

# Prevalence and Topography of the *Peroneus tertius* Muscle: a Study of Human Cadavers

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J Morphol Sci 2018;35:106–109.

## Abstract

**Introduction** The peroneus tertius muscle, also known as fibularis tertius, is classified as an anatomic variation and has been described as inconstant in a wide variety of contemporaneous studies and in the classical medical literature. Its fibers are sometimes mistaken for those of the extensor digitorum longus muscle. In fact, peroneus tertius is detached from the extensor digitorum longus muscle through a tendon inserted into the base of the fifth metatarsal bone, after passing through the frondiform ligament of the extensor retinaculum.

**Objectives** The present study evaluated the prevalence, origin and insertion point of the peroneus tertius muscle in human cadavers.

**Methods and Results** Thirty-two lower limbs, 18.75% of which came from female cadavers, were obtained from two different anatomy laboratories at two separate institutes. The cadaver parts were dissected and photographed. Overall, the muscle was present in 93.75% of the samples and in 100% of the samples from female cadavers. The fibers of the muscle originated in the proximal third of the fibula in 6.68% of cases, in the middle third in 46.66% and in the distal third in 46.66% of cases. Insertion of the tendon was at the base of the fifth metatarsal in 70% of cases and in the space between the fourth and the fifth metatarsal in 30%.

**Conclusion** Therefore, the peroneus tertius muscle was present in the majority of the cadaver parts analyzed; however, the sites of origin and insertion varied. These results contradict data in the classical literature and in contemporaneous studies.

## Keywords

- ▶ anatomy
- ▶ anatomic variation
- ▶ skeletal muscular fiber
- ▶ lower limb
- ▶ fibularis tertius

## Introduction

The peroneus tertius, also known as fibularis tertius, is a flat muscle located laterally to the extensor digitorum longus muscle, originating along the medial face of the fibula. Its fibers are sometimes mistaken for those of the extensor digitorum longus muscle. Actually, peroneus tertius is detached from the extensor digitorum longus muscle through a tendon that goes through the frondiform ligament of the extensor retinaculum and is inserted into the base of the fifth metatarsal bone.<sup>1</sup>

The muscle evaluated here acts during the swing phase of gait and is a powerful synergist for the extensor digitorum longus in dorsiflexion, abduction and lateral rotation of the feet.<sup>2,3</sup> It is suggested, however, the insertion of the tendon in

the fifth metatarsal could put more stress and, therefore, make it more easy for a avulsion fracture of the head of the fifth metatarsal to happen.<sup>4</sup>

The peroneus tertius is supplied by the anterior tibial nerve and anterior tibial artery. Its prevalence is 86% in African American, 90% in Jewish, and 93% in European as well as studies showing the muscle in constant development in bipedal animals. There may be a unique or double tendon and the insertion occurs in the fifth metatarsal, fourth metatarsal or in the interosseous space.<sup>3,5</sup>

The aim of the present study was to evaluate the prevalence and topography of the peroneus tertius muscle in cadaver parts to help clarify conflicting literature reports regarding this anterolateral structure of the leg.

**Table 1** Prevalence and distribution of the peroneus tertius muscle according to sex

Sex	n	Frequency (%)	Prevalence (%)
Female	6	18.75	100
Male	26	81.25	66.66
Total	32	100.00	93.75

## Materials and Methods

This cross-sectional observational study was conducted in compliance with Brazilian federal law number 8.501 of November 30, 1992, which authorizes the use of non-reclaimed cadavers for research purposes. Lower limbs were obtained from two different anatomy laboratories at two separate institutes. The samples were dissected on a stainless steel bench without the use of optics, using a number 4 scalpel handle (ABC Stainless Ltd.), a number 24 scalpel blade (Embramac) and a grasping forceps with teeth (Erwin Guth). An incision was made from the anterolateral surface of the leg to the dorsal region of the foot exposing the muscles and tendons.

Photographs were then taken to enable data analysis to be conducted, and data were assembled to describe the frequency, origin and insertion of the peroneus tertius muscle. Finally, the point of division between the tendons of the peroneus tertius muscle and the extensor digitorum longus muscle was noted.

## Results

Thirty-two lower limbs were analyzed. ► **Table 1** describes the prevalence of the peroneus tertius muscle according to sex.

For the purposes of analysis, the fibula was divided into proximal, middle and distal thirds, and the origin of the muscle was described accordingly (► **Fig. 1**).

**Table 2** Point of origin of the peroneus tertius muscle

Location	n	Percentage (%)
Proximal third of the fibula	2	6.68
Middle third of the fibula	14	46.66
Distal third of the fibula	14	46.66

Fibers originating in the middle and distal thirds were equally common, being found in 46.66% of the specimens (► **Table 2**). Insertion of the tendon was either at the base of the fifth metatarsal or in the space between the fifth and the fourth metatarsal (► **Fig. 2**).

However, the tendency was toward the fifth metatarsal, a finding recorded for 70% of the specimens examined (► **Table 3**). The fibers of the peroneus tertius muscle that mark the division site from the fibers of the extensor digitorum longus muscle were found in the proximal, middle or distal thirds of the fibula. Nevertheless, the distal third was the predominant location, being the division site in 46.66% of the cases (► **Table 4**).

## Discussion

In the present study, the peroneus tertius muscle was found to be present in 93.75% of the samples analyzed, a finding that contradicts the results of other previous studies in which its presence was considered inconstant<sup>2,6-11</sup> or largely absent,<sup>3,12</sup> who determined that it was present in around 7 to 14% of cases.

To describe the origin of the peroneus tertius muscle fibers, the fibula was divided into the proximal, middle and distal thirds. In 6.68% of cases, the fibers originated in the proximal third, in 46.66% of cases in the middle third and in 46.66% of cases they originated in the distal third. These findings are in

**Fig. 1** Different origin sites of the peroneus tertius muscle marked with \* in proximal third, middle third and distal third of the fibula.



**Fig. 2** Insertion sites of the peroneus tertius muscle marked with \* in fifth metatarsal and between the fourth and fifth metatarsal.

**Table 3** Insertion point of the peroneus tertius muscle

Location	n	Percentage (%)
Fifth metatarsal	24	70
Between the fourth and fifth metatarsal	6	30

**Table 4** Division point between the peroneus tertius muscle and the extensor digitorum longus muscle

Location	n	Percentage (%)
Proximal third of the muscle belly	5	16.66
Middle third of the muscle belly	11	36.66
Distal third of the muscle belly	14	46.66

agreement with the results reported in another Brazilian study;<sup>12</sup> however, other studies have suggested that the distal third of the fibula would be the only possible site of origin of the peroneus tertius muscle fibers.<sup>1-3,7</sup>

The peroneus tertius muscle was most commonly found to be inserted into the base of the fifth metatarsal (70%), with the space between the fourth and the fifth metatarsal bases being a less common insertion site (30%). Although these findings are confirmed in the literature,<sup>2,3,6,11,12</sup> some studies have proposed the base of the fifth metatarsal as being the only possible insertion site of the peroneus tertius tendon.<sup>1,8-10</sup>

There is a general consensus that the peroneus tertius muscle fibers can be mistaken for those of the extensor digitorum longus muscle.<sup>3</sup> Notwithstanding, the fact that the peroneus tertius fibers separate themselves through their own tendon, which is inserted into the base of the fifth metatarsal, leads us to believe that the muscle belly and the tendon of the peroneus tertius muscle are both distinct from those of the extensor digitorum longus muscle<sup>11</sup> and in contradiction with classic authors.<sup>7</sup>

The peroneus tertius muscle is considered a feature of anthropoids, particularly bipeds such as humans, in whom, it represents an advantage from an evolutionary perspective.<sup>13</sup>

Some studies have suggested that during activation of the dorsiflexion and eversion movements of the foot, the peroneus tertius muscle may play a role in protecting the ligamentum talofibulare anterius against the risk of rupture induced by proprioception and neuromuscular control.<sup>14,15</sup>

Due to the easy access of the peroneus tertius muscle through a longitudinal incision in the anterolateral surface of the leg, its lack of primary function and its minimal importance from an aesthetic point of view, it is an ideal muscle for use as a myocutaneous flap in plastic surgery involving the distal part of the lower limb.<sup>11,16</sup>

The peroneus tertius muscle may also be detrimental to the healing process of a Jones fracture, since it produces a positive torque at the base of the fifth metatarsal, delaying the healing process.<sup>17</sup>

## Conclusion

The presence of the peroneus tertius muscle is extremely common; however, its origin and insertion sites may differ. The sample size of cadaver parts used here was small and no data were available on ethnicity; therefore, further studies need to be conducted to shed further light on such issues. Nevertheless, the data and the methodology used here should serve as inspiration for investigators to design new studies to evaluate the overall prevalence and topography of this anatomic structure.

## References

- Baptista N. Manual de dissecação. 3rd ed. São Paulo: Atheneu; 1969:136-137
- Jungers WL, Meldrum JD, Stern Júnior JT. The functional and evolutionary significance of the human peroneus tertius muscle. *J Hum Evol* 1993;25(05):377-386. Doi: 10.1006/jhev.1993.1056
- Testut L, Latarjet A. Tratado de anatomia humana. 9th ed. Barcelona: Salvat Editores; 1951
- Ercikti N, Apaydin N, Kocabiyik N, Yazar F. Insertional characteristics of the Peroneus Tertius tendon: revisiting the anatomy of an underestimated muscle. *J Foot Ankle Surg* 2016;55(04):709-713. Doi: 10.1053/j.jfas.2016.01.018
- Satler TW. Langman's medical embryology. 12th ed. Philadelphia: Wolters Kluwer Health; 2015
- Moore KL, Dalley AF, Agur AMR. Clinically oriented anatomy. 7th ed. Philadelphia: Wolters Kluwer Lippincott Williams and Wilkins; 2014:586
- Gardner E, O'rahilly R, Gray D. Anatomia: estudio por regiones del cuerpo humano. 2nd ed. Barcelona: Salvat Editores; 1971:294
- Gilroy A, Macpherson B, Ross L, Schuenke M, Schulte E. Atlas of anatomy. 2nd ed. Rio de Janeiro: Guanabara Koogan; 2014:421
- Friedrich P, Waschke J. Sobotta atlas de anatomia humana: quadro de músculos, articulações e nervos. 2nd ed. Rio de Janeiro: Guanabara Koogan; 2012:62
- Warwick R, Williams PL. Gray anatomia. 35th ed. Rio de Janeiro Guanabara Koogan. vol. 1, 1979
- Gusmão L, Lima J, Duarte F, Souto A, Couto B. Bases anatômicas para utilização do músculo fibular terceiro em retalhos miocutâneos. *Rev Bras Cir Plást* 2013;28(02):191-195. Doi: 10.1590/S1983-51752013000200003

- 12 Marin L, Barbosa FR, Andrade O, et al. Anatomic study of the peroneus tertius muscle in humans. *Arquivos Médicos do ABC* 2006;31(01):23–26
- 13 Macalister A. Observaciones sobre las anomalías musculares em la anatomia humana. Terera serie com um catálogo de las principales variaciones musculares hasta la fecha de publicación. *Trans Kans Acad Sci* 1875;25:1–130
- 14 Palastanga N, Soames R, Field D. *Anatomy & human movement: structure and function*. 5th ed. Philadelphia: Butterworth-Heinemann; 2006:157
- 15 Witvrouw E, Borre KV, Willems TM, Huysmans J, Broos E, De Clercq D. The significance of peroneus tertius muscle in ankle injuries: a prospective study. *Am J Sports Med* 2006;34(07):1159–1163. Doi: 10.1177/0363546505286021
- 16 Yildiz S, Yalcin B. An unique variation of the peroneus tertius muscle. *Surg Radiol Anat* 2012;34(07):661–663. Doi: 10.1007/s00276-011-0929-0
- 17 Vertullo CJ, Glisson RR, Nunley JA. Torsional strains in the proximal fifth metatarsal: implications for Jones and stress fracture management. *Foot Ankle Int* 2004;25(09):650–656