A Case Report of Bilateral Popliteal Artery Entrapment Syndrome in a Female Runner

Poster No.: R-0089
Congress: 2016 ASM
Type: Educational Exhibit
Authors: P. D’Anvers, P. Cleland; QLD/AU
Keywords: Vascular, Musculoskeletal soft tissue, Emergency, Ultrasound-Colour Doppler, MR, Ultrasound, History, Normal variants, Education, Athletic injuries, Congenital, Education and training
DOI: 10.1594/ranzcr2016/R-0089

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slidshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

Abstract:

Popliteal artery entrapment syndrome (PAES), also known as "Jogging disease", is a rare diagnosis to be considered in the young runner or athlete with exertional calf pain or claudication.\textsuperscript{2} We present a case of bilateral popliteal artery entrapment in a 21-year-old female presenting with bilateral exertional calf pain on running. Knowledge of PAES is important amongst General Practitioners, Emergency doctors and Radiologists, as missed or late diagnosis can lead to functional impairment in the young, active individual or in severe cases, may even be limb threatening.\textsuperscript{11}

Learning Objectives:

1. With this case report we wish to emphasize to the Radiologist, GP and Emergency doctor the differential diagnosis of PAES in the young claudicating patient.

2. Combined with an adequate history and examination, imaging modalities to evaluate patency of the artery on FPF, include DU and angiography. To confirm the anatomy of the popliteal fossa and cause for the entrapment, further imaging looking at the surrounding musculotendinous structures should be employed such as MRI or CT.\textsuperscript{6,10}

3. For the radiologist, radiographer or sonographer it is important to note that dynamic maneuvers, mainly forced plantar flexion of the foot, must be incorporated during the DU or angiography to display the entrapment of the popliteal artery against the medial head of gastrocnemius.\textsuperscript{10}
Background

Background:

First described in 1879 by an Edinburgh medical student, Anderson Stuart, PAES is caused by an abnormal anatomical relationship between the popliteal artery, the gastrocnemius and surrounding musculotendinous structures as a consequence of abnormal embryological development of the popliteal fossa.

There are six recognized variants first proposed by Love and Whelan, with the most predominant feature being medial displacement of the popliteal artery either due to the artery taking an exaggerated course, a variation of the medial head of gastrocnemius (MHGN) insertion site, accessory muscle slip or the neurovascular bundle lying deep to the poplitea.11

Typically forced plantar flexion (FPF) or repetitive exertion, for example during running, causes occlusion of the medially displaced artery against the contracted MHGN, resulting in claudication.

Late or missed diagnosis is potentially limb threatening as chronic arterial micro-trauma may lead to aneurysm, dissection, thrombotic artery occlusion and acute distal ischemia.5

The prevalence of PAES is difficult to determine but a study on 20,000 soldiers found a rate 0.165% and a study of 83 cadavers found 3 cases representing 3.5%, suggesting not all cases of entrapment lead to symptoms. Comorbid vein entrapment is thought to occur in only 10-15% of cases and represents type V entrapment.2 The syndrome has an 80-85% male predominance,2,8 making a case of female PAES quite rare. Bilateral symptoms with bilateral anatomic anomaly can be found in 25% of cases.8

Patient Information:

We present the case of a 21-year-old female university student and recreational runner who presented to her General Practitioner (GP) with a two-year history of bilateral exertional calf pain. The patient was a non-smoker and did not have diabetes.
Pain reliably occurred one to two kilometers into her daily six to eight kilometer run. During exercise she would need to stop secondary to the pain in her calves and tingling and numbness in her feet.

During one incidence the pain was so severe and the tingling had proceeded to parasthesia of the bilateral feet. The patient had to lie on the ground with her legs elevated for 45 minutes to produce some relief in her symptoms.

The patient would at times have pain during rest and night for which she would take paracetamol and non-steroidal anti-inflammatory. The general practitioner referred her to a Sports Medicine Physician.

Examination revealed palpable dorsalis pedis pulses bilaterally with feet resting in a neutral position, however pulses disappeared in forced plantar flexion (FPF). An Ankle Brachial Index (ABI) performed at rest measured 1.0 bilaterally. Post-exertional (1000 meter run) ABI was 0.47 bilaterally.
A Duplex ultrasound (DU) was performed, showing normal popliteal arteries bilaterally with normal triphasic arterial flow, when the foot was in a neutral position (figure 1 and figure 2). However, with the patient in forced plantar flexion (FPF), DU demonstrated high grade stenosis of the popliteal artery bilaterally with loss of continuous wave Doppler signals on the left (figure 3) and right (figure 4).

The patient was referred to a vascular surgeon, at which time magnetic resonance imaging (MRI) was performed to confirm the anatomy of the popliteal fossae. MRI showed bilateral findings of a variable attachment of the MHGN to the lateral aspect of the medial femoral condyle with significant crowding of the popliteal fossa (figure 5). There was no evidence of aneurism, stenosis, thrombosis or arterial damage at this time.
Fig. 1: Left Popliteal Artery Doppler Ultrasound: Left Popliteal artery at rest (ie foot in neutral position) showed normal outlines and laminar flow, with no intimal damage, stenosis, cystic change or aneurysm.

© Royal Brisbane and Women's Hospital - QLD/AU
**Fig. 2:** Right Popliteal Artery Doppler Ultrasound: Right Popliteal artery at rest (ie foot in neutral position) showed normal outlines and laminar flow, with no intimal damage, stenosis, cystic change or aneurysm.

© Royal Brisbane and Women's Hospital - QLD/AU
**Fig. 3:** Left Popliteal Artery Doppler Ultrasound: High grade stenosis of the left popliteal artery on forced plantar flexion is demonstrated by luminal narrowing and loss of continuous wave Doppler signal.

© Royal Brisbane and Women's Hospital - QLD/AU
Fig. 4: Right Popliteal Artery Doppler Ultrasound: High grade stenosis of the right popliteal artery on forced plantar flexion is demonstrated by luminal narrowing and loss of continuous wave Doppler signal.

© Royal Brisbane and Women's Hospital - QLD/AU
**Fig. 5:** 2D axial TOF (Time of Flight) MRI (Magnetic Resonance Imaging) of the bilateral lower limbs at the the level of the popliteal fossa with feet in neutral position. There is variable attachment of the medial head of gastrocnemius to the lateral aspect of the medial femoral condyle with crowding of the popliteal fossa and lateral displacement of the popliteal artery.

© Royal Brisbane and Women's Hospital - QLD/AU
Conclusion

For the referring physician and reporting radiologist, diagnostic evaluation of PAES can be performed with non-invasive testing such as DU of the popliteal artery with the involvement of dynamic maneuvers or 'stress test', ie FPF with the knee in full extension. The dynamic maneuverers are important, as typically the artery and Doppler waveform will appear normal in the neutral position and increased velocities and complete compression of the artery will only be seen on active plantar flexion.\textsuperscript{11} Should DU be performed with out the completion of dynamic maneuvers, the diagnosis of PAES may be missed.

Invasive testing includes angiography, looking for medial deviation, focal occlusion or post-stenotic dilatation of the popliteal artery.\textsuperscript{2} Once again, low sensitivity rates can occur if dynamic maneuvers are not performed during angiography. Angiography is often the preferred method of investigation as the distal vessels can be clearly visualized and surveilled for evidence of emboli or occlusion.

Computed Tomography (CT) and MRI are useful in demonstrating the specific anatomy of the popliteal fossa and vessel lumen which may aid the treating surgeon to classify the type of PAES, allowing for surgical planning.\textsuperscript{10,11}

Given the age and gender of the patient in this case report, the treating doctor chose to avoid imaging modalities involving exposure to radiation and contrast mediums, hence DU and MRI were utilized as alternatives.
Personal information

\textsuperscript{1}Portia D'Anvers MBBS, \textsuperscript{1}Perry Cleland MBBS, PhD, RANZCR.

\textsuperscript{1}Department of Medical Imaging, Royal Brisbane and Women's Hospital, Herston, QLD, Australia.

Additional Information:

In aim of providing full disclosure, we wish to inform the audience that the person who is the subject of this case report is also the primary author of this case report.
References


