

Extensor Indicis Brevis Muscle: Report of a Rare Muscular Variant and Classification Proposal

Músculo Extensor Corto del Índice: Reporte de una Rara Variante Muscular y Propuesta de Clasificación

Ahmed F. EL Fouhil¹; Abdulaziz S. Albatati²; Hasem Darwish¹; Essam Eldin A. Salama¹; Muhammad Atteya¹; Waad M. Assiri² & Khaleel I. Alyahya¹

EL FOUHIL, A. F.; ALBATATI, A. S.; DARWISH, H.; SALAMA, E. E. A.; ATTEYA, M.; ASSIRI, W. M. & ALYAHYA, K. I.
Extensor indicis brevis muscle: Report of a rare muscular variant and classification proposal. *Int. J. Morphol.*, 40(2):339-342, 2022.

SUMMARY: The current report presented a rare variant of extensor indicis brevis muscle, replacing extensor indicis, in the left hand of an adult male cadaver. The origin of the muscle was reported, for the first time, to be from the distal margins of radius and ulna. The muscle is inserted into the extensor expansion of the index. A new classification for extensor indicis brevis muscle was proposed based on its origin. Awareness of rare anatomical variations would help clinicians and surgeons in accurately managing suspected cases and planning surgical procedures.

KEY WORDS: Extensor indicis brevis muscle; Extensor indicis; Anatomical variations.

INTRODUCTION

Anatomical variations of the extensor muscles of the fingers rarely can be anticipated and sometimes can be neglected when occasionally found during surgery. These anomalous muscles can be the source of different syndromes, which appear due to manual exertion during physical activities (Iliev *et al.*, 2015).

The extensor indicis is a narrow, elongated muscle located on the dorsum of the forearm, medial to extensor pollicis longus. This extensor muscle originates from the posterior surface of the ulna and posterior surface of the interosseous membrane. The tendon of the extensor indicis usually passes in the fourth compartment of extensor retinaculum along with the tendons of the extensor digitorum. Opposite to the head of the second metacarpal bone, the extensor indicis joins along with extensor digitorum tendon to index (Georgiev *et al.*, 2018). The muscle permits independent extension of the index, even in extremes of ulnar or radial wrist deviation (el-Badawi *et al.*, 1995; Komiyama *et al.*, 1999). Though the anomalous variation of extensor

indicis tendon is very rare, the anatomical knowledge of such variation is very important while performing tendon graft surgeries in the hand (Arathala *et al.*, 2016). Different anatomical variations of this muscle have been documented in the literature (Georgiev *et al.*); one of the rare variants is the extensor indicis.

In this report, we describe a rare case of extensor indicis brevis muscle, review the relevant literature, propose a new classification for extensor indicis based on its origin and emphasize on its possible clinical significance.

CASE REPORT

During routine dissection teaching for the first-year medical students in the Department of Anatomy, College of Medicine, King Saud University, Riyadh, Saudi Arabia, an unusual muscular variation was observed. The variant muscle

¹ Clinical Anatomy Lab, Department of Anatomy, College of Medicine, King Saud University, Riyadh, Saudi Arabia.

² Postgraduate Student, Department of Anatomy, College of Medicine, King Saud University, Riyadh, Saudi Arabia.

This work is supported and funded by the Deanship of Scientific Research - King Saud University through the research group no. (RG-1441- 517).

replaced extensor indicis in the left hand of an adult male cadaver of unknown age preserved in formalin (5 %). Instead of arising from the posterior surface of ulna, it originated from the dorsum of the distal margins of both radius and ulna, occupying the fourth compartment deep to the extensor retinaculum, together with the tendons of extensor digitorum. The muscle ran, medial to the tendon of extensor pollicis longus, across the third metacarpal bone and the second dorsal interosseous muscle, deep to the tendon of extensor digitorum for the index. Its tendon became incorporated, together with the tendon of extensor digitorum, to form the extensor expansion of the index. The muscle belly was fusiform, 3 cm long and 1,7 cm wide. The length of its tendon was approximately 3.5 cm. It was innervated by the posterior interosseous nerve and the blood supply was provided by the posterior interosseous vessels. Due to its morphological characteristics, innervation, and apparent function, the muscle is considered as extensor indicis brevis (Figs. 1 and 2).

DISCUSSION

The extensor indicis brevis is a variant muscle found on the dorsum of the wrist and hand. The variations of muscles and tendons in hand are not uncommon, however, this type of variation is relatively rare (Arathala *et al.*). This muscle is found in approximately 2 % to 3 % of the population with a slight male predominance and is easily mistaken for other dorsal hand pathology (Paraskevas *et al.*, 2002). This variant muscle has been described mostly in cadaver dissections and rarely in distinct clinical case reports (Fernandez Vazquez & Linscheid, 1972).

Different variations of the extensor indicis has been described. Regarding its origin, the muscle arises from the dorsal radiocarpal ligament, the wrist joint capsule, or from the extensor tendons (Fernandez Vazquez & Linscheid; Ogura *et al.*, 1987). It may also arise from the dorsum of the

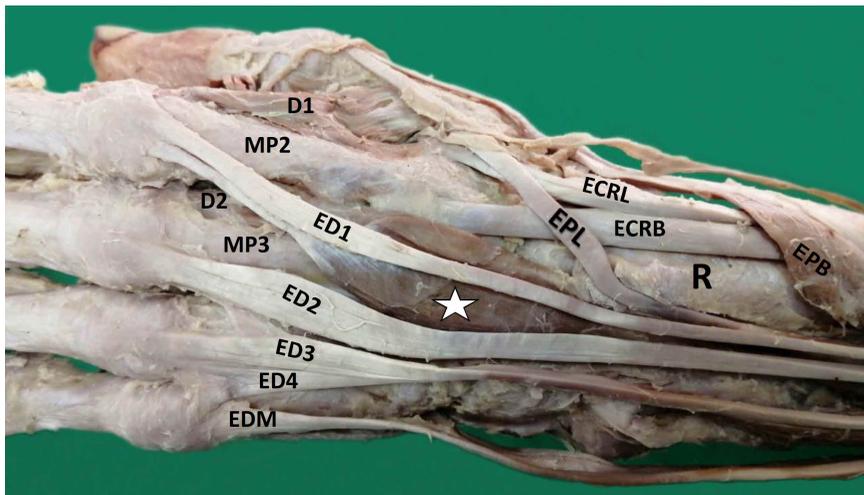


Fig. 1. Dorsum of the hand after dissection of extensor retinaculum. Extensor indicis brevis (star) extends, medial to the tendon of extensor pollicis longus (EPL), across the third metacarpal bone (MP3) and the second dorsal interosseous muscle (D2), deep to the tendon of extensor digitorum for the index (ED1) then fuses with it to form the extensor expansion of the index. R: Radius; ED2: Extensor digitorum for middle finger; ED3: Extensor digitorum for ring finger; ED4: Extensor digitorum for little finger; D1: first dorsal interosseous muscle; MP2: Second metacarpal bone; ECRL: Tendon of extensor carpi radialis longus; ECRB: Tendon of extensor carpi radialis brevis; EDM: Tendon of extensor digiti minimi muscle; EPB: Extensor pollicis brevis.

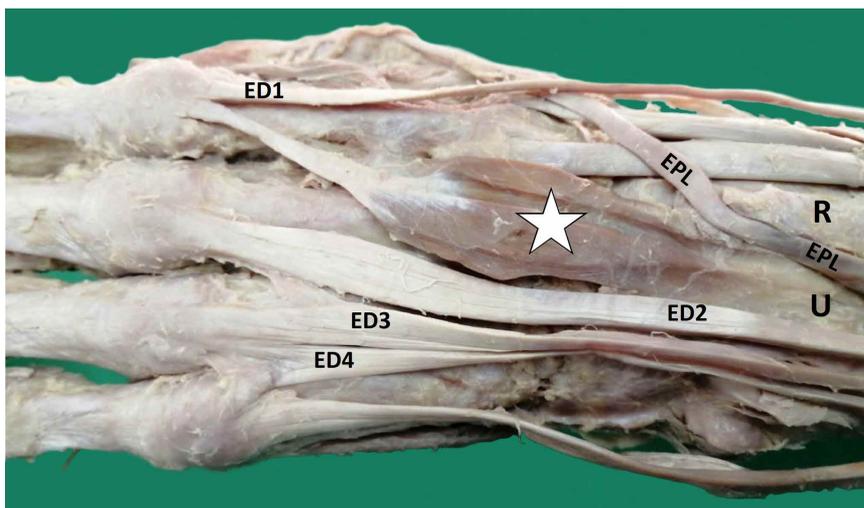


Fig. 2. Dorsum of the hand after dissection of extensor retinaculum and reflection of the tendon of extensor digitorum for index finger (ED1). Extensor digitorum brevis (star) originates from the radius (R) and ulna (U). ED2: Extensor digitorum for middle finger; ED3: Extensor digitorum for ring finger; ED4: Extensor digitorum for little finger; EPL: Tendon of extensor pollicis longus muscle.

carpal bones such as lunate bone (Arathala *et al.*), scaphoid and trapezoid bones (Garbelotti Junior *et al.*, 2012) or from scaphoid and lunate bones (Iliev *et al.*). The extensor indicis brevis generally consists of a single belly, but cases with two bellies with variable sizes have also been reported (Paraskevas *et al.*).

Regarding its insertion, extensor indicis brevis unites with the tendon of extensor digitorum for the index opposite to the second metacarpophalangeal joint to be inserted into the base of the distal phalanx (Arathala *et al.*), or fuses with the extensor expansion of the index (Garbelotti Junior *et al.*; Iliev *et al.*). The current report presents a unique and rare variation of an extensor indicis brevis muscle originating from the dorsum of the distal margins of both radius and ulna. To the best of the authors' knowledge, the attachment of extensor indicis brevis described in the current study has never been reported before. Moreover, it is the most proximal attachment reported in the literature. Such attachment is the nearest to that of the original attachment of extensor indicis proprius in the ulna. Similar to extensor indicis, absent in the present case, the muscle is attached to the ulna and occupies the fourth compartment deep to the extensor retinaculum.

Based on its insertion and relationship with extensor indicis, extensor indicis brevis has been classified into three types; Type I, extensor indicis brevis is inserted onto the dorsal aponeurosis of index with absence of extensor indicis; type II, both muscles are inserted into the index; and type III, extensor indicis is inserted into the index and extensor indicis brevis is inserted into the middle finger (Ogura *et al.*). Accordingly, the current case would be classified as type I. However, due to the more variability of the sites of attachment of the origin of extensor indicis brevis compared to those of insertion, the current report proposes another classification based on the origin of the muscle. According to the present suggestion, extensor indicis brevis is classified as Type 1, if it originates from radius, ulna or from both bones as in the present case; type 2, if it has a fibrous origin from joint capsules, ligaments or tendons; and Type 3, if extensor indicis brevis originates from carpal bones.

Extensor tendons of the hand are of clinical interest due to their usage in tendon transfers during reconstructive surgical procedures; extensor indicis proprius is considered an ideal donor for this type of surgery (Gonzalez *et al.*, 1996). Lying superficially in the dorsum of the hand, extensor indicis brevis is liable to be damaged in minor injuries and any surgeries at this region. It is also misdiagnosed as dorsal wrist ganglion (Fernandez Vazquez & Linscheid) or benign soft tissue tumor (Murakami & Todani, 1982). Most of the cases of extensor indicis brevis are asymptomatic and

discovered accidentally during cadaveric studies. They rarely cause pain and swelling on the dorsum of the hand, as in cases of heavy manual workers (Slavchev & Georgiev, 2015). Therefore, knowledge of individual variations in the pattern of distribution of extensor tendons would help clinicians, surgeons occupational and physical therapists formulating better clinical and surgical decisions (Garbelotti Junior *et al.*).

In conclusion, the current report presents a rare variant of extensor indicis brevis with an origin from both radius and ulna, reported for the first time, and proposes a new classification for extensor digitorum brevis based on its origin. Awareness of anatomical variations is important for planning and applying surgical procedures, as well as, interpreting unusual clinical presentations.

ACKNOWLEDGMENTS

The authors extend their appreciation to the Deanship of Scientific Research - King Saud University for funding this work through the research group no. (RG-1441- 517).

EL FOUHIL, A. F.; ALBATATI, A. S.; DARWISH, H.; SALAMA, E. E. A.; ATTEYA, M.; ASSIRI, W. M. & ALYAHYA, K. I. Músculo extensor corto del índice: Reporte de una rara variante muscular y propuesta de clasificación. *Int. J. Morphol.*, 40(2):339-342, 2022.

RESUMEN: Este informe presenta una variante rara del músculo extensor corto del índice, que reemplaza al extensor del índice en la mano izquierda de un cadáver masculino adulto. Se informó por primera vez, que el origen del músculo se realiza en la parte distal de los márgenes del radio y la ulna. El músculo se insertaba en la expansión extensora del índice. Se propuso una nueva clasificación para el músculo extensor corto del índice basada en su origen. El conocimiento de las variaciones anatómicas raras es útil para los médicos y cirujanos al abordar los casos sospechosos y planificar los procedimientos quirúrgicos.

PALABRAS CLAVE: Músculo extensor corto del índice; Extensor del índice; Variaciones anatómicas.

REFERENCES

- Arathala, R.; Sankaran, P. K.; Ragnath, G.; Harsha, S. S. & Sugumar, T. S. The extensor indicis brevis – A rare variation and its significance. *J. Clin. Diagn. Res.*, 10(2):AD03–AD04, 2016.
- el-Badawi, M. G.; Butt, M. M.; al-Zuhair, A. G. & Fadel, R. A. Extensor tendons of the fingers: arrangement and variations--II. *Clin. Anat.*, 8(6):391-8, 1995.

- Fernandez Vazquez, J. M. & Linscheid, R. L. Anomalous extensor muscles simulating dorsal wrist ganglion. *Clin. Orthop. Relat. Res.*, 83:84-6, 1972.
- Garbelotti Junior, S.; Yukio Fukuda, T.; Rodrigues Pereira, V.; Garcia Lucareli, P. & Olave, E. Extensor indicis brevis muscle: an unusual muscular variant. *Int. J. Morphol.*, 30(3):1071-3, 2012.
- Georgiev, G. P.; Tubbs, R. S.; Iliiev, A.; Kotov, G. & Landzhov, B. Extensor indicis proprius muscle and its variants together with the extensor digitorum brevis manus muscle: a common classification. Clinical significance in hand and reconstructive surgery. *Surg. Radiol. Anat.*, 40(3):271-80, 2018.
- Gonzalez, M. H.; Weinzweig, N.; Kay, T. & Grindel, S. Anatomy of the extensor tendons to the index finger. *J. Hand Surg.*, 21(6):988-91, 1996.
- Iliiev, A.; Georgiev, G.P.; Dimitrova, I.N.; Landzhov, B. Extensor indicis brevis muscle: anatomical and clinical considerations. *Acta Morphol. Anthropol.*, 22:75-8, 2015.
- Komiyama, M.; Nwe, T. M.; Toyota, N. & Shimada, Y. Variations of the extensor indicis muscle and tendon. *J. Hand Surg. Br.*, 24(5):575-8, 1999.
- Murakami, Y. & Todani, K. The extensor indicis brevis muscle with an unusual ganglion. *Clin. Orthop. Relat. Res.*, (162):207-9, 1982.
- Ogura T.; Inoue H. & Tanabe, G. Anatomic and clinical studies of the extensor digitorum brevis manus. *J. Hand Surg. Am.*, 12(1):100-7, 1987.
- Paraskevas, G.; Papaziogas, B.; Spanidou, S. & Papadopoulos, A. Unusual variation of the extensor digitorum brevis manus: A case report. *Eur. J. Orthop. Surg. Traumatol.*, 12(3):158-60, 2002.
- Slavchev, S. A. & Georgiev, G. P. Ultrasound diagnosis of a ganglion cyst within an extensor digitorum brevis manus muscle. *Chir. Main.*, 34(5):269-71, 2015.

Corresponding author:
Prof. Ahmed Fathalla Ibrahim El Fouhil
Department of Anatomy
College of Medicine
King Saud University
Riyadh 11461
SAUDI ARABIA

E-mail: aelfouhil@ksu.edu.sa

ORCID Profile: <https://orcid.org/0000-0001-7833-5247>