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Poplítea Artery Entrapment Syndrome

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Abstract

Popliteal artery entrapment syndrome (PAES) is a rare pathological compression of the popliteal artery, mostly unilateral. Its diagnosis is a challenge due to low recurrence and confusion with other injuries that affect the lower limb. Delay in its repair can cause arterial stenosis, emboli, aneurysm, inability to perform physical activities, thromboembolism and acute limb ischemia. Young men without comorbidities who may exercise regularly with intermittent claudication that affects their daily activities should draw attention to research and treatment of the syndrome.Investigation is extremely important to rule out differential diagnoses, such as chronic compartment syndrome, neurogenic claudication, peripheral atherosclerosis and cystic disease of the popliteal artery.

Keywords: Popliteal artery; constriction pathologic; intermittent claudication

Popliteal artery entrapment syndrome (PAES) is a pathology caused by extrinsic compression of the popliteal artery due to the anomalous relationship with the structures that surround it, presenting in the acquired/functional or anatomical/congenital form1. Observed for the first time in Edinburgh in 1879, it was considered a little-known occurrence for a long time, however, from the first case description by Hammings in 1959, several other case reports were made 2,3.

PAES is a rare pathogen, present in only 0.6 to 3.5% of the general population, and has a higher incidence in young males, athletes and those without atherosclerotic risk factors, with 80% of cases being asymptomatic 2. Those who are symptomatic have mainly intermittent claudication, but the symptoms are variable, which makes diagnosis based solely on clinical findings difficult 4.

Even with the low incidence, when a high degree of suspicion does not remain, the lack of adequate treatment leads to complications, such as the formation of strictures, emboli, aneurysms, thrombosis and inability to perform exercises. There is, therefore, an impact on quality of life,

and it is extremely important to build training that allows for early diagnosis [7].

PAES is the pathological compression of the popliteal artery by its neighboring structures. It can be classified as acquired (functional), which concerns excessive hypertrophy of the gastrocnemius, soleus and/or plantar muscles, or as anatomical (congenital) due to embryological variations. It can be subdivided into 6 types [8-11,17].

- Type I: popliteal artery runs medial to the medial head of the gastrocnemius muscle [17].
- Type II: medial head of the gastrocnemius is fixed in a more lateral position [17].
- Type III: accessory structure of the gastrocnemius muscle entraps the popliteal artery [17].
- Type IV: popliteal artery courses below the popliteal muscle [17].
- Type V: incarceration due to the anomalous location of the popliteal vein [17].
- Type VI: other variations [17].

It was first documented in 1879 in Edinburgh by medical student Anderson Stuart, who dissected an amputated leg. However, it was only in 1959 that Hammings wrote the first surgical case of popliteal artery entrapment. In Brazil, Ximenes and Ristow wrote the first national case report and literature on the subject between 1991 and 1995 [12,13].

The population that is most affected by PAES are young men, on average 32 years old, often with a habit of practicing sports, especially for functional classification, without risk factors for atherosclerosis. Type IV is most frequently affected, followed by Type II and III, with the unilateral artery being more typical [4,14].

There are no specific symptoms, therefore, it presents itself in a variable and intermittent way. With 80% of cases asymptomatic, complaints will depend on the progression of the pathology. This scenario, combined with the low number of cases on a daily basis, makes it difficult to diagnose PAES early, which makes it necessary to consider possible differential diagnoses. Symptoms may include intermittent claudication, pain in the feet and calves after exercise, cramps, paresthesia and hypothermia. Symptoms tend to improve when the patient rests or changes position [5]. In cases of long-lasting PAES, pain may be associated even with relaxed muscles. The physical examination is essential and must be well researched [2,5,15]. Its characteristics are the reduction or absence of the amplitude of the pedal and tibial pulses, especially in dorsiflexion or plantar hyperextension [16].

For the diagnosis to be given in a satisfactory time, a high level of suspicion and elimination of differential diagnoses are necessary, such as chronic compartment syndrome, neurogenic claudication, peripheral atherosclerosis and cystic disease of the popliteal artery. To follow an appropriate clinical logic, it is essential to be aware of the pain characteristics of each diagnosis, so there will be no delays in the treatment of PAES. Adequate clinical training will prevent complications such as arterial stenosis, emboli, aneurysm, inability to perform physical activities, thromboembolism and acute limb ischemia [14,7].

The current diagnostic imaging arsenal allows the investigation of PAS in an incisive way, whether with radiography, echo-doppler, tomography angiography, magnetic resonance angiography or dynamic arteriography. Initially, radiography may be useful to rule out bony or cartilaginous abnormalities that may compress the popliteal artery [25]. However, soft tissues absent on an x-ray, even if calcified, may not be seen on this exam. The ankle-brachial index is a recommended and auxiliary method for differential diagnosis as it is non-invasive, but it is more applied to obstructive diseases. As an indication of PAES, studies show a decrease of 30 to 50% in the index, but do not exclude other pathologies [25].

Echo Doppler has become increasingly important in the investigation of patients with suspected PAS, as this imaging method has the advantage of being fast, highly informative about arterial function and non-invasive 5. However, it has the disadvantage of being an operator-dependent method.

Like dynamic arteriography, echo-doppler is performed with the foot in a neutral position and with provocative maneuvers, such as active plantar flexion, as compression of the popliteal artery during plantar flexion is diagnostic evidence of PAES. However, the provocation maneuver has its value questioned, despite the good performance of echo-doppler, its use for diagnosing PAES should not be based on the isolated provocation maneuver [5].

Tomography is useful for demonstrating the anatomical

relationship of the soft tissues in the popliteal fossa, such as the relationship between the gastrocnemius muscle and the popliteal artery, but it is an exam that uses ionizing radiation and iodinated contrast. Its nature is more confirmatory, with great utility in identifying PAS when arteriography and positional tests are not accurate [6,7].

Computed tomography angiography (CTA) with iodinated contrast may be useful in investigating pathologies associated with complaints of atypical lameness. Separate progressive scans can be performed with dorsiflexion to specifically look for signs of popliteal entrapment. CTA can demonstrate mild to severe popliteal stenosis, popliteal artery occlusion, and even popliteal vein compression [21].

Magnetic resonance imaging allows for a better study of popliteal anatomy without the use of ionizing radiation or intravenous iodinated contrast, with high contrast between muscles, bones, vascular structures and the adipose layer. It is the imaging modality that facilitates the identification of the etiological factor of this syndrome, through a fast spin or spin-echo sequence, which may indicate a loss of flow in the popliteal artery due to some existing pathology. The angiographic technique is the one that best assesses artery entrapment, especially during dorsal flexion [22,23].

The treatment of PAES is considered based on the anatomical or functional classification and progression of the syndrome. When decompression of the popliteal artery is performed early, the surgical plan will aim to correct the anatomical correction of the musculotendinous structures and vascular variations, while late treatment may involve the correction of associated vascular injuries [14,25]. In classifying PAES by anatomical variation, correction of the artery and gastrocnemius and/or popliteal muscles is necessary, in some cases, repair of the popliteal vein [14].

In functional SAAP, myofascial release is performed. It = In functional PAES, myofascial release is performed. It was observed that maintaining the fascia open and suturing only the skin tissue presented a greater chance of symptom remission. Furthermore, in 1992, a new technique using the medial approach had a more satisfactory recovery than the posterior S-shaped approach, as done in studies from 1985. Recently, botulinum toxin has been used as a non-invasive method to improve symptoms, however, it is not yet a concrete indication [24]. The toxin is used in the context of treating compartment syndrome, in which it was able to reduce pressure by 50% in up to 9 months. The most common adverse effect is hypotonia. [25, 26]. Prophylactic treatment is being studied in the limb contralateral to the limb with symptomatic PAES [25]. = limb with symptomatic PAES [25,26].

PAES is a rare condition with variable clinical presentation. Its definitive diagnosis depends on imaging tests and should be part of the differential diagnosis of intermittent claudication in young patients. Contrast imaging exams, despite being invasive, seal the diagnosis and allow for adequate surgical planning. Surgical decompression is the most used therapeutic modality and the approach varies depending on the classification as anatomical or functional. PAES is a rare pathology, suspected in young patients with claudication that impacts quality of life, but with a good prognosis.

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