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Presence of Accessory Soleus Muscle in Cadaver: Case Report

Kadavrada Musculus Soleus Accessorius Varlığı: Vaka Sunumu

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ABSTRACT

Human anatomy is a variable structure. There are various rare muscle-specific accessory structures. The accessory soleus muscle (ASM) is one of them and was studied in this case report. ASM was seen during routine learning and teaching dissection lessons while dissecting the right leg of a male body. When this muscle was examined, a thick beginning with fascial connections from the soleus muscle, medially in the lower 1/3 of the leg was seen. This unipennate-shaped super numeric muscle had a 3.95 cm width, 25.82 cm length, and 0.82 cm thickness. This muscle, which is seen on radiological images, may often be confused with soft tissue tumors such as ganglion, lipoma, hemangioma, synovioma, and sarcoma, and on the pathology of the muscle may cause pain and tarsal tunnel syndrome-like effects.
Keywords: Accessory soleus muscle; anatomic variation; ankle.

ÖZ

İnsan anatomisi değişken bir yapıya sahiptir. Kasa özgü çeşitli ve nadir yardımcı yapılar görülebilmektedir. Aksesuar soleus kası (accessory soleus muscle, ASM) bunlardan biridir ve bu olgu sunumunda incelenmiştir. ASM, bir erkek kadavranın sağ bacağını rutin öğrenme ve diseksiyon derslerini öğretme sırasında diseke edilirken görüldü. Bu kas incelendiğinde bacağın alt 1/3'inde medialde soleus kasından fasiyal bağlantılarla başlayan kalın bir yapı görüldü. Bu unipennate şekilli süper numerik kas 3,95 cm genişliğe, 25,82 cm uzunluğa ve 0,82 cm kalınlığa sahipti. Radyolojik görüntülerde görülmekte olan bu kas sıklıkla ganglion, lipom, hemanjiyom, sinovioma ve sarkom gibi yumuşak doku tümörleri ile karışabilmektedir ve kasın patolojisinde ağrı ve tarsal tünel sendromu benzeri etkilere neden olabilmektedir.
Anahtar kelimeler: Musculus soleus accessorius; anatomik varyasyon; ayak bileği.

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INTRODUCTION

Anatomical variations such as the absence of a muscle, the abnormal presence of extra muscle tissue, abnormal location of a muscle or an unusual course of a muscle are frequently encountered. Accessory muscles are the name given to anatomical variations that represent additional different muscles encountered with the normal complement of muscles. In the literature, most of the data on accessory muscles are based on findings obtained during anatomical dissection, surgical procedures, or clinical examination methods. However, the widespread use of modern cross-sectional

imaging techniques such as ultrasonography (US), computed tomography (CT) and magnetic resonance (MR) imaging has led to more frequent encounters with accessory muscles and their more accurate identification (1). Accessory muscles are usually asymptomatic and overlooked, but may occasionally present with symptoms (1-3). These symptoms are usually palpable swelling caused by the muscle mass in the patient, symptoms that occur with the compression of the neighboring structures (3,4). Cross-sectional imaging can accurately display accessory muscles and help distinguish them from other soft tissue masses (1).

Accessory soleus muscle (ASM), first described by Jean Cruveilhier in his anatomy book titled "Traité d'anatomie descriptive", is a rare anatomical variation in the posteromedial ankle (5). The incidence of this congenital variation varies between 0.7 and 5.5 on average (4). It has been suggested that ASM is formed by the splitting of the soleus muscle (MS) muscle in the early stages of development (6). The ASM originates from the anterior surface of the MS, the fibula, or the linea solei musculi in the tibia (7). According to the insertion point, it has been described that there are 5 types (8). Its innervation is provided by the tibial nerve, and its nutrition is provided by the posterior tibial artery (8,9). The presence of ASM is usually asymptomatic (1-3). With exercises, excessive activities, and the increase in the size of the muscle, the structures in the region may be under pressure, so there may be symptoms such as pain and numbness mimicking tarsal tunnel syndrome (4,10). Sometimes they can be confused with soft tissue (ganglion, lipoma, hemangioma, synovioma, and sarcoma) tumors (11).

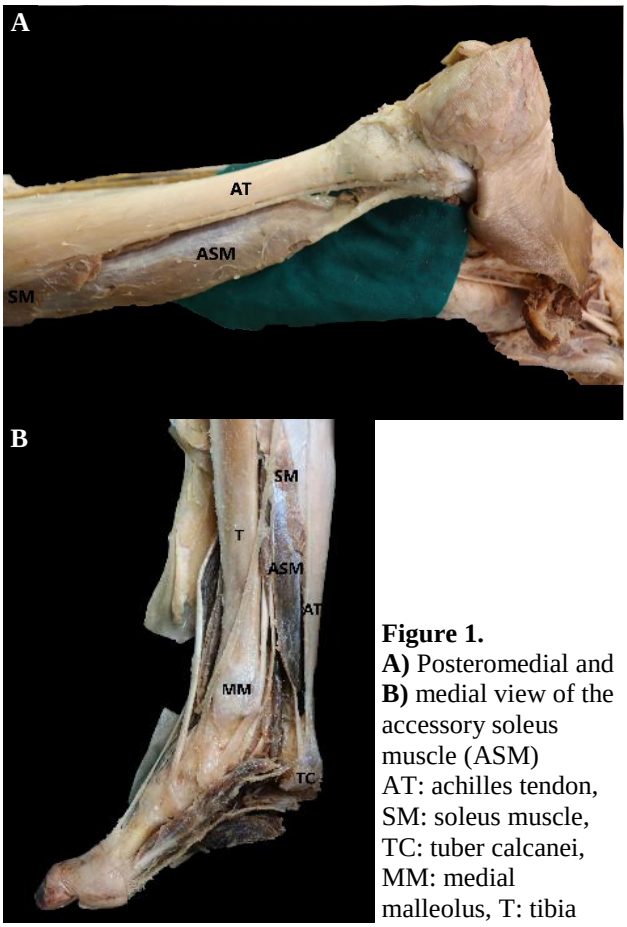

Figure 1.
A) Posteromedial and **B)** medial view of the accessory soleus muscle (ASM)
AT: achilles tendon, SM: soleus muscle, TC: tuber calcanei, MM: medial malleolus, T: tibia

CASE REPORT

This case was found during routine learning and teaching dissections on a cadaver used for anatomy practice at the University of Health Sciences, Hamidiye Faculty of Medicine, Department of Anatomy in 2022. The male cadaver's clinical history, family history, and other details were unknown. The cadaver was fixed using 10% formaldehyde. In order to examine the ankle structures, a tendon that terminates in the calcaneus was detected in the posteromedial of the right ankle in the dissected cadaver in accordance with the dissection techniques. When this muscle was examined, a thick beginning with fascial connections from the soleus muscle, medially in the lower 1/3 of the leg has been seen. It ended by attaching to the posteromedial of the calcaneus with a thin tendon at the attachment site (Figure 1). This unipennate-shaped super numeric muscle has a 3.95 cm width, 25.82 cm length, and 0.82 cm thickness. Innervation with the tibial nerve, supply it was through the posterior tibial artery.

DISCUSSION

Various anatomical variations of the posterior leg region have been described in the literature. Anatomic variations have been detected in musculature during anatomical dissection, clinical evaluations, or surgical procedures (12). Variations in the muscles of the posterior leg region can lead to chronic painful conditions of the ankle. ASM is a condition that manifests itself with the increase in clinical problems caused by advanced age (13-17). ASM, whose incidence was reported as 0.7%-5.5% in cadaver studies, is usually unilateral and it has been reported to be more common in males (4,18,19). Reported that the presence of ASM causes nerve compression at a rate of 7-8% in tibial nerve compressions (13).

The soleus muscle (SM) is located deep in the gastrocnemius and the head of the fibula originates from the upper part of the posterior surface of the fibula and the middle part of the posterior aspect of the tibia, forming a short tendon structure and unites with the Achilles tendon. There is a fibrous band between the parts originating from the tibia and fibula. ASM originates from the deep surface of the SM and the line joining the parts of the SM that starts from the two bones. Types starting from the linea musculi solei or fibula in the tibia have also been reported (20). The muscle then runs downward and terminates posteromedially of the calcaneus (1). At the endpoint, the muscle or tendon structure can be seen. Lorentzon and Wirell (21) categorized the endings of the ASM, and Yu and Resnick (8) added a fifth shape to this classification:

1. Insertion along the Achilles tendon
2. Tendinous insertion on its upper surface
3. With muscle tissue on the upper surface of the calcaneus insertion
4. Insertion with muscle tissue on the medial surface of the calcaneus
5. Tendinous insertion on the medial surface of the calcaneus

In another study, they divided attachment sites of ASM into 3 types (22):

A. Proximal attachment to the soleus and distal attachment to the medial surface of the calcaneus by a separate tendon.

B. Proximal attachment to the soleus and distal tendinous attachment to the calcaneal tendon.
C. Proximal attachment to the soleus and distal fleshy attachment to the medial surface of the calcaneus.
According to the division of Hatzantonis et al. (22), this case report fits type A, while according to Yu and Resnick (8), this case reports defines as the 5th type.
In Hatzantonis et al. (22)'s study, six specimens were investigated for ASM attachments, and all six fit type A. In their study, it is indicated that in clinical literature 26.1% of specimens had type A attachments. In unilateral type A attachment of ASM, the accessory muscle measured 3.7 cm in width and 13.5 cm in length (22). In our case report, ASM has been measured at 3.95 cm width and 25.92 cm length. For males, 46.4% of ASM cases are on the right leg, 43.5% left leg, and 10.1% are bilaterally (22). In our case report ASM is seen unilaterally on the right leg of a male body. If the Achilles tendon and ASM are separately attached to the calcaneus, it is generally stated that the ASM is attached to the anterior side of the Achilles tendon. The muscle is usually innervated by the tibial nerve and supplied its oxygenated blood posteriorly to the tibial artery (23). In the presence of ASM, pain especially on exertion has been described. Pain occurs in the later stages of life. The reason for this was shown as the increase in muscle mass in the later periods (4). It is claimed that it is detected more in athletes based on the same reason (8). The mechanisms that will cause pain in the presence of ASM are listed as follows: Increased pressure in the fascia of the muscle, insufficient blood flow to the muscle, and excessive development of the tibial nerve posteriorly (4,8). Even though it does not pass through the tarsal tunnel, there have been researchers who have associated it with tarsal tunnel syndrome (24). In their statement, the researchers suggested that compression of the ASM triggers tarsal tunnel syndrome. On clinical examination, swelling may be detected in the posterior part of the wrist.
In addition to radiography US, CT, and MR imaging methods were used to detect the presence of ASM (3,8,21). In the radiographic imaging method, the image of the Kager fat pad is not formed and is shadowed by the ASM. With these imaging methods, ASM is usually detected in front of the Achilles tendon, superficial to the Flexor retinaculum, between the medial edge of the Achilles tendon and the medial malleolus (1).
In the presence of ASM, in symptomatic cases, it has been reported that treatment methods such as fasciotomy, tendon release, ligation of the artery feeding the muscle, and botulinum toxin injection are applied (25,26). While success was achieved in the short term, the return of symptoms in the long term suggested that surgical excision is the definitive treatment method (1).

CONCLUSION

Painful conditions of the posterior inner region of the ankle should be investigated considering the presence of ASM even if no swelling is detected. MRI examinations applied to patients presenting with such a complaint should be performed by keeping in mind that the muscle may exist. Particularly in the cases with painful conditions that decrease at rest and increase with effort may be associated with ASM.

Informed Consent: Since our study was a cadaveric study, there was no consent form.

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