



Bilateral absence of fibularis tertius: clinical implications and phylogeny

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ABSTRACT

Fibularis tertius (FT) muscle is found in the anterior compartment of the leg. It assists in dorsiflexion and eversion of foot. The FT muscle originates from the distal third of the medial surface of fibula, the adjoining interosseous membrane and the anterior intermuscular septum. It is inserted on the dorsal surface of the base of the fifth metatarsal. During routine dissection of an adult female cadaver, a bilateral absence of FT was observed. Cases of absence of FT may be asymptomatic; it may be accidentally detected during dissection or autopsies. FT when present, may act in swing phase of gait. Its tendon may be used in transplantation and treatment of ankle laxity. Stress fracture of the fifth metatarsal may be produced by the pull of FT. Surgeons planning tendon transplants might be perplexed by absence of FT. The clinical implications and phylogeny of the bilateral absence of FT are discussed. © IJAV. 2010; 3: 170–172.

Key words [fibularis tertius] [bilateral] [absence] [ankle] [transplantation]

Introduction

Anatomical variations found during cadaveric dissections have been important learning resources. They make us consider the embryological basis for their genesis. Variations also provide explanation of different surgical and medical conditions. Moreover, variations have to be taken into account during medical and surgical treatment of individuals.

Fibularis tertius (FT) muscle is a relatively small unipennate muscle found in the anterior compartment of the leg. It assists in dorsiflexion and eversion of foot. The FT muscle originates from the distal third or more of the medial surface of fibula, the adjoining anterior surface of the interosseous membrane and the anterior crural intermuscular septum. It is inserted on the medial aspect of the dorsal surface of the base of the fifth metatarsal. The muscle is supplied by the deep peroneal nerve [1–3]. FT has been described as a part of the extensor digitorum longus (EDL) muscle in classical textbooks [1]. Although closely associated with the EDL, the FT is not a member of the superficial layer of digital extensors (EDL), and in reality, it is a proximally migrated part of the extensor digitorum brevis (EDB) of the little toe [4]. The FT, in humans, is a variable muscle – it may be as bulky as the EDL or be very thin and rudimentary. It represents the extensor digiti minimi (proprius) (pedis) with its insertion displaced to the base of the fifth metatarsal [5]. It has also

been reported to be absent in about 10% cases [4,5]. The presence of FT is important for dorsiflexion of the foot in swing phase of the gait [1]. According to Vertullo et al., the insertion of the FT might play an important role in the causation of torsional stresses as observed in Jones fractures and stress fractures. Arnold et al. and Karlsson et al. stated that foot surgeons might use the FT muscle flap for transposition and also for correcting any laxity in the ankle joint [6]. Thus the bilateral presence or absence of the FT may have a clinical and phylogenetic viewpoint that is highlighted in this case report.

Case Report

During routine dissection of an adult female cadaver, it was observed that the FT muscle was absent bilaterally (Figures 1, 2). All the other extensor group muscles viz. the tibialis anterior (TA), the extensor hallucis longus (EHL) and the EDL were present and displayed usual features. The relationship of structures of the anterior compartment of leg at the ankle from medial to lateral side was as follows: TA, EHL, anterior tibial artery, deep peroneal nerve, EDL. For better understanding of the presence and absence of FT, a schematic line diagram is shown (Figure 3).

Discussion

FT was formerly called as the peroneus tertius [7]. FT normally originates from the distal third of the medial surface of the fibula [1–3], but in the present case, no such origin was found in both the lower limbs. In cases

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of absence of the FT, it might be expected that the fourth slip of EDL might show localized thickening, but in the present case no such observation was made.

Bryce (1923) has stated that FT may be absent; Wood Jones (1949) described its absence in 15% cases [4]; Williams et al. (1995) have quoted the figure as 4.4% [1]; Joshi et al. (2006) have found absence of FT in 10.45% cases [4] and Rourke et al. (2007) have found the same in 6.1% cases [7].

Functionally FT acts along with the TA and EDL during the swing phase of gait to maintain a level foot and prevent the toes from dragging on the ground. However, due to its synergistic role in walking, it may be sacrificed to perform various reconstructive surgeries with little donor site morbidity. People who lack FT do not exhibit decreased eversion or dorsiflexion strength [7,8]. The attachment of FT to the fifth metatarsal might define its role in providing proper support to the outer aspect of the sole of foot. Hence its absence might weaken the support along the lateral border of the foot [6].

Insertion of the FT might play an important role in imposing torsional stress leading to fractures of the base of the fifth metatarsal [9]. Hence people with absence of FT might be less vulnerable to such stress fractures

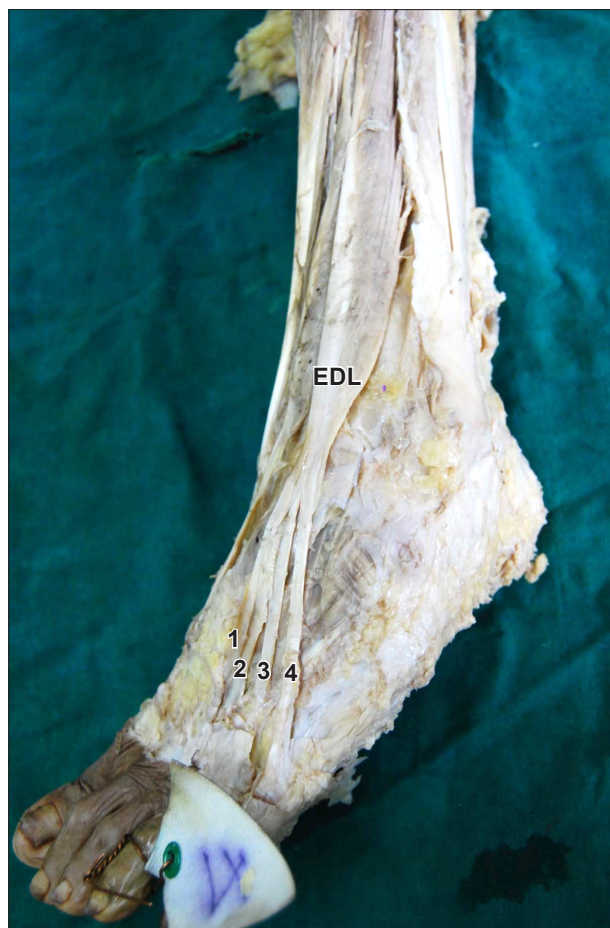


Figure 1. Photograph of left lower limb showing absence of fibularis tertius. (EDL: extensor digitorum longus; 1,2,3,4: slips of extensor digitorum longus)

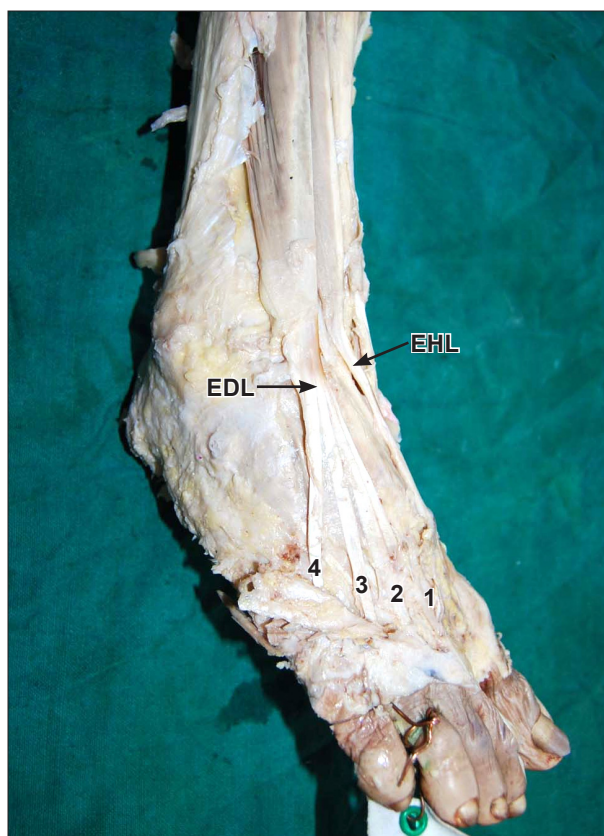


Figure 2. Photograph of right lower limb showing absence of fibularis tertius. (EDL: extensor digitorum longus; 1,2,3,4: slips of extensor digitorum longus; EHL: extensor hallucis longus)

[6]. FT muscle might aid in supporting the ankle from the lateral aspect. But it has been found that people with absence of FT are not at higher risk of ankle ligament injury than the ones with its presence [8]. Since FT has been a source for tendon transplant surgeries, surgeons planning such transplants might be perplexed by its absence. Hence surgeons must confirm the presence of FT before surgery.

The FT muscle is absent in many primates with much variation in humans [6]. Anatomical studies in primates like gorillas, chimpanzees and baboons, which are closely related to man, have not reported many cases of presence of FT. It would therefore seem reasonable to suggest that FT is yet another character that developed in association with bipedalism [10]. Bipedalism involves plantigrade position of the foot. The body weight is transmitted from the calcaneal tubercle to the first and the fifth metatarsals. Two tendons, namely TA from the anterior compartment and fibularis longus from the lateral compartment of leg, are inserted on the base of the first metatarsal. Likewise two tendons namely, the fibularis brevis from the lateral compartment and the FT from the anterior compartment are inserted on the base of the fifth metatarsal. The author would like to propose that fifth slip of the EDB that has migrated to the leg and gained its distal attachment to the dorsal aspect of the

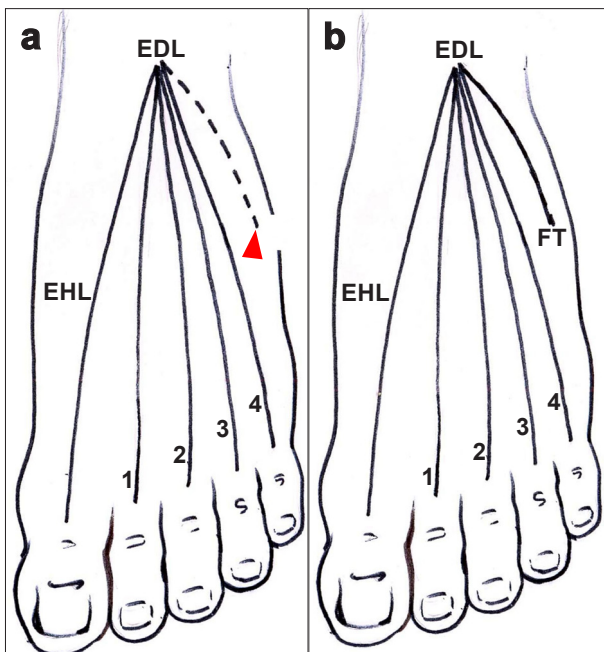


Figure 3. *a)* Line diagram showing absence of fibularis tertius. (EDL: extensor digitorum longus; 1,2,3,4: slips of extensor digitorum longus; EHL: extensor hallucis longus; red arrowhead points to broken line representing course of fibularis tertius when present). *b)* Line diagram of left foot. (EDL: extensor digitorum longus; 1,2,3,4: slips of extensor digitorum longus; EHL: extensor hallucis longus; FT: fibularis tertius)

base of the fifth metatarsal, is to balance the proximal part of the foot from the lateral aspect.

Conclusion

The present study suggests that the FT muscle might be bilaterally absent in humans. Absence of FT need not result in compensatory thickening of the fourth tendon of EDL. Phylogenetically, FT is peculiar to humans who

are associated with bipedal gait. Support to the lateral aspect of the foot might be compromised due to absence of FT but it may not increase risk to ankle injuries. Stress exerted on fifth metatarsal might be altered when FT is absent. Thus bilateral absence of FT is important for anatomists, plastic surgeons and orthopedic surgeons.

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