Role of angiography in popliteal artery entrapment syndrome

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Popliteal artery entrapment syndrome (PAES) is an uncommon clinical entity that occurs due to compression of the popliteal artery by adjacent muscle and tendinous structures (1). Extrinsic arterial compression causes chronic vascular microtrauma, early arteriosclerosis, and thrombus formation that, in turn, cause distal ischemia (1).

Case report
An 18-year-old female soccer player presented with severe cramping pain in both calves for over a year. The pain was increased on exertion and relieved by rest. Past medical and family history were noncontributory, and were negative for diabetes mellitus, hypertension, or smoking. Clinical examination and laboratory data were not helpful for diagnosis. Magnetic resonance imaging of both knees was inconclusive. Diagnostic angiography demonstrated bilateral, smooth and focal narrowing of both popliteal arteries only on active flexion and extension. PAES was confirmed by surgery. Our case is unique because of female gender and functional PAES. A review of the literature regarding PAES and its clinical relevance is presented.

Key words: • angiography • popliteal artery

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Turnipseed (7) found that patients with functional PAES are younger than those with the anatomic types (mean age, 24 vs. 43 years) and are more commonly female (60% vs. 28% of cases), as was our patient.

Patients with PAES usually present with calf claudication and, rarely, with ischemia due to thrombosis. On physical examination, the pulses may be normal, but may disappear or decrease with plantar flexion or dorsiflexion of the foot. Resting ABIs will usually be normal in patients with PAES, but ankle pressures will decrease with exercise. Duplex ultrasonography may demonstrate stenosis on color imaging, and increased velocities with flexion maneuvers. MRI and MR angiography are important noninvasive modalities that can demonstrate the vessel lumen as well as the surrounding anatomy to help determine if the artery-muscle relationship is normal. Stress angiography (i.e., angiography performed in the neutral position, as well as with the foot in either dorsiflexion or plantar flexion to elicit compression) is usually performed to confirm the diagnosis prior to surgery. Imaging commonly shows a normal arterial lumen when the foot is in the relaxed position, and a narrowing of the arterial lumen during stress maneuvers (4).

Untreated PAES almost invariably progresses to permanent narrowing of the popliteal artery due to repeated microtrauma to the vessel, with subsequent fibrosis making the vessel...
susceptible to thrombosis (5). Surgical release of the muscle or tendon is the treatment in PAES types I–V (5). PAES alone is not an indication for angioplasty or stent placement; however, interventional thrombolysis would be appropriate therapy for patients who present with occlusion due to PAES. Thrombolysis of the distal popliteal and runoff vessels can be very important prior to surgical correction. The affected segment of the popliteal artery is usually bypassed or replaced if thrombosis has developed due to fibrosis. In patients with functional PAES, myomectomy of the medial head of the gastrocnemius muscle can result in complete relief of symptoms, but is recommended only for patients with discrete and typical symptoms because narrowing of the popliteal artery with plantar flexion or dorsiflexion may occur in up to 50% of the general population (8).

Figure 2. a–d. Bilateral lower extremity angiogram (a) demonstrates no obvious abnormality of the popliteal arteries in neutral position of the knees. On plantar flexion of the feet (b), there is bilateral narrowing of popliteal arteries, right > left. Selective angiograms of bilateral extremities (c, d) demonstrate narrowing of the popliteal arteries (arrows), seen only on plantar flexion, and more significant on the right (c) than on the left (d).
Figure 3. Drawings illustrate the classification scheme for popliteal artery entrapment syndrome (PAES). In type I, the medial head of the gastrocnemius muscle is normal, and the popliteal artery is displaced medially around and deep to the muscle. In type II, the medial head of the gastrocnemius muscle arises from an abnormal lateral position. The popliteal artery descends normally but passes medial to and deep to the muscle. In type III, the popliteal artery is compressed by an abnormal slip of gastrocnemius muscle. In type IV, the popliteal artery is entrapped by a fibrous band or by the popliteus muscle. Type V is any of the four preceding types that includes the popliteal vein. Type VI is functional PAES (normal anatomy).

References