Higher division of the extensor digitorum longus muscle: A cadaveric case report.
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Abstract
Introduction
The higher division of extensor digitorum longus (EDL) in the leg is seldomly reported in the past. This paper reports a cadaveric case of higher division of the extensor digitorum longus muscle.

Case report
During a regular dissection, we came across a rare anatomical variation of the EDL, in an adult male cadaver. At the level of the upper part of the leg, a separate long slender tendon arising from the EDL was observed. This tendon coursed between the tibialis anterior and EDL muscles in the upper part of the leg, between the extensor hallucis longus and EDL muscles in the lower part of the leg. The tendon divided into two tendinous slips for the second and third toes, over the dorsum of the foot. The main portion of the EDL muscle became completely tendinous on the dorsum of the foot and divided into two tendinous slips for the third and fourth toes. The insertion of the all the four tendinous slips was found to be normal.

Conclusion
Awareness of presence of an extra tendon in the anterior compartment of leg is crucial while treating the compartment syndrome.

Introduction
The EDL muscle takes continuous origin from the lower surface of the tibial lateral condyle, upper one third of the fibular medial surface, adjacent interosseous membrane, deep fascia and anterior inter-muscular septum. The muscle becomes tendinous while passing deep to the superior and inferior retinacula. Usually, it divides into four tendons on the dorsum of the foot for the lateral four toes. The tendons for the second, third and fourth toes, at the level of the metatarsophalangeal joints joined by the tendons of the extensor digitorum brevis to form the dorsal digital expansion. Through this expansion each of the EDL tendons finally get inserted to the base middle and distal phalanges1. EDL muscle frequently shows variations in the arrangement and insertion of the tendons in the dorsum of the foot2,3,4,5. The higher up division of EDL in the leg is seldom reported in the literature6. Herein, we report a rare case of higher up division of the EDL tendon in the upper part of the leg and discuss its clinical significance.

Case report
During a regular dissection, we came across a rare anatomical variation of EDL in an approximately 55-year-old male cadaver. The observed variation was unilateral and it was observed in the right leg. The EDL arose normally from the lateral condyle of the tibia, medial surface of the fibula and the interosseous membrane. Then at the level of the upper part of the leg, it gave a separate long tendon. This long slender tendon ran between the tibialis anterior and EDL in the upper part of the leg, between the extensor hallucis longus and EDL in the lower part of the leg (Figure 1). On the dorsum of the foot, it divided into two tendinous slips for the second and third toes. The main portion of the EDL became completely tendinous after passing deep to the inferior extensor retinaculum, then divided into two slips for the third and fourth toes (Figure 2). The insertion of all the four EDL tendinous slips to the lateral toes was found to be normal. EDL muscle received the nerve supply from the deep peroneal nerve.

Discussion
The EDL is one of the anterior compartment muscles of the leg. For many years, EDL has been an area of special interest and it has been studied in various fields such as comparative anatomy, embryology, morphology and electromyography5. The EDL muscle frequently shows variation in the arrangement and insertion of its tendons.

Figure 1: Dissection of the right leg and dorsum of the foot showing the higher up division of the extensor digitorum longus muscle (EDL). Note the origin of the long slender separate tendon (EDLT) from the EDL, in the upper part of the leg. (PT: peroneus tertius, EHL: extensor hallucis longus muscle, TA: tibialis anterior muscle).

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It may give an additional slip to the base of the proximal phalanx of the second toe, the first interosseous muscle and the anterior end of the fifth metatarsal bone. Sometimes, it may be connected to the extensor hallucis longus by a slip, extensor digitorum brevis by a cross band and peroneus tertius by a slip. Further, the digital tendon to each toe may be doubled or rarely tendon to the second and little toes alone may be doubled.\(^2,\,3,\,4,\,5,\,6\) Rarely, one of the four tendons may be absent.\(^5\) Sometimes peroneus tertius tendon may arise from the fourth digital tendon.\(^7\) The higher up division of the common tendon of the EDL is rarely reported in the literature. In the past, Arora et al. have observed the higher up division of the common tendon of the EDL in the lower part of the leg. In this case, the EDL common tendon divided initially into three tendons in the lower part of the leg, the medial most tendon re-divided on the dorsum of the foot and finally there were four tendons for lateral four toes.\(^5\) Contrary to previous cases, we report a rare case of higher division of EDL at a much higher level in the leg. EDL tendons diameter is quite enough for the need of the tendon grafts and reconstruction procedures, so they are usually used in reconstruction of ankle joint lateral ligaments and Achilles tendons\(^8\) and also used for free tendon grafts.\(^9\) Awareness of anatomical variation observed in the present case may be clinically important during the selection of the donor site for tendon graft procedures. Knowledge of occurrence of an extra tendon is also important during the diagnosis and surgical release of compartment syndrome of the leg. Closed rupture of EDL tendons are very rarely reported in the literature. Hattori et al. have reported a case of closed subcutaneous rupture of the EDL. They performed a biomechanical study on three cadavers, to reveal the mechanisms of EDL tendons rupture. They concluded that EDL rupture occurred during plantar flexion.\(^10\)

**Conclusion**

In cases of the higher division of the EDL muscle, the pressure on the bare tendon while it is passing through the inferior retinaculum will be high and the chances of ruptures are predominant.

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**Figure 2:** Closer view of the right foot showing the separate tendon of the extensor digitorum longus muscle (EDLT) and the tendon of the main extensor digitorum longus muscle (EDL). Note the four tendinous slips (asterisks) for the lateral four toes from the both EDLT and EDL. (TA: tibialis anterior, PT: peroneus tertius, EHL: extensor hallucis longus).

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**References**


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All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.

All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.