



## **STUDY OF EXTENSORS ON DORSUM OF FOOT AT K. J. SOMAIYA MEDICAL COLLEGE, MUMBAI**

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### **ABSTRACT**

Aim to study the variant extensors on the dorsum of foot. 100 lower limbs of 50 donated embalmed cadavers (45 males & 5 females) of age group ranging from 70 to 80 years were dissected in the department of Anatomy at K. J. Somaiya Medical College, Sion, Mumbai, India. The variant extensors on the dorsum of foot were observed in 2 specimens. The neurovascular pattern in the leg and foot was also observed. The photographs of the extensors on the dorsum of foot were taken for proper documentation. In 2 specimens we observed that Peroneus tertius was absent. The existence of Peroneus tertius may help in the swing phase of bipedal walking. The Peroneus tertius may be used for tendon graft surgeries. The pull of the Peroneus tertius may be responsible for causing stress on the fifth metacarpal and account for all stress fractures in any individual. The absence of the Peroneus tertius may confuse any transplant and foot surgeons performing graft operations.

**Keywords:** Absence of Peroneus tertius, Asymptomatic, Tendon graft surgeries.

### **INTRODUCTION**

Peroneus tertius (fibularis tertius) is a uniquely human muscle. It often appears to be part of extensor digitorum longus, and might be described as its 'fifth tendon'. The muscle fibres operating on this tendon arise from the distal third or more of the medial surface of the fibula, the adjoining anterior surface of the interosseous membrane, and the anterior crural intermuscular septum. The tendon passes behind the superior extensor retinaculum and within the loop of the inferior extensor retinaculum it shares with extensor digitorum longus. Peroneus tertius lies in lateral to extensor digitorum longus. It is inserted into the medial part of the dorsal surface of the base of the fifth metatarsal bone, and a thin expansion usually extends forwards along the medial border of the shaft of the bone. Peroneus tertius is supplied by the same vessels as extensor digitorum longus. The main blood supply to extensor digitorum longus is derived from anteriorly and laterally placed branches of the anterior tibial artery, supplemented distally from the perforating branch of the peroneal artery.

Proximally there may also be a supply from the lateral inferior genicular, popliteal or anterior tibial recurrent arteries. At the ankle and in the foot, the tendons are supplied by the anterior lateral malleolar artery and network, and by lateral tarsal, metatarsal plantar and digital arteries. In the foot it receives an additional supply from the termination of the arcuate artery and the fourth dorsal metacarpal. Peroneus tertius is innervated by the deep peroneal nerve. L5, S1.

During the swing phase of gait electromyographic studies show that peroneus tertius acts with extensor digitorum longus and tibialis anterior to produce dorsiflexion and eversion of the foot. This levels the foot and helps the toes to clear the ground, an action that improves the economy of bipedal walking. Peroneus tertius is not active during stance phase, a finding that contradicts suggestions that it acts primarily to support the lateral longitudinal arch or to transfer the centre of pressure of the foot medially.

Peroneus tertius cannot be tested in isolation, but its tendon can sometimes be seen when the foot is dorsiflexed against resistance [1]. This muscle is seldom found in other primates, a fact that has linked its function to efficient terrestrial bipedalism [1–3]. Peroneus tertius is considered to be a part of the extensor digitorum longus muscle and it is often described as the fifth tendon of the extensor digitorum longus [1].

Although closely associated with the extensor digitorum longus, the Peroneus tertius has been considered the migrated part of the extensor digitorum brevis of the little toe [4]. The Peroneus tertius has been reported to attain a bulk similar to the extensor digitorum longus, even remain rudimentary, or absent in 4.4–10% cases [1, 4]. The presence of Peroneus tertius is important for dorsiflexion and extension of the foot in swing phase of the gait [1]. The insertion of the Peroneus tertius might play an important role in the causation of torsional stresses as observed in Jones fractures and stress fractures [5].

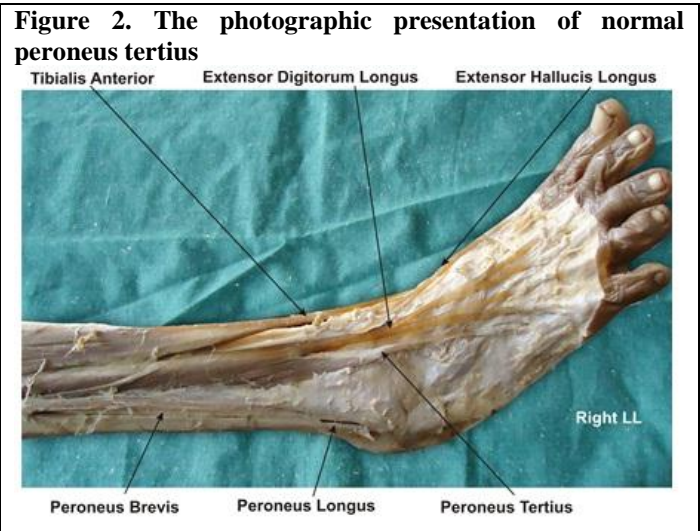
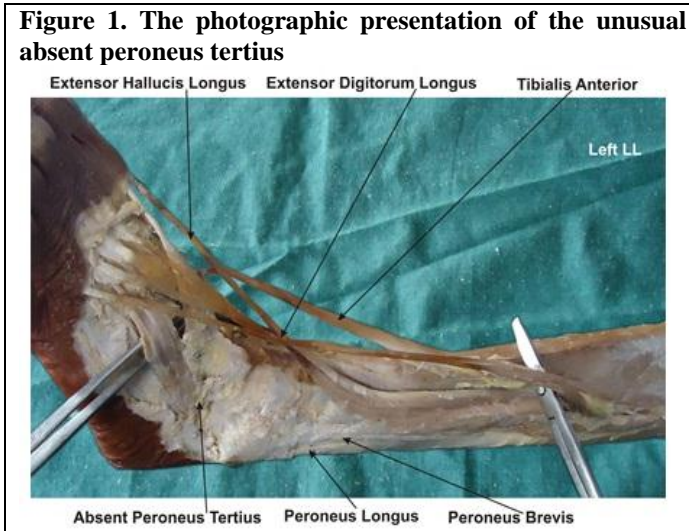
Foot surgeons might use the Peroneus tertius muscle flap for transposition and also for correcting any laxity in the ankle joint [6,7]. Thus, the presence or absence of Peroneus tertius may be important from the academic and clinical point of view.

**MATERIALS AND METHODS**

100 lower limbs of 50 donated embalmed cadavers (45 males & 5 females) of age group ranging from 70 to 80 years were dissected in the department of Anatomy at K. J. Somaiya Medical College, Sion, Mumbai, INDIA. The extensors on the dorsum of foot were observed in 2 specimens. The neurovascular pattern in the leg and foot was also observed. The photographs of the extensors on the dorsum of foot were taken for proper documentation.

**Observations:**

In 2 specimens we observed that Peroneus tertius was absent.



**DISCUSSION**

Recently Peroneus tertius is called as fibularis tertius (FT) [8]. The Peroneus tertius normally originates from the medial surface of the distal third of the fibula [1–3]. In the present study, it was absent and there was no thickening of the extensor digitorum longus. Studies have been designed to determine the exact time of its earliest time of appearance of Peroneus tertius in humans so as to know the nature of early bipedalism [11]. The Peroneus tertius 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 Peroneus tertius tendon [12]. Peroneus tertius 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 Peroneus tertius 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 Peroneus tertius 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 Peroneus tertius might play an important role in imposing torsional stress [5]. Under such circumstances, the absence of the Peroneus tertius might be considered a boon to individuals who would be less vulnerable to such stress fractures. The Peroneus tertius may be considered as an accessory muscle for eversion and dorsiflexion. Witvrouw et al in their studies have shown that eversion or dorsiflexion may not be affected in the absence of the Peroneus tertius [13].

### Comparative anatomy

The Peroneus tertius muscle is absent in many primates with much variation in the humans. Interestingly, in the animal kingdom, the Peroneus tertius 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 Peroneus tertius muscle may be a primitive condition for anthropoids [10]. With evolution, the frequency of the Peroneus tertius has increased and perhaps that is the reason why it might be found in 95% of the human population [9].

Anthropologically, the Peroneus tertius muscle has been found to be evolutionary in nature with its role in bipedal walking.

### Clinical Significance

In the present study, it was found that the Peroneus tertius was absent and its absence did not result in thickening of the lateral fourth slip of the extensor digitorum longus. The stress component exerted on the fifth toe would certainly be altered in cases where it is absent. The absence of Peroneus tertius is an interesting finding, which could be important for anatomists, anthropologists, surgeons and orthopedic surgeons.

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### CONCLUSION

Thus, the absence of Peroneus tertius 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.

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### Competing Interests

The author declares that he has no competing interest.

### Authors' contributions

SPS draft the manuscript, performed the literature review & obtained the photograph for the study.