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Anatomy

Anatomical study of Peroneus tertius

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Abstract: Peroneus tertius is an evolutionary muscle of anterior compartment of leg found exclusively in human being due to their erect posture. The aim of present study is to highlight the variations of Peroneus tertius from academic, phylogenetic and clinical point of view. We dissected both the lower limbs of 100 embalmed apparently normal cadavers. Any variations in Peroneus tertius if observed were meticulously noted. Absence of Peroneus tertius was seen in 16 cases. Peronius tertius was replaced by additional slip from Extensor digitorum longus in 5 cases. Extensive origin was seen in 44 cases. Extended insertion was noted in 4 cases upto the shaft of fifth metatarsal. Insertion to base of fifth metatarsal & medial slip to shaft of forth metatarsal was noted in 3 cases. Knowledge of such variations is important in various surgical procedures as peroneus tertius may be used for tendon transplantations, its correlation with stress fracture and treatment of ankle laxity.
Keywords: Peroneus tertius, Extensor digitorum longus, variations.

INTRODUCTION

Peroneus tertius has gained interest in the present study as it is an evolutionary muscle found exclusively in human being due to their errect posture. Though Peroneus tertius appears to be a part of extensor digitorum longus it has been considered as the migrated part of extensor digitorum brevis of the little toe. It is the muscle of anterior compartment of leg. Peroneus tertius lies lateral to extensor digitorum longus. It arises from the distal fourth of medial surface of the shaft of the fibula, the adjoining anterior surface of the interosseous membrane, and the anterior crural intermuscular septum. It is inserted into the base of fifth metatarsal. Peroneus tertius is innervated by the deep peroneal nerve [1].

Peroneus tertius produces dorsiflexion and eversion of the foot during the swing phase of gait [2]. The insertion of the peroneus tertius may cause stress fractures [3]. The Peroneus tertius muscle is also used for tendon graft surgeries.

Aim

The aim of present study is to highlight the importance of Peroneus tertius from academic, phylogenetic and clinical point of view.

MATERIALS AND METHODS

For the dissection procedure we followed guidelines given by Cunningham's manual[1]. We dissected both the lower limbs of 100 embalmed cadavers from various Government institutes for three consecutive years with prior permission.

Anterior compartment of leg and dorsum of foot were exposed by classical incisions. Attachments of all the muscles were entirely traced from their origin to the insertion. Any variations in Peroneus tertius if observed were meticulously noted.

RESULTS

In the present study anterior compartment of leg and dorsum of foot of both the lower limbs of 100 embalmed cadavers were exposed. In the table no.1 we have noted the variations of peroneus tertius.

Tabl-1: Variations of Peroneus tertius

Sr.no.	Variations	Right	Left	Total
1.	Absent	10	6	16
2.	Absent and replaced by additional slip from Extensor digitorum longus.	2	3	5
3.	Extensive origin from more than distal one third of extensor surface of fibula	24	20	44
4.	Insertion extending to shaft of fifth metatarsal	3	1	4
5.	Insertion to base of fifth metatarsal & medial slip to shaft of forth metatarsal	2	1	3

Complete absence of peroneus tertius muscle was found in 11 lower limbs (7 on right and 4 on left). In 5 limbs PT was absent but it was replaced by lateral slip coming from EDL. In 44 limbs peroneus tertius muscle had an extensive origin from more than distal 1/3 of extensor surface.

In the present study Peroneus tertius muscle was completely absent in 16% cases, whereas in 5% cases it was replaced by additional lateral slip from Extensor digitorum longus. Most of the standard texts define origin of peroneus tertius from distal 1/3 of medial surface of fibula but in the present study extensive origin of peroneus tertius from distal 1/2 to distal 3/4 of fibula was seen in 44% cases. Incidence of extensive origin was more on right side than on left side. Similar to extensive origin, insertion of peroneus tertius extended from base of fifth metatarsal to the shaft of fifth metatarsal in 4% cases and to the shaft of forth metatarsal in 3% cases. The incidence of extended insertion was more on the right side than on the left side.

Fig-1: only absence of PT

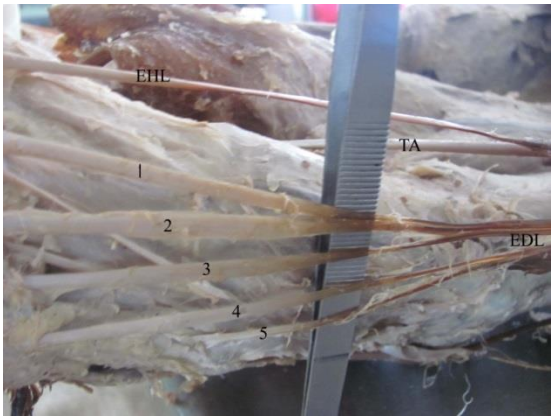

Fig-2: Absence of peroneus tertius and accessory slip of EDL

DISCUSSION

Anatomical studies in primates like gorillas, chimpanzees and baboons, who closely ressemble to man, have no peroneus tertius in many cases. Because of functional demands of bipedal gait and plantigrade foot, part of extensor digitorum brevis has migrated upwards into the leg from the dorsum of foot. Thus the presence of peroneus tertius is an evidence of evolution [4, 5].

Joshi [6] *et al*. have reported absence of peroneus tertius in 10.45% cases while Williams [2] *et al*. have mentioned it to be absent in about 4.4%. Wood Jones [7] noted its absence in 15% of cases. In the present study, Peroneus tertius was absent in 16% cases.

The insertion of peroneus tertius to the fifth metatarsal bone suggest that it provides support to the outer aspect of the foot. People who lack Peronius tertius do not exhibit decreased eversion or dorsiflexion strength but it might weaken the support along the lateral border of the foot [8]. Insertion of the peroneus tertius on fifth metatarsal may lead to torsional stress.

According to Hollinshead[9], Peroneus Tertius originates from lower one -third of extensor surface of fibula, whereas, in the present study in 44 lower limbs extensive origin from lower half to lower three-fourth of the extensor surface of fibula was noted. In the study by Figen[10] *et al*. in one case the peroneus tertius originated from the middle and lower third of the fibula and crural fascia but not from the extensor digitorum longus muscle. Bryce [11] has also described that the

muscle varies much in size, it might be as large as Extensor digitorum longus or Peroneus tertius may even be absent. Williams *et al.* [2] has described its insertion to the medial part of the dorsal surface of the base of fifth metatarsal; a thin expansion usually extends along the medial border of the shaft. Romanes[1] has described the insertion of Peronius tertius on the dorsum of the fifth metatarsal near its base or into the deep fascia nearby. This muscle is peculiar to man in whom insertion has been displaced to the base of the fifth metatarsal for the support of the outer side of the foot in walking. In the study by Joshi *et al*. [6] on 110 cadavers, in 4 percent, the tendon of peroneus tertius extended beyond fifth metatarsal up to metatarsophalangeal joint of fifth toe, and in 1.5 percent, it extended up to the proximal phalanx of little toe. They concluded that Peronius tertius, which is predominantly seen in human, is extending its purchase both proximally and distally. In study by Rourke *et al*. [12], in all cases the tendon inserted into the dorsal surface of the shafts of both the fourth and fifth metatarsals.

CONCLUSION

The absent peroneus tertius may misguide foot surgeons performing graft operations and transplant surgeries. Hence radiological imaging techniques must be performed to confirm the existence of the peroneus tertius muscle before planning any operations on the foot. Insertion of the peronius tertius at the base of the fifth metatarsal may impose torsional stress leading to Jones fractures. Hence people with absence of peronius tertius might be less vulnerable to such stress fractures [9]. Peronius tertius supports the ankle from lateral aspect. But it has been found that people with absence of peronius tertius are not at higher risk of ankle ligament injury than the ones with its presence.

Thus presence of peronius tertius in human can be considered as phylogenetical variation seen in evolved errect posture [13]. Knowledge of such variation is important for anatomists, plastic surgeons and orthopedic surgeons since peronius tertius has been a source for tendon transplant surgeries [14]. During the swing phase of gait Peronius tertius acts along with the Tibialis anterior and Extensor digitorum longus to maintain a level foot and prevent the toes from dragging on the ground[2]. Due to its synergistic role, it may be sacrificed to perform various reconstructive surgeries.

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