

## CASE REPORT

# Absence of the peroneus tertius muscle: cadaveric study with clinical considerations

S. DAS, FARIHAH HAJI SUHAIMI, AZIAN ABD LATIFF,  
KHIN PA PA HLAING, NORZANA ABD GHAFAR,  
FAIZAH OTHMAN

Department of Anatomy, Universiti Kebangsaan Malaysia,  
Kuala Lumpur, Malaysia

### Abstract

Peroneus tertius (PT) is a muscle of the anterior compartment of the leg. The PT muscle originates from the anterior surface of the fibula and the interosseous membrane and inserts into the medial side of the dorsal region of the fifth metatarsal bone. During routine dissection, we observed the absence of PT on the left lower limb of a cadaver. Usually, the PT is involved in dorsiflexion and eversion of the foot. In many cases, the absence of PT maybe asymptomatic and it may be incidentally detected during cadaveric dissections or autopsies. The existence of PT may help in the swing phase of bipedal walking. The PT may be used for tendon graft surgeries. The pull of the PT may be responsible for causing stress on the fifth metacarpal and account for all stress fractures in any individual. The absence of the PT may puzzle any transplant and foot surgeons performing graft operations. We as anatomists discuss the clinical implications of the absence of PT.

**Keywords:** peroneus tertius, muscle, absence, morphology, cadaver, ankle, injury.

### ■ Introduction

The anterior or the extensor group of muscles of the foot comprises of the tibialis anterior (TA), extensor hallucis longus (EHL), extensor digitorum longus (EDL) and the PT [1]. Classical anatomy textbooks describe the PT to be a part of the EDL muscle and it is often described as the fifth tendon of the EDL [1].

The PT is a unipennate muscle originates from the distal third or the medial surface of the fibula, anterior surface of the interosseous membrane and the anterior crural intermuscular septum, which passes deep to the superior extensor retinaculum to insert into the medial part of the dorsal surface of the base of the fifth metatarsals [1–3]. The muscle is innervated by the deep peroneal nerve and its main action is to dorsiflex and evert the foot [1–3].

The PT has been described to be a peculiar muscle. Although closely associated with the EDL, the PT has been considered the migrated part of the extensor digitorum brevis of the little toe [4]. Thus, one might even expect the last slip of the EDL to be thickened which might have replaced the PT muscle. The PT has been reported to attain a bulk similar to the EDL, even remain rudimentary, or absent in 4.4–10% cases [1, 4]. The presence of PT is important for dorsiflexion and extension of the foot in swing phase of the gait [1].

The insertion of the PT might play an important role in the causation of torsional stresses as observed in Jones fractures and stress fractures [5]. Foot surgeons might use the PT muscle flap for transposition and also for correcting any laxity in the ankle joint [6, 7]. Thus, the presence or absence of PT may be important from

the academic and clinical point of view and the present study aims to highlight such.

### ■ Material and Methods

During routine dissection of cadavers in the Department of Anatomy, we detected the absence of PT in a single left lower limb (Figure 1).

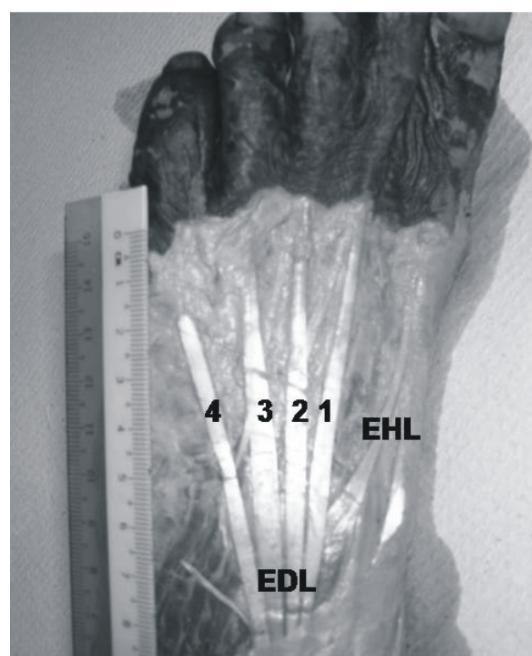
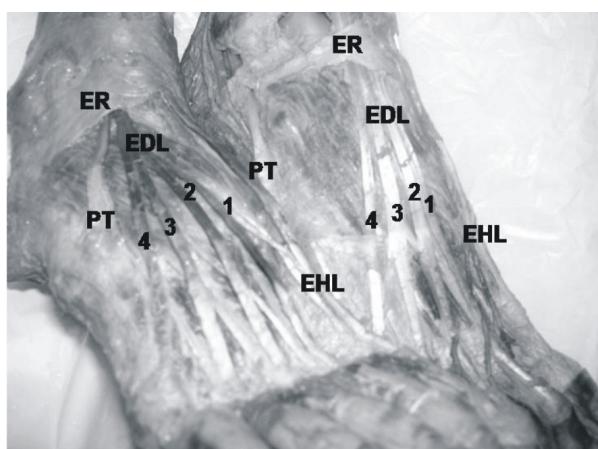


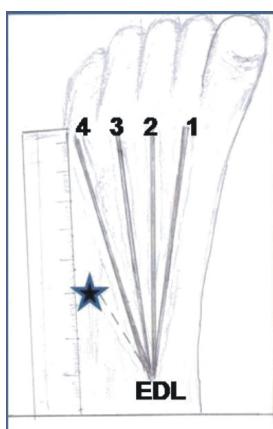
Figure 1 – Photograph of anomalous left lower limb showing: EDL – extensor digitorum longus with its tendons labeled as 1, 2, 3, 4; EHL – extensor hallucis longus.

The study conformed to the Ethical Code laid down by the Institution. The EDL displayed the usual four tendons with a slip to each of the lateral four digits. All the other extensor group muscles like the TA and EHL displayed normal characteristics. We even double-checked for the origin of the PT muscle in the lower half of the distal part of the fibula but we could not observe any such origin. In fact, in the anomalous specimen, the relations of the structures in the anterior compartment from the medial to lateral side were as follows: tibialis anterior, extensor hallucis longus and extensor digitorum longus. The anomalous specimen was compared to that of the normal PT (Figure 2). Admittedly, no history of the cadaver was available. All the cadavers were of unclaimed origin.



**Figure 2 – Photograph of two normal right lower limbs showing:** EDL – extensor digitorum longus with its tendons labeled as 1, 2, 3, 4; EHL – extensor hallucis longus; ER – extensor retinaculum; PT – peroneus tertius.

In the normal lower limbs, the PT was observed to originate from the lower one fourth of the medial surface of the shaft of the fibula. In the normal cases, the origin of the PT was observed at an average distance of 12 cm from the lateral malleolus. In all the normal specimens, the PT was invariably observed to insert into the base of the fifth metatarsal bone. In the normal specimens, the tendon of the PT was much separated from the tendons of the EDL and was innervated by the deep peroneal nerve. A schematic diagram to show the normal EDL and PT if present was also drawn for better interpretation (Figure 3).



**Figure 3 – A schematic diagram of the lower left foot (dorsum) showing:** EDL – extensor digitorum longus with its tendons labeled as 1, 2, 3, 4. Asterix (\*) shows the actual attachment of the peroneus tertius (if present in the cadaver). The peroneus tertius (if present) is represented with dotted lines.

## Discussion

Fibularis tertius (FT) is a recent coined term for the PT-muscle [8]. The PT has been reported to originate from the medial surface in its distal third of the fibula [1–3] but in the present case, we did not observe any such origin. One might even expect that in both the cases, the absence of the PT might be accompanied by a localized thickening of the fourth tendon of the EDL, but we did not observe any such finding.

The PT-muscle is absent in many primates with much variation in the humans. Interestingly, in the animal kingdom, the PT-muscle is found occasionally in the apes and monkeys but its incidence increases in the gorillas [9]. The variability of the muscle suggests that the absence of PT-muscle may be a primitive condition for anthropoids [10]. With evolution, the frequency of the PT has increased and perhaps that is the reason why it might be found in 95% of the human population [9]. Studies have been designed to determine the exact time of its earliest time of appearance of PT in humans so as to know the nature of early bipedalism [11].

The PT-tendon can be used for transplant surgeries. In foot drop, the tibialis posterior tendon manipulation might be required. There are past reports of the tibialis posterior tendon being transferred to the anterior compartment and anastomosed to the PT-tendon [12]. PT causes dorsiflexion and eversion of the foot during the swing phase of gait and it is important that the toes be lifted from the ground to assist in bipedal walking [4]. The attachment of the PT to the fifth metatarsal might define its role in providing proper support to the outer aspect of the sole of the foot. We, as anatomists believe that in the absence of the PT as seen in the present study, the support along the lateral border would be weakened.

It should not be forgotten that both Jones' fractures and stress fractures involve the proximal fifth metatarsal and the insertion of the PT might play an important role in imposing torsional stress [5]. Under such circumstances, the absence of the PT might be considered a boon to individuals who would be less vulnerable to such stress fractures. The fixation of screws might be important in proper fixation of screws in such fractures.

The PT may be considered as an accessory muscle for eversion and dorsiflexion thereby making its excision compatible for normal walking procedures. Eversion or dorsiflexion may not be decreased in the absence of the PT and this fact has already been studied earlier [13]. Thus, the absence of PT would not cause much clinical problems as thought earlier but its absence in any individual might perplex the operating surgeons planning a transplant or resection. We as anatomists would surely advocate prior imaging techniques to prove its existence before any surgical operation on the foot.

## Conclusion

In the present study, it was found that the PT might be absent in human population and its absence does not necessarily result in thickening of the lateral fourth slip of the EDL. Anthropologically, the PT-muscle has been

found to be evolutionary in nature with its role in bipedal walking. Some clinical aspects like those that stress component exerted on the fifth toe would certainly be altered in cases where it is absent. The absence of PT is an interesting finding, which could be important for academicians, anthropologists, surgeons and orthopedic surgeons.

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### Corresponding author

Faizah Othman, MD, Head of the Department of Anatomy, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Raja Muda Abdul Aziz, 50300 Kuala Lumpur, Malaysia; Phone 006–0392897263, Fax 006–0326989506, e-mail: faizah@medic.ukm.my

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