

Pain Case No. 5, January 2009

This case is no longer available for CME Credit.

Presenting Symptom(s): Bilateral calf pain

Case Prepared by: Marla S. Kaufman, MD, Venu Akuthota, MD

Affiliations: University of Colorado School of Medicine

Disclosures: Faculty members have no relevant financial relationships to disclose.

CME Credit Information: CME credit is available for three (3) years from the date of publication. CME credit for completing this case study must be claimed online through your Portfolio via the Academē Web site (www.me.aapmr.org).

Software Requirement(s): CME credit must be claimed online via Academē. This print version of the case study is available for download as a PDF file, which can be viewed with Adobe Acrobat Reader software. Reader allows you to view, navigate, and print PDF files across all major computing platforms. To download a free copy of Reader, [connect to the Adobe Acrobat site](#).

Appropriate Audience: Residents and practicing physicians

Learning Objectives: After completing this educational activity, participant will be able to: (1) Describe a methodical approach to diagnosing leg pain in an athlete; (2) Define popliteal artery entrapment syndrome (PAES); (3) Explain treatment options for PAES.

Estimated Level of Difficulty: Intermediate

History

An 18 year-old female high school varsity soccer player presents to clinic with an 18 month history of leg pain. The symptoms began in the off-season while she was cross training with a weight lifting program and continued when she returned to soccer. Symptoms progressed and she began to experience them while swimming, walking less than ½ mile, and even when performing activities of daily living. She had to quit soccer secondary to the pain.

1. Prior to continuing, please develop a differential diagnosis and list each possible diagnosis in order of likelihood.
2. Is there any additional information regarding the clinical history that might be helpful in clarifying your differential list or changing its order of priority?

Commentary I

****Differential diagnosis:**

1. Medial tibial stress syndrome
2. Chronic exertional compartment syndrome
3. Stress fracture
4. Popliteal artery entrapment syndrome
5. Nerve entrapment (i.e. superficial fibular nerve)

These should be on the list of differential diagnoses for any athlete with leg pain.



****Additional information:**

1. Where is the leg pain?
2. What is the character of the pain?
3. Does she have any associated sensory or motor changes?

History, Continued

She describes the pain as a cramping in her bilateral posterior calves. Currently, she denies any numbness, tingling, burning sensations or swelling. Symptoms do not extend proximal to her knees.

1. If necessary, revise your differential diagnosis based on the additional clinical history.
2. On which details of the physical examination should you focus at this point?

Commentary II

Most of the items on the differential diagnosis should remain on the list. Her symptoms may be consistent with stress fracture, chronic exertion posterior compartment syndrome, popliteal artery entrapment syndrome and nerve entrapment. As her pain is posterior, not anterior, bilateral medial tibial stress syndrome is less likely.

Physical Examination

Examination demonstrates tenderness to palpation in bilateral bellies of the gastrocnemius, which was accentuated with ankle dorsiflexion (ADF). In addition, decreased ADF range of motion (ROM) is noted.

1. At this point, review your differential diagnosis and revise as appropriate.
2. Are there additional observations on physical examination that might be helpful in narrowing your differential list?

Commentary III

Given the physical examination, chronic exertional posterior compartment syndrome and popliteal artery entrapment syndrome should be moved to the top of the list. Stress fracture, though still possible, is most likely in either the tibia or fibula and usually presents with symptoms anteriorly. Nerve entrapment (i.e. superficial fibular nerve) should also remain on the differential, but in the bottom 2.

Physical Examination, Continued

There is no tenderness to palpation of her anterior tibiae or fibulae. Sensation and manual muscle testing are normal.

1. If necessary, revise your differential diagnosis based on the additional physical findings.

Clinical Impression

1. Chronic exertional posterior compartment syndrome
2. Popliteal artery entrapment syndrome

1. What diagnostic tests would you order at this time?

Commentary IV

Based upon the fact that her pain is isolated to her posterior calves, chronic exertional posterior compartment syndrome or popliteal artery entrapment syndrome are most likely.

Test Results

1. MRI bilateral lower legs: Normal
2. Compartment pressures: Pre-exercise compartment are: right leg superficial posterior compartment = 10 mmHg, right leg deep posterior compartment = 10 mmHg, left superficial posterior compartment = 9 mmHg, left deep posterior compartment = 9 mmHg. She is able to run on the treadmill for 12 minutes and then has to stop secondary to significant calf pain. Immediately post-exercise her pressures are: right superficial posterior compartment = 12 mmHg, right deep posterior compartment = 11 mmHg, left superficial posterior compartment = 12 mmHg, and left deep posterior compartment = 13 mmHg. IMPRESSION: Symptoms not related to exercise-induced compartment syndrome.

1. If necessary, augment or change the clinical impression based on the test results.

Commentary V

Based upon the compartment pressures, we have ruled out chronic exertional compartment syndrome. Additionally, a normal MRI is not consistent with stress fracture or medial tibial stress syndrome.

1. What additional diagnostic testing would you order?

Commentary VI

In order to evaluate for popliteal artery entrapment, MR angiogram is performed initially. If this is normal and popliteal entrapment is still suspected, then angiogram can be performed for definitive diagnosis.

Test Results, Continued

1. MR angiogram shows a high insertion of left anterior tibial artery, but was otherwise unremarkable (no stenosis was noted).
2. Angiogram is consistent with classic bilateral popliteal entrapment.



L Popliteal Fossa



R Popliteal Fossa

1. What is the impact of the additional test results on the final diagnosis?



2. Considering all the data from the history, physical examination and laboratory studies, what is/are your final diagnostic impression(s)?

Final Diagnostic Impression

Bilateral popliteal artery entrapment syndrome.

Commentary VII

MR angiogram did not reveal a definitive diagnosis, but as our clinical suspicion is high, an angiogram needs to be ordered for definitive diagnosis and to direct treatment.

1. What treatment would you now initiate for this patient?

Commentary VIII

Referral to vascular surgery for treatment is indicated. This patient underwent bilateral fasciotomies in posterior and superficial compartments and bilateral popliteal artery mobilization and excision of external compressive tendinous bands.

Final Discussion

Post-operatively the patient has resolution of her bilateral calf cramping.

Though uncommon, PAES must be included in the differential diagnosis of leg pain. Most of the lower limb vascular problems in athletes are secondary to trauma, but may also be non-traumatic. Many patients with PAES have a long course of physician visits with a delay in diagnosis since vascular etiologies are often not considered in young patients without cardiovascular risk factors. PAES usually occurs in males under 30 and is seen after high-intensity exercise with excessive ADF and APF (i.e. football, basketball, soccer, running). It may present unilaterally or bilaterally. Patients generally report calf cramps, coldness, blanching, and paresthesias of the leg.

Entrapment may be classified as anatomic or functional. Anatomic entrapment has been described as a result of the abnormal relationship between the popliteal artery and surrounding musculotendinous structures, secondary to abnormal displacement of the heads of the gastrocnemius muscle and popliteal artery during embryonic development. Functional entrapment may be classified according to the following (first described by Whelan, modified by Rich):

Type I: Medial head of gastrocnemius (MHG) is normal, popliteal artery (PA) is deviated medially and has an aberrant course

Type II: MHG is located laterally, no deviation of PA

Type III: Abnormal muscle bundle from MHG surrounding the PA

Type IV: PA is located deeply and entrapped by the popliteus muscle or a fibrous band

Type V: Popliteal vein is also entrapped with any type of PA

As surgical intervention is recommended for treatment, the correct and early diagnosis is imperative. In addition, the risk of development of late complications such as stenosis, thrombosis, and aneurysm increases as the course continues without diagnosis.



Bibliography

1. Edwards PH, Wright ML, Hartman JF. A practical approach for the differential Diagnosis of chronic leg pain in the athlete. *The Am J of Sports Medicine*. 2005;33(8):1241-1249.
2. Tercan F, Oguzkurt L, Kizilkilic O, et al. Popliteal artery entrapment syndrome. *Diagn Intervent Radiol*. 2005;11:222-4.
3. Baltopoulos P, Filippou DK, Sigala F. Popliteal artery entrapment syndrome: Anatomic or Functional Syndrome? *Clin J Sport Med*. 2004 Jan;14(1):8-12.
4. Turnipseed WD, Pozniac M. Popliteal entrapment as a result of neurovascular compression by the soleus and plantaris muscles. *J Vasc Surg*. 1992;15:285-294.
5. Carter AE, Eban R. A case of bilateral development abnormalities of the popliteal arteries and gastrocnemius muscles. *Br J Surg*. 1964;51:518-522.
6. Rich NM, Collins GJ, McDonald PT, et al. Popliteal vascular entrapment. *Arch Surg* 1989;114:1377-1384.
7. DiMarzo L, Cavallaro A. Popliteal artery entrapment syndrome: the role of early diagnosis and treatment. *Surgery*. 1997;22:26-31.