

Case Report

Anatomical Variation of the Extensor Tendons of the Second Toe in the Dorsum of the Foot: A Case Report

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Abstract

Extension of the lateral four toes of the foot is caused by the extensor digitorum longus. Each tendon of the extensor digitorum longus is attached to the middle and distal phalanges of the corresponding toes. The medial three tendons receive the insertion of lateral three tendons of the extensor digitorum brevis. During regular dissection for the undergraduate medical students, we came across a rare variation of extensor tendons of the second toe. The extensor digitorum brevis gave two tendinous slips to the second toe; medial slip and lateral slip. The extensor digitorum longus tendon for the second toe received the insertion of extensor digitorum brevis medial slip for the second toe, opposite to the base of second metatarsal bone. Further, the lateral slip of the extensor digitorum brevis was inserted to the lateral side of the extensor digitorum longus tendon for the second toe, opposite to the base of the proximal phalanx. Precise knowledge about the anomalies of extensors of the toes is clinically important while harvesting the tendon grafts. The knowledge of the anomaly presented in present case report is also important during plastic and orthopaedic surgeries as preference and selection of a donor site for a tendon graft is crucial.

Keywords: Extensor digitorum brevis, extensor digitorum longus, tendon graft, second toe, metatarsal bone

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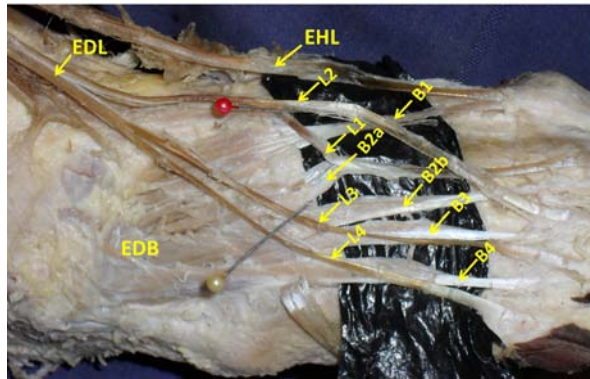
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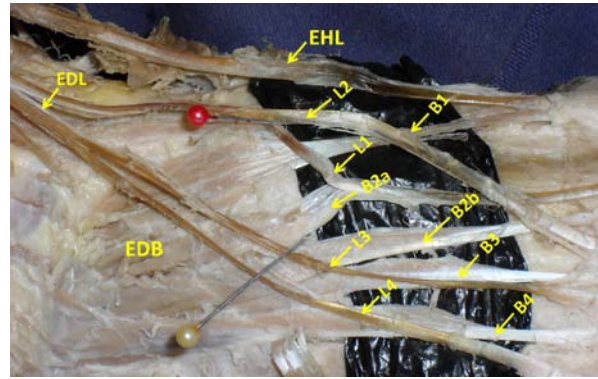
Introduction

Extensor digitorum longus (EDL) takes its origin from the upper three-quarters of the shaft of the fibula. It also takes origin from the lateral side of the tibial condyle, the proximal part of the interosseous membrane and intermuscular septum. Approximately, at the level of lower end of the leg, it becomes tendinous and then divided into four slips. The slips for the third, fourth and fifth toes run on the dorsum of the foot and finally get inserted to the middle and distal phalanges of the corresponding toes. Variations of EDL are rarely reported in the literature. Earlier, it has been described in various fields of embryology, electromyography, comparative anatomy and morphology (1).

The extensor digitorum brevis muscle (EDB) arises from the distal part of the superolateral surface of calcaneus and divides into four slips. Medial part of the muscle usually ends in a distinct slip which inserts on to the base of the proximal phalanx of the great toe. This slip is often termed as extensor hallucis brevis (EHB). The remaining slips are attached to the lateral sides of the tendons of EDL for second, third and fourth toes. Since the extension of the toes can be maintained by the long extensors, functionally EDB is indispensable. The EDB tendons are frequently used to correct the crossover toe deformity and painful toe disorders such as lateral ankle deformity (2). Precise knowledge about the anomalies of extensors of the toes is of clinical importance in plastic and orthopaedic



(a)



(b)

Figure 1a & 1b: Dissection of dorsum of right foot showing the tendons of extensor digitorum longus (EDL) and proximal and distal attachments of extensor digitorum brevis (EDB). Note the EDB gave two tendinous slips for the second toe: medial slip (B2a) and lateral slip (B2b). The EDL for the second toe received the insertion of medial slip (B2a) of the EDB for the second toe opposite to the base of the second metatarsal bone. (L1: EDL tendon for second toe; L2: EDL tendon for third toe; L3: EDL tendon for fourth toe; L4: EDL tendon for fifth toe; B1: EDB tendinous slip for the great toe; B2: EDB medial tendinous slip for the second toe; B3: EDB tendinous slip for the third toe; B4: EDB tendinous slip for the fourth toe; EHL: extensor hallucis longus)

surgeries, and care must be taken before harvesting the tendon grafts (1). We here report a rare anatomical variation in the extensor tendons of the second toe in the dorsum of the foot.

Case Report

During regular dissection classes for medical undergraduates in a 55-year-old male cadaver, we came across an unusual arrangement of extensor tendons for second toe in the dorsum of the foot. EDL arose from the upper three-quarters of the anterior surface of the shaft of the fibula; partly from the lateral side of the tibial condyle, the interosseous membrane. It became tendinous at lower end of the leg and then divided into four slips. The slips for the third, fourth and fifth toes ran forward on the dorsum of the foot and inserted to the middle and distal phalanges of the corresponding toes. The tendon to the second toe of the EDL received the insertion of medial slip of EDB for the second toe at the level of base of second metatarsal bone (Fig. 1a & 1b). EDB divided into five tendinous slips for medial four toes. There were two slips for second toe: medial slip and lateral slip. After receiving the medial slip of the EDB, the EDL tendon for the second toe was attached to the base of the middle and distal phalanges of the second toe (Fig. 1a & 1b). The lateral slip of the EDB was inserted to the lateral side of the EDL tendon for the second toe, opposite to the base of the proximal phalanx. The other tendinous slips of the EDB were normal; the first slip was attached to the base of the proximal phalanx of the great toe whereas the slips for third and fourth toes were attached to the lateral side of corresponding EDL tendons.

Discussion

The EDL muscle shows variations in its mode of insertion and arrangement of tendons. Extra slips or connecting slip from the EDL may extend to the base of the proximal phalanx of the second toe, the fifth metatarsal bone, the first interosseous muscle, the extensor hallucis and the extensor brevis. Double tendons may be present for the second and little toes (3,4,5). Absence of one of its tendons is very rare, earlier a case with absence of tendon for the third toe has been reported. In this case, there was an additional tendon for the fourth toe (3). Absence of tendon was also observed in two of cases in Japanese population (1,6): in one case the tendon for the little toe was absent (6), in another case the tendon for the fourth toe was absent (1). EDL is present in the anterior compartment of the leg, along with the extensor digitorum longus, tibialis anterior and extensor hallucis longus muscles. All these anterior crural muscle can be recognized individually between 5 and 6 weeks of embryonic age (7). Probably, the developmental error causes the absence of the tendon of the EDL occurred during the 5th week of development (8). Even though EDL tendons are used for Achilles tendon and ankle joint lateral ligament reconstruction (9,10), the donor site for a tendon graft is usually determined by the surgeon according to the demand of the surgical procedure (1).

The EDB is known to show variations in its heads, tendons and in presence of additional fascicles. Usually, it divides into four tendinous slips. Rarely, it may have only two or three tendinous slips or very rarely whole muscle itself is absent. Muscle has also

been reported to have double tendon for the second toe. Sometimes, its second and third tendinous slips have found to receive accessory fasciculus arising from the adjacent bones of the foot. Rarely, an extra tendon of the muscle may join with the EDL tendon of the little toe (3). In the present situation, we reported a rare case of EDB, where it gave two tendinous slips to the second toe; medial slip and lateral slip. The EDL tendon for the second toe received the insertion of EDB medial slip for the second toe, opposite to the base of second metatarsal bone. As the EDB is functionally insignificant, the tendons of EDB are frequently used to treat crossover deformity and painful toe disorders such as lateral ankle deformity (2).

According to our opinion, selection of EDB medial tendinous slip of second toe as a donor site for tendon graft in similar cases like present case may not appropriate as its usage might affect the functional status of the second toe. Although, the anomaly presented in present case report is probably very rare, the knowledge about such anomalies are essentially important for the plastic and orthopaedic surgeons while harvesting tendon grafts.

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