



Accessory Tibionavicular Muscle: An Unusual Cause of Medial Ankle Pain

Karthikeyan P. Iyengar^{1,2} Gaurav Kant Sharma² Rajesh Botchu³

¹ Department of Orthopedics, Southport and Ormskirk NHS Trust, Southport, United Kingdom

² Department of Radiodiagnosis, Jaipur Institute of Pain and Sports Injuries, Jaipur, Rajasthan, India

³ Department of Musculoskeletal Radiology, Royal Orthopedic Hospital, Birmingham, United Kingdom

Address for correspondence Rajesh Botchu, MRCS, FRCR, Royal Orthopedic Hospital, Bristol Road South, Northfield, Birmingham B21 3AP, United Kingdom (e-mail: drbrajesh@yahoo.com).

Indian J Radiol Imaging 2023;33:555–559.

Abstract

Keywords

- ▶ ankle
- ▶ accessory muscles
- ▶ ultrasound
- ▶ magnetic resonance imaging
- ▶ platelet-rich plasma
- ▶ dry needling

Accessory or anomalous muscles around the ankle are not uncommon and are usually asymptomatic. They are traditionally encountered during imaging undertaken for evaluation of ankle pain. We reported the first case of a new accessory muscle in the anteromedial part of the ankle with associated partial thickness tear in an 18-year-old football player presenting as symptomatic pathology. In this article, we described the role of cross-sectional imaging in its diagnosis including successful management of the condition with ultrasound-guided platelet-rich plasma therapy and review-associated literature.

Introduction

A wide spectrum of accessory or anomalous or supernumerary muscles has been described in literature.¹ Usually asymptomatic, around the foot and the ankle, they are usually visualized on imaging undertaken to evaluate this region.² From a clinical point of view, these accessory or anomalous muscles may become symptomatic and present as other more common pathologies such as tarsal tunnel syndrome, compressive neuropathy, chronic ankle pain, impingements, or mimic soft tissue tumors.^{3,4} Anomalous muscles traveling along similar path of established anatomical muscles or tendons in the region of clinical interest may provide a diagnostic challenge. Recognition and identification of these symptomatic anomalous muscle are key to effective patient management. Cross-sectional imaging

with magnetic resonance imaging (MRI) and dynamic ultrasound (US) are investigations of choice in accurate diagnosis of the condition.^{5,6}

The commonly described accessory or anomalous around the ankle and foot include the flexor digitorum accessorius longus, the accessory soleus, the peroneocalcaneus internus, tibio calcaneus internus, the tibioastragalus anticus of Gruber muscle, and the accessory peroneal muscles (–Table 1).^{1,7–12}

We describe a case of dorsomedial ankle pain in a patient arising due to partial thickness tear of a new accessory muscle at the ankle in an 18-year-old male football player. We highlight the clinical presentation, role of MRI in its accurate diagnosis including its successful management with US-guided platelet-rich plasma (PRP) therapy, and review-associated literature.

article published online
June 1, 2023

DOI <https://doi.org/10.1055/s-0043-1769472>.
ISSN 0971-3026.

© 2023. Indian Radiological Association. All rights reserved.
This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)
Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

Table 1 Summary of commonly described accessory muscles around the ankle joint

Name of accessory muscle (abbreviation)	Origin	Insertion	Relationship with flexor retinaculum deep Aponeurosis of ankle	References
Flexor digitorum accessorius longus (FDAL)	Variable Any posterior compartment components such as tibia, fibula, soleus, flexor hallucis longus (FHL), or flexor retinaculum	Flexor digitorum longus (FDL) or quadratus plantae (QP)	Deep	2-5,7-9
The accessory soleus (AS)	Posterior part of tibia, soleal line or fibula or anterior surface of soleus muscle	Achilles tendon, upper calcaneum, or medial calcaneum via a muscular or tendinous insertion	Superficial	2,5,8
The peroneocalcaneus internus (PCI)	Medial, distal fibula, distal to origin of flexor hallucis longus (FHL)	Medial calcaneum, distal and inferior to the sustentaculum tali	Deep	2,5,6,10
Tibiocalcaneus internus (TCI)	Lower third of tibia-medial crest	Anterior to the Achilles tendon on the medial surface of the calcaneum similar to AS	Deep	2,5,8
The tibioastragalus anticus of Gruber muscle (TAAG)	The lower third of the anterolateral tibia and the interosseous membrane	Anterior superolateral neck of the talus	Deep	2,5,11

Case Description

An 18-year-old male football player presented to our fracture clinic with subacute onset of anteromedial right ankle pain of 3 weeks duration. This followed a training session without any specific incident or twisting mechanism that resulted in the injury. The pain was localized to the anteromedial part of the ankle with visual analogue scale of 6/10. He had self-managed the pain at home with rest, elevation, ice, and an elastic bandage without much improvement. There was no history of surgery or trauma to this site previously.

He walked with a slight limp. Clinical examination revealed mild swelling and focal tenderness over the anteromedial aspect of ankle, anterior to the medial malleolus. The ankle, subtalar, and midfoot joint range of movements were equivalent to the opposite, left side. The ankle joint was stable with a negative Drawer test.

The neurovascular examination was normal with congruent ankle radiographs.

With a suspicion of deltoid ligament injury, an US was performed to evaluate the pain further. This demonstrated a linear muscle extending from the medial malleolus, anterior to the origin of the tibionavicular component of deltoid ligament extending anteriorly and inserting on the dorsomedial aspect of the navicular bone. There was a 5×5 mm hypoechoic focus in the mid-substance of this muscle in keeping with a low-grade partial thickness tear (**►Fig. 1**, **►Video 1**). The deltoid ligament, anterior tibiofibular ligament, tibialis posterior, tibialis anterior, and flexor digitorum longus tendons in particular were normal.

Video 1

Video showing accessory tibionavicular muscle with small tear. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0043-1769472>.

MRI was performed subsequently that confirmed the sonographic finding of an accessory muscle originating from the medial malleolus and inserting at the dorsomedial aspect of navicular bone. There was marked edema of this accessory muscle with a 5×5 mm partial thickness tear (**►Figs. 2, 3**). The superficial and deep components of deltoid ligament and lateral ligament complex were intact (**►Fig. 4**). The medial tendons, specifically the tibialis posterior and tibialis anterior tendons, were discrete, uninjured, and intact without features of tenosynovitis. The bone marrow signal was normal without osseous edema.

He had failed to respond to physiotherapy and conservative treatment for 8 weeks. Hence, the symptomatic strain of the accessory muscle was managed with one session of US-guided PRP injection (2 mL prepared using double spin method) into the partial thickness tear along with dry needling (**►Fig. 5**).

He had significant improvement in symptoms at 6 weeks clinical follow-up with supervised, gradual return to sports.

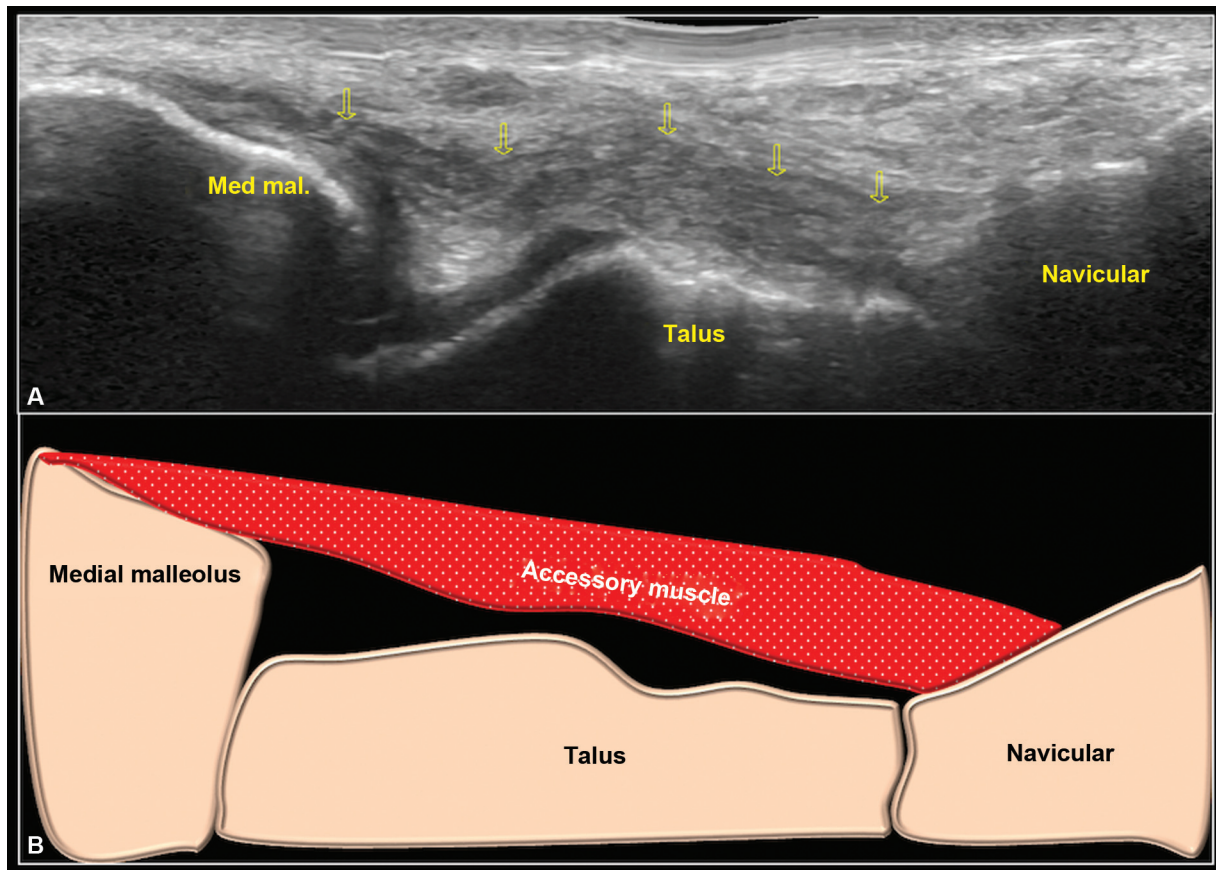


Fig. 1 Longitudinal ultrasound (A) and schematic (B) showing the accessory tibionavicular muscle arising from medial malleolus and inserting on the navicular.

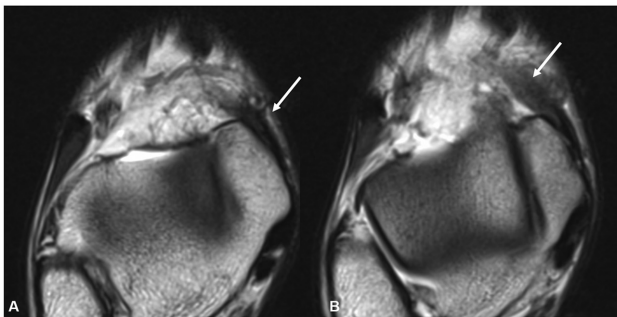


Fig. 2 Proton density axial magnetic resonance images (A and B) showing the accessory tibionavicular muscle (arrow).

Discussion

Ankle pain can present as a clinical quandary since a multitude of pathologies can be attributed to these symptoms. These can be either traumatic injuries or nontraumatic conditions. Common causes of medial ankle pain include injuries to the ankle bones, capsuloligamentous structures, tendons, arthritis, degenerative tendinopathies particularly of the tibialis posterior tendon, compressive neuropathy (tarsal tunnel syndrome), or soft tissue tumors.^{13–15}

One of the rare causes of ankle pain can be due to accessory muscle or its pathological presentation.⁴ Though accessory, anomalous or supernumerary muscles around the

ankle are well described, these can rarely cause symptoms of pain due to tears of the accessory muscles, paraesthesia due to compressive neuropathy, and rarely as a soft tissue tumor mimic.^{2,3,5,9,12}

Our patient presented with typical injury that can happen due to impact during kicking in football. A preliminary injury to deltoid ligament was suspected, since it has been reported even individual components of the deltoid ligament (either superficial or deep) can present as medial ankle pain without features of ankle instability and normal radiographs.¹⁴

Variation in muscular anatomy can complicate interpretation of cross-sectional imaging. Our patient benefited from the senior author's experience and high index of suspicion on the US performed to evaluate the pain further. A new accessory muscle (tibionavicular muscle) was found coursing on the anteromedial aspect of the ankle with an associated partial thickness tear in its substance. This muscle arose from the medial malleolus anterior to the origin of the tibionavicular component of the deltoid ligament. It was approximately 3 cm in length and 0.7 cm in width with a relatively broad insertion on the dorsomedial part of the navicular bone. We hypothesize that the mechanism of injury is due to direct impact of muscle by football during kicking. The force of the impact had been enough to cause a partial tear but not enough to cause a complete tear or injury to adjacent capsuloligamentous or tendinous structures.

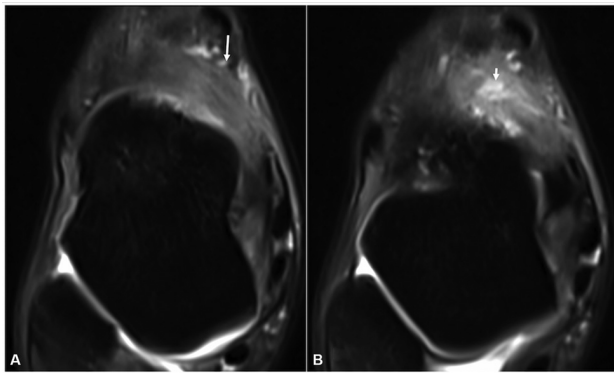


Fig. 3 Fat-saturated proton density axial magnetic resonance images showing the accessory tibionavicular muscle (arrow) (A) with a small tear (small arrow) (B).

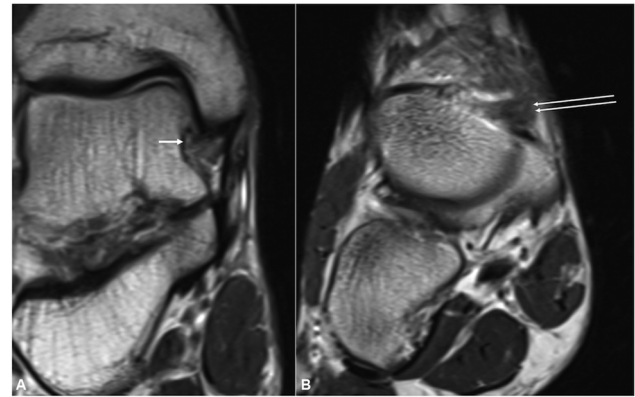


Fig. 4 Coronal T2-weighted magnetic resonance images showing normal deltoid ligament (A) (short arrow) and accessory tibionavicular muscle (B) (long arrows).

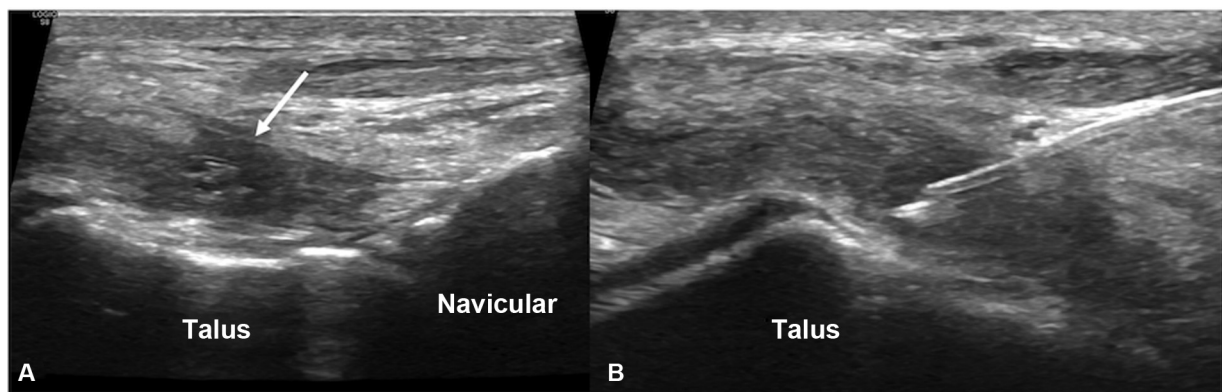


Fig. 5 Longitudinal ultrasound showing the small tear the accessory tibionavicular muscle (A) treated with ultrasound-guided platelet-rich plasma injection (B). Arrow in (A) is showing tear in the Accessory Tibionavicular muscle.

Various studies have examined clinical outcomes of the advantage of PRP in the management of muscle strain injuries with promising results.¹⁶ PRP injection therapy into the muscle tear can result in quicker healing, which decreases recovery time, hence reducing the time of return to sport.¹⁷ US-guided PRP injection therapy along with dry needling led to significant improvement in symptoms and assisted in effective return to sports in our patient.

This case report highlights that tear of this previously undescribed muscle should be included in the differential of medial ankle pain in particular sprain of the deltoid ligament (especially the tibionavicular and tibiospring components). The management process strengthens the need to identify such accessory muscles, leading to symptomatic pain around the ankle and the utility of complementary imaging and US-guided intervention in successful patient treatment.

Conclusion

Though accessory muscles around the ankle are typically asymptomatic and incidental findings on ankle evaluation, our case report highlights the need of a high index of suspicion, recognition, and identification of symptomatic, accessory muscle injury such as the described new accessory tibionavicular muscle. This can lead to effective patient

management. Complementary imaging with MRI is crucial in accurate detection of such accessory muscles and US-guided interventions are helpful in targeted treatment.

Pathologies of the new accessory tibionavicular muscle should be considered in the differential diagnosis of patient presenting with medial ankle pain.

Funding

None.

Conflict of Interest

None declared.

References

- 1 Sookur PA, Naraghi AM, Bleakney RR, Jalan R, Chan O, White LM. Accessory muscles: anatomy, symptoms, and radiologic evaluation. *Radiographics* 2008;28(02):481–499
- 2 Cheung Y. Normal variants: accessory muscles about the ankle. *Magn Reson Imaging Clin N Am* 2017;25(01):11–26
- 3 Ettehadi H, Saragas NP, Ferrao P. A rare case of flexor digitorum accessorius longus muscle presenting as tarsal tunnel syndrome. *Arch Bone Jt Surg* 2022;10(01):112–116
- 4 Al-Himdani S, Talbot C, Kurdy N, Pillai A. Accessory muscles around the foot and ankle presenting as chronic undiagnosed pain. An illustrative case report and review of the literature. *Foot* 2013;23(04):154–161

- 5 Duran-Stanton AM, Bui-Mansfield LT. Magnetic resonance diagnosis of tarsal tunnel syndrome due to flexor digitorum accessorius longus and peroneocalcaneus internus muscles. *J Comput Assist Tomogr* 2010;34(02):270–272
- 6 Howe BM, Murthy NS. An accessory peroneocalcaneus internus muscle with MRI and US correlation. *J Radiol Case Rep* 2012;6(10):20–25
- 7 Hur MS, Won HS, Oh CS, Chung IH, Lee WC, Yoon YC. Classification system for flexor digitorum accessorius longus muscle variants within the leg: clinical correlations. *Clin Anat* 2014;27(07):1111–1116
- 8 Aparisi Gómez MP, Aparisi F, Bartoloni A, et al. Anatomical variation in the ankle and foot: from incidental finding to induc-tor of pathology. Part I: ankle and hindfoot. *Insights Imaging* 2019;10(01):74. Doi: 10.1186/s13244-019-0746-2
- 9 See PL. You can never have too many accessories - a case of two accessory muscles of the ankle. *Med J Malaysia* 2016;71(04):199–200
- 10 Mellado JM, Rosenberg ZS, Beltran J, Colon E. The peroneocalca-neus internus muscle: MR imaging features. *AJR Am J Roentgenol* 1997;169(02):585–588
- 11 Berkowitz Y, Mushtaq N, Amiras D. MRI of the tibioastragalus anticus of Gruber muscle: a rare accessory muscle and normal anatomical variant. *Skeletal Radiol* 2016;45(06):847–849
- 12 Chinzei N, Kanzaki N, Takakura Y, et al. Surgical management of the peroneus quartus muscle for bilateral ankle pain: a case report. *J Am Podiatr Med Assoc* 2015;105(01):85–91
- 13 Crim J. Medial-sided ankle pain: deltoid ligament and beyond. *Magn Reson Imaging Clin N Am* 2017;25(01):63–77
- 14 Kakarala CL, Iyengar KP, Beale D, Botchu R. Isolated tear of the tibionavicular component of the superficial deltoid ligament: unusual cause of medial ankle pain. *BMJ Case Rep* 2022;15(06):e251287. Doi: 10.1136/bcr-2022-251287
- 15 Rodríguez-Merchán EC, Moracia-Ochagavía I. Tarsal tunnel syn-drome: current rationale, indications and results. *EFORT Open Rev* 2021;6(12):1140–1147
- 16 Setayesh K, Villarreal A, Gottschalk A, Tokish JM, Choate WS. Treat-ment of muscle injuries with platelet-rich plasma: a review of the literature. *Curr Rev Musculoskelet Med* 2018;11(04):635–642
- 17 Grassi A, Napoli F, Romandini I, et al. Is platelet-rich plasma (PRP) effective in the treatment of acute muscle injuries? A systematic review and meta-analysis. *Sports Med* 2018;48(04):971–989