A new variant of fibulocalcaneus anterior

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SUMMARY

Anatomical literature contains only three previous descriptions of an anterior compartment leg muscle that inserts onto the lateral side of the foot. This muscle has been named fibulocalcaneus anterior. Routine dissection of the leg and foot revealed a fourth example. The muscle originated within the anterior crural compartment and inserted onto the lateral calcaneus and talus. An attachment to the talus is not included in the previous descriptions. A consideration of cruro-pedal muscle function suggests that this muscle may be an example of an evolutionary experimentation with foot evertor capabilities. Enhanced knowledge of these types of variants may increase clinical and biomechanical appreciation of the leg to foot functional relationships.

Key Words: *Foot evertors; Anterior crural compartment; Muscle variants*

INTRODUCTION

A muscle of the anterior leg compartment that inserts onto the lateral calcaneus has been described within the literature at least three times. It was first identified by Gruber (1) who named this muscle "peroneo-calcaneus externus anterior." Lambert and Atsas (2) discovered another bilateral example, which they named "anterior fibulocalcaneus." The muscle has subsequently been identified in a clinical setting using MR imaging (3). The aim of this article is to present the fourth description of this muscle, but one that differs from the previous observations in that this example has a dual insertion. Knowledge of this variation may help clinicians and basic researchers form a more nuanced appreciation of variations in foot dorsiflexor and evertor muscular anatomy.

CASE REPORT

During a routine anatomy dissection an anomalous muscle was identified in the right leg of a White male cadaver, age 89 years at death (Figure 1). The muscle lay within the anterior compartment between fibularis tertius and the fibula. It originated on the anterior surface of the fibula and partially shared an origin with extensor digitorum longus and fibularis tertius. A dissection artifact gives the impression that the muscle may have originated as two heads when in fact it had a single head along the shaft of the fibula. Followed distally the muscle quickly differentiated from this common origin and presented with a unipennate structure attaching to an anterior tendon. The muscle belly persisted about 90% of the length of the leg. Thereafter, the muscle continued as a single cord-like tendon to cross the talocrural joint anteriorly. At the level of the lateral malleolus of the fibula the tendon bifurcated into two unequal insertions. The thicker insertion tendon attached to the superior lateral calcaneus just proximal to the calcaneocuboid joint. The thinner insertion tendon attached to the lateral talus at the point of transition from the body to the talar neck. A branch of the deep fibular nerve appeared to be the source of innervation to this muscle.

No trace of this muscle could be identified within the left leg. No other muscular variations were identified within this individual. The other muscles of the right anterior leg compartment did not appear to be irregular or diminished in any way.

DISCUSSION

Bergman et al (4) describes several examples of fibula-to-calcaneus muscles that are associated with the name "fibulocalcaneus." Most are muscles that arise in the posterior compartment and insert onto the sustentaculum tali of the calcaneus. Therefore those muscles are not comparable to the muscle described here. The muscle described here is offered as a unique example of the fairly rare muscle variant fibulocalcaneus anterior. This name, or anything like it, is not listed within Terminologica Anatomica (5).

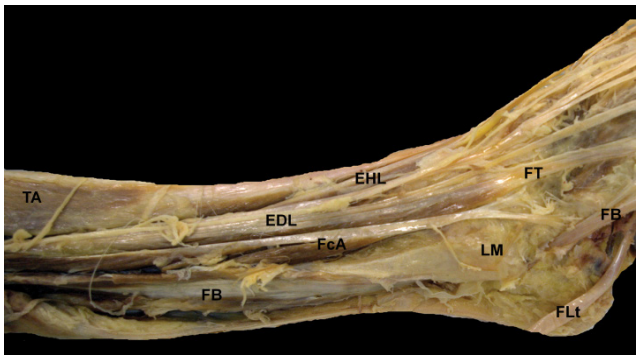

Figure 1) *The fibulocalcaneal anterior muscle. Abbreviations in the image label structures as follows: TA Tibialis anterior; EHL Extensor hallucis longus; EDL Extensor digitorum longus; FT Fibularis tertius; FcA Fibulocalcaneal anterior; LM Lateral malleolus of the fibula; FB Fibularis brevis; FLt Displaced tendon of FIBULARIS longus.*

The location of the fibulocalcaneus anterior implies that this muscle may have played some role in ankle dorsiflexion and foot eversion. The common actions of the anterior compartment muscles suggest a contribution to dorsiflexion at the talocrural joint. Attachment to the lateral calcaneus suggests that the muscle acted to extort (6) the subtalar joint. The line of action implied by this tendon insertion is nearly perpendicular to the rotational axis commonly described for the subtalar joint (7) and therefore would be well suited for that action. However, the attachment onto the talus suggests that the muscle may have also contributed to an abducting torque at the talocrural joint. Both of these motions are commonly viewed as components of foot eversion (6). The combination of foot dorsiflexion and eversion recalls the actions that are typically associated with fibularis tertius. The implied action line of fibulocalcaneus anterior would lie almost parallel and immediately posterior to that of fibularis tertius.

Many researchers (8-10) describe fibularis tertius as being an active foot everter, and through that function as having a role in supporting the arch of the foot during stance phase perhaps by aiding the transfer of body weight to the medial border of the foot. This interpretation is challenged by Jungers et al (11) who employ electromyography to show that fibularis tertius is primarily utilized as a foot dorsiflexor during the swing phase of locomotion; the eversion capability of fibularis tertius does not seem to be regularly employed during normal locomotion. If one were to view fibulocalcaneus anterior as an adjunct to fibularis tertius one might conclude that the fibulocalcaneus anterior would also act primarily as a dorsiflexor. That conclusion would seem unlikely because the tendon and insertion

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locations imply an action line that would be very close to the talocrural axis of rotation. This arrangement would yield a very small moment arm, and thereby imply that fibulocalcaneus anterior is a very weak dorsiflexor. The interpretations of foot eversion that were originally ascribed to fibularis tertius may be properly applied to the fibulocalcaneus anterior.

The literature provides descriptions of several fibula to calcaneus foot evertor muscles. Most of these muscles are found within the lateral compartment of the leg (1,2,12-14). The recurring incidence of these muscular variants suggests that additional foot eversion capabilities may be showing some selective favor in human biomechanical evolution. Therefore, it may be proper to view fibulocalcaneus anterior as another example of one of these evolutionary "experiments" in foot eversion.

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REFERENCES

1. Gruber W. Ein neuer Musculus peroneo-calcaneus externus anterior. Arch Path Anat Physiol Klin Med. 1884;95:177-9.
2. Lambert HW, Atsas S. An anterior fibulocalcaneus muscle: an anomalous muscle discovered in the anterior compartment of the leg. Clin Anat 2010;23:911-4.
3. Upadhyay B, Amiras D. MRI appearances of the anterior fibulocalcaneous muscle: a rare anterior compartment muscle. Skel Radiol. 2015;44:723-6.
4. Bergman RA, Afifi AK, Miyauchi R. Illustrated encyclopedia of human anatomic fariation.
5. Federative Committee on Anatomical Terminology (FCAT). Terminologica anatomica. Stuttgart, Thiem. 1988.
6. Greiner TM. The jargon of pedal movements. Foot Ankle Int. 2007;28:109-25.
7. Inman VT. The joints of the ankle. The Williams & Wilkins Company, Baltimore. 1976;57-65.
8. Hecker P. Study on the peroneus of the tarsus. Anat Rec. 1923;26:79-82.
9. Spuhler JN. Genetics of three normal morphological variations: patterns of superficial veins of the anterior thorax, peroneus tertius muscle, and number of vallate papillae. Cold Spring Harbor Symp Quant Biol. 1950;15:175-89.
10. Krammer EB, Lischka MF, Gruber H. Gross anatomy and evolutionary significance of the human peroneous III. Anat Embryol. 1979;155:291-302.
11. Jungers WL, Meldrum DJ, Stern JT. The functional and evolutionary significance of the human peroneus tertius muscle. J Hum Evol 1993;25:377-86.
12. Zammit J, Singh D. The peroneus quartus muscle. Anatomy and clinical relevance. J Bone Joint Surg Br. 2003;85:1134-7.
13. Seipel R, Linklater J, Pitsis G, et al. The peroneocalcaneus internus muscle: an unusual cause of posterior ankle impingement. Foot Ankle Int. 2005;26:890-3.
14. Lambert HW, Atsas S, Fox JN. The fibulocalcaneous (peroneoclacaneus) internus muscle of MacAlister: clinical and surgical implications. Clin Anat. 2011;24:1000-4.