ECRONICON OPEN ACCESS

EC CARDIOLOGY
Case Report

Exercise Ischemia Revealing a Trapped Popliteal Artery Syndrome: About a Case

O Belmaachi*, R El Mrabet, N El Azrak, K Farahi, S Lyazidi and Y Ettaoumi

Cardiovascular Surgery Department, CHU Ibn Rochd, Casablanca, Morocco

***Corresponding Author:** O Belmaachi, Cardiovascular Surgery Department, CHU Ibn Rochd, Casablanca, Morocco.

Received: April 07, 2022; **Published:** April 11, 2022

Abstract

Popliteal artery entrapment syndrome is the cause of vascular (artery, veins) and even neurological compression. PAES (Popliteal artery entrapment syndrome) is a pathology that is part of the differential diagnosis of claudication of the lower limbs, or even of acute arterial occlusion. Occurring mainly in young adults, PAES can nevertheless manifest itself at any age. Often a dissociation of the arteriovenous popliteal paths is observed, due to an aberrant musculotendinous insertion. Arterial echodoppler and MRI are, according to some authors, the only examinations essential for the positive and differential diagnosis of trapped popliteal artery syndrome and will make it possible to eliminate other differential diagnoses: atheromatous popliteus and early atheroma, disease of Buerger, popliteal aneurysms and adventitial cysts of the popliteal artery. The treatment is always surgical and must be early. It includes the removal of the trap associated if necessary with an arterial revascularization gesture. For the authors, the short- and long-term patency was better for the patients in whom an aberrant section of the musculotendinous bundle was performed compared to the patient who benefited from a gesture of vascular restoration.

Keywords: *Entrapped Popliteal Artery; Intermittent Claudication; Exertional Ischemia*

Introduction

Trapped popliteal artery syndrome appears original in many ways. It represents the most common cause of non-atheromatous arteriopathy of the popliteal artery responsible for intermittent claudication in young subjects [1].

This damage is the result of changes in the anatomical relationship between the arterial axis and the walls of its compartment. This leads to postural or permanent intermittent arterial compression and parietal alterations which reflect the clinical symptoms and the severity of the complications (thrombosis, post-stenotic aneurysm, embolism) [2]. The diagnosis guided by the clinical examination which must specify the existence of intermittent claudication of the lower limb, the abolition of the peripheral pulses, is confirmed by the complementary imaging examinations, especially the arterial Doppler echo and resonance imaging magnetic. Treatment for entrapped popliteal artery syndrome is surgical and dependent on the impatience of arterial damage at the time of diagnosis. In any young subject with intermittent claudication of the lower limbs, the popliteal trap should be considered, and the involvement can be unilateral or bilateral [3].

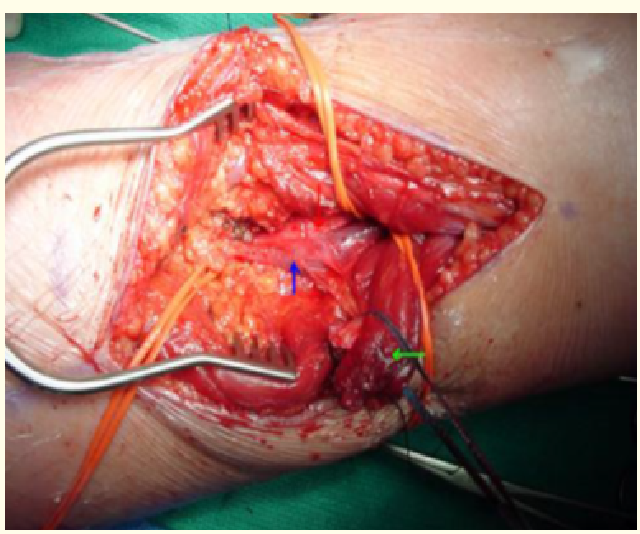
Observation

We describe the case of a young patient presenting, at the age of 25, left popliteal arterial compression. Referred for the first time to the cardiovascular surgery department three years after the onset of his symptoms, the patient reported the presence of claudication and which currently forced him to stop his physical activity. The precise questioning shows that the patient is a former athlete who presented 10 months ago with acute pain in the left calf during a competition. The patient complained of a slight claudication of the calf sometimes when walking sometimes in certain positions of hyperextension of the knee, but currently this claudication occurring during sustained effort, forced him to stop his physical activity. The clinical examination highlights a moderate asymmetry of the distal pulses in favor of the MIG. The ankle/arm pressure index is within the norm on the right and reduced on the left (0.76 for a norm of 0.9 - 1.3). The disappearance of the left pedal pulse was noted during dynamic maneuvers (active plantar flexion and passive dorso-flexion).

Arterial echo-doppler did not show any abnormalities in the standard position of the lower limb; however, it noted a marked decrease in flow on the left side during dynamic maneuvers. The CT angiography of the popliteal fossa showed the insertion of a bundle of the Medial Gemini between the artery and the popliteal vein, and the involvement was unilateral. An MRI confirms these results. Abnormal fibrous bands arising from the medial gastrocnemius and inserting into the supracondylar region are described.

The context evokes the diagnosis of left popliteal trap at the origin of this left arterial compression.

Surgical treatment was proposed. The approach was posterior bayonet. Exploration found a popliteal artery whose course and caliber were normal, it was trapped by aberrant fibromuscular bands originating from the tendon of the internal gastrocnemius muscle (type III according to the Whelan classification) [3]. A section of the bands was made and the artery was freed all along its path. For postoperative follow-up: the patient was discharged on the seventh day. The patient had resumed his normal activities after one month without any discomfort. The last clinical check-up was a year ago, the patient showed no symptoms and the physical examination was satisfactory.



Picture 1: *Release of the fibromuscular bundle of the inner twin (Popliteal artery, bundle of the resected inner twin).*

Discussion

Embryogenesis

During embryogenesis, developmental abnormalities, or even synchronization in the formation of the popliteal artery and the adjacent musculature (in particular the gastrocnemius muscle) can lead to variations in the spatial relationships between these structures, with the consequence anatomical conditions at the origin of the popliteal trap [4].

Classification

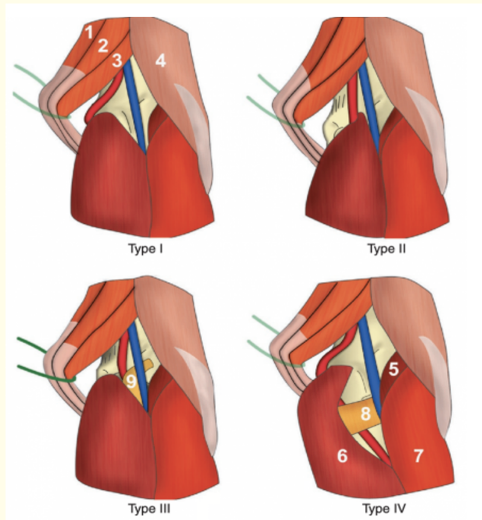
Successive descriptions of anatomical variants led to consider different types of trap (including venous), the majority of them being characterized by a dissociation of arterial and popliteal venous pathways secondary to the aberrant insertion of musculotendinous structures. In the absence of this dissociation, the arterial and venous paths can be found, in type V, in a medial position. If the medial head of the gastrocnemius muscle, as well as the popliteus muscle are most often at the origin of the popliteal trap, other muscle parts, in particular the lateral head of the gastrocnemius muscle, can also be involved in this pathology [3,12].

The functional trap is evoked in the absence of anatomical variation (hypertrophy of the medial head of the gastrocnemius muscle is sometimes described) [3,11].

Some differences in the classification are noted during the review of the literature, the functional trap being reported both as type VI,5 or even type F in the classification issued by the Popliteal Vascular Entrapment Forum 6 (Board 1). Picture 2 shows the anatomical landmarks, usually described in the classifications of types I to V.

Type I	Popliteal artery running medial to the medialhead of gastrocnemius
Type II	Medial head of gastrocnemiuslaterally attached
Type II	Accessory slip of gastrocnemius/fibrous bands arising from medial head of gastrocnemius
Type IV	Popliteal artery passing below popliteus muscle/fibrous bands arising from popliteus
Type V	Primarily venous entrapment
Type VI	Other variants
Type F	Functional entrapment

Board 1: *Classification issued by the popliteal vascular entrapment [12].*



Picture 2: *WHELAN classification (Popliteal artery entrapment syndrome) [3].*

Incidence

PAES is known to be rare. The exact incidence is not known, the PAES, being unknown, is probably under-diagnosed also because of subjects who remain asymptomatic. A post-mortem study revealed a popliteal entrapment in 3.8% of cases. PAES is often bilateral [6-8]. A male predominance, up to 90% of cases according to the literature, mainly concerns traps with anatomical abnormalities. The functional trap is often described in athletes (hypertrophy of the gastrocnemius muscle) and is found more frequently in women compared to other types of PAES [10,11].

Clinical manifestation

PAES occurs mainly in young adults, but cases occurring in childhood, even after the fifties have been reported [13,14,16]. If the symptomatology generally consists of intermittent claudication, cases of acute ischemia have been described, sometimes during aneurysm thrombosis [13,16,17]. Manifestations in the form of cramps, or even compartment syndrome, are also possible, the latter manifestation being part of the differential diagnosis of the functional trap [15,17].

Investigations

The angiological examination makes it possible to evaluate the presence of a dissociation between the arterial and venous popliteal paths, due to the aberrant tendon insertion, or even an eccentric vascular path, adjacent to the bony structures. It also provides information on possible haemodynamic repercussions. Concerning provocative maneuvers (for example: dorsal or even plantar flexion), it should be noted that popliteal vascular compression can also be triggered in subjects asymptomatic and without anatomical alteration [9,12,17]. These dynamic maneuvers must therefore be interpreted in the overall clinical context. Diagnosing PAES is therefore not always easy, especially in the absence of anatomical variation with aberrant tendon insertion.

In addition to angiological investigations, radiological imaging is required. If arteriography makes it possible to detect arterial stenoses, or even occlusions during provocation maneuvers, it is advisable to favor the realization of a dynamic MRI or a CT-scan allowing a detailed evaluation of the anatomical relationships of the vessels with the musculature [3,11,12].

Treatment

Surgical treatment in case of anatomic trap is required. In the absence of arterial damage, the intervention may only concern the treatment of the musculotendinous part at the origin of the trap [3,11,12]. In the event of arterial damage, it will be a question of proposing a vascular intervention, for example, in the form of a bypass. In case of acute ischemia, an approach initially by thrombolysis may be necessary [13,12]. The option of endoluminal revascularization (thromboembolectomy and angioplasty) has been described, during occlusion of the popliteal and leg arteries initially treated by local lysis, with strict follow-up by echo-Doppler because of the risk of reocclusion, or even development popliteal aneurysm [5,12].

Regarding interventional abstention, a recent review mentions cases whose evolution was characterized by a recurrence of thrombosis (patient refusing decompressive surgery after thrombolysis of a first occlusive episode), or even ischemia requiring amputation [9,12]. The loss of a sufficiently functional run-off led to the impossibility of performing a bypass.

Regarding the functional popliteal trap, the attitude varies according to the importance of the symptomatology. It is known that popliteal vascular compression can be triggered in asymptomatic subjects and without anatomical alteration, and an interventional attitude is not indicated in this case [12]. On the other hand, it is possible in symptomatic subjects, although cases with resolution of the symptomatology have been described when the causal physical activity is stopped [3,9,12]. The use of echo-Doppler during surgery can help confirm sufficient and appropriate muscle resection (partial resection of the medial head of the gastrocnemius muscle, which may be enlarged) [12,16,17].

Conclusion

Arteriopathy of the lower limbs is most often secondary to atheromatous involvement. Rarer vascular pathologies, including PAES, can nevertheless be the cause of clinical manifestations such as claudication or even ischemia. The clinical latency linked to the intermittent nature of the compression may explain the occurrence of embolic, thrombotic or aneurysmal complications.

The syndrome is bilateral in 25 to 30% of cases. The role of the primary care physician is essential in the early consideration of symptoms evoking a vascular problem, even in the absence of classic cardiovascular risk factor. The diagnosis, guided by dynamic maneuvers, is made by arterial echodoppler and imaging by magnetic resonance.

The treatment is always surgical and must be early. It includes the removal of the trap associated if necessary with an arterial revascularization gesture.

Bibliography

1. Biemans RG and Van Bockel JH. "Popliteal artery entrapment syndrome". *Surgery, Gynecology and Obstetrics* 144.4 (1977): 604-609.

2. Chicha L and Darrieus H. "Artère poplitée piégée: aspects diagnostiques et thérapeutiques". *STV* 6 (1994): 178-187.

3. Cormier JM., *et al*. "Artère poplitée piégée. Apport de l'exploration ultrasonographique". *La Presse Médicale* 14 (1985): 2183-2185.

4. Di Marzo L., *et al*. "Popliteal artery entrapment syndrome: the role of early diagnosis and treatment". *Surgery* 122.1 (1997): 26-31.

5. Dany Laskar M and Legarconc Aubard Y. "Artères poplitées piégées: Incidence, épidémiologie, considérations thérapeutiques". *Archives des Maladies du Coeur et des Vaisseaux* 78.10 (1985): 1511-1518.

6. Goh BK Taykh. "Diagnosis and surgical management of popliteal artery entrapment syndrome". *ANZ Journal of Surgery* 75.10 (2005): 869-873.

7. Jose Saez De Ibarra and Claude Laurian. "Sang Thrombose Vaisseaux". 13.6 (2001): 380-381.

8. Lewis J and Levien G Martin. "Popliteal artery entrapment syndrome: More Common than previously recognized". *Journal of Vascular Surgery* 30.4 (1999): 587-598.

9. Rosset HD. "Popliteal artery entrapment syndrome. Anatomic and embryologic bases, diagnostic and therapeutic considerations Following a series of 15 cases with a review of the literature". *Surgical and Radiologic Anatomy* 17.2 (1995): 161-169, 23-27.

10. Rich NM. "Popliteal entrapment and adventiciel cystic disease". *Surgical Clinics of North America* 62.3 (1982): 449-465.

11. S El Khloufi., *et al*. "Syndrome de l'artere poplitee piegee: une cause rare de claudication intermittente du sujet jeune". *Journal Marocain des Sciences Médicales* 16.4 (2009).

12. F Glauser. "Syndrome de l'artère poplitée piégée Service d'angiologie et d'hémostase, Hôpitaux universitaires de Genève". *Revue Medicale Suisse Angiologie Hemostase* (2013).

13. Soyka P and Dunart JH. "Popliteal artery entrapment syndrome Familial occurrence". *Vasa* 22.2 (1993): 178-181.

14. Vuong PN and Laurian C. "Artère poplitée piégée. Intérêt de l'imagerie médicale et revue de la littérature". *J Radial* 73 (1992): 247-252.

15. Zund G and Brunner U. "Surgical aspects of popliteal artery entrapment syndrome 26 years of experience with 26 legs". *Vasa* 24.1 (1995): 29-33.

16. Tercar F and Oguzkurtl. "Popliteal artery entrapment syndrome". *Diagnostic and Interventional Radiology* 11.4 (2005): 222-224.

17. Toorop R and Poniewier Skij. "Popliteal artery entrapment syndrome". *JBR-BTR* 87.3 (2004): 154-155.

Volume 9 Issue 2 April 2022