

Persistent Bilateral Lower Leg Pain in a Collegiate Swimmer: A Case Study

Sennett, A.M. ; Lumpkin, K., PhD, LAT, ATC ; Bonser, R.J., DAT, LAT, ATC, PES

Initial Case Presentation

Background: A twenty-two-year-old female collegiate swimmer presented with recurring, intermittent symptoms of bilateral anterior lower leg pain over the span of four years. Upon initial examination, the patient complained of pain walking to class and described soreness, diffused pain, inflammation, and point tenderness during and after plyometrics. Immediately following activity, the patient stated her pain would persist for approximately two hours. Pain continued to persist, and upon further physical examination, the patient reported point tenderness bilaterally on the anterior aspect of the lower leg. During the functional assessment, the patient could not complete more than two single leg hops. The initial diagnosis of medial tibial stress syndrome (MTSS) was formed within the first eight weeks of her freshman season and the patient was referred to a radiologist for bilateral radiographic imaging. The radiographic images revealed double stress reactions in both tibiae that had the potential to worsen and become stress fractures.

Differential Diagnoses

Differential Diagnoses: MTSS, Popliteal Entrapment, Neuromuscular Compartment Syndrome, Posterior Compartment Syndrome, Secondary Non-Traumatic Compartment Syndrome, Complex Regional Pain Syndrome, Raynaud's Syndrome, and Diabetes.

Background

Medial Tibial Stress Syndrome (MTSS): MTSS is commonly referred to as "shin splints" and is described as exercise induced lower leg pain that presents over the anterior tibial region.¹ MTSS is categorized as an overuse condition seen in approximately 5-35% of runners.² Conservative management focused on activity modification is indicated.¹

Stress Injuries: Stress injuries, including stress reactions and fractures, are caused by an inflammation of the bone's periosteum.³ Repetitive sub-maximal stresses on the bone results in an overuse injury.³ Conservative management is also indicated for stress injuries.³

Chronic Exertional Compartment Syndrome: Chronic exertional compartment syndrome is characterized by an increase of intercompartmental pressure within a fascial compartment.⁴ In the lower leg, the anterior and lateral compartments are most commonly affected.⁴ Initially, conservative management is pursued, and if symptoms do not resolve, then surgical compartmental release is performed.⁴

Popliteal Entrapment: Popliteal artery entrapment syndrome results from the impingement of the popliteal artery by the medial gastrocnemius.⁵ This condition can be either congenital or acquired.⁵ Conservative management is initially pursued, and a surgical release can be performed if symptoms do not resolve.⁵

Further Diagnosis and Treatment

Further Diagnosis and Treatment: Following diagnosis of the stress reactions, the patient was placed in a walking boot for their left leg for a month and crutches were utilized for two weeks to relieve axial loading of the extremity. A limited return to play program consisting of completing upper extremity cardiovascular exercise in the pool (i.e. pulling) in addition to beginning physical therapy (PT). Various treatments such as cryotherapy, heat, and ultrasound were utilized in an effort to reduce pain. PT exercises included a focus on increasing ankle range of motion (ROM), increasing strength within the ankle musculature, and improving neuromuscular control and proprioception. A full return to play (RTP) was achieved three months following the diagnosis of bilateral stress reactions.

Following an intense stair climbing session two years later, the athlete complained of severe, bilateral lower leg pain. The patient was once again referred to a physician for further radiographic imaging. The physician diagnosed her with MTSS after her radiographic imaging came back normal. The patient was prescribed with a restrictive exercise program which withheld the athlete from running and jumping activities in addition to anti-inflammatory medication. PT was also continued to improve ankle ROM, ankle muscular strength, and neuromuscular control.

After continued pain with no improvements, the patient was referred back to the physician for further testing which revealed chronic bilateral compartment syndrome in the anterior and lateral compartments. In September of 2019, the patient underwent corrective surgery and continued post-operation PT to increase ROM, muscular strength, and neuromuscular function. She returned to full swimming participation around a month following surgery. The patient continued to report symptoms intermittently following RTP protocol and underwent various modalities to relieve pain such as Graston®, cupping, ultrasound, and dry needling.

Eight months later, the patient reported a sudden increase in lower leg pain, stating that her feet have grown progressively colder and more purple. She noted pain with resisted knee extension, increased pressure, and severe tibial sensitivity.

The patient met with an orthopedic physician again to determine the cause of her continued pain. She decided to return home to continue testing with her primary physician. Continued testing revealed the patient presented with bilateral popliteal entrapment. The patient underwent bilateral corrective surgery to release the artery from being impinged. The patient was restricted to non-weight bearing (NWB) approximately four weeks post-operation and completed PT with her home physical therapist. The patient retired from sport due to continued lower leg pain following corrective surgery.

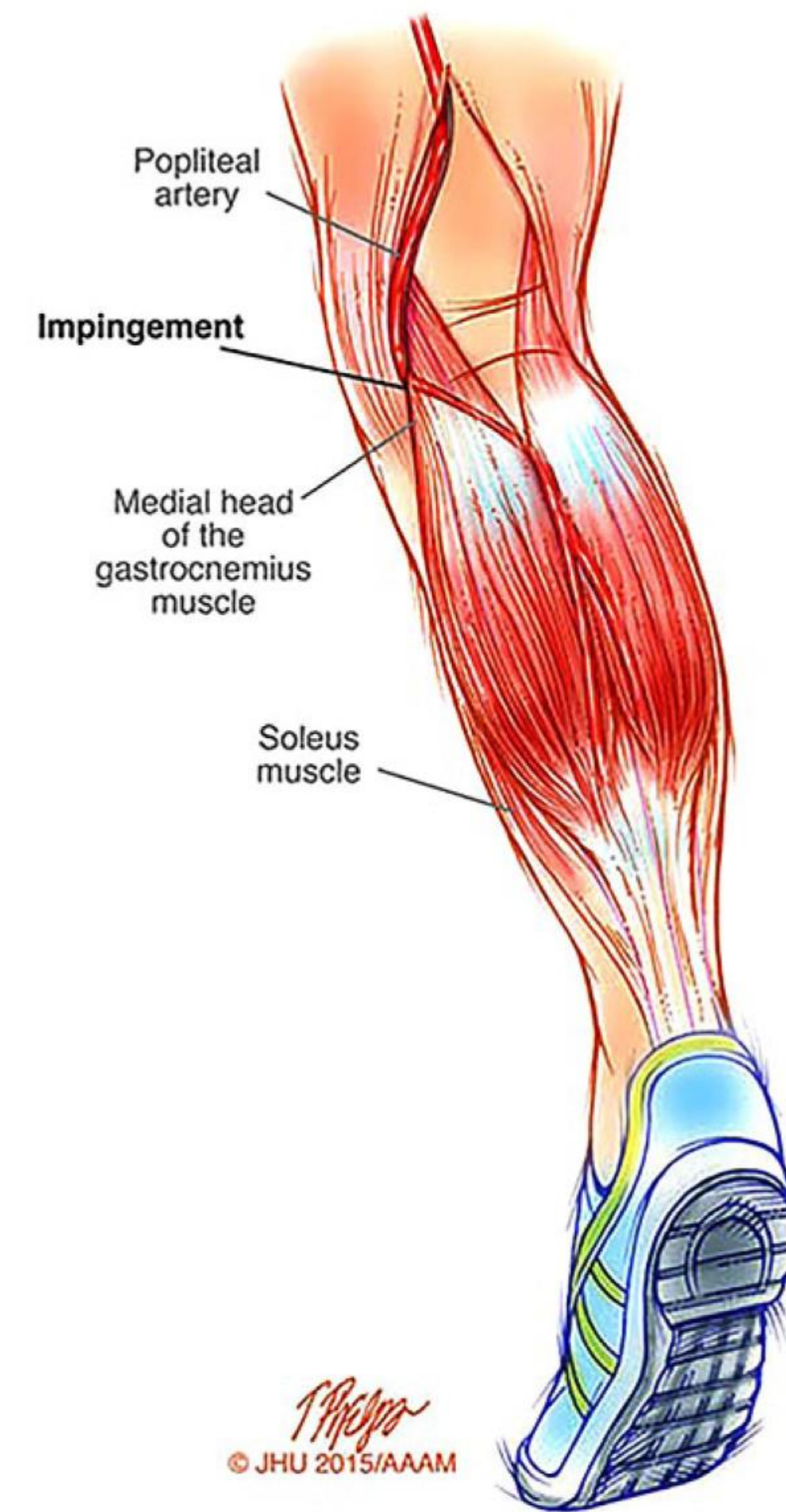


Figure 1: Depiction of Popliteal Entrapment: Retrieved from Popliteal Artery Entrapment Syndrome (PAES): Symptoms and Treatment. Cleveland Clinic. Accessed January 25, 2024. <https://my.clevelandclinic.org/health/diseases/17375-popliteal-artery-entrapment-syndrome-paes>⁷



Figure 4: Depicted above is the patient's healed incision site following the popliteal entrapment corrective surgery.



Figure 3: Depicted above is the patient's left, dorsal MRI result revealing impingement of the popliteal artery.

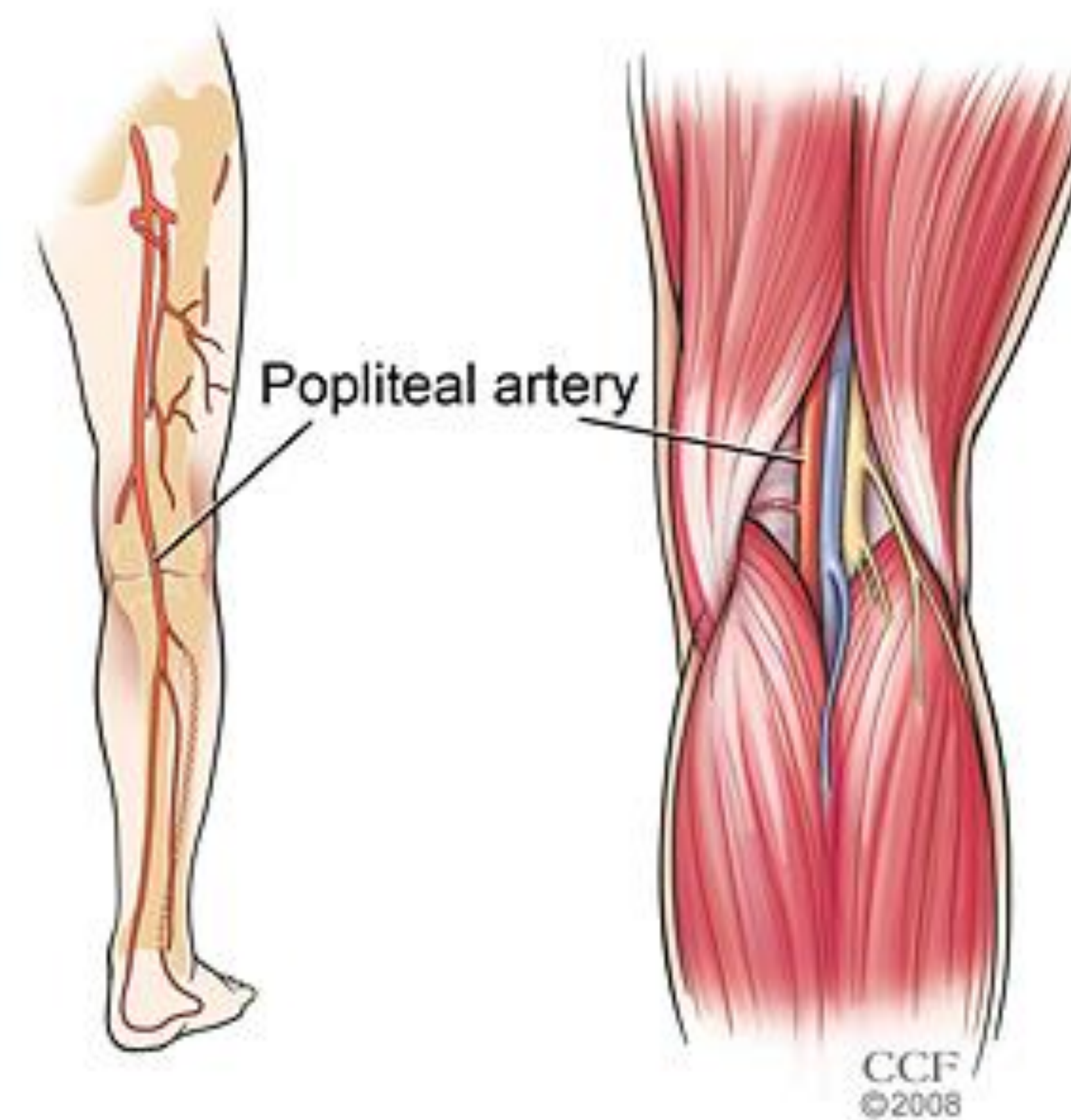


Figure 2: Depiction of Popliteal Artery: Retrieved from Popliteal Artery. Stepwards. Accessed February 26, 2024. https://www.stepwards.com/?page_id=4011⁸

Uniqueness

Uniqueness: Chronic exertional compartment syndrome is prevalent in approximately 14-27% of the population that report exercise induced lower leg pain.⁶ Because this athlete is a swimmer who compete in a NWB sport, the incidence of MTSS, stress reactions, and compartment syndrome would be even lower. Similarly, due to the continued symptoms after compartment release surgery, the percentage of those with continued pain would drop even more.

Additionally, popliteal entrapment is prevalent in approximately .17-3.5% of the general population (2, 3).^{5,7} Due to the similarities between popliteal entrapment and other chronic conditions exhibited in this case, diagnosis can prove to be difficult. Therefore, the prevalence of bilateral MTSS, stress reactions, chronic exertional compartment syndrome, and popliteal entrapment in a non-contact, NWB swimmer is extremely unique.

Conclusion

Conclusions: The initial injury presented following a series of intense plyometric training when the athlete had not participated in similar training prior to her freshman season in college. Previous training history is an important aspect of the preparticipation screening prior to participation in athletics. The athletic trainer and strength and conditioning coach should combine efforts to educate athletes that have not participated in complex training programs such as advanced weight-lifting and plyometrics. These athletes should be progressively introduced and educated on the proper form for these movements to ensure their safety. Additionally, previous history of lower leg pain should also be noted and monitored by athletic trainer to better prevent lower leg pain through modification of duration, volume, or intensity of plyometric training or aggravating activities.

The athlete continued to communicate that she was experiencing pain and adhered to the treatment protocol created for her by the physicians and athletic trainers involved. Despite adherence, pain persisted which caused frustration over a lack of diagnosis and continued pain in the athlete. Sports medicine teams and physicians should continue to maintain an open, honest line of communication to monitor ongoing and previous injuries. By being well informed in previous histories, the sports medicine team can prioritize their athletes' health, wellness, and performance.

Despite low incidence rates, clinicians working with MTSS patients' experiencing persistent pain should consider utilizing diagnostic imaging to rule out popliteal entrapment to avoid ongoing chronic pain that impedes on daily activities and sport.

References and/or Acknowledgments

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