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CASE REPORT

Popliteal artery entrapment syndrome

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ABSTRACT

Popliteal artery entrapment syndrome is a rare but potentially limb threatening peripheral vascular disease occurring predominantly in young adults. We report a case of a 17-year-old boy who presented with intermittent claudication on the right side. Digital subtraction angiography revealed bilateral, focal narrowing of the popliteal arteries. Magnetic resonance imaging displayed compression of the arteries by the medial head of the gastrocnemius muscles. The mechanism, presentation, imaging findings, and management of this rare disease are discussed.

Key words: • *popliteal artery* • *angiography, digital subtraction*

Popliteal artery entrapment syndrome (PAES) is an uncommon clinical entity that occurs due to compression of popliteal artery by adjacent muscle and tendinous structures (1). Extrinsic arterial compression causes chronic vascular microtrauma, early arteriosclerosis and thrombus formation that cause distal ischemia. In this report, we present clinical and radiological findings of a patient with popliteal artery entrapment syndrome.

Case report

A 17-year-old boy complaining of right leg pain, that appeared after walking 30-40 meters and abated with rest was transferred from an outside center to our angiography department for lower extremity arteriography examination. The complaint was of one and a half year duration and had increased within the prior several months. The patient had no complaint of his left leg. He was a non-smoker, and his complete blood cell count, liver and renal function tests, blood lipid levels, and coagulation tests were within normal ranges. The aortofemoropopliteal angiography was performed via right common femoral artery access. Symmetric, well-defined, focal severe stenoses in both popliteal arteries and occlusion in the right anterior tibial artery and peroneal artery were observed during angiography (Figure 1), consistent with the diagnosis of PAES. Magnetic resonance (MR) imaging with T1 weighted images in transverse and coronal, and T2 weighted images in transverse planes showed aberrant attachments of the medial heads of both gastrocnemius muscles to the lateral condyles (Figure 2). On the right, entrapment of the popliteal artery was due to an aberrant tendon, which branched from medial head of gastrocnemius muscle and attached to the superior portion of the intercondylar notch (Figure 2a, b). On the left, entrapment of the popliteal artery was caused by the lateral attachment of the medial head of the gastrocnemius (Figure 2c, d). These MR imaging findings were consistent with type IV PAES on the right and type II PAES on the left. The patient did not accept surgery.

Discussion

The popliteal fossa is a diamond-shaped depression at the posterior of the knee that is bordered by biceps femoris tendon superolaterally, semimembranosus muscle superomedially, and medial and lateral heads of the gastrocnemius muscle inferiorly. The popliteal artery normally courses between the medial and lateral heads of gastrocnemius muscle. Popliteal artery might be entrapped by neighboring muscles and tendons due to variations that occur during embryologic development of the muscles and arteries (2). Due to the complexity of embryologic development, anatomical abnormalities that cause PAES are classified into various types (1, 3, 4). The most accepted classification

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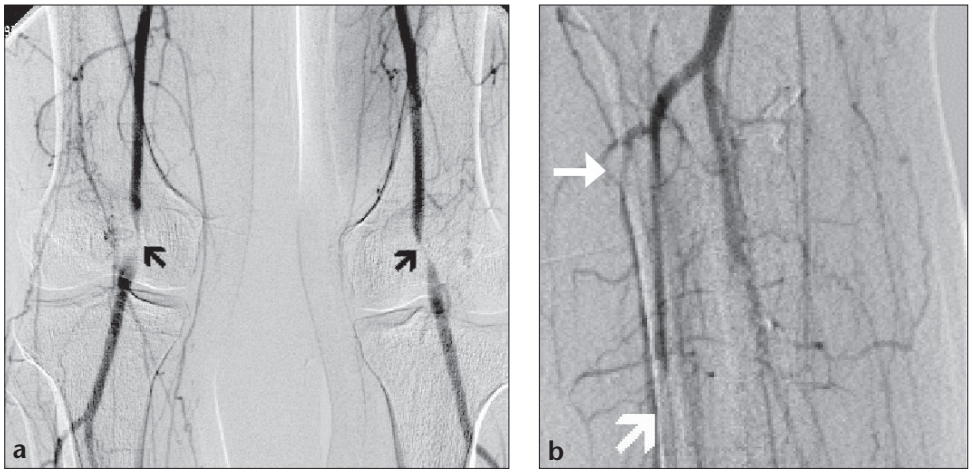

Figure 1. a, b. Digital subtraction angiography shows focal, well-defined, severe stenoses of bilateral popliteal arteries *(***a**, *arrows)*. Occlusion of the right anterior tibial artery *(***b**, *upper arrow)* and the peroneal artery *(***b**, *lower arrow)* are seen.

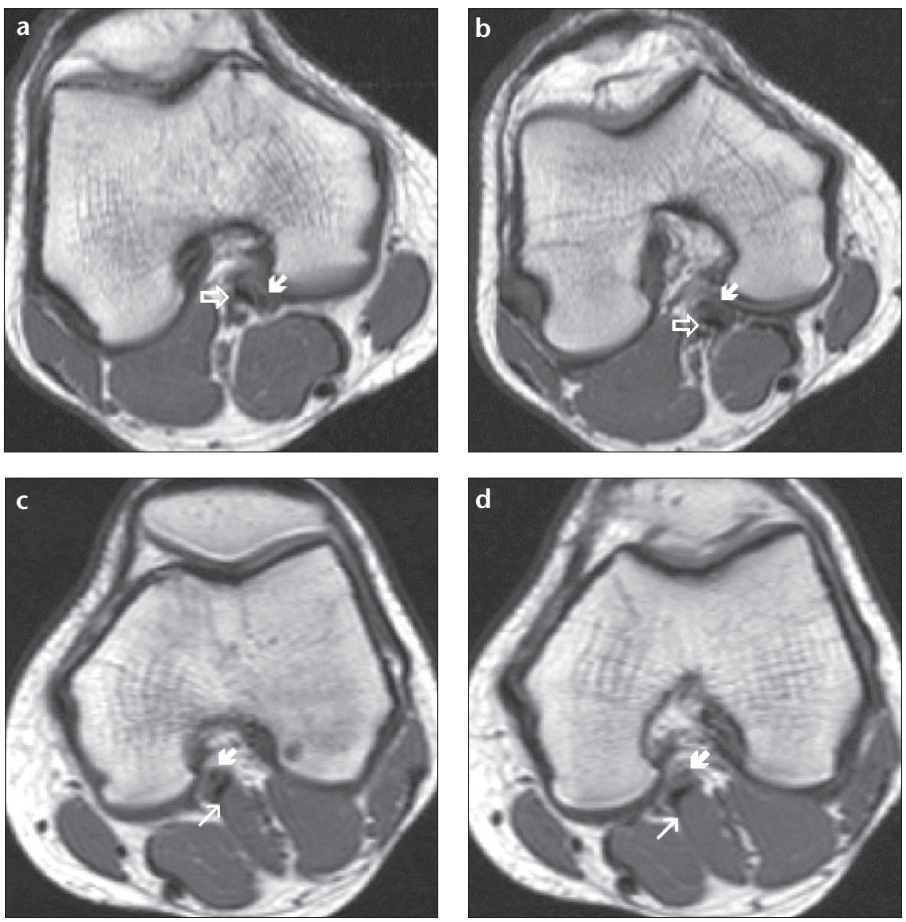

Figure 2. a-d. Transverse T1 weighted sequential MR images of the right knee (**a** and **b**) show the popliteal artery entrapped by an aberrantly coursed tendon *(open arrow)* originating from the medial head of gastrocnemius muscle *(white arrow)*. Transverse T1 weighted sequential MR images of the left knee (**c** and **d**)show popliteal artery *(thick arrow)* entrapped by the laterally originated medial head of the gastrocnemius muscle *(thin arrow)*.

of Whelan was modified later by Rich (1) (Table). Functional entrapment syndrome has been reported in athletes as a physiologic variation without anatomic abnormalities (5).

PAES is frequently seen in young males. Patients are usually admitted with complaint of intermittent calf claudication (walking pain). Absence of foot pulses during passive dorsiflexion and active plantar flexion is characteristic, although this finding may also be seen in healthy persons. Most patients, like ours, are diagnosed years after the initiation of symptoms and complications, and poststenotic aneurysm or distal embolization have usually already developed at the time of diagnosis. The main reason of the delay in diagnosis is nonconsideration of any vascular problem in patients without cardiovascular risk factors (6).

Typical angiographic findings are medial deviation and well-defined focal narrowing of the popliteal artery. Occlusion in the midportion of the artery and poststenotic dilatation in the distal portion may be seen. Occlusion in distal arterial structures is due to embolus as seen in the anterior tibial and peroneal arteries in the present case.

Noninvasive imaging techniques such as Doppler ultrasonography, CT angiography (CTA), MR imaging and MR angiography (MRA) can be used for diagnosis. Angiography may not demonstrate the cause of underlying thrombus. Doppler ultrasonography shows narrowing with changing posture, variations of color mode, and increase in peak systolic velocity. CTA shows stenosis of vessel and delineates the anatomy of popliteal fossa. MR imaging and MRA enable evaluation of the popliteal fossa anatomy and entrapment of vessel without the need for iodinated contrast agent and radiation. Transverse T1 weighted MR sequence is the most useful in diagnosis by showing the deviation of the popliteal artery and the muscle anatomy. Two-dimensional time-of-flight MRA may show functional entrapment both at neutral resting position and during active plantar flexion. MR imaging with gadolinium

Table. Classification of popliteal artery entrapment syndrome (1)

Type I	MHG is normal, 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

MHG: medial head of gastrocnemius muscle, PA: popliteal artery

increases the diagnostic accuracy in detecting the vascular narrowing (2, 6-8).

PAES should be treated by surgery regardless of the degree of symptoms. Surgical treatment technique is releasing of the vessel by extracting the muscle that causes entrapment, and reconstructing the narrowed lumen by endarterectomy or by-pass grafting. Endovascular treatment is not effective without removing the underlying reason of vessel entrapment, in which case the risk of reocclusion is high. Treatment of the occlusion by angioplasty may be a proper approach after removal of the factor that causes entrapment (6, 8, 9).

Although PAES is a rarely encountered vessel disease, the correct diagnosis is important for treatment planning. It is usually diagnosed by radiological methods, especially angiography. The correct diagnosis is very important to avoid unnecessary endovascular or surgical treatment. PAES should be suspected, if focal, well-defined narrowing of popliteal artery is seen in a young patient without any risk factor for arterial diseases. It is also important to know that complications due to entrapment syndrome, namely development of popliteal artery aneurysm distal to the stenosis and arterial occlusion due to thromboemboli, may mask the underlying pathology and that possibility of existence of PAES should be investigated with sectional radiological imaging modalities.

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