



Two accessory muscles of leg: potential source of entrapment of posterior tibial vessels

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Abstract

Accessory muscles can be found in any part of the body. In most of the regions, they go unnoticed. However, in some cases, they become symptomatic or of cosmetic concern. In this particular case, the presence of two accessory muscle slips was observed in the flexor compartment of the leg. Among the two, the first accessory muscle belly connected the lower part of flexor hallucis longus to the tibialis posterior. The muscle crossed superficial to the posterior tibial vessels. The second accessory muscle took origin from the connective tissue around the lower part of the posterior tibial vessels and was inserted to the upper part of the lateral border of tibia near the attachment of the interosseous membrane. One of the accessory muscles crossed the posterior tibial vessels, while the other surrounded them. The above accessory muscles were supplied by the branches of tibial nerve.

Keywords Posterior tibial vessels · Accessory muscle slips · Flexor hallucis longus and tibialis posterior muscles

Introduction

The reported muscle variants of the leg include absence of a muscle, presence of supernumerary muscles, abnormal course of tendon, or an anomalous origin or insertion. The flexor hallucis longus (FHL) muscle is the largest and strongest deep muscles of the flexor compartment of the leg. It acts as flexor of distal phalanx of the great toe, plantar flexor of the foot. Tibialis posterior muscle is one of the most important muscles supporting the longitudinal arch of foot. The posterior tibial artery is one of the terminal branches of popliteal artery [6]. It starts at the level of lower border of popliteus muscle and ends at the distal border of flexor retinaculum. At the distal border of flexor retinaculum, it terminates by dividing into medial and lateral plantar arteries [5, 9]. We report some muscle slips, which have not been reported in the literature yet. Aim of this case report is to alert the clinicians and surgeons about possibilities of some new muscle slips in the leg which could be the potential source of nerve and vessel entrapment.

Case report

During dissection classes for medical undergraduates, we found two accessory muscle slips in the flexor compartment of the right leg. This variation was unilateral. The first among the two was a small fleshy belly connecting the lower part of flexor hallucis longus to the tibialis posterior. The muscle crossed superficial to the posterior tibial vessels. The second accessory muscle arose from the connective tissue around the lower part of the posterior tibial vessels. Its fleshy belly was found about 5 cm above the flexor retinaculum. It had a narrow tendon which crossed superficial to the tibialis posterior lateral to medial side. Upon crossing the tibialis posterior, it broadened into an aponeurosis, which spiraled around the tibialis posterior muscle and finally got inserted to the upper part of the lateral border of the tibia near the attachment of the interosseous membrane. The fleshy fibres of this muscle surrounded the posterior tibial vessels. It was interesting to note that fleshy part of both these muscles was situated below and the tendons coursed upwards and medially towards their insertion. Both these accessory muscles were supplied by the branches of tibial nerve. Apart from this, there was no wasting or atrophy of any of the leg muscles in this cadaver. The accessory muscles have been shown in Figs. 1, 2, 3 and 4.

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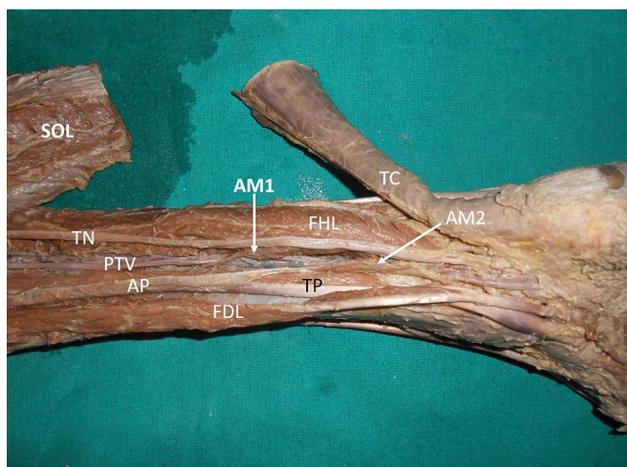


Fig. 1 Dissection of the flexor compartment of the right leg showing the two accessory muscle slips (AM1 and AM2). *SOL* soleus, *TC* tendocalcaneus, *FHL* flexor hallucis longus, *TN* tibial nerve, *PTV* posterior tibial vessels, *AP* aponeurosis of AM2, *TP* tibialis posterior, *FDL* flexor digitorum longus

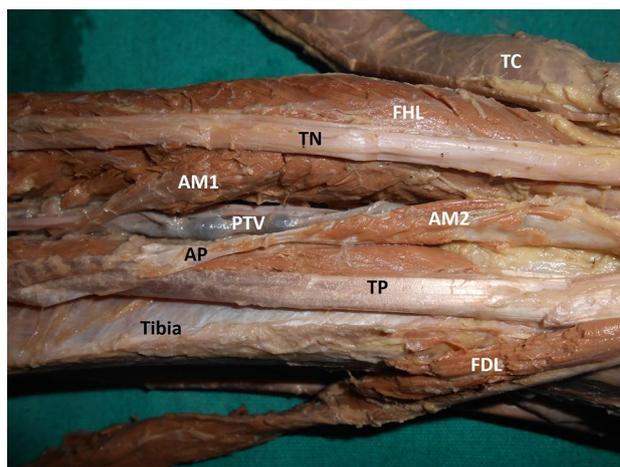


Fig. 3 Closer view of the two accessory muscle slips (AM1 and AM2) and their relationship to the posterior tibial vessels. *SOL* soleus, *TC* tendocalcaneus, *FHL* flexor hallucis longus, *TN* tibial nerve, *PTV* posterior tibial vessels, *AP* aponeurosis of AM2, *TP* tibialis posterior, *FDL* flexor digitorum longus

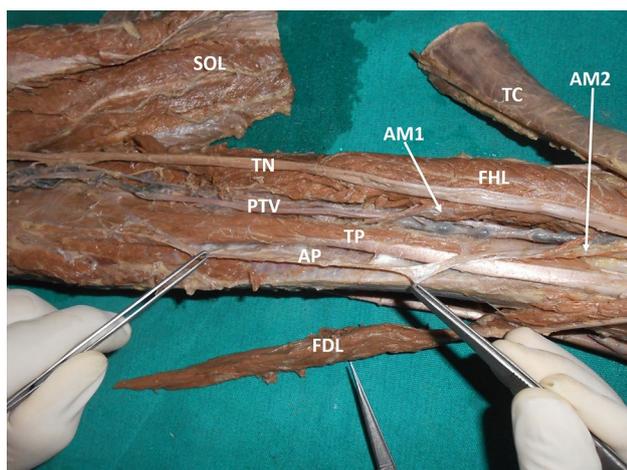


Fig. 2 Dissection of the flexor compartment of the right leg showing a closer view of the two accessory muscle slips (AM1 and AM2). *SOL* soleus, *TC* tendocalcaneus, *FHL* flexor hallucis longus, *TN* tibial nerve, *PTV* posterior tibial vessels, *AP* aponeurosis of AM2, *TP* tibialis posterior, *FDL* flexor digitorum longus

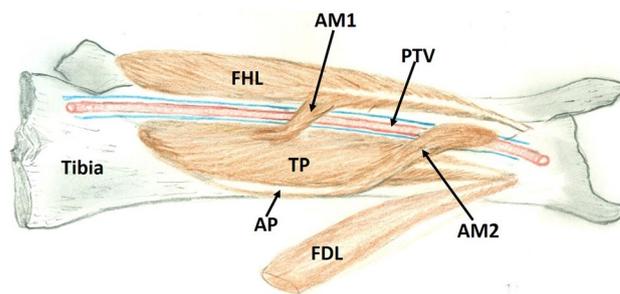


Fig. 4 A simplified schematic diagram of the two accessory muscle slips (AM1 and AM2) and their relationship to the posterior tibial vessels. *FHL* flexor hallucis longus, *PTV* posterior tibial vessels, *AP* aponeurosis of AM2, *TP* tibialis posterior, *FDL* flexor digitorum longus

Discussion

Multiple accessory, supernumerary and anomalous muscles have been defined in the anatomic, radiologic and surgical literature. Evidence about these accessory muscles and their location and attachments is useful in making a proper diagnosis and guiding surgical procedures [4]. Accessory muscles are often found complementing the normal muscles. According to the literature, accessory muscles of posterior compartment of leg, are

characteristically asymptomatic but can cause pain, compressive neuropathy and compartment syndromes [10].

In the present case, we found two accessory muscle slips in the flexor compartment of the leg. Among them, one of the muscle bellies was extending from the lower part of flexor hallucis longus to the tibialis posterior. The muscle crossed superficial to the posterior tibial vessels. The second accessory muscle arose from the connective tissue around the lower part of the posterior tibial vessels and inserted to the upper part of the lateral border of the tibia near the attachment of the interosseous membrane. The fleshy fibres of this muscle surrounded the posterior tibial vessels. Both these accessory muscles can compress the posterior tibial vessels and can produce the vascular entrapment syndrome. As both these muscles were not crossing any synovial joint, their contribution to the movement of the leg is doubtful.

As for the development of leg muscles, about 44 days after fertilization, the lower limb develops from mesoderm. Variations of the lower limb muscles could be due to the extensive migration and rearrangement of the muscles during its development [7].

The FHL tendon is considered the main endoscopic landmark. The tibial neurovascular bundle (tibial nerve, posterior tibial artery and veins) is located just medial to the FHL tendon [1]. A detailed knowledge of this anatomical landmark is important to avoid injury to the tibial neurovascular bundle. In the current case, the two accessory muscles were located lateral to the FHL tendon and were covering the posterior tibial vessels. Hence, identification of posterior tibial vessels could be difficult. These accessory muscles could be used in plastic reconstructive surgeries as they might not have any important role to play in the leg and are the potential trouble creators.

Flexor digitorum accessorius longus muscle can vary widely in origin, arising from any structure in the posterior compartment, including adjacent muscles such as the FHL [3, 11]. The accessory soleus, peroneus quartus, and flexor digitorum longus accessories are other known anomalous muscles of the lower extremity [13]. Another rare muscle, peroneocalcaneus internus deep to the flexor retinaculum in the posterior compartment of leg has been reported [2, 8]. Reports are also available on a small muscle originating from the tendon of flexor digitorum longus, which was supplied by the tibial nerve [13]. The other accessory muscles supplied by the tibial nerve include accessory soleus, which arises from the anterior aponeurosis of soleus and gets inserted to the calcaneus through a separate tendon [12].

Conclusion

Though there is a possibility of existence of accessory muscle slips in the posterior compartment of the leg, the muscles similar to the ones being reported here have not been reported earlier. These muscle slips may not have any action on any joints and could be used for muscle graft procedures. If hypertrophied, they might compress the posterior tibial vessels or tibial nerve in the leg. This report may be of specific importance to orthopaedic surgeons, plastic surgeons, radiologists and vascular surgeons.

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Author contributions SDS drafted the manuscript. SBN dissected the cadaver and prepared the figures. He also helped in reviewing the literature, proofreading the manuscript and final approval.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interest.

References

- Batista JP, Del Vecchio JJ, Golano P, Vega J (2015) Flexor digitorum accessories longus: importance of posterior ankle endoscopy. *Case Rep Orthop* 2015:823107. <https://doi.org/10.1155/2015/823107>
- Best A, Giza E, Linklater J, Sullivan M (2005) Posterior impingement of the ankle caused by anomalous muscles. A report of four cases. *J Bone Jt Surg Am* 87:2075–2079
- Cheung YY, Rosenberg ZS, Colon E, Jahss M (1999) MR imaging of flexor digitorum accessorius longus. *Skelet Radiol* 28:130–137
- Dunn AW (1965) Anomalous muscles simulating soft-tissue tumors in the lower extremities: report of three cases. *J Bone Jt Surg Am* 47:1397–1400
- Frazer JE, Robbins RH (1937) *Manual of practical anatomy*, vol 1. Bailliere, Tindall & Cox, London, pp 624–627
- Grant JCB, Basmajian JV (1965) *Grant's method of Anatomy*. 7th edn. The Williams and Wilkin's Company, Baltimore, pp 366–367
- Hamilton WJ, Boyd JD, Mossman HW (1978) Cardiovascular system. In: Hamilton WJ, Mossman HW (eds) *Human embryology*, 4th edn. Williams Wilkins, Philadelphia, pp 271–290
- Mellado JM, Rosenberg ZS, Beltran J, Colon E (1997) The peroneocalcaneus internus muscle: MR imaging features. *AJR Am J Roentgenol* 169:585–588
- Schaeffer J (1942) *Morris human anatomy*, 11th edn. The Blakiston Division/McGraw-Hill Book Company, New York, pp 736–740
- Nathan H, Gloobe H, Yosipovitch Z (1975) Flexor digitorum accessorius longus. *Clin Orthop Relat Res* 113:158–161
- Peterson DA, Stinson W, Lairmore JR (1995) The long accessory flexor muscle: an anatomical study. *Foot Ankle Int* 16:637–640
- Sekiya S, Kumaki K, Yamada TK, Horiguchi M (1994) Nerve supply to the accessory soleus muscle. *Acta Anat (Basel)* 149(2):121–127
- Kumar UA, Sharma T (2011) Rare variation of flexor digitorum longus muscle of leg—a case report. *IJAV* 4:69–71