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Variation in Innervation of Lumbricals of Hands

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Abstract:

Aim: To study the innervation pattern of lumbricals.

Materials & methods: The study was carried on 54 hands of both sexes of different age groups used for routine dissection in Anatomy department at CHRI. The distribution patterns of the muscular branches of median & ulnar nerve were studied in detail.

Results: In the present study, variations in innervations of lumbricals from the normal pattern were found. In 3 hands (5.5%), the second lumbrical was solely supplied by a branch from the deep branch of ulnar nerve. The third lumbrical was supplied by median nerve in 1 hand (1.85%), & by both median and ulnar in 4 hands.

Conclusion: Clinician & hand surgeons should be aware of such a variation in innervation of lumbricals during various surgical procedures.

1. Introduction

The human hand has several intrinsic muscles which are responsible for the highly specialized and intricate movements that are characteristic of the human hand. Among all those muscles, the lumbricals have a significantly greater role to play in the intricate movements of the fingers though small in size.

The lumbricals of the upper limb are four small muscles resembling earthworms (*Ascaris lumbricoides*) and hence named so. In all anatomical descriptions they are conventionally numbered from the lateral to the medial side. The lumbricals take their origin in the palm from the four tendons of the flexor digitorum profundus and pass distally along the radial side of the corresponding metacarpophalangeal joints, in front of the deep transverse metacarpal ligament. Each muscle forms a narrow tendon and runs in a facial canal and on reaching the dorsal surface of the proximal phalanx, joins the radial margin of the dorsal digital expansion as the distal wing tendon.

The first and second lumbricals are unipennate, and are supplied by the median nerve while the third and fourth lumbricals are bipennate and are supplied by a deep branch of the ulnar nerve.

A large number of variations have been described in the literature ranging from complete absence of lumbricals to reduction in their numbers or presence of accessory slips. Neurovascular structures in the hand are variable within a population and that anomalous cases occasionally be encountered. This information may be useful to a surgeon operating in the palm, we undertook a cadaver study to decline more precisely the pathways of innervations of the lumbrical muscles

2. Materials and Methods

2.1. Source of the data

The study was carried on 54 hands of both sexes of different age groups used for routine dissection in Anatomy department at Chettinad hospital & research institute.

2.2. Methods

Beginning at the palmar wrist crease, the median & ulnar nerves were followed distally, taking care to dissect all the branches & show their anatomical relationships. The lumbrical were also carefully dissected & all areas of innervations noted. Each nerve innervating a lumbrical was traced to its origin from the parent nerve.

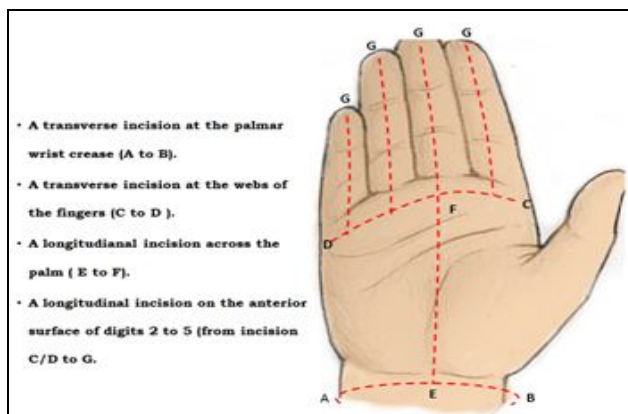


Figure 1: Shows the incision for exposure of lumbrical muscles

2.3. Observations

In the 54 hands which were dissected, the following observations were made. The first lumbrical was innervated by the median nerve via its proper palmar digital nerve to the lateral side of the index finger in all the cases. The second lumbrical received its nerve supply from the median nerve via its lateral common digital branch for the adjacent sides of index & middle finger in 51 hands. In 3 hands (5.5%), the muscles were solely supplied by the branch from the deep branch of ulnar nerve.

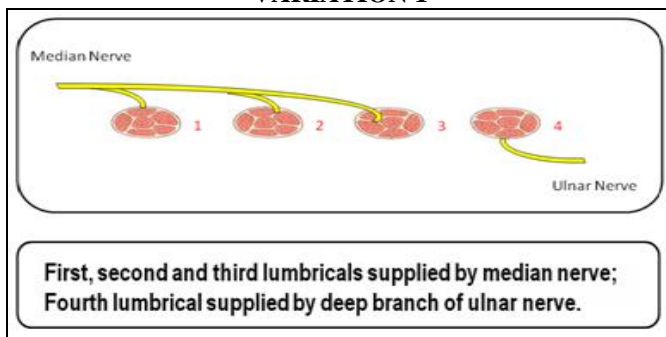
The third lumbrical was innervated by the deep branch of ulnar nerve in 49 hands. In one hand (1.85%) the muscle was solely supplied by the median nerve via its medial common digital branch for the adjacent sides of middle & ring finger. Along with deep branch of ulnar nerve, an additional source of innervation came from medial common digital branch of median nerve in 4 hands (7.4%). The fourth lumbrical received its nerve supply from the deep branch of the ulnar nerve.

In the present study, three types of variation were observed.

Variation 1	First, Second and Third lumbricals supplied by Median Nerve. Fourth lumbrical supplied by Deep Ulnar nerve.	1 Case (1.85%)
Variation 2	First & Second lumbricals supplied by Median Nerve. Third lumbrical supplied by Median & Deep Ulnar nerve. Fourth lumbrical supplied by Deep Ulnar nerve.	4 Cases (7.4%)
Variation 3	First lumbrical supplied by Median nerve. Second, third and Fourth lumbricals supplied by Deep Ulnar nerve.	3 Cases (5.5%)

Table 1: Types of variations and their innervation and incidence

VARIATION 1

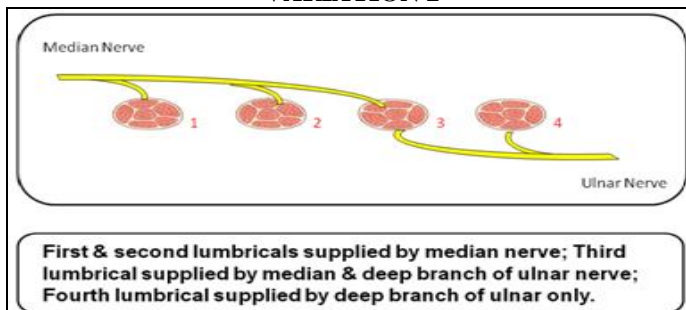


**First, second and third lumbricals supplied by median nerve;
Fourth lumbrical supplied by deep branch of ulnar nerve.**



FIG. 2: Third lumbrical supplied by Median nerve

VARIATION 2



**First & second lumbricals supplied by median nerve; Third
lumbrical supplied by median & deep branch of ulnar nerve;
Fourth lumbrical supplied by deep branch of ulnar only.**

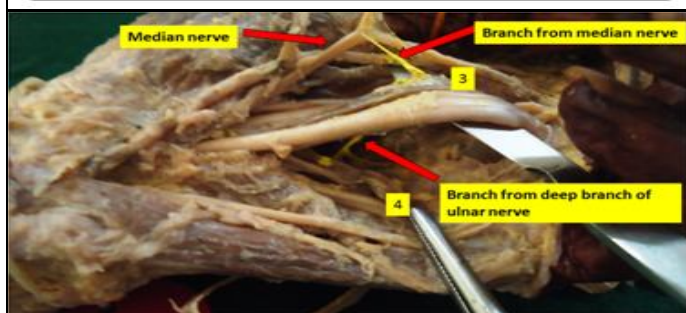


FIG 3: Third Lumbrical supplied by median and deep branch of ulnar nerve

VARIATION 3

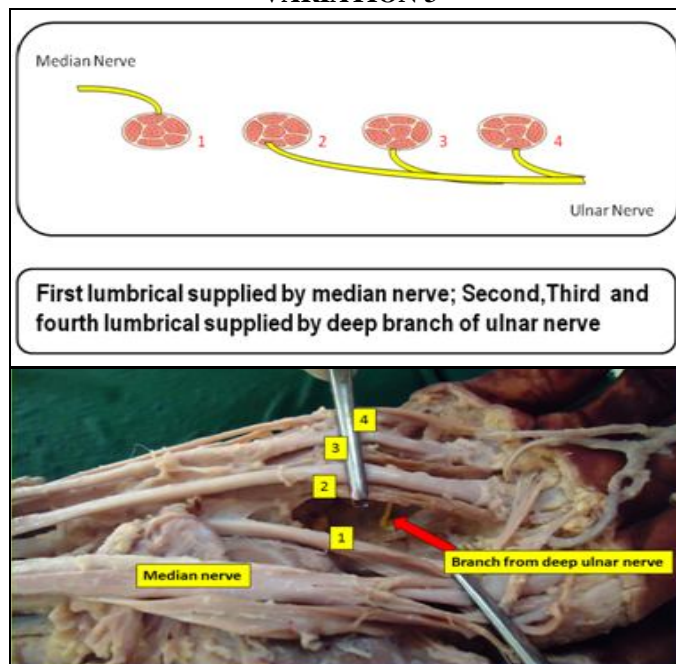


FIG. 4: Second lumbrical supplied by deep branch of the ulnar nerve

3. Discussion

Neurovascular structures in the hand are variable within a population & that anomalous cases occasionally be encountered.

The nerve, supplying the muscles as textbooks describe, not absolutely true. Buchanan (1950): Mentioned that innervation to second lumbrical was inconstant, sometimes derived from deep ulnar & sometimes having a double supply. In the present study, normal pattern was found in 46 hands (85.2%). The median nerve supplied the 1st lumbrical in all cases. In 4 hands (5.5%), Second lumbrical was solely supplied by a branch from deep branch of ulnar nerve. In Mehta & Gartner's series (1961) the median nerve supplied 1st & 2nd lumbricals in all cases. In 3 hands (7.4%), additional branch to 3rd lumbrical came from median nerve (via medial common palmar digital nerve for the middle & ring finger).

Sparing of the innervation to the lumbrical muscles in carpal tunnel syndrome has been described (Desjacques et al, 1980). Unlike the motor branches to the thenar muscles which are superficial (palmar) & hence subject to compression against the flexor retinaculum, the branches to lumbricals are more dorsal & therefore better protected from direct compression. Morphological changes in this variation may be 1) Variation in myotome formation or 2) different path chosen by nerve fibres itself.

Rabischong (1962) noted that the lumbrical muscles have the greatest density of mechanoreceptors than any other muscle, & proposed that they play a critical role in proprioception in addition to their function as IP joint extensors. It would appear to be prudent to protect the innervation of the lumbricals wherever possible & in particular to avoid unnecessary mobilization of the digital nerves during surgical dissection in this area.

4. Conclusion

Clinician and hand surgeons should be aware of such a variation in innervation of lumbricals during various surgical procedures.

5. References

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