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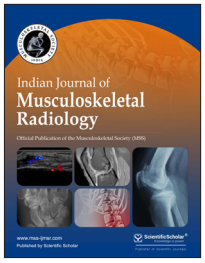

Case Report

Imaging of accessory soleus muscle: A case report with review of the literature

Kunwar Pal Singh[1], Sukhdeep Kaur[2], Arvinder Singh[1], Abhiraj Kakkar[3]

Departments of [1]Radiodiagnosis, [2]Pediatrics, and [3]Radiodiagnosis, SGRDIMSR, Amritsar, Punjab, India.

***Corresponding author:**
Kunwar Pal Singh,
Department of Radiodiagnosis,
SGRDIMSR, Amritsar, Punjab,
India.

kpsdhami@gmail.com

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ABSTRACT

The accessory soleus muscle is an uncommon anatomical variant. It usually manifests as ankle pain and swelling or as an asymptomatic soft-tissue mass along the posterior and medial aspect of the ankle. In a few cases, it is sometimes misdiagnosed as a mesenchymal lesion. The idea of this case report was to highlight the existence of accessory soleus muscle mistaken as a mesenchymal tumor on fine needle aspiration cytology (FNAC). A 32-year-old male patient presented to the orthopedics department with a soft swelling in the distal one-third of the left leg posterior to the medial malleolus. The patient noticed this swelling about 5 years back. The swelling was non-tender and non-pulsatile. Before the imaging, FNAC from the swelling was done which raised suspicion of a mesenchymal lesion. He was referred to the radiodiagnosis department for imaging evaluation of the swelling. A radiological diagnosis of accessory soleus muscle was made; ruling out the possibility of a mesenchymal tumor. This accessory muscle is a less common congenital anatomic variant rather than a soft-tissue mass lesion. The characteristic imaging appearance and location of this muscle give a definite diagnosis. Further, it highlights this rare variation pertaining to its calcaneal insertion and relation with the flexor retinaculum and tarsal tunnel, which should be kept in mind by radiologists.

Keywords: accessory soleus muscle, congenital anatomical variant, magnetic resonance imaging, ankle, ultrasonography, flexor retinaculum

INTRODUCTION

The accessory soleus muscle is a less common congenital anomaly. Its incidence ranges from 0.7% to 5.5% in the general population.[1-3] On clinical examination, the accessory muscle presents as a soft-tissue swelling posterior to the medial aspect of the ankle. The swelling becomes more conspicuous with strenuous activity or dorsiflexion of the foot. It can be painful in a few cases. Sometimes, it can be misdiagnosed as a lipomatous lesion, a ganglion cyst, vascular malformation, or a mesenchymal tumor.[2] Radiological investigations include plain skiagram, high resolution ultrasonography, computed tomography, or magnetic resonance imaging (MRI).[3,4] The soleus muscle arises from two heads, joined by a tendinous arch. The fibular head of the soleus arises from the posterior aspect of the fibular head and the adjacent part of the diaphysis. The tibial head arises from the soleal line on the tibia shaft. The gastrocnemius and the soleus muscles jointly form a muscular mass known as the triceps surae. It inserts on the calcaneum as tendoachilles. Just like other anatomical variations of the musculoskeletal system, anatomists were well versed with this entity.[5]

CASE REPORT

A 32-year-old male patient presented with a soft swelling in the distal part of the left leg along the posterior aspect of the medial malleolus. The swelling was non-tender and non-pulsatile. Overlying skin was normal. He noted this swelling approximately 5 years ago. The swelling became more conspicuous on the dorsiflexion of the foot. Before the imaging, fine-needle aspiration cytology (FNAC) from the swelling was done which raised suspicion of a mesenchymal lesion. He was referred to the radiodiagnosis department for imaging evaluation of the swelling. The plain skiagram of the leg with ankle of the patient was done which revealed a soft tissue in the distal leg posteriorly, with partial effacement of Kager's fat pad. The X-ray of the contralateral leg shows normal lucency of Kager's fat with no abnormal soft tissue in this region [Figure 1]. High resolution ultrasonography of the right ankle was done using 5–18 Mhz linear transducer, which revealed a well-defined hypoechoic area with interspersed hyperechoic bands. It was isoechoic to the adjacent muscles. It was located deep to the tendoachilles slightly toward the medial aspect. The Kager's fat hyperechogenecity was partially effaced. The ultrasonography of the contralateral ankle revealed normal hyperchogenic Kager's fat deep to the tendoachilles [Figure 2]. MRI of both ankles was performed on Phillips Gyroscan Acheiva D stream 1.5 tesla unit. Proton density fat suppressed (PDFS) and spin echo T1-weighted sequences (SE T1W) were obtained in axial, saggital, and coronal planes. The MRI finding revealed as well-defined soft-tissue signal intensity area in the distal leg medially and extending along the posteromedial aspect of the medial malleolus. It was isointense to the rest of the muscle PDFS and SE T1W images. It was arising from the medial aspect of soleus muscle and inserting as muscular insertion on the medial aspect of the calcaneum. No tendon was visualized [Figure 3]. Based on the above described imaging findings, an imaging diagnosis of accessory soleus muscle was made. It also ruled out the diagnosis of mesenchymal tumor. The muscle was lying superficial to the flexor retinaculum [Figure 4]. A small ill-defined altered signal intensity area was observed within the muscle medially appearing hyperintense on PDFS images. It was presumed to be post-FNAC edema. The tendons of the flexor and extensor compartment appeared normal. The neurovascular bundle and flexor retinaculum were also normal. MRI of the contralateral ankle showed normal Kager's fat appearing hyperintense on SE T1WI with signal suppression on PDFS images.

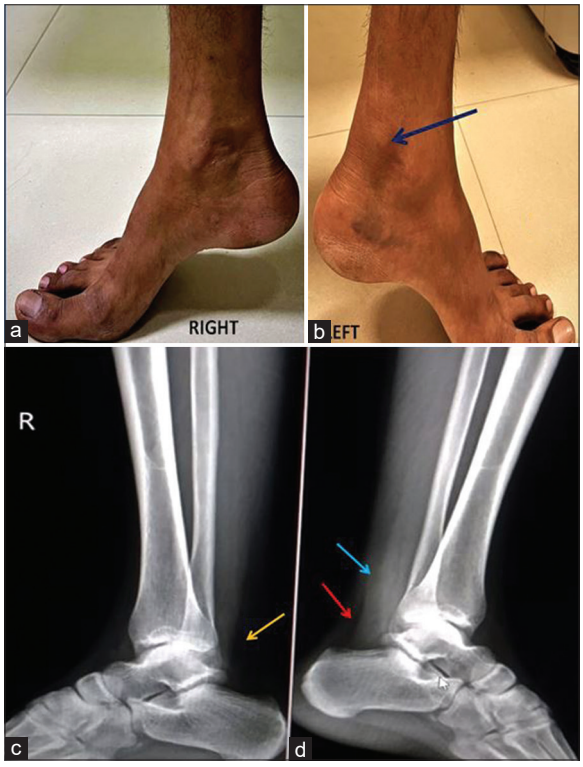

Figure 1: Image of right ankle (a) and left ankle (b) of the patient showing swelling along posteromedial aspect of left ankle (marked with blue arrow in b). X-ray ankle with leg lateral view shows normal lucency of Kager's fat pad on the right side (marked with yellow arrow in c). There is a soft-tissue opacity along the posteromedial aspect of the left lower leg and ankle in the X-ray (marked with blue arrow in d) and partial effacement of Kager's fat lucency (marked with red arrow in d).

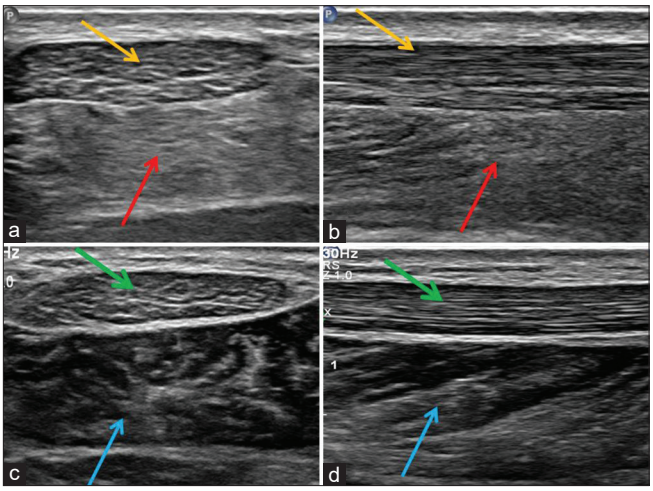

Figure 2: High resolution ultrasonography of the right ankle in transverse (a) and longitudinal (b) planes shows normal hyperechoic Kager's fat (marked with red arrows). The normal tendoachilles is marked with yellow arrows in A and B. High resolution ultrasonography of the left ankle in transverse (c) and longitudinal (d) planes shows normal tendoachilles (marked with green arrows). A soft-tissue area is observed deep to the tendoachilles showing hypoechoic appearance with interspersed linear hyperechoic stripes resembling normal muscle. (marked with blue arrows).

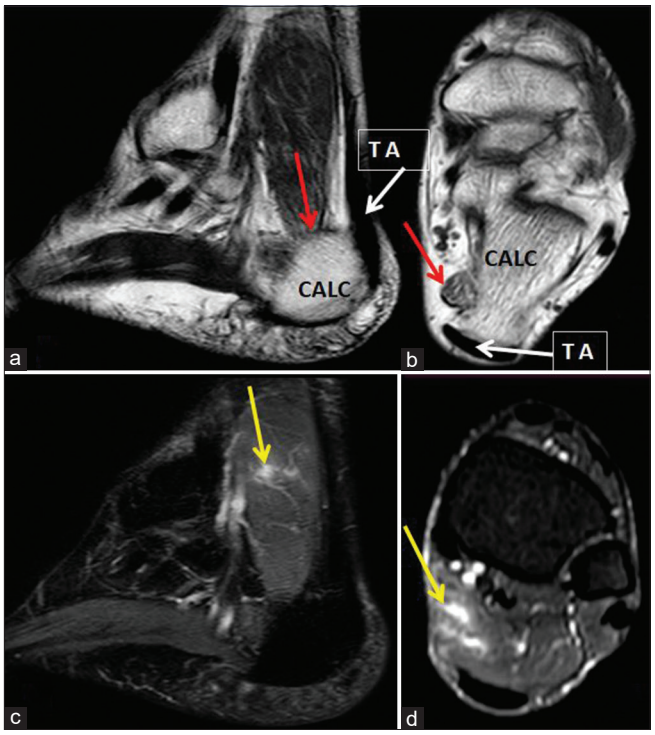

Figure 3: Magnetic resonance imaging (MRI) of the left ankle of patient with spin echo T1-weighted sequences sequence in sagittal (a) and axial (b) planes shows normal tendoachilles (TA-marked with white arrows). A well-defined soft-tissue signal intensity area is noted with signal intensity isointense to the adjacent muscles with fleshy insertion on the superomedial aspect of the calcaneum (CALC) and no tendon visualized (marked with red arrows). MRI of the left ankle of the patient with proton density fat suppressed sequence in sagittal (a) and axial (b) planes shows ill-defined hyperintense focus within the above described area Suggestive of post-fine-needle aspiration cytology changes.

DISCUSSION

Hatzantonis *et al*. described that the prevalence of the accessory soleus muscle in the cadavers ranged from 0.7% to 5.5%. Similar prevalence of approximately 3% was observed in the routine imaging of the patients. Unilateral presence of accessory soleus muscle was common in male gender; whereas bilateral involvement was more common in the females. Its overall prevalence is approximately 2.4% in males and 2.1% in females. There are multiple cases of symptomatic pain associated with the accessory soleus muscle, most of them are asymptomatic and present incidentally during routine imaging evaluation.[4]

As described in the literature, the attachment sites of the accessory soleus muscle are divided into five types.[6] These include (1) Insertion along the tendoachilles, (2) muscular insertion to the upper part of the calcaneum, (3) tendinous insertion to the upper part of the calcaneum, (4) muscular insertion to the medial part of the calcaneum, and (5) tendinous insertion to the medial part of the calcaneum. A few studies have described the three patterns of accessory soleus muscle attachment. Three common attachment types were reported in the literature: (i) A distal attachment to the medial aspect of the calcaneus by a separate tendon (26.1% of subjects), (ii) a distal tendinous attachment to the calcaneal tendon (3.5%), and (iii) a distal fleshy attachment to the medial surface of the calcaneus (4.3%), with the remaining 66.1% of subjects from the previous studies with unidentified attachment types.[4] Although the presence of this accessory muscle is not uncommon, these patients are usually asymptomatic.[7] It mostly presents as a soft-tissue mass along the posterior and medial aspects of the ankle. In some of the patients, it may present with congenital club foot.[8] In symptomatic patients, it usually presents as a painful soft swelling in the posteromedial part of the ankle.[1] The cause of pain in these patients is usually mainly due to focal ischemic, tibial nerve compression, increased pressure on the innervating nerve, or localized compartment syndrome.[7]

Initially, it was usually diagnosed by surgery. On plain skiagram of the ankle and leg, the Kager's fat of pad is replaced by this soft-tissue mass and effacing normal lucency of fat. Ultrasonography can help in delineating the normal echo texture of this accessory muscle isoechoic to other normal muscles along with the typical anatomical location. Ultrasonography usually shows the exact location and isoechoic echotexture of the accessory soleus muscle but sometimes, it is difficult to differentiate it from other soft-tissues masses.[9] MRI is helpful in the definite diagnosis due to its ability to discriminate the signal intensity pattern between normal muscle tissue and the tumors such as lipomatous lesions, ganglion cysts, vascular malformations, and mesenchymal tumors.[10] Furthermore, we can see the origin and insertion sites of this muscle very clearly on MRI. It is the imaging modality of choice for a definitive diagnosis of this entity. Soft-tissue mesenchymal tumors are a common occurrence in clinical practice with a particular predilection for the extremities. The main concern is to exclude any evidence of malignancy. The key to the differentiation from other lesions is the typical signal intensity pattern isointense to other muscles and the typical anatomic location of this accessory muscle.[2] Treatment is required only in the case of symptomatic patients depending on the severity of their symptoms. For patients with mild-to-moderate symptoms, conservative treatment is required. However, surgical treatment may be required in patients with severe symptoms.

The accessory soleus muscle is seen anterior to the tendoachilles and superficial to the flexor retinaculum. It characteristically extends medial to the area between the medial edge of the tendoachilles and the medial malleolus.

There is another rare accessory muscle in this region which arises from the medial shaft of the tibia. It is less commonly described in the literature. It extends deep to the flexor retinaculum and

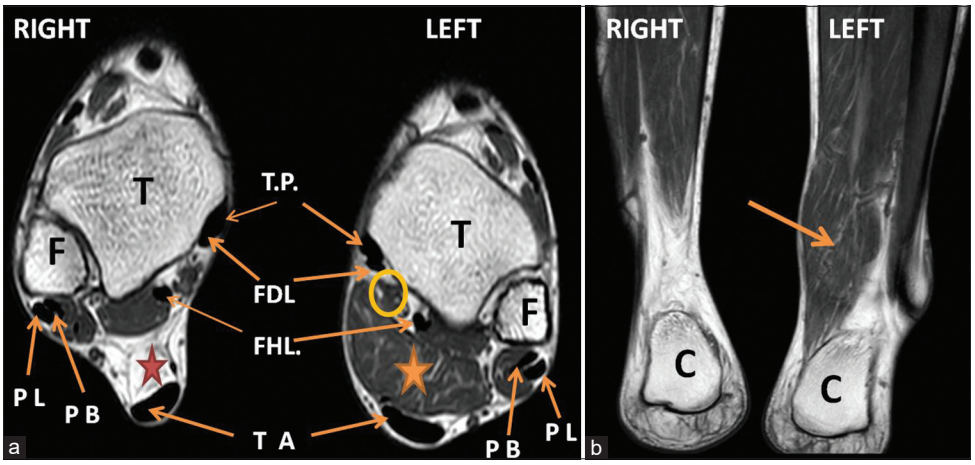

Figure 4: Magnetic resonance imaging of the left and right ankles of patient with spin echo T1-weighted sequences sequence in axial (a) and coronal (b) planes shows normal hyperintense signal of Kager' s fat in the right ankle (red asterix in A). Image B shows a large soft-tissue signal intensity area in the left ankle (peach asterix in A) appearing isointense to the other muscles. It is lying superficial to the flexor retinaculum with normally visualized neurovascular bundle (yellow circle in A). Its insertion is seen on the superomedial part of calcaneum (peach arrow in B). The flexor tendons compartment is normally visualized bilaterally (marked with peach arrows). TA: Tendoachilles, PL: Peroneus longus, PB: Peroneus brevis, TP: Tibialis posterior, FHL: Flexor hallucis longus, FDL: Flexor digitorum longus, C: Calcaneum, T: Tibia, F: Fibula.

posterior to the neurovascular bundle. This rare accessory muscle inserts more distally on the medial aspect of the calcaneus approximately 1–2 cm anterior to the insertion of tendoachilles. Its origin and insertion is quite similar to the accessory soleus that inserts onto the medial aspect of the calcaneum. However, the main differentiating feature is their anatomical relation with the flexor retinaculum. The tibiocalcaneal internus muscle passes deep to the flexor retinaculum and the accessory soleus muscle is located superficial to it.[10]

CONCLUSION

This case report highlights an uncommon variation pertaining to the accessory soleus muscle and its uncommon site of insertion. Its diagnosis on imaging modalities especially MRI can help in the diagnosis avoiding unnecessary surgical exploration.

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Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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