The presence of an additional first lumbral muscle starts from the body of flexor digitorum profundus muscle

INTRODUCTION

The lumbricals in human hand are four in number. They are intrinsic muscles of the human hand, and their origin is from the radial side of the flexor digitorum profundus tendon respectively corresponding to the index finger, middle finger, ring finger and little finger (Putz and Pabst, 2000).

It is important to mention that first and second lumbricals are unipennate muscles whereas third and fourth lumbricals are bipennate muscles. Each muscle forms a narrow tendon and on reaching the dorsal surface of the proximal phalanx joins the margin of the dorsal digital expansion (Williams et al., 1995). Their body passes posteriorly along the radial side respectively of the index finger, middle finger, ring finger and little finger and inserts on the extensor expansion near the metacarpophalangeal joint.

Usually, the first and second lumbricals are innervated by the median nerve. The nerve supply of the third and fourth lumbricals is from the deep branch of the ulnar nerve. Sometimes, the third lumbral is innervated by the median nerve (Williams et al., 1995). It is possible that the second lumbral is innervated by the ulna nerve. It means that the ratio between the median nerve and the ulna nerve may be as 2: 2 and 3: 1, and 1: 3 (Putz and Pabst, 2000).

In normal anatomy of the hand, blood supply of the lumbricals is from the superficial palmar arch, the deep palmar arch, the common palmar digital artery and the dorsal digital artery (Putz and Pabst, 2000). Their function is to flex the metacarpophalangeal joints and to extend the interphalangeal joints. Some variations in the attachments of the lumbricals muscles have been commonly reported in the Caucasian population, as well as an anomaly in a Chinese cadaver (Singh et al., 2001), South Indian cadavers (Potu et al., 2008).

Interesting findings are about unusual anatomical variant of lumbral muscles in a functionally normal hand (Frank...
Durksen). Literature data shows other different variation about lumbricals - carpal tunnel syndrome, which manifested an anomalous origin of the lumbral from muscles in the forearm and has the potential to cause compression of the median nerve in the carpal tunnel (Singh et al., 2001). We did not find enough evidence for the connection of first lumbral muscle with the body of the flexor digitorum profundus muscles. As such, the aim of the present work was to describe and analyze the unusual anatomical variation of the additional and the normal lumbral muscles captured together of the usual place - the dorsal aponeurosis of the index.

MATERIALS AND METHODS

The materials for the present study were taken from human cadaveric materials. Fixation of cadaveric materials in the dissecting room training for students and graduates of each medical university in the European Union is very specific and regulated by the principal politic of state law. During routine dissection in April, 2012 in the section hall of the Department of Anatomy and Histology in Medical University, Sofia, we came across a very interesting variation in the presence of an additional first lumbral muscle on the left upper limb. It was found that the additional first lumbral muscle comes from the body of the flexor digitorum profundus muscle.

The observations were made in accordance to the ethical principles applied by the Sofia's Medical University. All legislative requirements to protect human rights have been respected as well. This unusual anatomical variation was photographed using a Nikon Coolpix 995 camera with a 3.34 Megapixels.

RESULTS

Muscle lumbricales are four small muscles that start from the tendons of muscles flexor digitorum profundus. Muscle lumbricales I and II from the anterolateral aspect of the tendons of the second and third fingers are caught laterally on the dorsal tendon finger digitorum muscle profundus for the soil level of metacarpophalangeal joints. Muscle lumbricales III and IV starting from next tendons of III and IV and V tendons. Their end tendons attach to the dorsal tendon area of finger muscles extensor digitorum and correspond to the fourth and fifth finger at the level of metacarpophalangeal joints. The size of our study muscle lumbricales of cadaver material seniors are averaged between 4 and 7 cm and depend on the size of the metacarpal boons (hand respectively). These characteristics are determined by morphological peculiarity such as height, gender, age, race and other anthropometric factors.

Bellies of I and II are unipennate lumbral muscle while bellies of III and IV are bipennate, consisting of two bellies and attached to the tendon of the muscle flexor digitorum profundus at the level of the proximal part of the metacarpals (Putz and Pabst, 2000).

In the routine work, we came across a very interesting variation in the presence of an additional first lumbral muscle on the left upper limb. Our scientific interest in the muscular abnormalities varieties includes a longer period of time. In the last 20 years in the dissecting rooms of the Department of Anatomy of Sofia's Medical University are dissected an average of 10 upper and 10 lower limb. This means that during this period there have been 200 upper limbs studied, and have been tracked at prehensile places and varieties of 800 lumbral muscles. Our findings described in this article is the first of its kind in our practice.

The left upper limb of a 76 years old woman with reduced fat and bulging muscles showed an interesting variation. It was found that the presence of additional first lumbral muscle comes from the body of the flexor digitorum profundus muscle. This variation is unique for our population.

Lumbral muscles are a small muscle group located in the space between the metacarpals and flexion of the metacarpophalangial join. Figure 1 shows a normal first lumbral muscle without variations. Its origin is from the radial side of the flexor digitorum profundus tendon respectively corresponding to the index finger and inserts to the dorsal surface of the proximal phalanx of the index. On the same upper limb we found the presence of an additional first lumbral muscle comes from the body of the flexor digitorum profundus muscle (Figure 2). It started from the very high proximal part of the forearm (Figure 3).

The additional lumbral muscle began with the tendon. Then, its tendon turned into muscle belly located in the distal part of the forearm (Figure 4). Finally, the additional first lumbral muscle ended with the tendon, which merged with the tendon of the first lumbral muscle (Figure 5) and these tendons captured together at the usual place - the dorsal aponeurosis of the index (Figure 6). The right upper limb of the same cadaver was not available and we do not know whether there were same variations of the lumbral muscles.

DISCUSSION

Normally, the lumbral muscles are four in number and their origin is from the radial side of the flexor digitorum profundus tendon respectively corresponding to the index finger, middle finger, ring finger and little finger. Each muscle forms a narrow tendon and when it reaches to the dorsal surface of the proximal phalanx, it joins the margin of the dorsal digital expansion.

Lumbricals are part of the intrinsic musculature which is important for its delicate digital movements. Lumbricals
are quite unique as they connect the flexors of the digits to the extensors and that both of their attachments are mobile. It is important to mention that the articular system in the digits is connected by mechanical links and lumbrical muscle is one of the links of this system that produces dynamic controlled extension of interphalangeal joints (Potu et al., 2008).

Haines (1950) studied flexor muscles of the forearm and
hand in the mammals and lizards. He suggested that the flexor digitorum superficialis in mammals is homologous with the intrinsic muscles of the palm, and that it shifts its origin proximally in the forearm. Furthermore, Koizumi et al. (2002) mentioned that the first lumbrical muscle and the distal muscle belly for the index finger of the flexor
Figure 5. The additional first lumbrical muscle - it ended with the tendon, which merges with the tendon of the first lumbrical muscle.

Figure 6. The additional and the normal lumbrical muscles captured together of the usual place - the dorsal aponeurosis of the index.
digitorum superficialis have an intimate relationship with each other, and have a common phylogenetic origin.

The anatomical literature has indicated small literature data describing a similar variation. Mehta and Gardner (1961) described the anomalous origin of first lumbral in 2.7% cases they studied. Koizumi et al. (2002) and Soubhagya et al. (2008) described an additional first lumbral starting from the body of the flexor digitorum superficialis muscle. The additional first lumbral starting from the flexor digitorum profundus muscle like our case also was described (Singh, 2001).

It is interesting to mention that this additional first lumbral muscle started from the distal part of the flexor digitorum profundus muscle whereas in our case, the origin of the additional first lumbral is proximally. There are literature data about variations of the first lumbral muscle which are different from the aforementioned described variation. The anomalous and additional lumbral muscle as a cause of carpal tunnel syndrome is in agreement with the study of Butler and Bigley (1971), Eriksen (1973), and Robinson et al. (1989).

Biomechanical functions of lumbral muscles are expressed in flexion of metacarpophalangeal joints and subsequent extension of the middle and distal phalanges of the fingers of the hand. Long body and tendon described in our variety trove showed that lumbral muscle passes through carpal channel. We suppose that in patients with the similar constitution of hand, this variety could cause biomechanical disorders, as well as inflammation in carpal tunnel such as in diabetes, arthritic changes in the joints, and involvement of the area of Pirogov - Parona.

Conclusion

In conclusion, the knowledge of this additional lumbral muscle is interesting whether this additional first lumbral muscle may lead to carpal tunnel syndrome, which requires operative treatment. On the other hand, it is very important to consider the occurrence of the aforementioned variations in the additional first lumbral muscle when surgical procedures are performed on the hand. It would be interesting to study in the future the upper lamb in people with similar varieties, how it affected the mobility of the phalanges of the fingers connected with specific activities, for example, writing, drawing, and use of different instruments etc.

REFERENCES


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