrical was originating from the profundus tendon within the carpal tunnel. Similar observation has been made by other studies⁴. Lumbrical muscle inclusion within the carpal tunnel has been implicated as a possible cause of carpal tunnel syndrome.

The variations of muscle especially accessory muscle may stimulate soft tissue tumor or if in close proximity to a nerve, it may cause pressure neuritis. The morphology and relations of the accessory muscles of the flexor muscles of the forearm are of importance from the clinical and surgical point of view.

CASE REPORT

During routine dissection of cadavers, fixed in 10% formalin, allotted to the, undergraduates for dissections bilateral multiple muscle variations of the forearm flexors were observed.

An accessory muscle was seen bilaterally, arising deep to flexor digitorum superficialis, from the coronoid process of ulna, distal to the origin of ulnar head of flexor digitorum superficialis. The muscle was between the flexor digitorum superficialis and flexor digitorum profundus. The muscle had a proximal muscular part and a distal tendinous part. The tendon passed superficial to the flexor digitorum profundus and joined with tendon of profundus to the middle finger. The muscle was supplied by a branch from the median nerve.

In the same specimen, an additional muscle was seen arising bilaterally from the radial side, from the fascia covering the distal part of flexor carpi ulnaris. This muscle had a proximal muscular part, which was passing superficial to the ulnar nerves and vessels at the wrist (Guyon's canal). Between the abductor digiti minimi and flexor digiti minimi it becomes tendinous and gets inserted to the ulnar side of the base of proximal phalanx of little finger, along with abductor digiti minimi and flexor digiti minimi.

The second lumbrical muscle originated from the tendon of flexor digitorum profundus to the index and middle finger in the carpal tunnel. (See fig. 1-4)

DISCUSSION

During routine dissection bilateral accessory muscles were observed in an adult male cadaver. The variations include an accessory muscle, arising from the deep surface of flexor digitorum superficialis and inserting into the tendon of flexor digitorum profundus muscle to the middle finger (Gantzer's muscle), an additional belly of flexor carpi ulnaris and the origin of lumbrical muscle in the carpal tunnel.

In previous study two accessory muscles have been described: flexor pollicis longus accessory head and a less frequent flexor digitorum profundus accessory head. Since their initial description, they have been examined in further details by a number of authors ⁵. The flexor muscles of forearm develop from the flexor mass which divides into two layers, superficial and deep. The flexor digitorum superficialis, flexor digitorum profundus and flexor pollicis originate from deeper layer. The presence of accessory muscles connecting the flexor muscles could be explained by incomplete cleavage of the deep layer of the flexor mass during development⁶. The flexor carpi ulnaris initially shows two muscular elements which later unite to form one muscle. The occurrence of an accessory muscle may be because of failure of fusion of the two muscular elements. This distinct morphology is an example of aberrant muscle that potentially leads to distal ulnar nerve compression⁷.

In the present study the accessory muscle of flexor carpi ulnaris was passing superficial to the ulnar nerve at the Guyon's canal and may cause compression of the ulnar nerve. Abnormal muscle in this region can
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Fig 1: Anterior view of the right forearm and hand. Superficial muscles are reflected to show the accessory belly. Downward yellow arrow indicate the tendon of accessory muscle to the middle finger. Upward yellow arrow indicates the tendon of flexor digitorum profundus to middle finger.

Fig 2: Anterior view of the left forearm and hand. Superficial muscles are reflected to show the accessory belly. Downward yellow arrow indicate the tendon of accessory muscle to the middle finger. Upward yellow arrow indicates the tendon of flexor digitorum profundus to middle finger.

Fig 3: Anterior aspect of lower part of right forearm and hand.

Fig 4: Anterior aspect of lower part of left forearm and hand.

Abbreviations: AMB-1: Accessory muscle belly-1; AMB-2: Accessory muscle belly-2; FCU: Flexor carpi ulnaris; FDP: Flexor digitorum profundus; FDS: Flexor digitorum superficialis; LB: Lumbrical; MN: Median nerve; P: Pisiform bone; TM: Thenar muscles; UN: Ulnar nerve; UV: Ulnar vessels.
compress the ulnar nerve within Guyon's canal. Accessory muscles are the most frequently described anatomical variations at Guyon's canal. They may be an aberrant flexor carpi ulnaris, anomalous palmaris longus or anomalous hypothenar muscles.

The lumbral muscles usually originate from the radial side of the tendon of flexor digitorum profundus at the level of metacarpals, which is distal to the carpal tunnel. In the present study the second lumbral was arising from the tendon of flexor digitorum profundus for the index and middle finger in the carpal tunnel. It has been observed that the proximal attachment of the second lumbral, in large percentage of cases, extending into the carpal tunnel compared to the rest of the lumbral muscles. A number of authors have described the origin of lumbricals being significantly proximal in patients with carpal tunnel syndrome. In cases of carpal tunnel syndrome and persons whose job requires repetitive finger movements, the origin of lumbricals has been found to be proximal. In a study on cadavers it was found that inclusion of the lumbricals into carpal canal may be a possible cause of occupational-related carpal tunnel syndrome.

The additional flexor tendon and the second lumbral muscle observed in the carpal tunnel in the present study increases the volume of the carpal tunnel and may cause carpal tunnel syndrome. Anomalous or accessory muscles have been implicated as a potential source of clinical symptoms. The symptoms may be secondary compression of adjacent structures such as nerves, vessels, or tendons or related to a palpable swelling. Further, flexor carpi ulnaris is useful in surgical rehabilitation of patients with paralytic disorders and also tendon grafts. Additionally knowledge of such variations supplements the anatomical information on the muscles of the antebrachial and carpal regions may become significant in preoperative diagnosis and in the hand during surgery.

CONCLUSION

The variations of muscle especially accessory muscle may stimulate soft tissue tumor and can result in nerve compression. The diagnosis of an accessory muscle depends on a familiarity with these variants and a good knowledge of normal anatomy. Therefore it is important to continue to record and discuss anatomical anomalies.

REFERENCES

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Address for communication:
Dr. D. Malar,
658/B, 7th Main, 8th Cross,
Vijayanagar 1st Stage, Mysore, Karnataka - 570 017,
e-mail ID: janavi.tk@gmail.com
Mobile: 09448434067