

Surgical Treatment for Popliteal Artery Entrapment Syndrome, a Common Cause of a rare Clinical Entity: Report of One Case

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Abstract Context: Popliteal artery entrapment syndrome (PAES) is a non-atherosclerotic cause of claudication and acute ischemia of the legs in young individuals. **Objective:** To report on a case of popliteal artery entrapment that was treated surgically. **Case report:** The patient was a 46-year-old hypertensive male diver who had been experiencing pain in his right leg for around six months, which worsened upon exertion. Physical examination showed absence of posterior tibial pulse and dorsal pulse in the right foot. Arterial duplex scan and angiotomography showed a popliteal artery with a tortuous path that passed behind the medial head of the gastrocnemius muscle, where its lumen was compromised when the knee was extended. This case of PAES was classified as type 1 and the surgical treatment implemented consisted of arterial decompression through sectioning the medial bundle of the gastrocnemius muscle, combined with a popliteal-to-popliteal graft from the great saphenous vein (inverted). **Conclusion:** Popliteal artery entrapment is a rare syndrome, but it may affect physically active young adults and worsen their quality of life. If this disease is suspected, diagnostic evaluation and surgical treatment need to be performed, and this will probably avoid the risk of losing the limb in cases of irreversible vascular injury.

Keywords: *peripheral vascular disease, intermittent claudication, popliteal artery, lower extremity, muscle, skeletal, gastrocnemius muscle*

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1. Introduction

Popliteal artery entrapment syndrome (PAES) is caused by an anomalous anatomical relationship between the popliteal artery and the muscle structures in the popliteal fossa [1]. It is the main cause of intermittent claudication among young adults [2]. Its incidence is unknown, but its prevalence among young soldiers was found to be 0.165% [3] and in limbs examined postmortem, 3.8% [4]. This signifies clinically that PAES is less common than anatomical abnormalities. If there is insufficient investigation, the diagnosis of PAES is easily forgotten and this may lead to irreversible arterial injuries such as complete obstruction of the popliteal artery, thus leading to acute ischemia of the limb [5]. The present study had the aim of reporting on a case of popliteal artery entrapment.

2. Case Report

A 46-year-old hypertensive white man who was a diver came to the angiology and vascular surgery service of the surgical hospital with a complaint of pain that he had been experiencing in his right leg for around six months. This

pain worsened upon exertion. Physical examination showed the presence of slight pain at rest, with a tingling sensation, paleness and a feeling of prominent fullness in his right calf. The peripheral pulse in the posterior tibial artery and the dorsal artery of the foot were not palpable and, after ankle flexion and extension movements, the paleness of the foot became more evident. An arterial duplex scan of the lower limbs was requested, and this showed that the popliteal artery was occluded in its middle third and was filled with hyperechogenic material compatible with thrombus of old appearance (Figure 1). It became restored in its distal third due to collateral expansion, and this was also seen on computed angiotomography (Figure 2). The popliteal artery followed a tortuous path, away from the usual location, such that it passed behind the medial head of the gastrocnemius muscle (Figure 3). During maneuvers to extend the leg, its lumen was compromised. The patient underwent surgical treatment in which the popliteal artery was approached through the popliteal fossa, by means of an incision of italic S-shape. Arterial decompression was performed by sectioning the medial bundle of the gastrocnemius muscle (Figure 4), combined with a popliteal-to-popliteal graft from the great saphenous vein (inverted) (Figure 5). After

the surgical procedure, the patient presented palpable pulses in both the posterior tibial artery and the dorsal artery of the foot, and was released from hospital on the second postoperative day. One year after the procedure, the patient returned to the outpatient clinic without any complaints, with all movements preserved, palpable pulses and a normal working life.

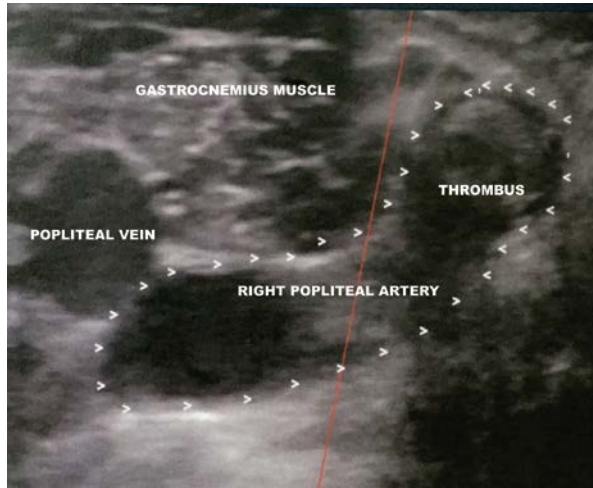


Figure 1. Arterial duplex scan of the lower limbs showing popliteal artery compatible with thrombus of old appearance

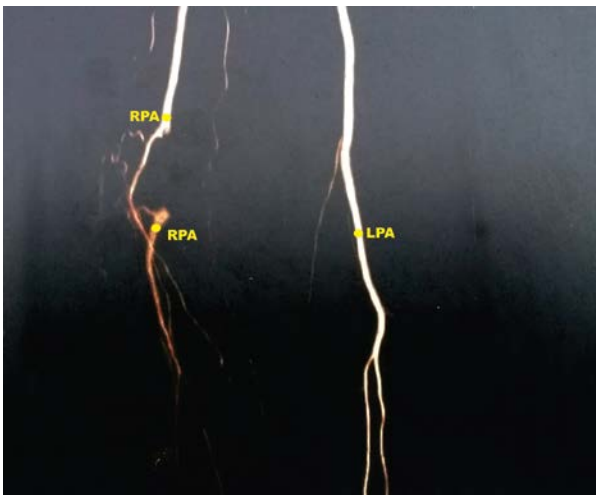


Figure 2. Angiotomography showing popliteal artery occluded in the proximal third, with restoration in the medial thirds through collateral expansion (RPA – Right popliteal artery, LPA - Left popliteal artery)



Figure 3. Medial head of the gastrocnemius muscle compressing the popliteal artery (RPA – Right popliteal artery, MHGM - Medial head of the gastrocnemius muscle)

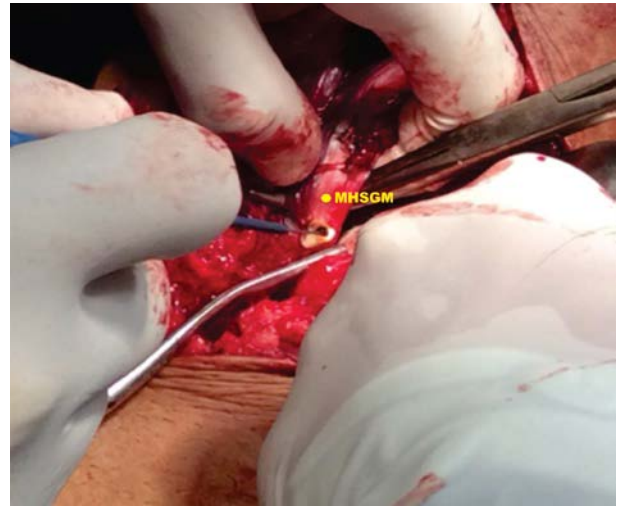


Figure 4. Medial head of the sectioned gastrocnemius muscle (MHSGM - Sectioned gastrocnemius muscle)

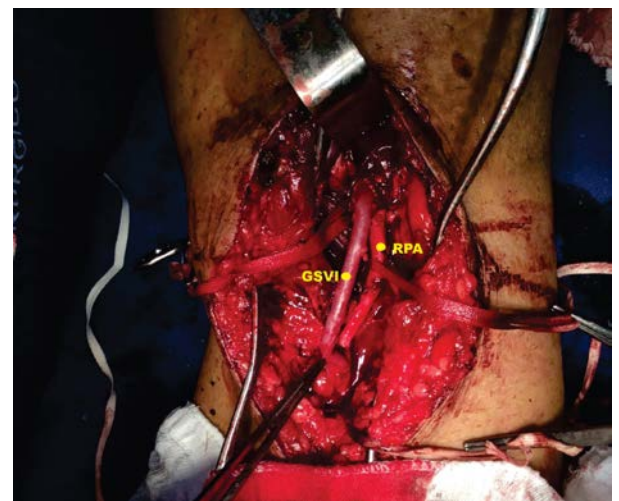


Figure 5. Final appearance from the surgery, with a popliteal-popliteal graft from the great saphenous vein (inverted) (RPA – Right popliteal artery, GSVI - Great saphenous vein inverted)

3. Discussion

Abnormal embryological development leads to various anomalous relationships in the popliteal fossa that are responsible for entrapment [6,7,8]. The most widely accepted classification system, proposed by Love and Whelan [9] and modified by Sinha et al. [10], divides popliteal vascular entrapment syndrome into seven types: Type 1, popliteal artery running medial to the medial head of gastrocnemius; type 2, medial head of gastrocnemius laterally attached; type 3, accessory slip of gastrocnemius/fibrous bands arising from medial head of gastrocnemius; type 4, popliteal artery passing below popliteus muscle/fibrous bands arising from popliteus; type 5, Primarily venous entrapment; type 6, Other variants; type F, Functional entrapment. In our case, the patient was classified as type 1.

Anatomically, popliteal artery entrapment results from different muscle-tendon abnormalities, and the commonest of these are medial passage of the popliteal artery to the medial head of the gastrocnemius, normal positioning of the artery with abnormal origins of the gastrocnemius muscles and compression of the popliteal artery caused by abnormal fibrous bands surrounding or in close proximity

to the popliteal muscle [12,13,14]. In our case, the popliteal artery was compressed by the medial head of the gastrocnemius muscle, where it was found to be occluded and containing a thrombus.

Surgery is indicated in cases of PAES due to anomalies of muscle insertion, even if the patient is asymptomatic [13]. This will probably avoid the risk of losing the limb in cases of irreversible vascular injury. Surgery eliminates the factor responsible for popliteal artery entrapment and also enables artery repair in cases of arterial thrombosis [2,15]. Two main access routes for approaching the popliteal artery through the popliteal fossa have been described: medial and posterior [13,15,17]. In our case, we chose to use a posterior access, with an S-shaped incision. We particularly believe that this is more beneficial for the surgeon, since it enables better viewing of the anomalous anatomical structures. This is also concordant with the findings from a review study conducted by Hoelting et al. [18], who showed that the majority of surgeons chose to explore the popliteal fossa through an S-shaped or bayonet-shaped posterior route. On the other hand, according to Darling et al. [19], Almeida et al. [17] and Gourgiotis et al. [13], a medial access would be a very good option in cases of major arterial occlusion in which femoropopliteal bypass became necessary. However, this would not allow identification and correction of the anomalous structure, which commonly might be causing the thrombosis.

In cases of PAES, treatment should be implemented early on, whether or not symptoms are present. In our study, the patient already presented symptoms, with an ankle-brachial index of 0.6 and thrombosis of the popliteal artery at the location in which this artery was compressed by the medial head of the gastrocnemius muscle. Thus, an indication for popliteal-popliteal bypass surgery, with interposition of the great saphenous vein, was quickly made. This surgical indication has also been advocated by several other authors [20,21], since in their view, in the presence of advanced arterial degeneration, replacement of the injured artery has a more durable patency rate than would endarterectomy.

4. Conclusion

Popliteal artery entrapment is a rare syndrome, but it may affect physically active young adults and worsen their quality of life. If there is a suspicion of this disease, diagnostic evaluation needs to be conducted. Modern diagnostic methods such as duplex scans and magnetic resonance imaging are necessary for abnormalities to be detected. Once the diagnosis has been confirmed, surgical treatment should be considered, even if the patient is asymptomatic. Revascularization should be performed when the entrapped popliteal artery shows injury to the intima, such as fibroplasias, stenosis or aneurysmatic transformation.

Conflict of Interests

We do not have any conflicts of interest.

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