

## An anatomical revisit into the pattern of extensor digitorum tendon distribution to the little finger

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### Abstract

**Introduction:** Extensor digitorum (ED) muscle is one of the component of fourth compartment of extensor retinaculum along with extensor Indicis muscle. The muscle is morphologically described to divide into four tendons to the medial four digits. Yet, multitude of individual variations in the contribution of ED tendon to the extension of little finger along has been reported. And so this study was done to reconfirm the distribution pattern of extensor tendon to the little finger.

**Materials and Method:** The upper extremities from 13 cadavers used for undergraduate routine dissection were observed. After dissection of the extensor compartment of the forearm and hand, the ED tendon in the dorsum of hand was delineated for focused study. The pattern of distribution of ED tendon to the little finger was noted in each hand. The morphology of extensor digiti minimi (EDM) and juncturae tendinum noted were also studied.

**Observation:** In all 26 hands studied, ED tendon to little finger was found to be absent. Type III junction tendons, Type II connecting the slip of ED tendon for ring finger with EDM were observed in 24, 2 hands respectively. In all the studied hands, EDM was noticed to be of two tendon slips distal to retinaculum.

**Conclusion:** The finding of absent tendon of ED for little finger deviates heavily from the generally accepted book description. It also necessitates double checking for the pattern of distribution during tendon transplant procedures involving ED to prevent accidental removal of EDM tendon.

**Keywords:** Extensor digitorum, Extensor digiti minimi, Juncturae tendinum

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### Introduction

Human hand is a complex and intricate structure designed for multitude of functions. The extensor compartment of forearm and hand commonly exhibits standard morphology of structures in comparison to flexor compartment. Still, reports of variations in distal tendons of the extensor muscle especially on the ulnar aspect exist.<sup>(1,2,3)</sup>

One among the extensor group of muscle is Extensor digitorum (ED) which is also called as extensor digitorum communis. This muscle is observed to arise from lateral epicondyle of humerus by means of common extensor tendon and its adjoining antebrachial fascia. It travels from the forearm to hand through the fourth compartment of extensor retinaculum along with extensor indicis muscle and divides into four tendons for the medial four digits. It is found to insert on either sides of the middle phalange of the respective digits.<sup>(4,5)</sup>

Variations in the number of distal tendons of ED had been observed.<sup>(6,7)</sup> Either absence or multiple tendon to any digit was frequently noticed by different authors. Absent ED tendon to index finger<sup>(8,9)</sup> was described less commonly than that of absent ED tendon to little finger. Incidence of absent ED tendon for little finger ranged from 1-92% in differing ethnicities.<sup>(1,2,3,6,7,10,11,12,13,14,15,16)</sup>

Studies had also noticed doubling of tendons of Extensor digiti minimi (EDM) or a thick type III juncturae tendinum.<sup>(1,6,17,18,19)</sup> Inconsistent literature proof of ED tendon contributing for little digit

extension with differing compensatory mechanism prompted us to do this study of reconfirming the distribution pattern of ED to medial four fingers.

### Materials and Method

After routine undergraduate dissection of upper extremities in 13 cadavers including both genders of different age groups, the extensor compartment of forearm and hand were subjected to our detailed observation. The ED was focused at the point of its exit from the extensor retinaculum. The number of tendons it gives and the digits into which they get inserted were noted. The EDM and existence of juncturae tendinum were also noticed.

### Observation



**Fig. 1:** ED showing only three tendons to Index (1), Middle (2), Ring (3) digits and two tendons of EDM

The total hands studied were 26 from 13 cadavers. The ED was found to divide only into three tendons and EDM as two tendons in all the 26 hands (Fig. 1). In 24 hands, type III Junction tendinae was seen connecting ED tendon for ring finger with tendon of EDM (Fig. 2). In two hands type II, transverse type junction tendinae was noted (Fig. 3). The ED tendons for other digits were often noted to be more than one in number. Since the focus of this study was the contribution of ED for little finger we did not add more description on this observation.



Fig. 2: Shows type 3 juncturae tendinum (blue arrow) connecting ED ring finger and EDM



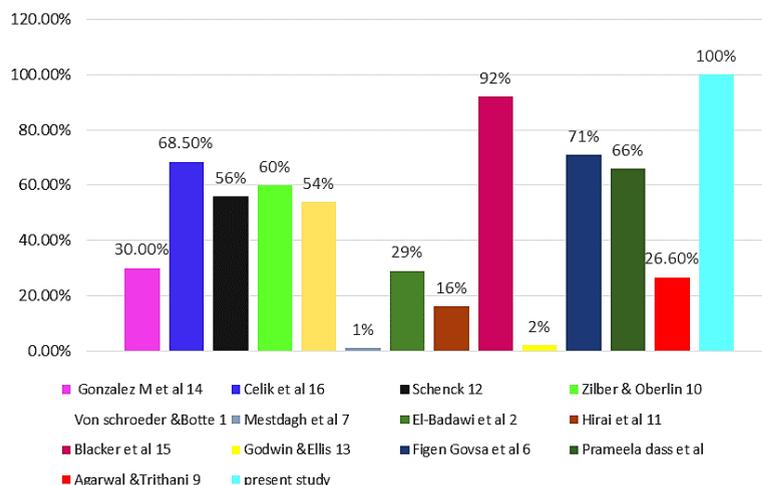
Fig. 3: Shows type 2 transverse juncturae tendinum (blue arrow) connecting ED ring finger and EDM

### Discussion

The increased industrial and accidental hand injuries that go in for repair procedures, necessitates constant revisit into the morphology of the muscles and tendons of the hand. The extensor compartment that often provides donor tendons for reconstructions has been often documented in literature to exhibit varied patterns of tendon distribution.<sup>(1,2,3,7-13)</sup>

As previously been reported by many authors, multiplicity of ED tendon to digits was seen in this study also.<sup>(1,2,6,7)</sup> Even though studies had shown absence of ED tendon to index finger, such variation was not noticed in this study.<sup>(8,9)</sup> Comparison of percentage absence of ED tendon distribution for little finger shows there definitely exist wide range variation which could be attributed mainly to the geographical region of study and the genetic make of the cadavers studied which needs to be further explored (Chart 1). Theories of evolutionary reduction had also been put forth by few authors for the absence of ED tendon for little digit.<sup>(17,18)</sup>

Chart 1: Comparison of percentage absence of ED tendon for little finger



Absence of ED tendon for little digit shifts our focus to the other extensor of that digit EDM. With literature providing 78%-88.9% incidence of double EDM tendons in case of absence of ED tendon for little finger, this study's observation of 100% double EDM needs further study with larger sample size.<sup>(1,6,17,18,19)</sup> The EDM being noticed as double tendon in the hands with absent ED for little finger suggest an inverse growth relationship between these extensor muscles. Defective ED stimulates EDM growth.<sup>(11)</sup>

Apart from compensatory doubling of EDM, presence of intertendinous slips or connections forms another widely observed balancing mechanism. An obliquely running aponeurotic band between the tendon of ED for ring finger and EDM called "tendinous slip of Testut" that lacks proximal muscular origin but with a distal extensor tendinous assimilation had been documented by a study.<sup>(20)</sup> Presence of intertendinous connection or juncturae tendinum type II /III between ED ring finger and EDM as the common compensatory mechanism was also noted in this studied.<sup>(6,16,17,18)</sup>

### Conclusion

The observation of varied extensor tendon distribution for the little finger shows prominent deviation from standard book descriptions. These findings which almost coincides with many previous studies stress the need for pre-operative understanding of the pattern of arrangement and distribution of the extensor tendons. Also, these observations puts forth the suggestion that more than one tendon is needed for effective extension happening at the little finger.

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