

AN ASSEMBLY OF ANOMALOUS EXTENSOR TENDONS OF THE HAND - ANATOMICAL DESCRIPTION AND CLINICAL RELEVANCE

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Summary: Innumerable descriptions about variations in the pattern of extensor tendons are recorded in the literature. The dorsum of the hand in an adult male cadaver revealed an unusual pattern of extensor arrangement during a gross anatomical practical session. The extensor digitorum, extensor indicis and extensor digiti minimi tendons displayed a variant pattern. Extensor digitorum contributed tendons only to the middle and ring fingers, with junctura tendinum present between the extensor digitorum for the ring finger and extensor digiti minimi. Interestingly, an accessory muscle was observed arising from the common extensor origin passing to the index finger, in addition to the usual extensor indicis. The origin and insertion of extensor digiti minimi was as usual with an accessory slip contributed from the extensor carpi ulnaris to the proximal phalanx of the fifth finger. The plethora of variations in this region is of paramount importance for the reconstructive surgeon, who may utilize the accessory tendons to restore functional capacity of the fingers.

Key words: *Extensor; Tendons; Hand; Anomalies; Variations; Anatomy*

Introduction

The hand is an exquisite structure in the human architecture suited for performing activities in everyday life. It is the most frequently used part of our body, rendering it vulnerable to injury. It is mandatory to enhance the existing anatomical knowledge of the extensor tendons of the hand and their common variations whenever reconstructive surgery is planned in this region. That the human extensor muscles of the hand have great variability is now a well-established fact (11). Due to a plethora of anomalies encountered in this region we planned to report these multiple variations found unilaterally in an adult male cadaver of Indian origin. We report an unusual extensor tendon arrangement with the presence of two accessory muscles, one to the index and the other to the little finger. Wartenberg sign is a well-known clinical entity which occurs in the context of sequelae of ulnar nerve palsy, as well as rheumatic arthritis (1).

Any deviation from the normal anatomy of the extensor to the fifth digit may be responsible for causing this clinical sign (2). A detailed study of the anatomical variations of this region is valuable in surgeries performed in cases of trauma, pathologies and degenerative diseases.

Case report

Dissection of the dorsum of right hand in an adult male cadaver revealed an anomalous pattern of extensor ten-

dons. The extensor retinaculum was exposed and the dorsum of the hand diligently dissected. The extensor tendons were delineated and followed to their insertions.

The tendons of the extensor digitorum, extensor indicis and extensor digiti minimi were studied and their respective variations noted. An appropriate photograph was also taken.

Extensor Digitorum: The extensor digitorum in the present cadaver originated as usual from the common extensor origin at the lateral humeral epicondyle. Subsequently, it divided into two tendons, one each for the middle and the ring fingers only. The tendon for the ring finger was seen to divide further into two slips anchoring to the contiguous sides of the proximal phalanx of the fourth digit. Junctura tendinum were observed between the ED tendons for the ring finger and middle finger and also between the ED tendon for the ring finger and Extensor digiti minimi (EDM).

Extensor Indicis: The usual muscle belly arising from the posterior ulnar shaft traversed to the index finger. Interestingly, an accessory muscle emanating from the common extensor origin at the lateral epicondyle of humerus to the index finger was observed.

Extensor Digiti Minimi: This muscle was found to have the usual attachment as described in the standard textbooks. However, an accessory tendon measuring 3.9 cm in length was observed merging proximally to the Extensor carpi ulnaris (ECU) and distally to its insertion onto the pisiform and head of fifth metacarpal bone.

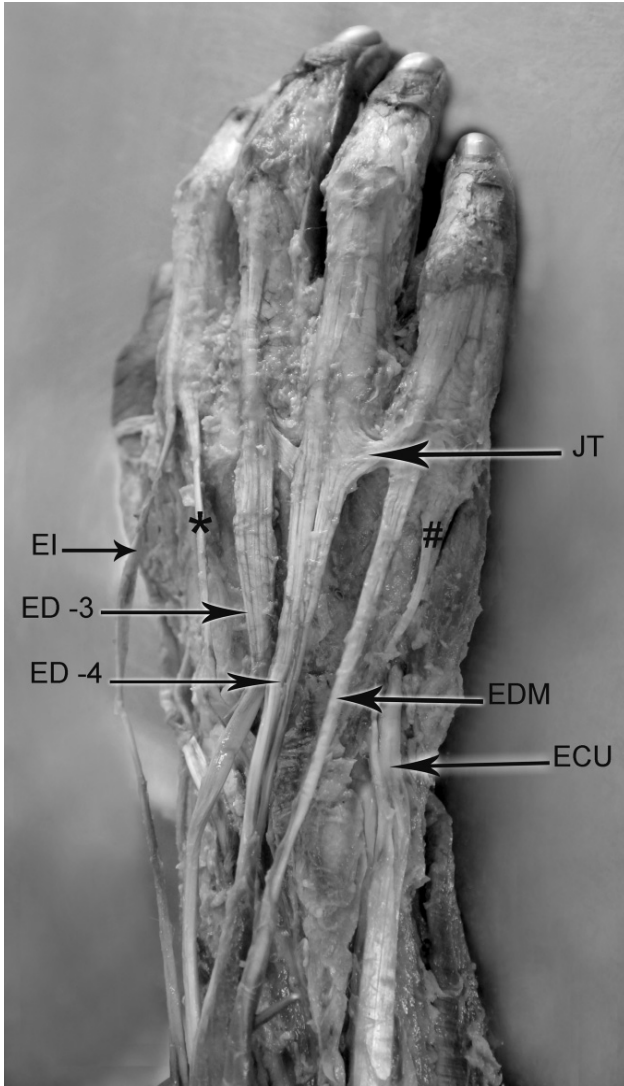


Fig. 1: Dissection of the dorsum of the right hand showing the following structures.
 EI - Extensor Indicis; * - Accessory extensor indicis; ED-3 - Extensor digitorum for the third finger.; ED-4 - Extensor digitorum for the fourth finger.; EDM - Extensor digiti minimi.; ECU - Extensor carpi ulnaris; # - accessory extensor digiti minimi; JT - Junctura tendinum.

Discussion

Several investigators have documented the incidence of various anomalies in the arrangement of extensor tendons of the hand (8, 15, 18). It is of the utmost importance for surgeons to pay attention and be aware of the variant pattern of extensor tendon distribution.

Extensor Indicis: The most common pattern of extensor indicis was a single tendon with one slip proximal to the extensor retinaculum (11). It was observed to lie in an ulnar position to ED -index finger. These researchers also docu-

mented an extensor indicis that initially was placed radial to the ED-index but shifted ulnar to it at the metacarpophalangeal joint (MCP). One case in their study revealed the absence of EI, while a small percentage revealed two slips, one to the middle and the other to the index finger. However 90 % of the cases reported only one tendon for the index finger (8). These EI were positioned ulnar to the main ED tendon. Gonzalez et al examined the relationship between the EI and EDC- index at the MCP joint (10). Contrarily, in our study, the extensor indicis ran radial to the ED-index, remaining in that position till its insertion. The present study revealed an accessory extensor indicis in addition to the usual one.

Extensor Digitorum: The study (11) documented that the most common pattern seen with ED was three tendons proximal and five distal to the extensor retinaculum. Our study presented a unique arrangement wherein, ED exhibited an absence of ED-index with only two contributions to the middle and ring fingers. Additionally, the EI was seen to pass radially to an accessory tendon to the index finger.

Extensor Digiti Minimi: All the study specimens exhibited a single EDM tendon with one slip proximal to the retinaculum. In the current case, an additional tendinous slip was seen to arise from the ECU and insert into the fifth digit. This small muscle matches the description of the Extensor brevis manus for the little finger (4, 14). It is believed that EDBM might have been part of the Extensor digitorum profundus that had not undergone proximal migration and therefore deserves classification into the antebrachial manual group (3). The muscles and tendons have different developmental origins, the former originating from migrating somatic mesoderm while the latter from the lateral plate mesoderm (5).

The clinical importance of this small sized muscle is that it may imitate a soft tissue tumour. The operative maneuvers on the dorsum of the hand should therefore be performed with extreme caution to avoid unnecessary complications.

Interestingly, another report postulated that when EDC-small is present, the growth of EDM is defective (11) and, vice versa, the EDM is of substantial size when the tendon of the EDC for the small finger is absent. This correlates with the findings in our study, where the EDC-small is absent and the EDM is well developed. Moreover, there is an accessory muscle related to the little finger. Awareness of these variant patterns of extensor tendons is imperative for reconstructive surgeons performing tendon transfer operations. Two theories postulated for the causation of tenosynovitis of the fifth extensor compartment are duplication of EDM (12, 18, 21) and presence of a long extensor sheath (16).

Surgeons performed a tendon transfer successfully for the first time and rectified the abducted position of the little finger in case of ulnar nerve palsy and rheumatoid arthritis (7). The transfer of EDM into the extensor expansion at the

MCP level enables transfer of direct force into the central slip, thus preventing hyperextension or swan neck deformity.

Our premise is that the accessory tendon of EDM as encountered in the present study could be effectively and safely used for tendon transfer in case of traumatic injuries. However, vigilance is required while performing this procedure, otherwise it could lead to severe complications.

Gonzalez studied extensively the various patterns of extensor tendons of the hand (10). A majority of hands had two tendon slips of EDM, whereas half the hands exhibited an unbalanced ulnar slip.

A slip from the EDC extending to the fifth digit was reported in a large number of cases. We report an absence of such a slip from the EDC, instead there was a strong slip contribution from the EDM.

Kaplan stated EDC-small is usually absent, similar to the description in Blacker series. (2, 13). Similarly, findings in our study are in accordance with their observations.

A vital step for restoration of finger extension is to relieve the junctura tendinum if EDC-small is absent. A single EDM tendon in 95 % of the cases along with a single case of ECU joining the EDM tendon was reported in a single study (8). They concluded that in over 70 % of hands, either the EDC contributed to EDM or the EDM had junctura tendinum with EDC-ring finger. Our observation collaborates with an earlier report (8) where it is agreed that when there is absence of EDC contribution to the little finger, the EDM compensates it by giving two or three tendons to fifth digit. It is in agreement with another suggestion that reduction in the number of tendons of EDM denotes an evolutionary change (9).

The description of the two accessory tendons revealed in our study do not match the one reported earlier (8). They described an Extensor medius proprius passing to the middle finger and extensor indicis et medii communis in place of extensor indicis proprius.

In an earlier study (20) the little finger received a separate tendon from the EDC; this extra slip of EDM could provide an additional donor slip. Bellan reported an original technique for correction by sectioning the EDM tendon at its insertion and rerouting the tendon till finally suturing it on the radial aspect of the interosseous muscle. This new direction of the tendon abolishes the abduction component and the tendon behaves as an adductor of the little finger. However, a fact often overlooked is that anatomical variations of extensor tendons could hamper the success of EDM tendon transfer. Therefore, Extensor indicis proprius was used by a surgeon as alternative reconstructive material to correct the abducted little finger (6). It was also felt that EIP could serve as an efficient and reliable option for treating abduction deformity of the small finger. Therefore, it is easy to surmise in our study that these extra tendons could be utilized for tendon transfer operations to treat degenerative and debilitating disorders. Anatomical factors such as an unbalanced ulnar slip of EDM and attachment

of EDM on abductor tubercle could be a possible etiology for Wartenberg sign in the event of ulnar nerve compression (10). In the present study, the extra slip from the ECU attaching to the proximal phalanx of little finger could be a cause for the Wartenberg sign. A thorough understanding of such an EDM tendon variation could be crucial for reconstructive surgeons who may accidentally sacrifice these accessory tendinous slips. The efficacy of transfer operations from EIP to EPL in case of ruptures due to rheumatoid arthritis was evaluated in terms of the range of motion of the thumb (17). Adequate function was re-established following surgery. We as anatomists submit that the supernumerary tendons found in the current study could be safely and effectively utilized for reconstructions in case of traumatic injuries, nerve lesions and degenerative conditions.

Conclusion

Precise knowledge and awareness of possible variations of extensor tendons of the hand are vital for the success of reconstructive procedures in this region. Furthermore, accurate interpretation of MRI scans of this region requires profound familiarity with the variations of the extensor tendons.

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