Fibularis accessorius muscle in South Indian population

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SUMMARY

The fibularis longus muscle, a key player in the lateral compartment of the leg, plays a crucial role in ankle stability and locomotion. It is the chief evertor of the foot. It maintains the lateral longitudinal arch and it also maintains the transverse arches of the foot. Anatomical variations of the fibularis longus muscle can manifest in diverse ways, including variations in muscle belly size, tendon number and course, and the presence of accessory muscle slips. The present study aims to contribute to the existing body of knowledge by investigating the anatomical variations of the peroneus longus muscle in a sample of Indian cadavers. A descriptive cross-sectional study was conducted in 28 specimens obtained from Anatomy lab, Government medical college, Nagapattinam specimens were dissected, well examined, photographed and relevant anatomical features were recorded.

We have observed variation in 1 specimen of fibularis longus tendon out of 28 specimens studied. So, the prevalence of specimens with variation in peroneus longus was observed to be 3.5%. Morphological features regarding origin, course and insertion were studied and the variations observed were documented. Origin and insertion were in normal pattern in all 28 specimens. The current study is a modest effort to emphasize the morphological features of an unusual arrangement of fibular tendons with clinical relevance. Understanding such anatomical variations is crucial for surgeons performing reconstructive procedures.

Key words: Fibularis longus – Accessory tendon – Fibula – Lateral malleolus

INTRODUCTION

The fibularis longus muscle, a key player in the lateral compartment of the leg, plays a crucial role in ankle stability and locomotion (Madhukar et al., 2023). The fibularis longus is the longer, larger, and more superficial of the two muscles of the lateral compartment. It is bipennate in the upper part and unipennate in the lower part. It arises from: upper two-third of the lateral surface of the shaft of fibula and adjacent surface of the head of the tibia, anterior and posterior intermuscular septa of the leg and deep fascia overlying it. The muscle converges below to form a long tendon, which lies superficial to the tendon of the fibularis brevis and lodges itself along with the tendon of fibularis brevis into a groove behind the lateral malleolus underneath the superior peroneal ret-

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inaculum. After emerging from underneath this retinaculum, the tendon of fibularis longus passes downward and forward through the inferior pulley of the inferior peroneal retinaculum below the peroneal trochlea of the calcaneus. On reaching the cuboid bone, the tendon longus changes its direction for the second time to pass through the Osseo fibrous tunnel on the plantar surface of the cuboid. It then crosses the sole of the foot obliquely from lateral to medial side to be inserted into the inferolateral surface of the base of the first metatarsal bone and the adjacent part of the medial cuneiform. The fibularis longus tendon may contain a sesamoid bone, the os peroneum, as it passes through the groove on the plantar surface of the cuboid bone. The fibularis longus is supplied by the superficial peroneal nerve. It is the chief evertor of the foot. It maintains the lateral longitudinal arch, and it also maintains the transverse arches of the foot (Vishram Singh, 2022). No major artery passes vertically through the lateral compartment of the leg. It is supplied by branches (mainly from the fibular artery in the posterior compartment of the leg) that penetrate into the lateral compartment (Drake et al., 2015). The variations of the lateral compartment muscles of the leg is not uncommon in human beings (Hecker, 1923). Reported prevalence in literatures ranges from 5.2% – 21.8% depending on population and methodology (Clarkson et al., 2013). While numerous studies have explored these variations across different populations, a comprehensive understanding of their prevalence and characteristics in the Indian population remains relatively limited.

Anatomical variations of the fibularis longus muscle can manifest in diverse ways, including variations in muscle belly size, tendon number and course, and the presence of accessory muscle slips (Clarkson et al., 2013). There are also variations in proximal and distal attachments as well as possibilities of being origin of other muscle (Sammarco and Brainard, 1991; Bergman et al., 2005). These variations can be influenced by a multitude of factors, such as genetic predisposition, developmental anomalies, and biomechanical stresses.

The present study aims to contribute to the existing body of knowledge by investigating the anatomical variations of the fibularis longus muscle in a sample of Indian cadavers (Clarkson et al., 2013). By systematically dissecting and examining the muscle's origin, insertion, course, and any associated anomalies, we aim to provide valuable insights into the prevalence and nature of these variations in the Indian population (Clarkson et al., 2013; Mendez-Rebolledo et al., 2021). This study will not only enhance our understanding of normal and variant anatomy but also provide a foundation for future research exploring the functional significance of these variations and their potential clinical implications.

MATERIALS AND METHODS

Study Design and Setting

A descriptive cross-sectional study was conducted in the Department of Anatomy, Government Medical College, Nagapattinam, over a period of one year (2024–2025).

Study Population

The study included 28 disarticulated lower limb specimens obtained from 14 formalin-preserved human cadavers of both sexes and varying age groups available in the department.

Inclusion Criteria

•Cadavers of either sex and any age group available during the study period.

•Well-preserved specimens suitable for dissection.

Exclusion Criteria

•Specimens damaged during dissection.

•Specimens with evidence of previous surgical intervention in the lower limb.

Data Collection and Procedure

Dissections were performed in accordance with the techniques described in Cunningham's Manual of Practical Anatomy.

For morphometry, muscle belly dimensions (length, width, and thickness) were recorded at the point of maximum bulk, taken at the mid-bel-

ly level. The fibularis longus belly was measured 13 cm distal to the fibular head, and the fibularis brevis 11 cm distal to the fibular head.

At the myotendinous junction (MTJ), width and thickness were measured where the muscle fibers tapered into the tendon. For the fibularis longus, this was taken 7 cm proximal to the tip of the lateral malleolus; for the fibularis brevis, 5 cm proximal to the lateral malleolus.

Tendinous measurements (length, width, and thickness) were recorded at the mid-tendon shaft. For the main fibularis longus tendon, this level was 6 cm proximal to the lateral malleolus; for the accessory tendon, 9 cm proximal to the lateral malleolus.

All findings were documented by direct observation and photography, and the morphometric data were tabulated.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee, Government Medical College, Nagapattinam (PR No. EC/NEW/INST/2022/2367; dated 23 July 2024).

RESULTS

In the present study, variations in the fibularis longus were identified in 1 specimen (3.5%) out of 28 examined lower limbs.

Origin

The fibularis longus and fibularis brevis originated as two distinct muscle bellies from the lateral surface of the fibula, each with its own proximal attachment. There was no single muscle mass encompassing all three fibularis tendons; instead, the variation consisted of an accessory tendon arising from the fibularis longus muscle belly at the middle third of the leg.

Course

The accessory tendon emerged approximately 17.4 cm distal to the fibular head (mid-leg level) from the lateral aspect of the fibularis longus muscle belly. It coursed parallel to the main fibularis longus tendon within the same fascial compartment and rejoined the main tendon 3.1 cm proximal to the tip of the lateral malleolus.

Morphology

The morphometric details of the fibularis longus and brevis muscle bellies, their myotendinous junctions, and the tendons are presented in Table 1.

Insertion

- The main fibularis longus tendon inserted into the inferolateral aspect of the base of the first metatarsal and adjacent medial cuneiform bone in the usual pattern.
- The accessory tendon merged with the main tendon before the retromalleolar groove and shared its insertion site.
- The fibularis brevis tendon inserted normally into the tuberosity on the lateral aspect of the base of the fifth metatarsal bone.

Fig. 1 shows the dissected specimen of right leg with peroneal compartment muscles and Fig. 2 shows the course of main tendon of fibularis longus muscle passing behind lateral malleolus.

DISCUSSION

The fibularis quartus muscle has been reported to be present in 11.5% of legs in cadaveric, MRI,

Table 1. Morphometry of fibularis muscles and accessory tendon

Structure	Length (cm)	Width (cm)	Thickness (cm)
Fibularis longus muscle belly	21.2	2.8	0.9
Fibularis longus MTJ	—	1.5	0.6
Fibularis brevis muscle belly	17.6	2.5	0.8
Fibularis brevis MTJ	—	1.3	0.5
Main fibularis longus tendon	31.5	0.6	0.4
Accessory tendon	9.8	0.4	0.3

Fig. 1.- 1. Lateral malleolus, 2. Tendon of fibularis brevis, 3. Main tendon of fibularis longus, 4. Accessory tendon of fibularis longus.

and ultrasound studies (Wood, 1865; Pozzi, 1872; Gruber, 1879; Hecker, 1923; Sobel et al., 1990).

The fibularis quartus muscle was first described by Otto in 1816. Anatomists, surgeons, and radiologists have discovered slight variations in the distal insertion of the fibularis quartus, resulting in both increased and ambiguous nomenclature (Clarkson et al., 2013). A subtype of the fibularis quartus muscle is the fibularis accessorius muscle (peroneoperoneolongus) of Hecker: the peroneus accessorius muscle arises from the fibularis brevis or fibularis longus muscle and inserts back into either the fibularis longus or brevis tendon. This fibularis quartus variant was originally described as the peroneoperoneolongus muscle by Hecker (1923) due to its insertion into the fibularis longus tendon, but it has also been found subsequently in other works (Hecker 1923; White et al. 1974; Jayakumari et al. 2006; Clarkson et al. 2013).

In a cadaveric series, Sammarco and Brainard (1991) quantified incidence and catalogued origins/insertions of the peroneus quartus: they reported a prevalence of approximately 6.6% in their sample and described common proximal origins from the fibularis brevis, or fibula, and distal insertions to the retrotrochlear eminence of the calcaneus, cuboid, or fifth metatarsal.

Sobel et al. (1990) reported a notably high incidence of 21.8% for the fibularis quartus in cadaveric specimens. The muscle most often originated from the peroneus brevis and inserted onto the calcaneal retrotrochlear eminence, which was commonly hypertrophied.

Clarkson et al. (2013), in a cadaveric and literature review, found accessory fibularis variants in 20.9% of 277 limbs. Subtypes were classified by distal attachment, most often calcaneal, followed by cuboid, fibularis longus/brevis tendons, and rare combined insertions such as the peroneo-

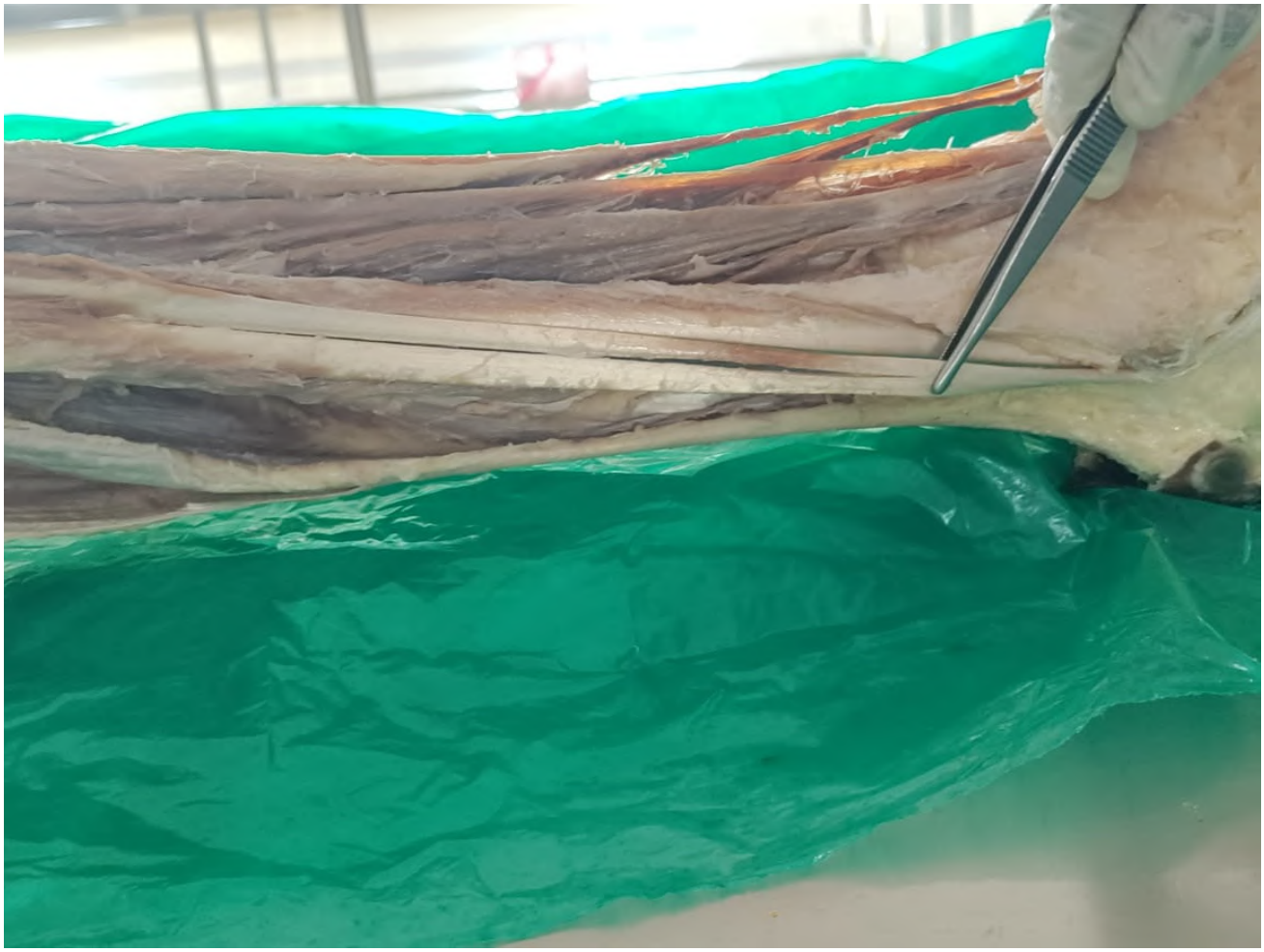

Fig. 2.- Tendon of fibularis longus passing behind lateral malleolus.

calcaneocuboideus. Clinically, variants within the retromalleolar tunnel may predispose to peroneal tendon crowding.

Jayakumari et al. (2006) observed accessory fibularis structures in 13% of cadaveric limbs, including extra muscular bellies and accessory tendons. A distinctive tripartite fibularis longus insertion to the first metatarsal base plus two plantar slips highlighted that variants may involve altered tendon architecture of primary muscles, as well as distinct accessory muscles. This study correlated with the findings of the present study.

Postigo et al. (2022) reviewed cadaveric and imaging literature, reporting prevalence from ~1% to 26%, with pooled modern estimates 11–12%. They outlined origin variants from the fibula, fibularis brevis, fibularis longus, or intermuscular septa, and insertion variants to the calcaneus, cuboid, or metatarsals, noting that detection method and definitional criteria strongly influence incidence figures.

Madhukar et al. (2023), in an Indian cadaveric study, documented fibularis quartus in 12% of limbs, most commonly originating from fibularis brevis and inserting into the retrotrochlear eminence of the calcaneus.

In the present study an Accessory tendon originated from the fibularis longus muscle at the middle of leg, and this tendon joined with main tendon of fibularis longus about 3 cm proximal to tip of lateral malleolus. This was a rare anomaly: one case was reported about 9 years ago from New Delhi (Jayakumari et al., 2006). A thorough understanding of these variations is essential for clinicians, particularly orthopedic surgeons, as they can impact surgical planning, diagnosis, and treatment outcomes (Clarkson et al., 2013; Koutsogiannis and Frane, 2022).

Conclusion

In this cadaveric study, a rare accessory tendon of the fibularis longus was observed in 3.5% of specimens, originating in the mid-leg and rejoining the main tendon proximal to the lateral malleolus. Although fibularis quartus variants are reported in 1–21.8% of limbs, this specific pattern is uncommon and has been described only rarely in Indian literature. Awareness of such anomalies is important for anatomists, radiologists, and surgeons, as they may mimic pathology, contribute to lateral ankle symptoms, or influence surgical planning in the peroneal region.

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