

Case Report

BILATERAL VARIATIONS IN TENDONS OF DORSUM OF FOOT

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ABSTRACT

Anterior or extensor muscles of foot comprises Peroneus tertius (PT), Extensor digitorum longus (EDL), Extensor hallucis longus (EHL) and Tibialis anterior (TA). Presence of PT in many of the primates and humans suggests terrestrial bipedalism. PT is a dorsi-flexor of ankle joint and a weak evertor of foot. TA is the most medial and superficial dorsiflexor. Standard text-books describe the course of tendon of TA as passing deep to inferior extensor retinaculum (IER).

In the present study, absence of PT with a course of TA superficial to IER on one side with variant origin of PT from Extensor digitorum longus on the other side were observed in an adult female cadaver. Knowledge on variations in PT and TA are of clinical significance and academic importance to orthopedic surgeons, radiologists and anatomists.

KEYWORDS: Peroneus tertius; Extensor digitorum longus; Tibialis anterior; Variations.

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INTRODUCTION

The order of arrangement of tendons on the dorsum of foot from lateral to medial are Peroneus tertius (PT), Extensor digitorum longus (EDL), Extensor hallucis longus (EHL) and Tibialis anterior (TA). The muscular bellies originating from the proximal parts of bones of leg become tendons in the distal part and pass deep to the extensor retinacula at the ankle to get inserted into the bones of foot.

Peroneus tertius (PT) is a small unipennate muscle of anterior compartment of leg and is unique to humans among primates [1]. It is absent in other primates and its presence in man is an evidence of evolution and supports its function of terrestrial bipedalism. It is occasionally found in apes and gorillas [2]. With evolution, the frequency of presence of PT has increased and is found in 95% of the human population [2].

Peroneus tertius is also called fibularis tertius (FT) [3]. The muscle arises from lower one - fourth of medial surface of shaft of fibula, adjacent anterior surface of interosseous membrane and anterior crural intermuscular septum. After passing beneath superior extensor retinaculum, it is inserted into dorsal surface of base of 5th metatarsal bone and may have a thin expansion usually extending forwards along the medial border of shaft of 5th metatarsal bone or shaft of 4th metatarsal bone or base of 4th metatarsal [3].

PT is often considered as a continuation of origin of EDL or 5th tendon of EDL [3]. Though it is closely associated with EDL it has been considered as migrated part of Extensor digitorum brevis (EDB) of little toe [4] or it represents extensor digiti minimi with displaced insertion to the base of 5th metatarsal [5].

Extensor digitorum longus muscle (EDL) originates from upper half of medial surface of fibula and deep fascia of leg and it becomes tendon in the lower part and passes deep to the extensor retinacula on to the dorsum of foot where it divides in to four tendons for the lateral four digits.

Tibialis anterior is the most medial and superficial dorsiflexor of ankle. It arises from lateral condyle and proximal two-thirds of lateral surface of shaft of tibia, adjacent interosseous membrane and the intermuscular septum between TA and EDL. In the lower one-third of leg the muscle becomes a tendon and passes through the medial compartments of superior and inferior extensor retinacula to get inserted in to the medial cuneiform bone on its medial and inferior surfaces [6]. The tendon of TA usually passes deep to IER.

Along with Extensor digitorum longus (EDL) and Tibialis anterior (TA), peroneus tertius facilitates the movements of dorsiflexion and eversion during swing phase of bipedal locomotion. This facilitates foot and toes to clear off the ground for bipedal walking.

The present case reports a rare combination of variations in PT i.e. absence on one side and origin as fifth tendon of EDL on other side and a deep to IER course of TA on one side.

CASE REPORT

During routine dissection of anterior compartment of leg and dorsum of foot in a 60 year old female cadaver in the Department of Anatomy, S.V. Medical College Tirupati, absence of Peroneus tertius muscle with an unusual course of the tendon of Tibialis anterior passing superficial to the inferior extensor retinaculum instead of deep to it on right side [Fig.1] and variant origin of Peroneus tertius as a fifth tendon of EDL with normal course of TA on left side (Fig.2) were observed.

DISCUSSION

The Peroneus tertius is usually considered to be a differentiated portion of the Extensor Digitorum Longus and its variations are commonly interpreted as mere variations in the degree of differentiation of this muscle [7].

PT is a variant muscle and may be as bulky as EDL or rudimentary or absent. The most common variation of Peroneus tertius is its absence.

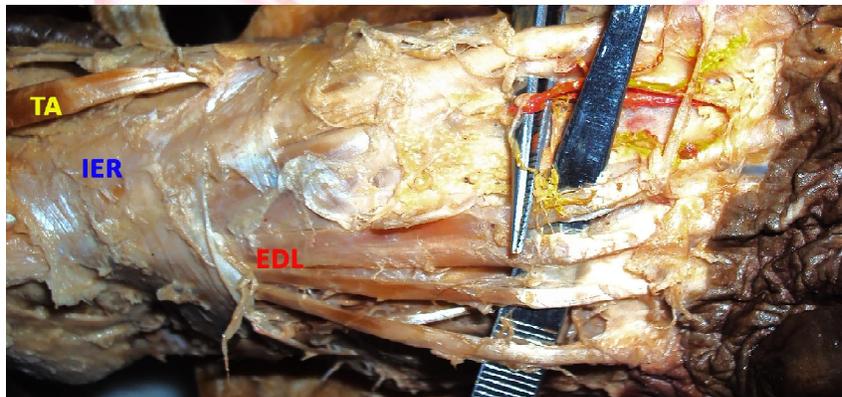


Fig.1: Right Dorsum of foot Showing absence of Peroneus Tertius (PT) and Tendon of the Tibialis Anterior (TA) Passing Superficial to Inferior Extensor Retinaculum (IER)



Fig.2: Left Dorsum of foot Showing Origin of Peroneus Tertius (PT) as 5th Tendon of the Extensor digitorum longus (EDL)

Absence of PT is considered as an advantage as those who are not having it would be less vulnerable to stress fractures of 5th metatarsal and Jones fracture [8]. Eversion or dorsiflexion movement may not be affected in cases of absent peroneus tertius [1,3,9]. The next commonest variation of PT is its origin from EDL tendon.

Presence or absence of PT is important for plastic surgeons and orthopedic surgeons for performing tendoplasty, tendon transfer or resection surgeries on foot. PT muscle flap is used for transposition and for correcting any laxity in the ankle joint. PT tendon is used in transplantation surgeries on Tibialis posterior tendon in foot drop [10] and in anterior talo-fibular ligament replacement for stabilization of ankle [11]. Presence of PT Muscle is closely related to development and evolution of EDL and its embryonic formation is based on progressive separation from EDL until final insertion into lateral border of foot [1].

The percentage incidence of absence of PT based on a large sample size reported in different populations varies from 4.4 to 17% [3-5,9,12]. Absence of PT suggests existence of a primitive condition of anthropoids[1]. During routine cadaveric dissection, isolated cases of unilateral and bilateral absence of PT were reported in literature [13-16]. In the literature, a study on 94 limbs of North Indian cadavers 10 limbs presented absence and 6 limbs presented its origin from EDL [12].

A gender based comparative study on the rate of PT existence was shown to be higher in men [1]. Absence of PT may not cause a significant decrease in its function as evertor and dorsiflexor of foot [9]. Support to lateral aspect of foot might be compromised by its absence but it may not increase risk to ankle injuries [14].

A percentage incidence of 1.67% each for EDL giving a slip to peroneus tertius and combined muscular belly of EDL and PT with separate tendons were reported based on dissection study of 60 lower limbs [17].

Tendon of TA is used for tendon transfer in treatment of recurrent congenital clubfoot to restore muscle balance and paralytic equinovarus foot deformities in cerebral palsy [18].

According to standard text-book description, TA passes deep to both superior and inferior extensor retinacula [6] but in the present case on right side it is running superficial to inferior extensor retinaculum. In the literature a case of superficial course of TA as was observed in the present study was reported [19].

The variations observed in the present study are important for Anthropologists, Anatomists, Physiotherapists and orthopedic surgeons [13,14]. Absence of PT may not cause much clinical problems but its absence may influence operating surgeons while planning a transplant or resection. Hence, pre-operative imaging for the presence of PT before planning any surgical operation on foot should be confirmed by radiological imaging techniques.

CONCLUSION

Variations observed in the present case are accidental finding during anatomical dissection or autopsies. Variant origin and absence of PT has functional importance in athletes as it has a protective role against injuries to talocrural joint in subjects with high functional demand. It is also important for orthopedic surgeons for performing graft operations and transplant surgeries in foot. Variant course of TA is also important for tendon transfer surgeries in Orthopedics.

Conflicts of Interests: None

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