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

Sirasanagandla SR1 (✉), Satheesh BN1, Kumar MR Bhat2, Swamy RS1, Deepthinath R1

1Department of Anatomy, Melaka Manipal Medical College, Manipal University, Madhav Nagar, Manipal, 576104 Karnataka, India.
2Department of Anatomy, Kasturba Medical College, Manipal University, Manipal, 576104 Karnataka, India.

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

Correspondence:
Swamy Ravindra S, Department of Anatomy, Melaka Manipal Medical College, Manipal University, Madhav Nagar, Manipal, Karnataka, 576104, India. Tel: +91-820-2922388 Fax: +91-820-257190 Email: ravindrammmc@gmail.com

Date of submission: 29 Mar, 2013 Date of acceptance: 24 Jun, 2013

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
surgires, 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
toess 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.

References


