



## SHORT COMMUNICATION

## The cadaveric study of lumbricals of hand in 100 specimens

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### Abstract

This study on the lumbricals was performed on 50 (100 specimens of human hands) embalmed donated cadavers (40 males & 10 females) in the department of Anatomy of K.J. Somaiya Medical College, Sion, Mumbai, India. The dissection of the palm was done meticulously to expose all the tendons of flexor digitorum superficialis and flexor digitorum profundus. The proximal and distal attachments of the lumbricals were seen. The arterial pattern of upper limb was also observed. The photographs of the variations were taken for proper documentation. Out of 100 specimens the variations were observed in 22 specimens. Out of 22 specimens in 7 specimens two bellies of second lumbrical were observed originating from the radial side of the tendon of both flexor digitorum profundus and flexor digitorum superficialis going to the middle finger, in 5 specimens an accessory belly of first lumbrical was observed originating from the radial side of the tendon of the flexor digitorum profundus going to the index finger and in remaining 10 specimens the bipennate second lumbrical originating from the ulnar side of the tendon of the flexor digitorum profundus going to the index finger and radial side of the tendon of the flexor digitorum profundus going to the middle finger was observed. There were no associated neurovascular variations seen. All the variations were unilateral.

**Key words:** Lumbricals, Accessory Belly, Bipennate, Flexor Digitorum Profundus, flexor digitorum superficialis

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### Introduction

The lumbricals are intrinsic muscles of the hand that flex the metacarpophalangeal joints and extend the interphalangeal joints (Standing, 2005). There are four of these small, worm-like muscles on each hand. These muscles are unusual in that they have no bony attachment. Instead they attach proximally to the tendons of flexor digitorum profundus and distally to the extensor expansions (Gosling et al., 2008). The first lumbrical is unipennate. It originates from the radial side of the most radial tendon of the flexor digitorum profundus corresponding to the index finger. It passes posteriorly along the radial side of the index finger to insert on to the extensor expansion near the

metacarpophalangeal joint. The second lumbrical is also unipennate. It originates from the radial side of the second most radial tendon of the flexor digitorum profundus which corresponds to the middle finger. It passes posteriorly along the radial side of the middle finger and inserts on to the extensor expansion near the metacarpophalangeal joint.

The third lumbrical is bipennate. One head originates on the radial side of the flexor digitorum profundus tendon corresponding to the ring finger, while the other originates on the ulnar side of the tendon for the middle finger. The muscle passes posteriorly along the radial side of the ring finger to insert on its extensor expansion. The fourth lumbrical is bipennate. One head originates on the radial

side of the flexor digitorum profundus tendon corresponding to the little finger, while the other originates on the ulnar side of the tendon for the ring finger. The muscle passes posteriorly along the radial side of the little finger to insert on its extensor expansion. The first and second lumbricals, the radial two are innervated by the median nerve. The third and fourth lumbricals, the ulnar two are innervated by the deep branch of the ulnar nerve. This is the usual innervation of the lumbricals occurring in 60% of individuals. However 1:3, median:ulnar - 20% of individuals and 3:1, median:ulnar - 20% of individuals also exist.

The lumbrical innervation always follows the innervation pattern of the associated muscle unit of flexor digitorum profundus i.e. if the muscle units supplying the tendon to the middle finger are innervated by the median nerve, the second lumbrical will also be innervated by the median nerve (Chummy Sinnatamby, 2011). There are four separate sources of blood supply for these muscles: the superficial palmar arch, the common palmar digital artery, the deep palmar arch, and the dorsal digital artery. The lumbrical muscles, with the help of the interosseous muscles, simultaneously flex the metacarpophalangeal joints while extending both interphalangeal joints of the digit on which it inserts. The lumbricals are used during an upstroke in writing. As a part of the intrinsic musculature, the lumbricals are important for delicate digital movements. They are said to flex the metacarpophalangeal joints and extend the interphalangeal joints. These are quite unique in their position as they connect the flexors of the digits to the extensors and that both of its attachments are mobile. These play a vital role in the precision movements of the hands, along with thenar, hypothenar, and interossei muscles. There are also lumbrical muscles of the foot that

have a similar action, though these are of less clinical concern.

### **Materials and Methods**

This study on the lumbricals was performed on 50 (100 specimens of human hands) embalmed donated cadavers (40 males and 10 females) in the department of Anatomy of K.J. Somaiya Medical College, Sion, Mumbai, India. The dissection of the palm was done meticulously to expose all the tendons of flexor digitorum superficialis and flexor digitorum profundus. The proximal and distal attachments of the lumbricals were seen. The arterial pattern of upper limb was also observed. The photographs of the variations were taken for proper documentation.

### *Observations*

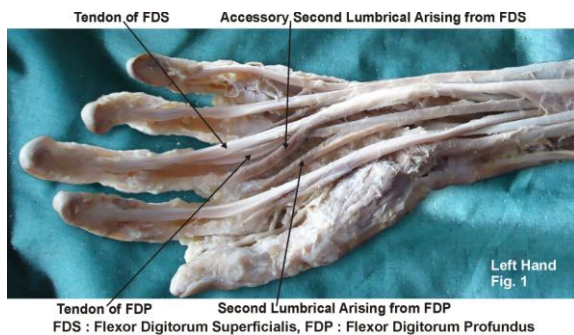
Out of 100 specimens the variations were observed in 22 specimens. Out of 22 variant specimens in 7 specimens two bellies of second lumbrical were observed originating from the radial side of the tendon of both flexor digitorum profundus and flexor digitorum superficialis going to the middle finger (Fig. 1), in 5 specimens an accessory belly of first lumbrical was observed originating from the radial side of the tendon of the flexor digitorum profundus going to the index finger (Fig. 2) and in remaining 10 specimens the bipennate second lumbrical originating from the ulnar side of the tendon of the flexor digitorum profundus going to the index finger and radial side of the tendon of the flexor digitorum profundus going to the middle finger was observed (Fig 3). There were no associated neuro vascular variations seen. All the variations were unilateral.

### **Discussion**

Much of the versatility of the human hand depends upon its intrinsic musculature. The lumbrical muscles constitute an important part of the intrinsic musculature of

the hands. Lumbricals as a part of the intrinsic musculature are important for its delicate digital movements. Variations in the origin and insertion of the lumbricals are common (Bergman et al., 1988). Lumbrical muscle variation has been reported in the literature by various authors (Goto et al., 1993; Singh et al. 2001; Potu et al., 2008). An anomalous origin of first lumbrical described in 2.7% cases (Mehta et al., 1961). In the present study, out of 22 variant specimens in 7 specimens two bellies of second lumbrical were observed originating from the radial side of the tendon of both flexor digitorum profundus and flexor digitorum superficialis going to the middle finger, in 5 specimens an accessory belly of first lumbrical was observed originating from the radial side of the tendon of the flexor digitorum profundus going to the index finger and in remaining 10 specimens the bipennate second lumbrical originating from the ulnar side of the tendon of the flexor digitorum profundus going to the index finger and radial side of the tendon of the flexor digitorum profundus going to the middle finger was observed. Additional lumbricals occurred more frequently than a reduction in their number.

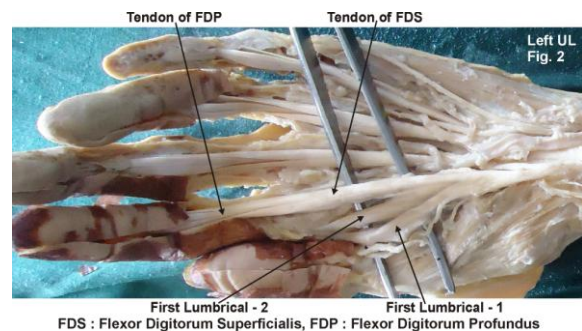
**Fig. 1.** Two bellies of second lumbrical originating from the radial side of tendon of both flexor digitorum profundus and flexor digitorum superficialis going to middle finger.



Origin of lumbricals may be displaced proximally arising from flexor carpi radialis, flexor digitorum superficialis, flexor digitorum profundus or flexor pollicis

longus. Accessory belly of first lumbrical may arise from flexor pollicis longus, flexor digitorum superficialis, first metacarpal, opponens pollicis or palmar carpal ligament (Ajmani, 2001). In literature it has been found that the additional fibers from the forearm merged at varying points with the belly coming from the palmar origin and in no case reached the insertion of extensor expansion independently. Hence, these are termed as additional forearm origin and not as double lumbricals (Mehta et al., 1961). In the present study, the first lumbrical had an accessory belly originating from the radial side of the tendon of the flexor digitorum profundus to index finger hence termed as double lumbricals (Mehta et al., 1961). First lumbrical and the distal muscle belly for the index finger of the flexor digitorum superficialis have an intimate relationship with each other and have a common phylogenetic origin (Koizumi et al., 2002).

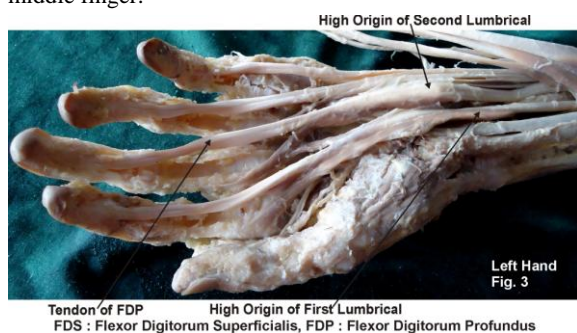
**Fig. 2.** Accessory belly of first lumbrical originating from the radial side of the tendon of the flexor digitorum profundus going to the index finger.



The articular system in the digits is connected by mechanical links and lumbrical muscles are one of the links of this system that produces dynamic controlled extension of interphalangeal joints (Standring, 2005). An anomalous origin of the lumbrical muscles were studied on South Indian cadavers (Potu et al., 2008). Flexor muscles of the forearm and hand were studied in the mammals and lizards; the flexor digitorum superficialis in mammals is

homologous with the intrinsic muscles of the palm, and that it shifts its origin proximally in forearm (Haines, 1950). The first lumbrical muscle and the distal muscle belly for the index finger of the flexor digitorum superficialis have an intimate relationship with each other, and have a common phylogenetic origin (Koizumi et al, 2002). From the above discussion it is quite clear that the variations in the lumbrical as observed in the present study has a phylogenetical significance.

**Fig. 3.** Presentation of bipennate second lumbrical originating from the ulnar side of tendon of the flexor digitorum profundus going to index finger and radial side of tendon of the flexor digitorum profundus going to middle finger.



### Conclusion

Clinicians and hand surgeons should be aware of such variations of first lumbrical while dealing with the hand during various surgical procedures.

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