Posterior Leg Pain: Understanding Soleus Muscle Injuries

Alvaro F. Siedi, MD[1]
Alejandro U. Rolon, MD[1]
Nicolas Bernard, MD
Juan Bernasconi, MD
Martin Palmas, MD
Damián A. Couto, MD
Tomas A. Pascual, MD

Soleus muscle injuries are frequently unrecognized, representing a common cause of sports inactivity. This is mainly because little is known about the anatomy of the soleus muscle and the clinical manifestations of injury. Unlike other muscles, the soleus muscle has a complex myoconnective structure with three intramuscular tendons, which makes the interpretation of muscle pathologic conditions challenging. Soleus muscle injuries can be acute or chronic and are usually considered to be a minor discomfort by both the patient and the sports medicine physician, leading to a relatively quick return to sporting activity with a high risk for reinjury. The authors review the soleus muscle anatomy and the importance of being familiar with the most frequent locations of injuries, which are fundamental aspects that every radiologist should understand to avoid underdiagnosis. The role of imaging, the clinical manifestations of injuries, and the differential diagnoses are key aspects to know when evaluating posterior leg pain.

The online slide presentation from the RSNA Annual Meeting is available for this article.

Abbreviations: CIT = central intramuscular tendon, LG = lateral gastrocnemius, LIT = lateral intramuscular tendon, MG = medial gastrocnemius, MIT = medial intramuscular tendon, RTP = return to play, STIR = short τ inversion-recovery

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From the Department of Radiology, HIMAN, Marcelo T. de Alvear 1719, 5th Floor, Buenos Aires 1060, Argentina. Recipient of a Certificate of Merit award for an education exhibit at the 2020 RSNA Annual Meeting. Received April 18, 2021; revision requested July 11 and received August 8; accepted August 13, 2021. For this journal-based SA-CME activity, the authors, editor, and reviewers have disclosed no relevant relationships. **Address correspondence to** A.F.S. (e-mail: *alvarosiedi@gmail.com*).

[1]A.F.S. and A.U.R. contributed equally to this article.

SA-CME LEARNING OBJECTIVES

After completing this journal-based SA-CME activity, participants will be able to:

- Describe the normal soleus functions, anatomy, insertions, and intrinsic complex myoconnective structure.
- Identify the clinical features that are suggestive of a soleus injury.
- Outline the most frequent locations of soleus injuries and their features at US and MRI.

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Introduction

Muscle strain injuries in the posterior aspect of the leg are a frequent cause of sports inactivity that affects both competitive and recreational athletes. The calf muscles are the fourth most frequent location of muscular strains, after the hamstring, adductor, and quadriceps muscles, in athletes who play professional soccer (1). They are essential biomechanical components that allow explosive movements as well as endurance.

Even though the soleus covers a large area of the back of the leg, its injuries are an unsuspected cause of pain and functional deficit, and symptoms are usually attributed solely to the gastrocnemius muscle (2). The underdiagnosis of soleus pathologic conditions is often based on a lack of knowledge about the characteristics of the symptoms, the muscle's complex anatomy with multiple intrinsic junctions, and its location deep in the posterior aspect of the leg.

From an anatomic point of view, the soleus has a complex myoconnective structure with three intramuscular tendons and two myoaponeurotic junctions where injuries tend to settle. US and MRI are useful tools for detecting soleus muscle injuries. Although both modalities can be used to evaluate the presence and location of tears, MRI is recommended in a patient with symptoms and negative US findings because it offers greater sensitivity for diagnosing deep injuries.

TEACHING POINTS

- The soleus is responsible for plantar flexion and is a monoarticular muscle with slow-twitch fiber predominance (type I muscle fibers). It plays an important role in maintaining posture and in other low-energy activities such as walking and endurance sports.
- The classic manifestation of soleus injuries is progressive subacute calf tightness or stiffness that tends to limit sport activity. Unlike in gastrocnemius strains, pain does not always appear in the posterior and medial sector of the leg but varies depending on the myotendinous union that is affected, and the patient may feel referred pain in the external region of the leg.
- After the initial episode, the condition usually self-limits in hours or days, so the patient usually considers it to be a minor muscle discomfort (contracture), does not consult a doctor, and starts practicing sports again relatively quickly. Underdiagnosis of these injuries, lack of treatment, and early return to sports lead to a torpid evolution with high reinjury rates.
- Essentially, there are five different anatomic areas in the soleus where the injury may occur, which can be divided into two groups: those involving the myoaponeurotic junctions and those affecting the myotendinous junctions.
- Lesions located in the anterior myoaponeurotic junction usually represent the greatest diagnostic challenge at US examination because of their depth, and therefore it is essential to rely on MRI findings for confirmation.

Anatomy

Posterior Leg Muscular Anatomy

The posterior leg has two compartments, the deep and superficial. The deep posterior compartment (deep crural group) consists of the flexor hallucis longus, the flexor digitorum longus (FDL), and the tibialis posterior. The superficial posterior compartment (superficial crural group or triceps surae) contains the gastrocnemius with the medial gastrocnemius (MG) and lateral gastrocnemius (LG) heads, the plantaris, and the soleus (Fig 1). The function and anatomic characteristics of the superficial group muscles make them more prone to injury when compared with the deep muscles. The latter tend to be less compromised because of their smaller size with less weight-bearing function.

The plantaris is a vestigial muscle that is absent in 20% of the population. It is a small muscle that contributes little to plantar flexion; thus it presents a low risk for injury (5%) (3,4). Although the MG and the soleus have different anatomic characteristics, they are the muscles of the posterior aspect of the leg that are most often activated in sports activities and are therefore at greater risk for injury. The gastrocnemius is responsible for the flexion of the knee and the plantar flexion of the ankle. It is a biarticular muscle (crossing two joints) and has a high proportion of type II fast-twitch muscular fibers, which makes it a muscle involved in rapid locomotion such as sprinting and jumping (3,5).

The soleus is responsible for plantar flexion and is a monoarticular muscle with slow-twitch fiber predominance (type I muscle fibers). It plays an important role in maintaining posture and in other low-energy activities such as walking and endurance sports. The soleus is wide and thick and accounts for 70% of the total area of the muscles of the posterior leg (2). It is located deep to the MG and LG, with a proximal origin in the tibia and fibula, and it distally merges with the gastrocnemius to form the Achilles tendon 8–10 cm above its insertion onto the calcaneus.

Soleus Proximal Origin

The soleus muscle has two proximal origins, one fibular and the other tibial. The fibular origin, which is higher than the tibial one, originates through a thick tendon band in the posterior sector of the fibular head, and through aponeurotic fibers from the lateral border of the fibula and the posterior intermuscular septum, which separates the soleus from the peroneus longus muscle. The tibial fascicle originates from a bony prominence on the posterior aspect of the tibia, called the soleus line, and from the medial border of this bone (6) (Fig 2).

A fibrous arch (tendinous arch of soleus) connects the tibial and the fibular osseous origins. It has a superior concavity through which the posterior tibial neurovascular bundle enters deep into the leg (6,7). Balius et al (8) have described an aponeurotic thickening adjacent to the muscle origin, on the anterior and posterior aspects of the muscle, that shows variable thickness and size among individuals.

Internal Myoconnective Structure

The muscle belly of the soleus is covered from its origin by an anterior and posterior aponeurosis, and it has an intrinsically complex myoconnective structure. Khoury and Rolon (9) describe the latter as three intramuscular tendons—the central intramuscular tendon (CIT), medial intramuscular tendon (MIT), and lateral intramuscular tendon (LIT)—that vertically cross the muscle belly from proximal to distal (Fig 3). They are an extension of the epimysium that covers the soleus and act as a fibrous skeleton that provides structure to the muscle belly (8).

The MIT and LIT come from the proximal one-third of the muscle; originate from the tibial and peroneal fascicles, respectively; and run inferiorly, reducing their size to the middle one-third of the muscle belly, where they are no longer visible (10) (Figs 4, 5).

On the other hand, the CIT originates proximally from the anterior fascia and descends,

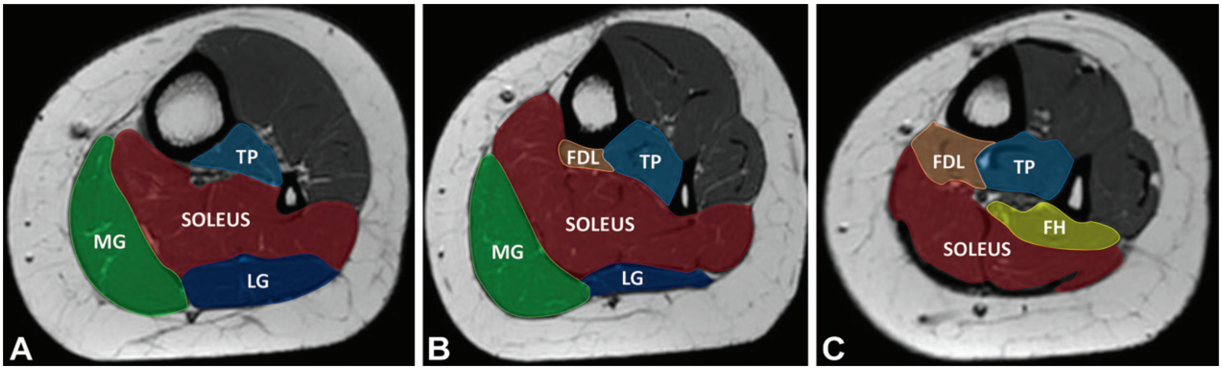
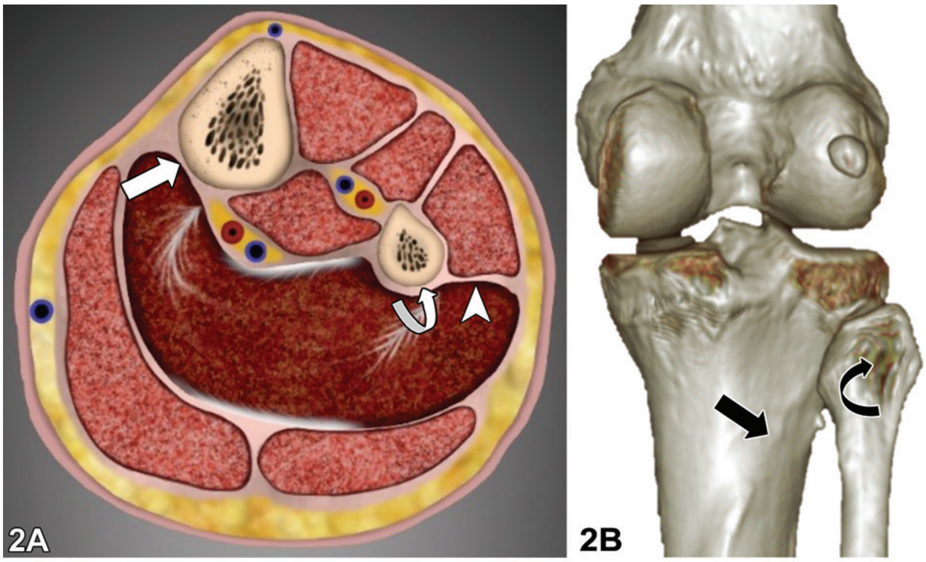
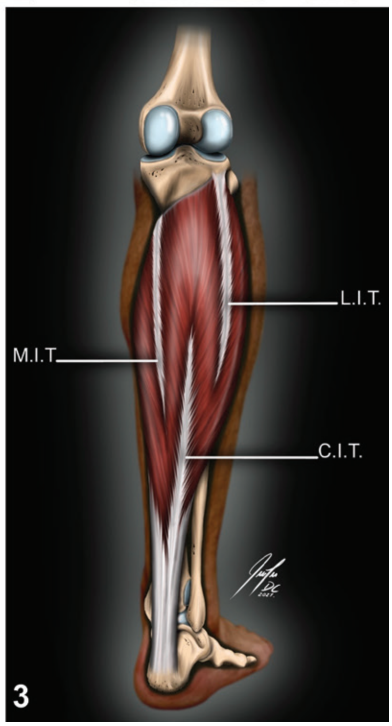


Figure 1. Posterior muscles at three different levels of the leg. **(A)** Axial T1-weighted MR image obtained in the proximal one-third of the leg depicts the tibialis posterior muscle (*TP,* light blue), soleus (red), and MG (green) and LG (dark blue) heads. **(B)** Axial T1-weighted MR image acquired in the middle one-third of the leg shows the tibialis posterior muscle (*TP,* light blue), flexor digitorum longus (*FDL,* orange), soleus (red), and MG (green) and LG (dark blue) heads. **(C)** Axial T1-weighted MR image obtained in the lower one-third of the leg demonstrates the tibialis posterior (*TP,* light blue), flexor digitorum longus (*FDL,* orange), flexor hallucis longus (*FH,* yellow), and soleus (red).

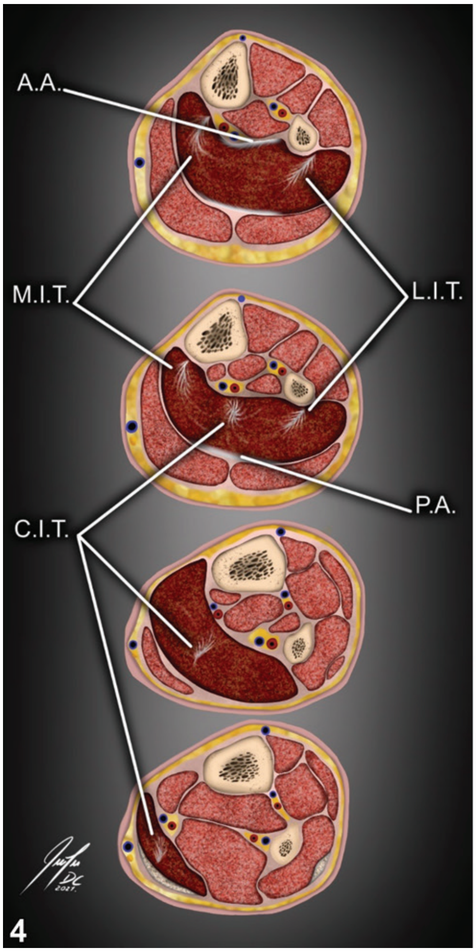


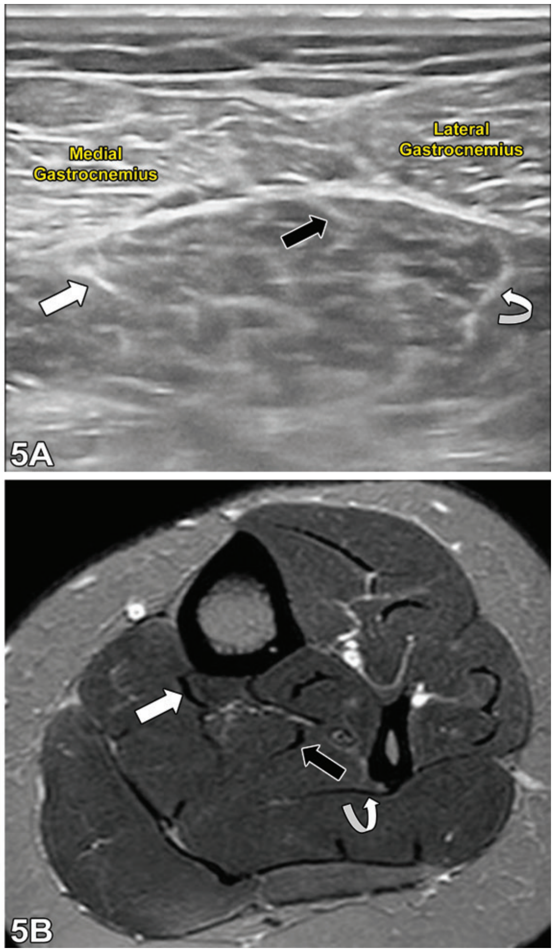
Figures 2, 3. **(2A)** Illustrated section of the proximal one-third of the leg shows the medial border of the tibial origin (straight arrow) of the soleus, the lateral border of the fibular origin (curved arrow) of the soleus, and the intermuscular septum origin adjacent to the peroneus longus (arrowhead). **(2B)** Surface-rendered reconstruction from CT shows the proximal osseous origin of the tibial fascicle of the soleus over the soleus line (straight arrow) and the proximal osseous origin of the fibular fascicle in the posterior sector of the fibular head (curved arrow). **(3)** Diagram of the soleus muscle shows the vertical path of the three intramuscular tendons: the LIT, CIT, and MIT.



slightly increasing its size, contributing to the formation of the Achilles tendon (Figs 4, 6). In some cases, the CIT is so large and fibrous that it can divide the soleus into two muscle bellies (8). This complex myoconnective structure gives the muscle a multipennate appearance and makes it predisposed to injury over the myotendinous junctions (11–13).

The muscle fibers originate from the proximal one-third of the muscle on the anterior aponeurosis, the MIT, and the LIT and run in a posteroinferior direction to insert on the CIT, thus representing the inferior muscle attachment,





Figures 4, 5. **(4)** Diagram of axial sections of the leg shows the course of the CIT that originates from the anterior aponeurosis *(A.A.)* and descends, contributing to the formation of the Achilles tendon. The LIT and MIT arise from the proximal one-third of the muscle at the peroneal and tibial fascicles, respectively, and descend, reducing in size. Note that the muscle belly is covered in its entire extension by the anterior aponeurosis *(A.A.)* and posterior aponeurosis *(P.A.)*. **(5)** Axial section of the middle one-third of the leg where the three intramuscular tendons can be seen. US image **(5A)** shows the LIT (curved white arrow), CIT (black arrow), and MIT (straight white arrow). Axial proton-density–weighted fat-saturated MR image **(5B)** shows the LIT (curved white arrow), CIT, (black arrow), and MIT (straight white arrow).

which progressively increases in size to insert on the anterior part of the Achilles tendon (8).

Soleus Distal Insertion

A distal tendon originates from the muscle belly of the soleus and then converges with the tendons of the MG and LG to form the Achilles tendon. As the Achilles tendon descends toward its insertion onto the calcaneus, there is a rotation of these three fascicles. The fascicles of the MG form the posterolateral part of the Achilles tendon, while those of the LG form the anterolateral part, and the fascicles from the soleus form the central and medial part of the tendon (14,15) (Fig 7).

Imaging Assessment

Both US and MRI are useful tools in diagnosing muscle injuries in the posterior aspect of the leg. They both help confirm tears, provide information about the area of the injury, and depict its location accurately within the muscle-tendon-bone unit. The deep soleus location and its complex anatomy with multiple intrinsic junctions sometimes make it difficult to perform a correct and complete assessment with US. Pedret et al (16) indicate that MRI is a sensitive imaging modality in confirming soleus strains and that the sensitivity of US is lower (27.2%) when comparing both methods (16,17). However, from our point of view, US has multiple advantages that make it a useful tool for evaluating soleus injuries, considering that it is accessible, is cost-effective, and offers the possibility of interviewing the patient while performing the examination to accurately determine the painful site by compressing it with the probe. Nevertheless, there is a strong correlation between the sensitivity of US and the experience of the operator in knowing the muscle anatomy, interpreting the clinical data, and managing the technical

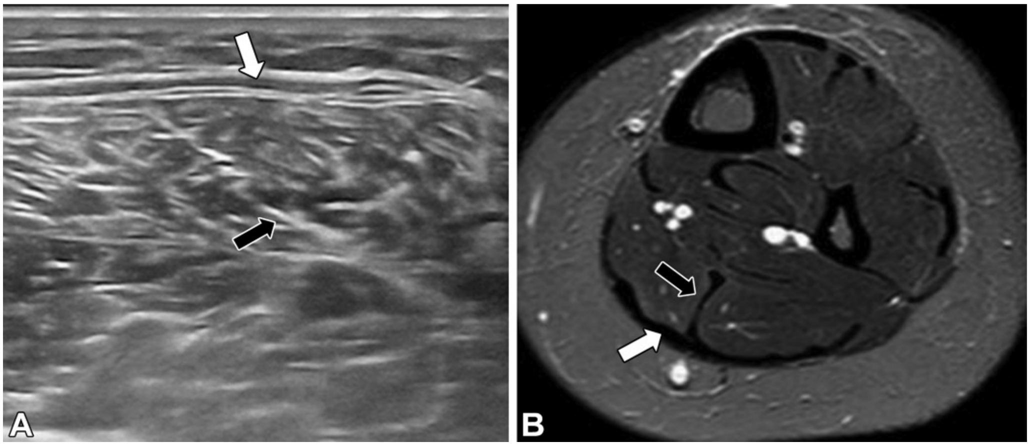


Figure 6. Anatomy of the distal one-third of the leg. US image **(A)** and axial proton-density–weighted fat-saturated MR image **(B)** show the distal one-third of the soleus muscle with its CIT (black arrow) contributing to the formation of the Achilles tendon (white arrow).

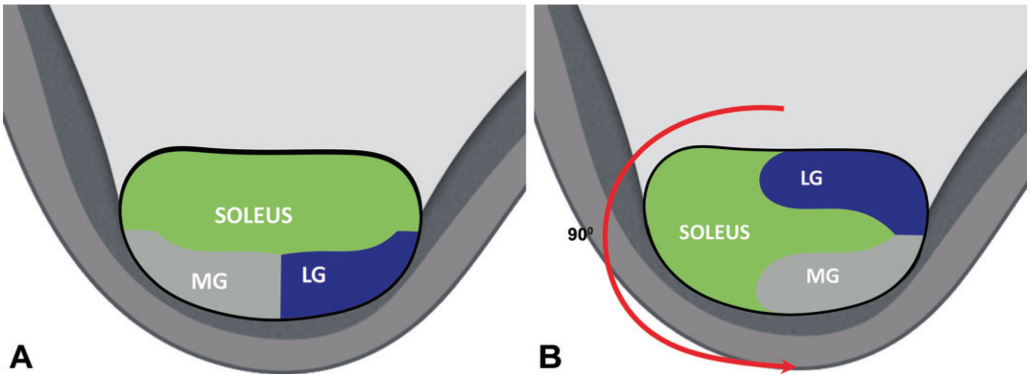


Figure 7. Diagrams show the integration of the soleus, MG, and LG components. **(A)** Diagram shows an axial section at the proximal one-third of the Achilles tendon before rotation of the three fascicles. **(B)** Diagram depicts an axial section at the middle one-third of the Achilles tendon after rotation of its components. The fascicles of the MG are located in the posterolateral sector, while the LG is located at the anterolateral sector, and the soleus fascicles form the central and medial part of the tendon.

aspects of the method, which allows acquisition of a good-quality image. The technical aspects include adequate setting of the depth and the focus of the image, where we should have a full visualization of the muscle; trying to include the deep myoaponeurotic junction; and adjusting the focus in relation to the area of interest to achieve optimum image quality (Fig 8).

Another technical factor to consider is the pressure applied with the US probe. Lack of probe pressure may generate a blurred image of the intramuscular tendons, whereas adequate pressure will allow us to see them with better definition, making it easier to diagnose surrounding lesions (Fig 9).

In the presence of a suggestive clinical context with high diagnostic suspicion for injury and normal US findings, or when it is not possible to assess the muscle completely or clearly, it is mandatory to perform MRI to evaluate the soleus in its whole integrity. Screening MRI usually consists of short τ inversion-recovery (STIR) and T1-weighted sequences performed in the axial and coronal planes. MRI offers a greater sensitivity for depicting deep injuries, particularly those located at the anterior myofascial junction.

Clinical Manifestations of Soleus Injuries

Triceps surae strains are common in athletes and were historically attributed to gastrocnemius injuries. In 2002, Delgado et al (18) described how MG injuries accounted for 66.7% of the causes of posterior leg pain, while soleus injuries accounted for only 0.7% of cases. In subsequent years, advances in muscle knowledge have changed these trends and led to the conclusion that soleus injuries have been underdiagnosed, so much so that Koulouris et al (17) described in 2007 how soleus tears represented 46.2% of muscle injuries in the posterior aspect of the leg, while gastrocnemius injuries represented a slightly higher percentage (48.7%). To determine an accurate prognosis and treatment plan, it is

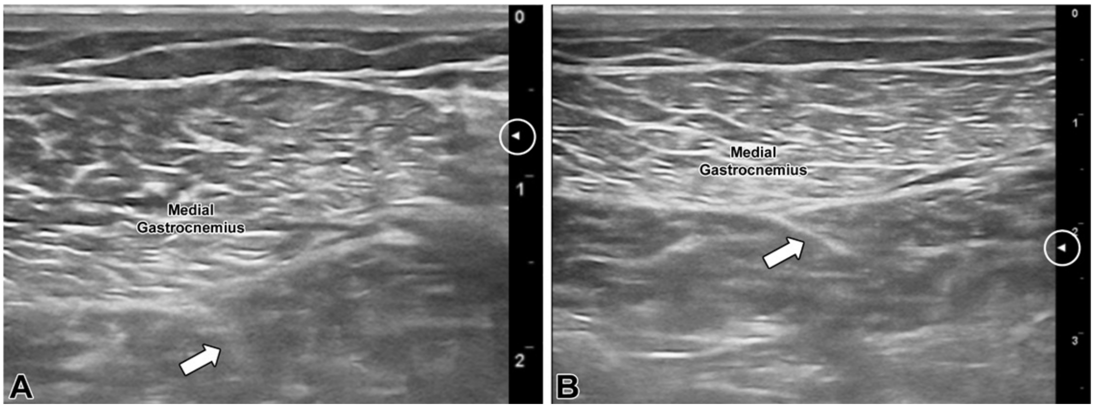


Figure 8. Transverse US images of the middle one-third of the leg demonstrate how technical aspects influence the quality of the image when evaluating a deep muscle such as the soleus. **(A)** Image shows how the lack of depth and the lack of focus adjustment (circle) generate a blurred image of the CIT (arrow). **(B)** Image shows how with greater depth and focus adjustment (circle) in the area to be explored, we achieve a better definition of the CIT (arrow) and see a higher percentage of the soleus muscle belly.

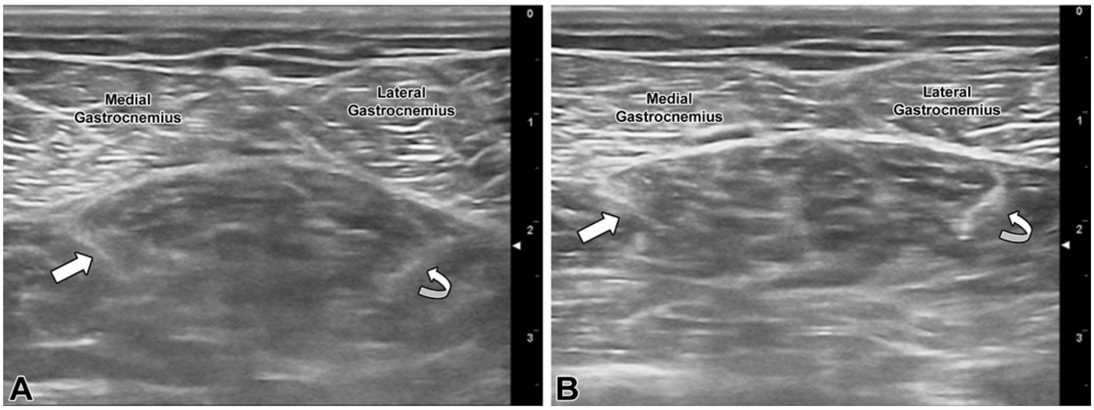
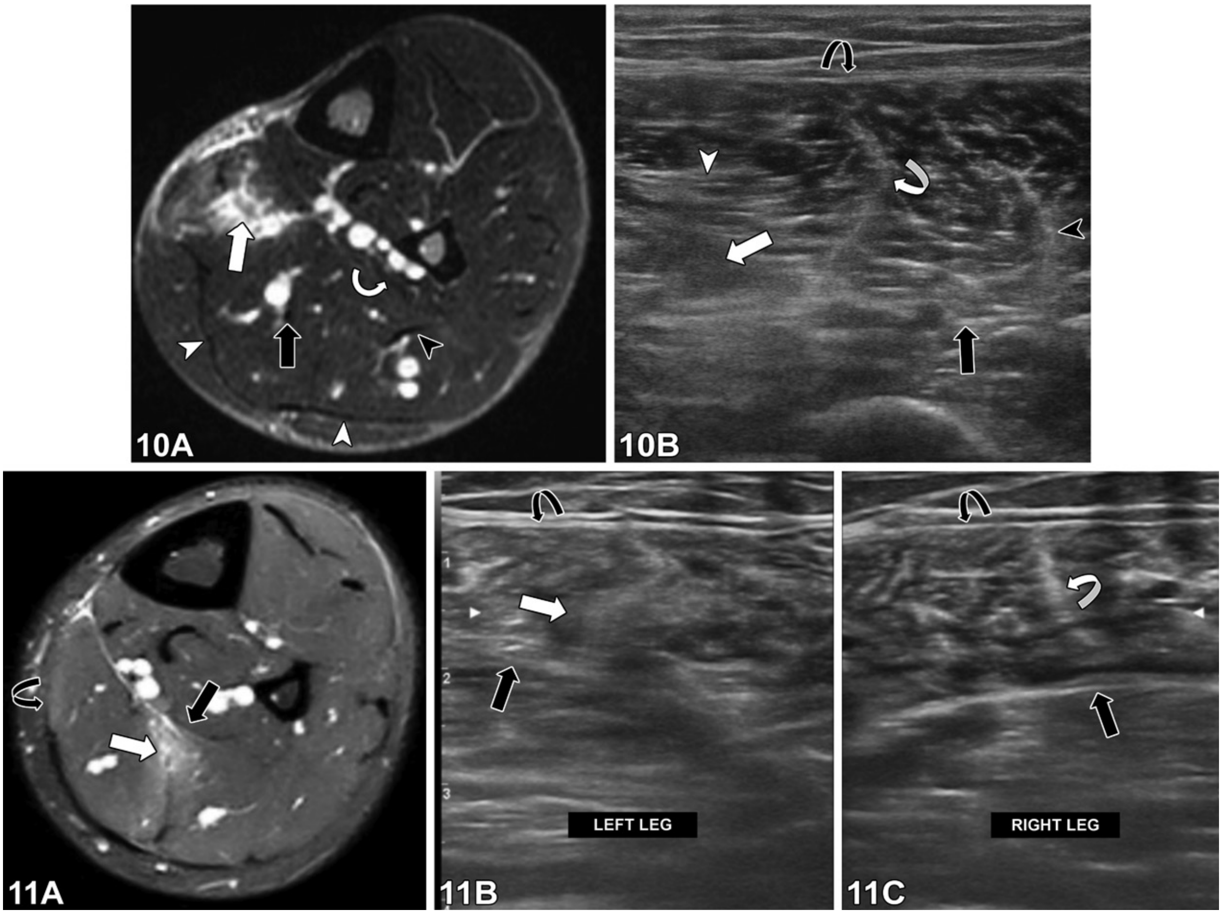


Figure 9. Transverse US images of the middle one-third of the leg demonstrate how the pressure applied with the US probe influences the quality of the generated image. **(A)** Image depicts the MIT (straight arrow) and LIT (curved arrow), but the image is blurry in the absence of adequate pressure. **(B)** Image demonstrates the well-defined shape of the MIT (straight arrow) and LIT (curved arrow) after pressure is applied with the probe.

important to differentiate gastrocnemius injuries from soleus injuries. There are certain differences in the clinical manifestations of injuries in both muscles that are related to the intrinsic anatomic characteristics of each.

On the one hand, the gastrocnemius is involved in explosive movements and is injured in dorsal flexion of the foot with the knee extended, as when initiating a sprint or a jump (10,19). Even though they can occur across all ages and in different sports, gastrocnemius injuries usually occur in men with poor conditioning who are in their 4th to 6th decades of life (20). Gastrocnemius injuries mainly occur in patients participating in sports that require explosive or ballistic movements, such as tennis, soccer, and high-speed running, and manifest clinically as an acute-onset pain that patients sometimes refer to as if “someone had thrown a stone at them” (19,21). It is a type of pain that forces them to abandon sports activities and generates discomfort during ambulation, causing the patient to limp. At physical examination, there is a specific area of pain over the middle one-third of the posterior aspect of the leg, coincident with the fact that the vast majority of gastrocnemius injuries are located over the distal myotendinous junction of the MG (17,22). In the days after the injury, there is usually a favorable evolution of pain, although there may be an increase in the diameter of the leg because of inflammatory changes, and hematoma is usually generated in the perifascial space that separates the MG from the soleus.

On the other hand, the soleus—being a slow-twitch muscle—is not usually injured with explosive movements but rather in sports activities that require endurance, so it is mostly connected to sports that involve high volumes of running load and to sports that generate fatigue and overtraining conditions (19). The classic manifestation of soleus injuries is progressive subacute



Figures 10, 11. **(10)** Clinically suspected soleus strain in a 40-year-old man who started feeling stiffness in his leg during a 15-km race the day before. Axial STIR MR image **(10A)** shows a 7-mm soleus tear (straight white arrow) over the MIT with edema of the adjacent muscle fibers. Note how the CIT (black arrow), LIT (black arrowhead), and posterior (white arrowheads) and anterior (curved white arrow) aponeuroses are preserved. Transverse US image **(10B)** at the middle one-third of the posterior leg shows a 7-mm soleus tear (straight white arrow) over the MIT with edema of the adjacent muscle fibers (white arrowhead). Note how the CIT (curved white arrow), LIT (black arrowhead), and anterior (straight black arrow) and posterior (curved black arrow) aponeuroses are preserved. **(11)** Soleus tear in a 42-year-old woman with progressive subacute calf tightness after she ran a marathon. **(11A)** Axial STIR MR image shows a 5-mm soleus tear (white arrow) over the deep sector of the CIT. The anterior (straight black arrow) and posterior (curved black arrow) aponeuroses are preserved. **(11B, 11C)** Transverse US images at the distal one-third of the posterior left leg **(11B)** and right leg **(11C)** show a 5-mm soleus tear (straight white arrow) over the deep sector of the CIT of the left leg. Note the different morphology of the normal CIT (curved white arrow) in the asymptomatic right leg. The anterior (straight black arrow) and posterior (curved black arrow) aponeuroses are preserved.

calf tightness or stiffness that tends to limit sport activity (8). Unlike in gastrocnemius strains, pain does not always appear in the posterior and medial sector of the leg but varies depending on the myotendinous union that is affected, and the patient may feel referred pain in the external region of the leg. After the initial episode, the condition usually self-limits in hours or days, so the patient usually considers it to be a minor muscle discomfort (contracture), does not consult a doctor, and starts practicing sports again relatively quickly (19). Underdiagnosis of these injuries, lack of treatment, and early return to sports lead to a torpid evolution with high reinjury rates (16). These factors generate frustration in the patient, who cannot return to practice sports in optimal condition, and after several episodes of exacerbation of the injury, decides to see a doctor.

Soleus Injury Distribution and Evolution

Injuries to the soleus, as to the rest of the muscles, usually occur at sites of inherent weakness within the muscle-tendon unit (23). Essentially, there are five different anatomic areas in the soleus where the injury may occur, which can be divided into two groups: those involving the myoaponeurotic junctions and those affecting the myotendinous junctions (9,16). The first group includes lesions of the anterior and posterior myoaponeurotic junctions, and the second group includes lesions of the medial, lateral, and central musculotendinous junctions (Figs 10, 11).

The results of a study conducted by Balius et al (8) showed that musculotendinous lesions represent 56.3% of all soleus tears, being slightly more frequent than myoaponeurotic lesions, which constitute 43.7%. In the subgroup of musculotendinous injuries, the most affected are usually the central (20%) and lateral (20%) musculotendinous junctions, while the involvement of the medial musculotendinous junction is slightly lower (16.3%). On the other hand, in the subgroup of myoaponeurotic lesions, those located on the anterior myofascial junction (16.4%) are less frequent than those located on the posterior myofascial junction (27.3%) (Table). Lesions located in the anterior myoaponeurotic junction usually represent the greatest diagnostic challenge at US examination because of their depth, and therefore it is essential to rely on MRI findings for confirmation. Sometimes myoaponeurotic lesions compromise the continuity of the fascia, generating small areas of serohematic bleeding in the neighboring perifascial compartments (Fig 12). Something similar can occur with tears of the MG, although in the case of soleus injuries, they tend to be less severe. This US finding should alert one to the possibility of a muscle injury involving the fascia.

The time it takes for an athlete to return to activity, with a similar physical demand as before the injury and with a low risk of reinjury, is known as return to play (RTP) (24,25). It is suggested that the average RTP time for a soleus injury is 29 days (16). However, a small study conducted by Pedret et al (16) with 44 patients with soleus injuries demonstrated trends showing that RTP is shorter after LIT injury than after CIT injury.

Soleus Chronic Injuries

After a muscle tear, there are usually inflammatory changes that try to repair the muscle tissue. Although muscular healing can occur by regeneration of the fibers or by the formation of a fibrotic scar, most of the time there is a combination of both, and the results may vary (26). Abnormal regeneration phenomena with chronic inflammatory and adipose infiltration may occur, and this eventually triggers muscle fibrosis in the area of the injury. These fibrous scars are usually sectors where the muscular function is compromised and where there is usually a greater predisposition to reinjury (19).

At imaging, the characteristics of scar tissue vary depending on the degree of maturation. Thus, in an acute stage we usually see hypoechoic scars at US, and as the healing process progresses, it does so in a centripetal way, from the peripheral region toward the center. Therefore, in subacute stages, a heterogeneous echogenicity with hyperechoic peripheral areas is seen, which refer to healing and hypoechoic central areas that indicate immaturity. In chronic stages, the scar tissue is totally hyperechoic (Fig 13). It is common to see that when the physical demand exceeds the tissue repair stage, areas of scar overload or reinjuries appear.

Distribution of Soleus Injuries

Location	Frequency
Myofascial	43.7%
Anterior aponeurosis	16.4%
Posterior aponeurosis	27.3%
Musculotendinous	56.3%
CIT	20%
LIT	20%
MIT	16.3%

Source.—Reference 10.

Occasionally, when a muscle is injured, ectopic calcifications can be deposited into the developing scar (Fig 14) (26,27). Although the cause is not entirely clear, these calcified scars generate a greater alteration in the muscular biomechanics, with loss of elasticity and functional capacity. They are also a risk factor for new muscle injuries.

Accessory Soleus

The accessory soleus muscle is an anatomic variation characterized by an additional muscle belly in the posteromedial distal one-third of the leg, located between the flexor hallucis longus and the Achilles tendon (Fig 15). The prevalence of the accessory soleus muscle is 0.7%–5.5%, and it is usually a unilateral finding that the patient associates with a soft-tissue mass in the posteromedial aspect of the ankle (28). While in most cases this is an incidental finding with no symptoms, it can occasionally become symptomatic as a result of a chronic compartment syndrome, as the muscle increases in size during activity (mainly repeated action in plantar flexion) or related to the fact that accessory soleus hypertrophy may cause neuropathy from compression of the posterior tibial nerve (29).

The insertion of the accessory soleus may occur into the fibula or the anterior surface of the soleus muscle. Five types of distal insertion have been described: *(a)* insertion at the Achilles tendon; *(b)* upper surface of the calcaneus with a muscular insertion; *(c)* upper surface of the calcaneus with a tendinous insertion; *(d)* medial aspect of the calcaneus with a muscular insertion; and *(e)* medial aspect of the calcaneus with a tendinous insertion (29).

Differential Diagnosis

Other causes associated with posterior leg pain include other types of musculotendinous injuries (gastrocnemius and plantaris), deep vein thrombosis (DVT), and an acutely ruptured Baker cyst. A

Figure 12. Soleus tear in a 30-year-old professional soccer player with pain that began after a match 24 hours earlier. **(A)** Axial STIR MR image shows a 6-mm soleus tear (white arrow) over the posterior aponeurosis. Note the serohematic content (arrowhead) in the perifascial space that separates the MG from the soleus. The anterior aponeurosis (black arrow) is preserved. **(B, C)** Transverse US image **(B)** at the middle one-third of the posterior leg shows a 6-mm soleus tear (straight white arrow) over the posterior aponeurosis (curved white arrow) in the left leg. Note the normal anatomy of the posterior aponeurosis of the right leg (curved black arrow) **(C)**. The anterior aponeurosis (straight black arrow) is preserved.

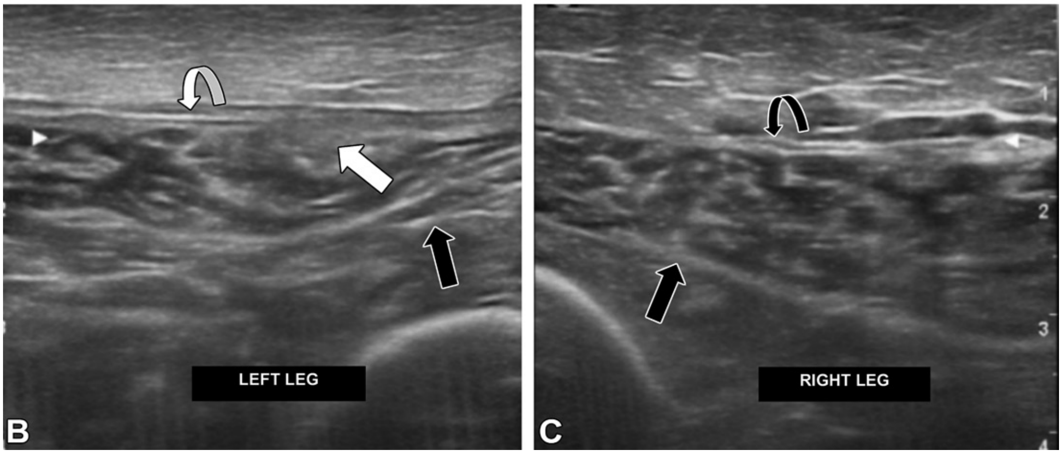
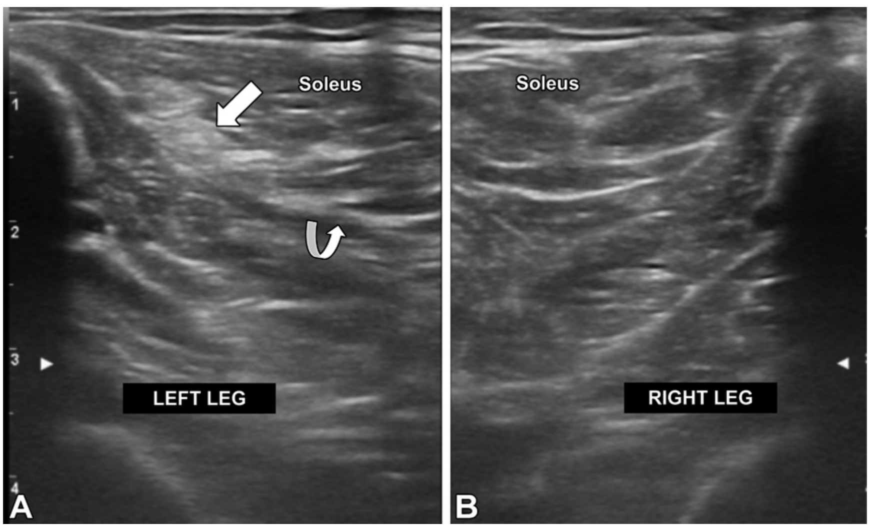


Figure 13. Muscular fibrosis in a 43-year-old man. **(A)** US image of the left leg depicts muscular fibrosis (straight arrow) in relation to an old soleus tear on the anterior myofascial junction (curved arrow). The patient did not have symptoms in this location at the time of examination. **(B)** US image of the right leg shows normal muscle anatomy for comparison.



detailed interview with the patient and an imaging examination allows one to limit the differential diagnosis and determine the cause of the discomfort.

The MG is the third most commonly strained muscle (30). As described in detail earlier in this article, the lesions are usually located in the distal myotendinous junction, and the patient describes them as a sharp pain located in the middle and inner one-third of the posterior aspect of the leg (Fig 16). On the other hand, it is also important to suspect and rule out other differential diagnoses such as DVT, which is responsible for 10% of episodes of posterior leg pain, or an acutely ruptured Baker cyst, which can generate discomfort in the proximal and middle one-third of the leg (18).

Conclusion

Although there are multiple conditions that produce pain in the posterior aspect of the leg, soleus injuries are not as infrequent as previously

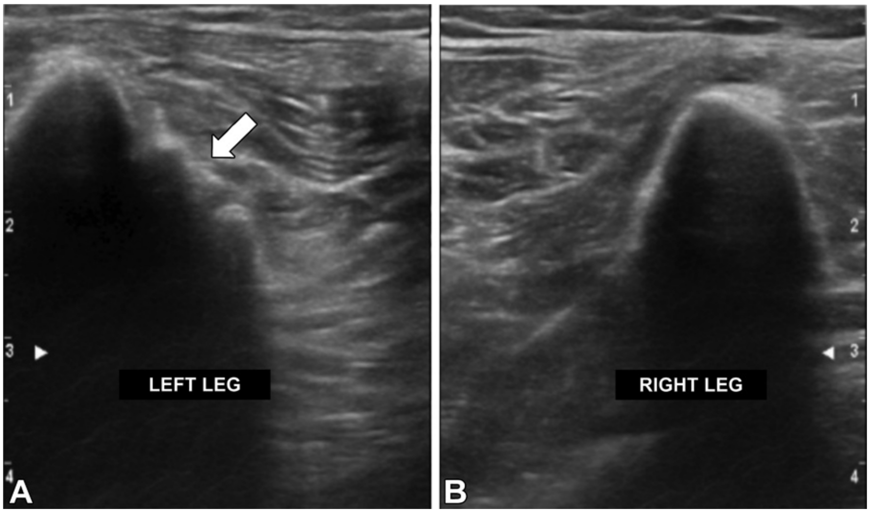


Figure 14. Ectopic calcification in a 48-year-old runner with a history of multiple soleus tears. **(A)** US image shows an ectopic calcification (arrow) located on soleus fibers that lie on the external and posterior border of the fibula of the left leg. **(B)** US image of the right leg depicts the normal anatomy for comparison.

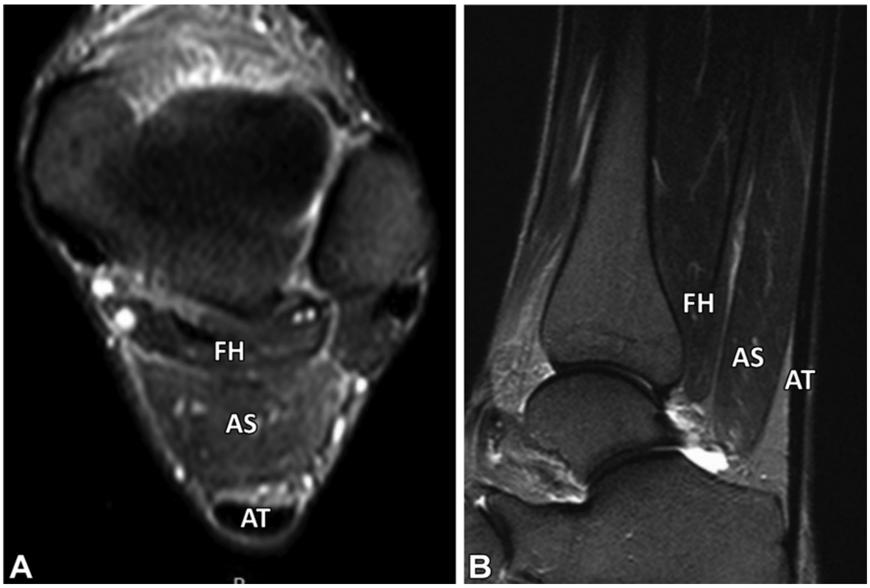


Figure 15. Accessory soleus muscle in a 37-year-old woman with chronic discomfort at the posteromedial aspect of the ankle when exercising. Axial **(A)** and sagittal **(B)** STIR MR images show an accessory soleus muscle *(AS)* between the flexor hallucis longus *(FH)* and Achilles tendon *(AT)*.

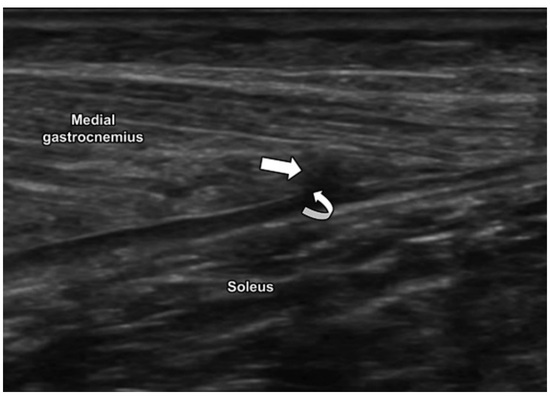


Figure 16. Longitudinal US image of the distal MG in a 24-year-old soccer player who had acute pain in the posterior leg during a soccer match shows a muscular strain (straight arrow) with disruption of the aponeurosis (curved arrow).

thought. They usually have a characteristic clinical manifestation that should make the professional suspect this pathologic condition, mainly in patients who report subacute pain with progressive tightness that is not located in the distal and internal area of the MG. In this context, it is important that the clinician and radiologist suspect a probable soleus injury and rely on US and MRI findings to reach an accurate diagnosis.

Knowledge of anatomy, clinical aspects, and biomechanics allows radiologists to interpret the pathologic condition accurately and improve reports. Although scientific evidence is limited and more studies on the subject are likely needed, the precise anatomic location of the injury could modify the RTP time.

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