



Variant composition of extensor digitorum co-existent with the absence of extensor indicis

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ABSTRACT

The human extensor tendons of hand often display an array of variations. Routine preclinical educational dissection revealed anomalous arrangement of extensor tendons in the left hand of an adult male cadaver. The extensor digitorum muscle was hypoplastic; there was no contribution to the index and the little fingers. It showed two parts, as lateral and medial. The lateral part was preponderantly tendinous, and divided into a thicker radial and a thinner ulnar slip. Both the slips eventually traversed towards the middle finger and formed its extensor digital expansion. The medial part of extensor digitorum was fleshy. It became tendinous as it approached the extensor retinaculum and formed the dorsal digital expansion of the ring finger. Strikingly, there was absence of extensor indicis muscle. The presence of an accessory muscle having an aponeurotic origin from the dorsal upper surface of the radius was another unique aspect of this study. This accessory muscle contributed to the extensor digital expansion of the index finger. The morphology of the other extensor muscles was as usual. We endeavor to discuss the relevance of embryogenesis with respect to the extensor tendons and highlight the possible clinical repercussions. Although extensor muscles of hand exhibit a number of variations, each merit documentation as the clinician is required to evaluate each case on an individual basis. © IJAV. 2009; 2: 116–118.

Key words [extensor digitorum muscle] [dorsal digital expansion] [extensor indicis] [variation]

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Introduction

The synergistic contraction of the extensor musculature along with the long flexors is indispensable for an efficient grip on different objects in daily life [1]. The thumb works independently due to its own abductors and extensors. Rest of the four digits has a common extensor, the extensor digitorum muscle (ED). The index finger and the little fingers have additional extensors of their own.

Variant arrangement of extensor musculature of hand has clinical importance and also alters the kinematics of the hand. The ED is one of the superficial muscles of the posterior aspect of the forearm. It originates from the common extensor origin, i.e. lateral epicondyle of the humerus, the adjacent intermuscular septa and antebrachial fascia [1,2]. It expands into a rounded belly in the middle of forearm and passes distally in a common synovial sheath with the tendon of extensor indicis, through a tunnel beneath the extensor retinaculum. These tendons diverge on the dorsum of the hand into four tendons for medial four digits, and each of these contribute to form the dorsal digital expansion over the corresponding metacarpophalangeal joint. This muscle provides extension of interphalangeal, metacarpophalangeal and wrist joints.

The extensor indicis (EI) muscle belongs to the deep muscles of the forearm. This muscle takes origin from posterior ulnar surface and from the interosseous membrane. The tendon of EI usually joins the ulnar side

of the tendon of ED for the index finger. This muscle helps in extension of index finger and wrist. Both these extensors pass through the same fourth compartment of extensor retinaculum within a common synovial sheath [1,2].

In this case, we present a variant composition of ED on the left hand with absence of EI. Concomitantly, we report an additional extensor muscle of the index finger.

The anatomical knowledge of the arrangement of extensor tendons, hypoplastic muscles and presence of additional muscles is of prime significance for surgeons performing tendon transfers, tenosynovectomy and other reconstructive surgeries [3,4].

Case Report

Cadaveric dissection of left upper limb during preclinical educational teaching programme for undergraduate medical students revealed variant extensor musculature of hand in a 72-year-old, male Indian cadaver. The limb had partial absence of ED and absence of the EI.

The ED was split into two parts at its origin; lateral and medial (Figure 1). The lateral part was tendinous and was further divided into a thicker radial and a thinner ulnar slip. Both of these slips formed the dorsal digital expansion of the middle finger. The fleshy medial part became tendinous 2.4 cm proximal to extensor retinaculum and significantly contributed to the dorsal digital expansion of ring finger. An interesting observation in this case was that the index and little finger didn't receive any

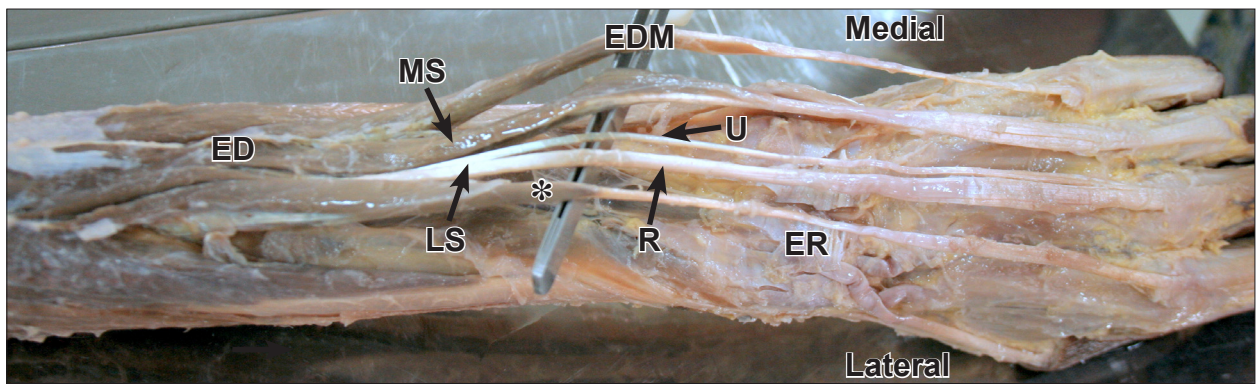


Figure 1. Dissection of the extensor compartment of left forearm and dorsum of hand. (**ED:** extensor digitorum muscle; **MS:** medial slip of extensor digitorum muscle; **LS:** lateral slip of extensor digitorum muscle; **U:** ulnar part of lateral slip; **R:** radial part of lateral slip; **ER:** extensor retinaculum; **EDM:** extensor digiti minimi; *****: accessory muscle)

contribution from the ED. In addition, an accessory muscle was found with an aponeurotic origin from the upper part of the posterior surface of radius, running along with the superficial muscles of the back of the forearm (Figure 1). Its fleshy belly measured 11 cm in length, and became tendinous 8.2 cm proximal to the radial styloid process. The tendon of this additional muscle traversed through the fourth compartment beneath extensor retinaculum along with the ED. This accessory muscle formed the dorsal digital expansion of the index finger. Interestingly, the EI was conspicuous by its absence; therefore this additional muscle was the sole extensor of the index finger (Figure 1). Rest of the extensor muscles displayed usual morphology and innervation.

Discussion

In another study the ED was seen to contribute a single tendon to index and middle finger whereas double slips were given for the ring and little finger. The presence of double tendon to these fingers will certainly influence the different pull of direction at metacarpophalangeal and interphalangeal joints [4]. In an earlier study, ED was providing one tendinous slip to index and middle fingers, two tendons for ring finger and none to the little finger [5]. In the present case study the two slips of the extensor digitorum given to middle and ring fingers at the metacarpophalangeal joints may alter kinematics around the site of attachment to the phalanx.

EI-Badawi et al. observed total number of the tendon on the dorsum of hand ranged from three to eight. They also observed a case where the EI was totally absent and replaced by an extensor indicis brevis muscle. This extensor indicis brevis originated from lower end of radius and posterior aspect of fibrous capsule of wrist joint, and joined with dorsal digital expansion of the index finger. The tendon from ED to the index finger was present along with extensor indicis brevis muscle beneath the extensor retinaculum [3]. In our study, the absence of

EI was compensated with the presence of an accessory muscle, which was the extensor for the index finger. This accessory muscle could be viewed as an effort to provide functional compensation for extensor indicis.

The cause of the enormous variability of ED remains obscure, its aplastic or hypoplastic status may be due to a defect that occurs probably at the myoblastic stage of development and accounts for rudimentary musculotendinous structures [6]. Another hypothesis stated that it is due to the failure of the radial nerve to innervate the affected muscle groups [6]. According to Wajid and Rangan, it is extremely rare to find total absence (congenital aplasia) of finger extensors [7]. This case can be considered as congenital hypoplasia of ED due to the absence of tendons to the index and the little finger. Multiple tendons of ED have been reported for the ring and the index finger with absence of tendon to the little finger [3,5].

Various etiological factors for the above stated anomaly could be ethnic differences, developmental defects or sex-linked inheritance [3,6,8–10].

The presence of single tendon in index and little finger may lead to restriction in movements, and excessive use may produce tenosynovitis or rupture of tendons commonly noticed in fourth and fifth digits [11]. Anatomical knowledge of extensor tendons is important for successful tenosynovectomy in the treatment of De Quervian's disease [12]. Tenosynovitis of the extensor tendons occurs in 30% of patients with rheumatoid arthritis; rupture of the tendons is more common in the extensor tendon of fourth and fifth digits [11].

The selection of appropriate tendon slip for transfer to restore hand function must be aided by the understanding of anatomical variations of the wrist extensors [13]. Knowledge of these anatomical variations of hand musculature is vital for reconstructive surgeons while attempting tendon transfer in trauma cases.

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