

# Idiopathic popliteal artery pseudoaneurysm: emergency diagnosis and treatment

## *Pseudoaneurisma idiopático da artéria poplítea: abordagem diagnóstico-terapêutica na urgência*

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### Abstract

Pseudoaneurysms or false aneurysms of the popliteal artery are uncommon arterial disorders. These disorders most commonly result from trauma and iatrogenic lesions following orthopedic procedures. The authors report a rare case of popliteal artery pseudoaneurysm in which etiology was unknown. The authors also demonstrate that Doppler ultrasonography may be sufficient for planning vascular surgical procedures and that the open surgical approach is the treatment of choice for cases in which the symptomatic lesion causes local compression.

**Keywords:** aneurysm, false; popliteal artery; ultrasonography, Doppler; vascular surgical procedures.

### Resumo

Pseudoaneurismas ou aneurismas falsos de artéria poplítea são doenças arteriais incomuns. Eles resultam, mais frequentemente, de traumatismos e lesões iatrogênicas após procedimentos ortopédicos. Os autores relatam um raro caso de pseudoaneurisma de artéria poplítea para o qual não foi encontrada etiologia. Demonstaram ainda que a ultrassonografia com Doppler pode ser suficiente para o planejamento de procedimentos cirúrgicos vasculares, sendo a abordagem aberta a escolha para casos em que se tenha uma lesão com sintomas compressivos locais.

**Palavras-chave:** aneurisma falso; artéria poplítea; ultrassonografia; Doppler; procedimentos cirúrgicos vasculares.

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Financial support: None.

Conflicts of interest: No conflicts of interest declared concerning the publication of this article.

Submitted: 11.15.13. Accepted: 04.02.14.

The study was carried out at Hospital de Urgências de Teresina, Piauí.

## INTRODUCTION

By definition, a “true” aneurysm is a dilatation of an artery that involves all three layers of the artery wall (intima, media and adventitial). In contrast, a pseudoaneurysm – or “false” aneurysm – develops from an injury to the artery wall, followed by formation of a hematoma and its containment by surrounding tissues and by the inflammatory process.<sup>1</sup>

The artery most frequently associated with pseudoaneurysms is the common femoral, since it is often subject to invasive diagnostic and/or therapeutic procedures.<sup>2</sup> Pseudoaneurysms of the popliteal artery (PPAs) are uncommon and there are a variety of etiologies described in the literature, with associations often described with traumatism, infections and iatrogenic injuries after orthopedic procedures.<sup>3-12</sup> Differential diagnosis is accomplished by observation of knee luxation and abscesses and tumors in the popliteal fossa.<sup>4</sup>

The objective of this report is to describe the diagnostic and therapeutic approach taken to a case of an expanding idiopathic pseudoaneurysm affecting the popliteal artery. The project was approved by the local Ethics Committee and the patient described a consent form.

## CASE DESCRIPTION

A 45-year-old, black, male agricultural worker presented at the Emergency Department complaining of pain and swelling in the left knee and leg with onset 10 days previously and exacerbation over the previous 12 hours. The patient reported no history of fever, surgery, traumas or any type of intervention to the affected limb. The patient was a smoker (10 pack-years) and had hypertension (under control). He reported being free of any other comorbidities.

Physical examination revealed a voluminous and painful pulsating mass in the left popliteal fossa, with thrill and murmur in the left popliteal cavity (Figure 1). There was infragenicular edema on the left with pitting (2+/4+), without cyanosis, pallor, or abnormal temperatures in the extremities, although distal pulses were difficult to take (probably because of edema). Leg extension movement was also limited, although neurological tests were normal.

Doppler ultrasonography showed venous system flow with normal phasicity and compressibility. However, there was a voluminous hematoma occupying the entire popliteal fossa and distal

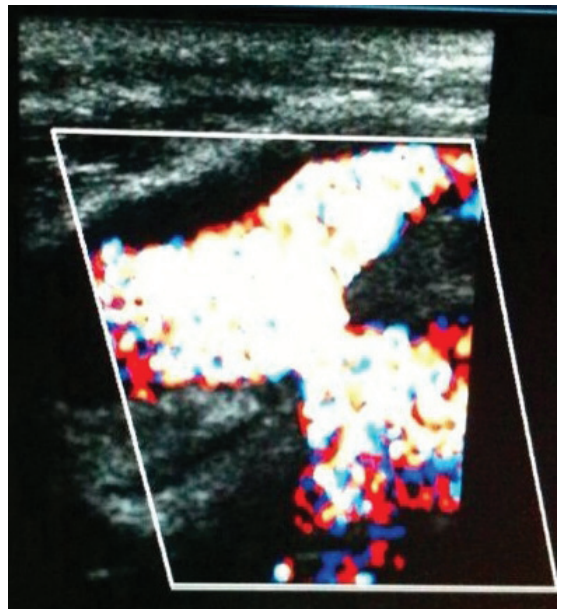
thigh, restricting the popliteal vein and exhibiting turbulent flow in its interior (Figure 2), with a pedicle communicating with the popliteal artery. The arteries of the leg were patent and showed three-phase flow in pulse mode.

With this confirmation of the hypothesis of a pseudoaneurysm of the left popliteal artery in expansion, the patient was prepared for surgical intervention. Via a medial access, a popliteal-popliteal bypass was constructed using the contralateral inverted great saphenous vein and end-to-end anastomoses (Figures 3 and 4).

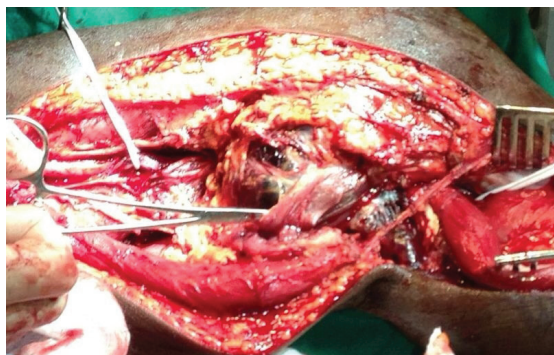
Material from the pseudoaneurysm capsule and its content were sent for microbiological and histopathological evaluation. The microbiology study ruled out infection. The histological study (Figures 5 and 6) with routine staining (HE), revealed arterial type blood vessel exhibiting luminal dilation but



**Figure 1.** Voluminous mass in left popliteal fossa.



**Figure 2.** Ultrasonography with Doppler: pseudoaneurysm of the popliteal artery.



**Figure 3.** Intraoperative finding.



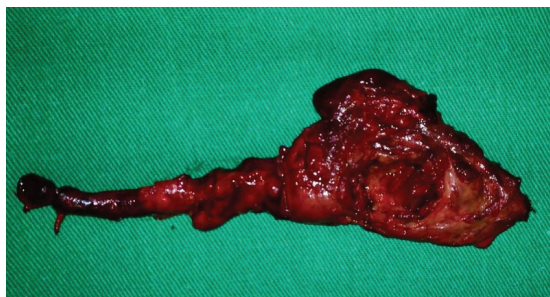
**Figure 4.** Popliteal-popliteal graft with inverted great saphenous vein.

without signs of atherosclerosis, inflammation or malignity.

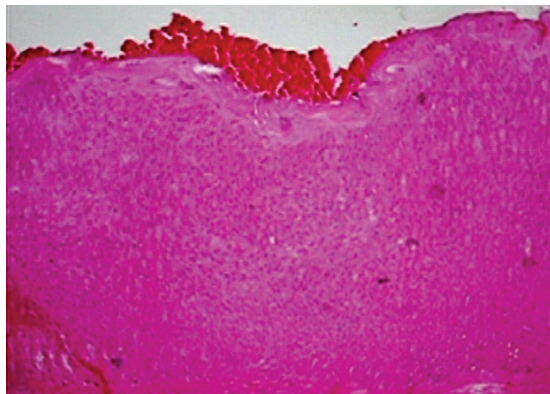
During the immediate postoperative period the patient was free from pain and distal pulses were present, which was still the case 1 month later.

## ■ DISCUSSION

PPAs are habitually the result of sequelae from injuries to the artery wall.<sup>3,4</sup> They rarely occur in civil settings and the most important element in their genesis is traumas, whether by explosions, penetrating weapons or from iatrogenic causes.<sup>3,4</sup> During the Korean war, for example, around 27% of all pseudoaneurysms and 1% of vascular injuries were PPAs and they were responsible for high limb amputation rates due to thromboembolic phenomena.<sup>3</sup> In the same study, from 1991,<sup>3</sup> Gillespie and Cantelmo listed explosions and penetrating wounds as the most common etiologic factors, but other traumatic factors can also cause injuries to the popliteal artery, such as orthopedic<sup>3,5</sup> and vascular procedures<sup>3,6</sup> and acupuncture<sup>3,7</sup> and should be investigated. Exostosis or osteochondromas of



**Figure 5.** Macroscopic appearance of the popliteal artery pseudoaneurysm.



**Figure 6.** Histological appearance (HE 100x) of the popliteal artery pseudoaneurysm.

the distal femur or proximal tibia have also been listed in the literature as pathophysiologic factors in development of PPAs, since they can lacerate the artery wall.<sup>8,9</sup>

During etiologic investigation, the hypothesis of trauma should be investigated with great insistence and should not be undervalued, even if the trauma happened many years before or there were no significant osteomuscular injuries.<sup>3,10</sup> If there is no explanatory history of trauma, however, autoimmune rheumatic causes, such as Behçet's disease, should be ruled out.<sup>3,11</sup> Even rarer causes of PPAs, such as infection, must also be ruled out.<sup>12</sup>

In the case described here, the patient denied having suffered any closed or penetrating trauma in the past or having undergone any interventions to the limb. He did not exhibit any sign of toxemia nor did he fit the clinical picture of any rheumatologic disease. The results of tests for inflammatory activity (erythrocyte sedimentation rate and C-reactive protein) were normal. Microbiology and pathology test results were normal, without abnormalities in the wall of the vessel that could cause weakening of the

artery wall and a propensity to rupture in response to minimal trauma.<sup>13</sup> There was no evidence of an inflammatory process in the artery wall or of the presence of giant cells.

Physical examination findings are normally highly suggestive in this condition, with a pulsating mass with palpable thrill, pain and attenuated pulses.<sup>14</sup> However, clinical status is not always typical and radiological assessment therefore has an important role to play.<sup>15,16</sup> In the case described here, Doppler ultrasonography confirmed the diagnosis with certainty and provided enough information to plan the surgery that would be used, since it provided the exact location of the injury and his relationship with neighboring structures, in addition to showing the undeniable patency of the distal arteries. This examination was also capable of ruling out deep vein thrombosis. Some authors consider that, although there have been advances in other diagnostic methods, arteriography via puncture with injection of intra-arterial contrast continues to be the gold standard for cases such as the one described here.<sup>16</sup> However, there are also reports from well-respected authors<sup>17,18</sup> that support the conduct adopted in this case.

Surgical intervention for popliteal aneurysms and pseudoaneurysms can be performed with open surgery by vein interposition, or using endovascular techniques with exclusion of the aneurysm with covered stents.<sup>19</sup> For elective surgery, both methods appear to be equal in terms of short and medium-term results.<sup>20</sup> However, according to Trinidad-Hernandez et al.,<sup>20</sup> the open technique is superior in emergency situations. Injuries to the popliteal artery, such as the one described here, are in themselves an indication for immediate surgical intervention because of the imminent risk of hemodynamic instability. In the case described here, the injury was very extensive, provoking compressive symptoms such as pain and swelling. Additionally, the possibility of infection as an associated factor cannot be ignored during initial workup. For this reason an endovascular approach was not considered the best option in this case. Finally, the access chosen was the medial approach because of the size of the injury, which extended up to the adductor canal, ruling out the posterior approach.<sup>21</sup>

The authors' conclusion is therefore that they were faced with a rare case of idiopathic popliteal artery pseudoaneurysm in which the diagnostic strategy based on ultrasonography defined the surgical intervention chosen.

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Critical revision of the article: GPO, ATG, LGS  
Final approval of the article\*: GPO, ATG, LGS  
Statistical analysis: N/A  
Overall responsibility: GPO  
Obtained funding: None.

\*All authors have read and approved of the final version of the article submitted to *J Vasc Bras*.