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Morphological Variations in Lumbricals of Upper Limb: A Cadaveric Study

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Abstract

The hand is a prehensile organ, it is endowed with grasping and precision movements for skilled work and it acts as a chief tactile apparatus. This is contributed by a higher degree of neuromuscular co-ordination and a larger cortical representation of the hand in the sensory motor cortex of the brain. This study was done on 30 cadavers who were available in the Department of Anatomy, National Medical College, Birgunj, Nepal. 93.3% of the lumbricals were normal in origin, innervation and its insertion. Variations were found in many of the specimens. 6.67% of the lumbricals showed a proximal origin, in 3.3% of the total specimens, 2nd lumbricals were bipennate. 3rd lumbrical was absent in 6.67% of the specimens and 1stlumbrical was hypertrophied in 3.3%.

Keywords: Variation in lumbricals; cadaveric study; Nepal

Introduction

The hand is a prehensile organ, it is endowed with grasping and precision movements for skilled work and it acts as a chief tactile apparatus. This is contributed by a higher degree of neuromuscular co-ordination and a larger cortical representation of the hand in the sensory motor cortex of the brain [1]. Thus human hand is a revolution in evolution. Indeed the lumbricals of the hand by producing flexion at the metatarsophalangeal joints and extension at the interphalangeal joints helps in writing, stitching and any other forms of precision work [2].

Lumbricals play a vital role in precision movements of the hand. These are four small muscles of the hand [2,3]. They are numbered from lateral to medial side. They originate in the palm from the tendons of flexor digitorumprofundus, pass distally along the corresponding metatarsophalangeal joint in front of the deep transverse metacarpal ligament. Each muscle forms a narrow tendon and on reaching the dorsal surface of the proximal phalanx joins the margin of the dorsal digital expansion. Lumbrical muscle variation has been reported in the literature by various authors [2-4].

Materials and Methods

Source of the data

This study was done on 30 cadavers who were available in the Department of Anatomy from the period July 2013 to July 2014.

Method

The study was carried out during the routine dissection procedure in the Department of Anatomy, National Medical College, Birgunj, Nepal after prior permission from Research and Ethical Committee of Institution. A longitudinal incision was taken from the distal end of the flexor retinaculum, up to the level of the metacarpophalangeal joint of the middle finger. The superficial fascia, the deep fascia and the flexor retinaculum were dissected and reflected. Then, the palmar aponeurosis and the slips which pass from its margin to each of the fingers was dissected and reflected. Then the tendons of flexor digitorumsuperficialis, flexor digitorumprofundus, branches of median nerve and superficial palmar arch were retracted. The lumbrical muscles which were situated at the distal end of flexordigitorumpro fundus were carefully observed. The lumbrical muscles were followed to their tendons which pass with the proper digital vessels and nerves to the lateral side of the base of each finger and later, the tendons of each of the lumbrical muscles were traced up to their insertions. The study was carried out to check for the variations in the origin, insertion, innervation and the extension of lumbrical muscle.

Results

The study was carried out in 30 cadavers and the results obtained were as follows (Table 1).

Variations	Percentage	Number of specimens in which variation was obtained
Normal Origin	93.30%	24
Proximal Origin	6.67%	2
Bipennate 2nd Lumbrical	3.30%	1
Absent 3rd Lumbrical	6.67%	2
Hypertrophied lumbrical	3.30%	1

Table 1: Summary of 30 cadavers

The lumbricals taking a normal origin distal to the flexor retinaculum and arising from the tendons of flexor digitorumprofundus was observed in maximum number of specimen's. However, significant variations were also observed. 6.67% of the lumbricals had a proximal origin (Figure 1) beneath the flexor retinaculum and a normal insertion.

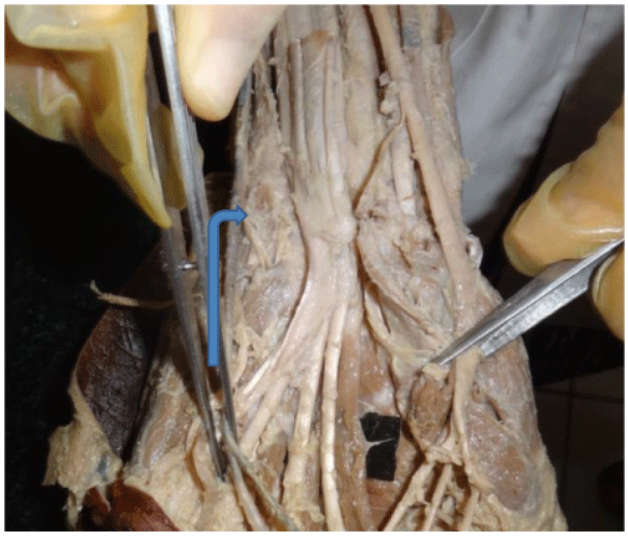

Figure 1: Proximal Origin of lumbrical in carpal tunnel

Figure 2: Bipennate origin of second lumbrical

About 3.3% of the 2nd lumbricals (Figures 2 and 3) showed a bipennate origin arising from the first and second flexor digitorum profundus tendon but these showed a normal insertion. In 6.67% of the specimens there was absence of 3rd lumbrical noted (Figures 4 and 5). In 3.3% of the specimens the first lumbrical showed a normal origin and insertion but it was hypertrophied (Figure 9).

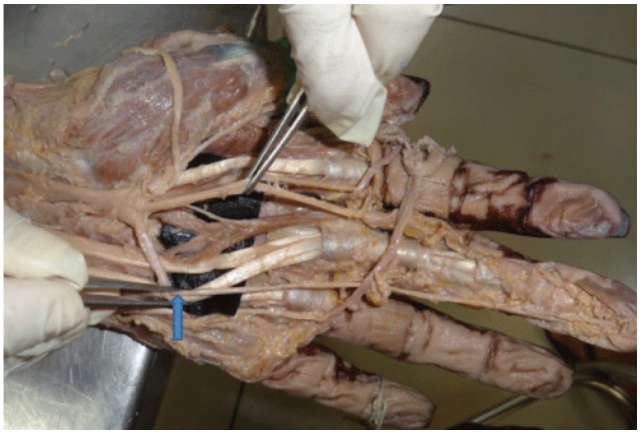

Figure 3: Bipennate origin of second lumbrical

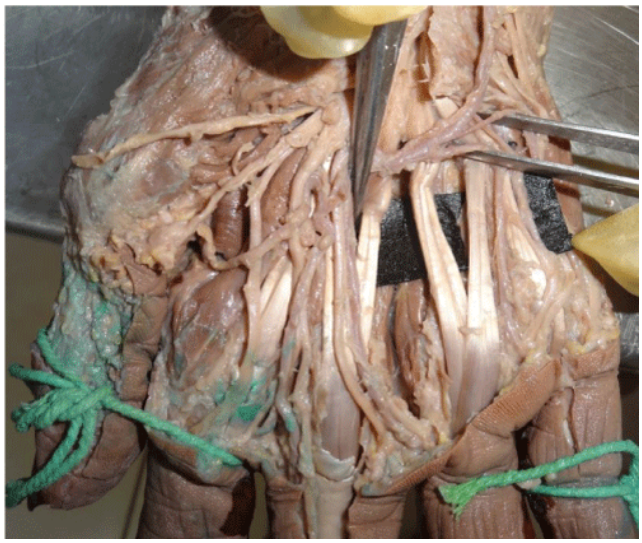

Figure 4: Absence of third lumbrical-1

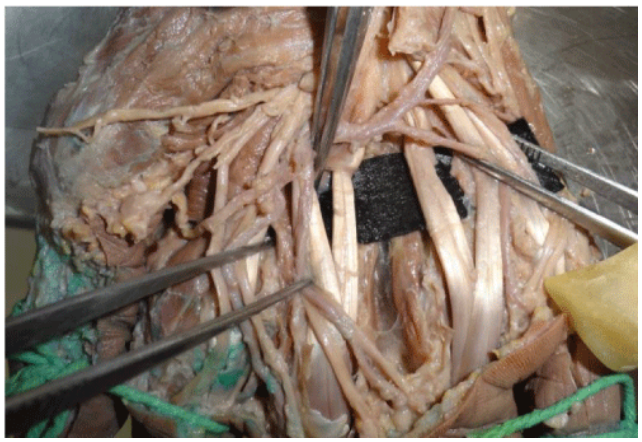

Figure 5: Absence of third lumbrical-2

The nerve innervation to all the lumbricals was normal, first two being supplied by the median nerve (Figure 6) and third and fourth being supplied by ulnar nerve.

Figure 6: Innervation by median nerve

Discussion

Lumbrical as a part of the intrinsic musculature is important for its digital movements. Lumbricals are unique as they connect the flexors of the digits to the extensors [2,5]. Anomalous and additional lumbrical muscle can cause carpal tunnel syndrome by compressing the median nerve [2,6].

The presence of an additional muscle belly for the first lumbrical (Figures 7 and 8) has a phylogenetical significance and the occurrence of such an anomalous muscle belly may compress the median nerve in carpal tunnel [3,4]. A muscle which arouses from the anomalous flexor pollicis longus (Figure 9) tendon in the region of the metatarsophalangeal joint, passes across the narrowed first web space joined the lumbrical belly of the index and inserted into extensor hood of that digit. Because of its attachments and action, it was given the name musculus lumbricals spollicis [4]. Additionally, notification of such muscular variants presumes importance in event of surgical intervention.

The anomalous origin of the lumbrical distal to its normal origin beneath the flexor retinaculum and cause compression of median nerve in carpal tunnel [2,4]. Hypertrophy of the lumbrical muscles which could compression of radial and ulnar arteries of the fingers, causing chronic sub ischemia [7].

The lumbricals also show variations in being unipennate or bipennate (Figures 3 and 4) [8,9]. The present study conducted, presence of bipennate 2nd lumbrical was obtained in 3.3% of the specimen's. The significance and etiology of the presence of bipennate lumbrical was not found in literature.

A study by Koizumi et al. ended that evidence of absence of 4th lumbrical was the most frequently absent of the lumbricals. In the present study, absence of 3rd lumbrical (Figures 6 and 7) was observed in 6.67% of the specimens.

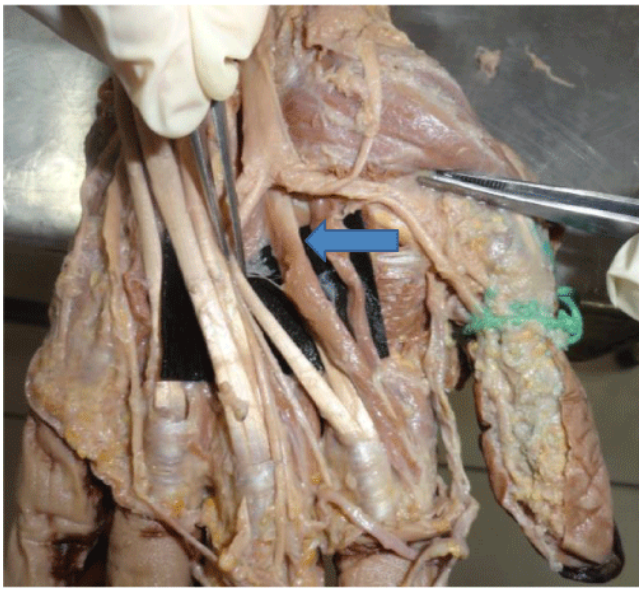

Figure 7: Bifid origin of first lumbrical

Figure 8: Hypertrophied first lumbrical

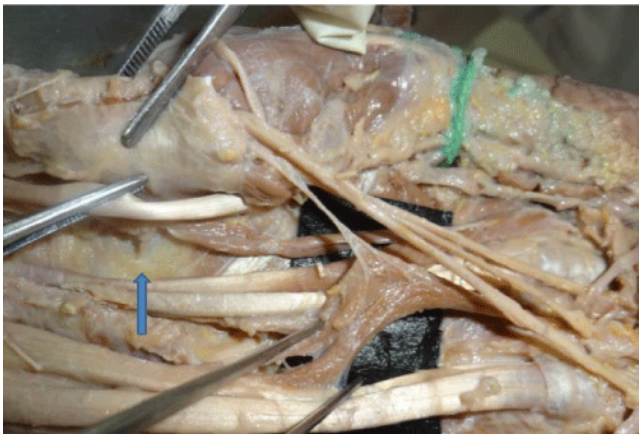

Figure 9: Slip of muscle from tendon of flexor pollicis longus

Conclusion

In the present study we found that 93.3% of the lumbricals were normal in origin, innervation and its insertion. Variations were found in many of the specimens. 6.67% of the lumbricals showed a proximal origin, in 3.3% of the total specimens, 2nd lumbricals were bipennate. 3rd lumbrical was absent in 6.67% of the specimens and 1st lumbrical was hypertrophied in 3.3%.

Clinicians and hand surgeons should be aware of enormous variations in lumbricals during various surgical procedures of hand.

Hypertrophied lumbricals can cause compression of the radial and ulnar digital arteries leading to chronic ischemia. Hence, a complete knowledge of lumbricals is essential.

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