

Case report

Endovascular repair of spontaneous popliteal artery pseudoaneurysm

Sergio Quilici Belczak, Leonardo Garcia Góes , Vanessa Stefaniak

Department of Vascular Surgery,
Centro Universitário São Camilo,
São Paulo, Brazil

Correspondence to
Leonardo Garcia Góes;
Leonardo.goes47@gmail.com,
Dr Sergio Quilici Belczak;
belczak@gmail.com and
Vanessa Stefaniak;
Van_stefaniak@hotmail.com

Accepted 6 February 2020

SUMMARY

Popliteal artery pseudoaneurysms are rare and are generally associated with local trauma, such as orthopaedic surgery or expansile bone lesions in the popliteal fossa. The authors describe a case of popliteal artery pseudoaneurysm in a 24-year-old man. A thorough workup revealed no history of trauma, invasive procedures, vasculitis or any other factors that could constitute a probable cause of the pseudoaneurysm. However, as the patient practices running, it is not possible to rule out minor previous trauma that has not been noticed.

BACKGROUND

This case shows the spontaneous occurrence of a popliteal artery pseudoaneurysm in a patient with no history of trauma, invasive procedures, vasculitis or any other factors that may constitute a probable cause of the injury. In addition, the treatment was performed using the endovascular technique that is less invasive than the conventional technique, giving the patient better recovery.

CASE PRESENTATION

A 24-year-old man amateur runner presented to the emergency department with 4-week history of pain and enlargement in the popliteal fossa, which worsened with exercise. On physical examination, lower limb pulses were palpable, and there was a palpable, non-pulsatile mass in the popliteal fossa. Doppler ultrasonography revealed a probable cystic mass in the popliteal region (figure 1), with no flow. MRI showed heterogeneous lesion, surrounded by a thick, hyposignal layer of deposited haemosiderin and within it heterogeneous hypersignal areas, parts of the thrombosed haematoma; and contrast extravasation into the region (figure 2), casting doubts about the presence of flow in the lesion. Laboratory tests, including a panel of inflammatory markers, were within normal limits.

The patient remained stable throughout, with only the symptom of mild pain. The decision was made to perform arteriography, which revealed a 4.5 cm popliteal artery pseudoaneurysm, with severe stenosis and extensive collateralisation (figure 3). After pseudoaneurysm diagnosis on the magnetic resonance, ultrasound Doppler was performed again to evaluate the flow. The pseudoaneurysm neck was larger than 5 mm, making thrombin injection impossible. Endovascular repair of the lesion was attempted. Briefly, a balloon was

inflated in the popliteal artery to protect against embolisation. A microcatheter was then advanced into the pseudoaneurysm and Onyx injected until exclusion was achieved. The access gained was antegrade 6F (figure 4).

OUTCOME AND FOLLOW-UP

The patient had an uneventful perioperative and postoperative course, and remains stable at 3-year outpatient follow-up. After the procedure, the patient developed a small palpable, asymptomatic nodule with no joint limitations that was accompanied by Doppler ultrasonography.

DISCUSSION

Pseudoaneurysms of the popliteal artery are unusual. They are usually associated with arterial wall injury^{1–3} as a result of femoral exostosis (63%),⁴ orthopaedic surgery (25%)^{1–3,5} or direct trauma to the knee (10%); young men (mean age, 30.48 years; 79% male) are most commonly affected.^{3,5}

During aetiological investigation, a history of trauma should be thoroughly sought, even if it occurred long ago or there were no significant musculoskeletal injuries at the time. Autoimmune causes such as Behçet's disease and infection should also be considered.¹

In the case described herein, although the patient fits the epidemiological profile described in the literature, there was no history of trauma or surgical manipulation of the affected limb. The patient had no rheumatic diseases, and inflammatory markers were normal. Microbiological and histopathological examinations were unrevealing, with no evidence of changes in the vessel wall that could have caused rupture on minimal trauma. The patient was also investigated by a geneticist, who ruled out any possible congenital syndromes. Magnetic resonance angiography and Doppler ultrasound examinations excluded the entrapment of the popliteal artery. No radiological aspect was found to justify cystic disease. Thus, we conclude that formation of the pseudoaneurysm occurred spontaneously, making this case particularly unusual.

The most common symptoms of pseudoaneurysms are painful swelling (44%) and a pulsatile mass (39%).² Physical examination is usually highly suggestive, revealing a pulsatile mass with palpable thrill and decreased pulses. However, the clinical picture is not always this typical, and imaging modalities play an important role in diagnosis.^{1,3}



© BMJ Publishing Group Limited 2020. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Belczak SQ, Góes LG, Stefaniak V. *BMJ Case Rep* 2020;13:e231200. doi:10.1136/bcr-2019-231200

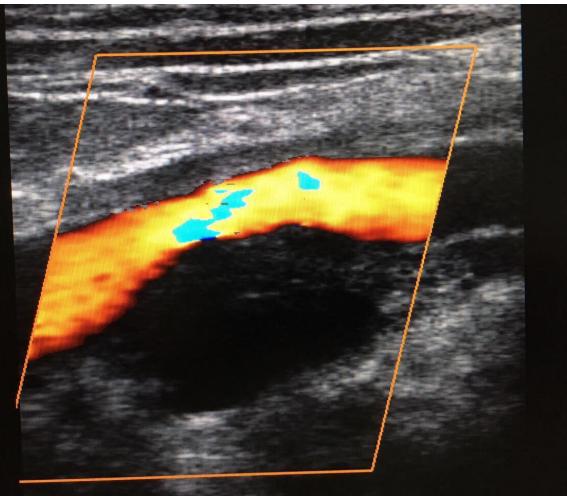


Figure 1 Preoperative Doppler of popliteal region evidencing probable cystic mass without flow in its interior.

The most commonly used radiological modalities are arteriography (49%) and CT angiography (27%).²

A previous case report of spontaneous popliteal artery pseudoaneurysm demonstrated that Doppler ultrasonography was sufficient for planning of vascular repair.¹ In the present case, however, only arteriography was able to confirm the diagnosis

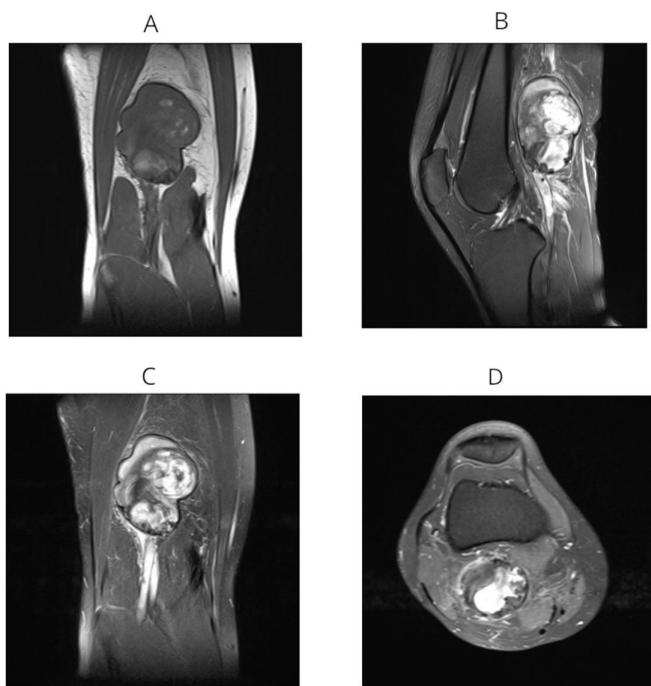


Figure 2 MRI of the popliteal region. (A) T1-weighted image demonstrates coronal section with heterogeneous formation behind the knee, surrounded by a thick, layer of deposited haemosiderin (hyposignal), with heterogeneous areas (parts of the thrombosed haematoma). (B) T2-weighted image demonstrates sagittal section with heterogeneous formation and capsule around, showing that there is a deposition of haemosiderin and fibrin. (C) T2-weighted image showing coronal section heterogeneous aspect of the lesion. (D) T1-weighted image post contrast showing that a part of the lesion is stained (white part), showing that it is heterogeneous with blood signal and flow in the lesion and hyposignal showing haemosiderin deposit.

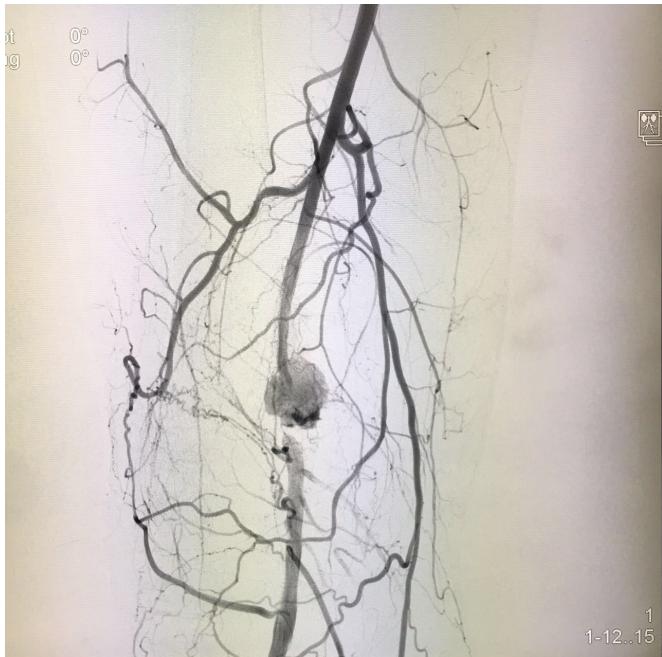


Figure 3 Arteriography demonstrating popliteal artery pseudoaneurysm with severe stenosis and extensive collateralisation.

and allow accurate surgical planning. Previous imaging had only suggested that a lesion was present, with severe stenosis and extensive collateralisation and no confirmation of blood flow.

There are no studies demonstrating that endovascular management of peripheral arterial trauma improves morbidity or mortality. However, in many cases where access to these vessels is hindered by anatomy or overlying tissue condition, there are advantages to endovascular repair. The popliteal vessels are particularly amenable to endovascular repair due to ease of access and the wide arsenal of therapeutic devices available.⁶

A systematic review showed that open surgical repair was performed in 85% of cases and endovascular stent placement in 14%, thus confirming that pseudoaneurysms are still classically repaired by the open approach.⁵ Endograft repair of popliteal aneurysms has also been described, with variable outcomes.⁷

Current thinking dictates that endovascular repair should be reserved for particular circumstances, and that longer follow-up is required before it can replace open surgery. However,

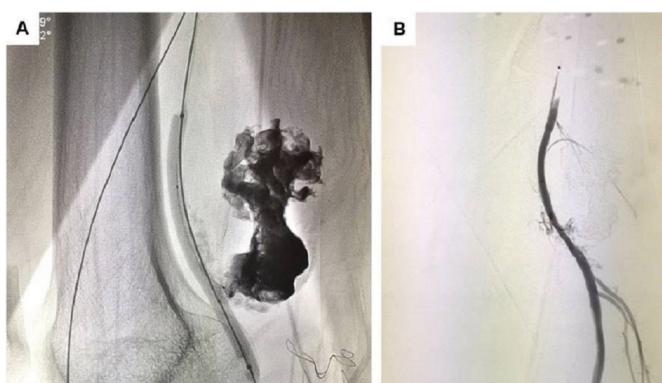


Figure 4 (A) Injection of Onyx by microcatheter and protection of popliteal artery with ballooning; fluoroscopic image showing that the Onyx has spread beyond the boundary of the original pseudo aneurysm. (B) Postembolisation angiography showing popliteal artery patency.

refinement of device design and increased experience with endovascular interventions in this region may expand the indications for endograft repair of popliteal artery lesions.⁷

Marín *et al*⁶ reported a case of popliteal artery pseudoaneurysm secondary to ballistic trauma. The authors concluded that open surgery would have made repair difficult, and chose the endograft route instead. However, they acknowledge that the graft is susceptible to future occlusion, which would then necessitate a conventional open approach.

In our case, endograft repair was not used because the pseudoaneurysm was located in an articular region, which is subject to constant flexion, particularly in such a young patient, as well as due to the high rate of remodelling, low long-term patency and risk of device migration, occlusion and fracture.⁸

Therefore, the decision was made to pursue endovascular repair by excluding the pseudoaneurysm with Onyx, a biocompatible polymer that, diffuses, precipitates, and solidifies at the tip of the catheter on contact with blood. Injection can be repeatedly stopped and resumed until the desired result is achieved; this slow, accurate and controlled method of administration reduces the risk of complications. Thus, Onyx is a promising embolisation material for peripheral interventions. During injection of an embolic agent, balloon catheters can be used to effectively control flow and protect the aneurysm neck.⁹

In our case, this resulted in successful exclusion of the lesion and avoided a more invasive surgical approach.

It was chosen to use Onyx for availability at the moment, for cost reasons (eg, many springs) and the possibility of maintaining an inflated balloon ensuring safety against distal embolisation and with the possibility of performing an angioplasty of a stenotic site.

Learning points

- This is a case of a spontaneous occurrence of a rare lesion in a patient with no apparent reason for its occurrence. Popliteal artery pseudoaneurysm is usually associated with local trauma such as orthopaedic surgeries or expansile bone lesions in the popliteal fossa.
- A less invasive approach (endovascular procedure) in a young patient is essential for good postoperative functional recovery, with less occurrence of scars and lesions of adjacent structures.
- The improvement of the endovascular techniques is essential for a greater use of this type of intervention, bringing greater quality of life for the patient.
- A lump in the popliteal fossa might be arterial pseudoaneurysm.
- It is possible to use onyx to treat this using balloon protection.

Classic open treatment of vascular trauma remains essential in situations such as massive haemorrhage, haemodynamic instability and repair of small and terminal arteries. However, this type of intervention usually requires large incisions and carries the risk of injuring important adjacent structures (large veins and nerves). Destruction of muscle tissue and the possibility of surgical wound infection and necrosis are also major concerns.⁶

One report presents a case of pseudoaneurysm after arthroscopic knee procedure in a young patient. We opted for ultrasound-guided thrombin injection, with active flow resolution within the pseudoaneurysm. In our case, we opted for the use of Onyx, since the aneurysm neck was not small in diameter, and there was concern that if injected thrombin could enter the vessel causing arterial thrombosis. This would hardly happen after the onyx quickly polymerised.¹⁰

Contributors SQB participated in planning, conduct, reporting, design and drawing, data acquisition and data analysis and interpretation. LGG participated in planning, reporting, design and drawing, data acquisition and data analysis and interpretation. VS participated in planning, reporting, design and drawing, data acquisition and data analysis and interpretation.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iD

Leonardo Garcia Góes <http://orcid.org/0000-0001-8578-6791>

REFERENCES

- 1 Oliveira GP, Guillaumon AT, De Brito IB, *et al*. Pseudoaneurisma idiopático dA arteria poplítea: abordagem diagnóstico-terapêutica Na urgência. *J Vasc Bras* 2014;13:244–8.
- 2 Raherinanenain F, Rajaonanahary TM, Rakoto HR. Management of popliteal artery pseudoaneurysms as a result of limb trauma and orthopedic surgery or associated with osteochondromas]. *Ann Cardiol Angeiol* 2016;65:265–74.
- 3 Khalifeh A, Kantar R, Watson JDB, *et al*. Management of chronic massive traumatic popliteal artery pseudoaneurysm: a case series with different treatment strategies. *Vasc Endovascular Surg* 2018;52:75–9.
- 4 Matsushita M, Nishikimi N, Sakurai T, *et al*. Pseudoaneurysm of the popliteal artery caused by exostosis of the femur: case report and review of the literature. *J Vasc Surg* 2000;32:201–4.
- 5 Nogueira A, Salgado CG, Nogueira F, *et al*. Pseudoaneurismas: quando E como tratá-los. *Arg Bras Cardiol* 2013;26:289–307.
- 6 Marín J, Schwartz E, Villalba M, *et al*. Terapia endovascular en trauma vascular periférico: experiencia inicial. *Revista Chilena de Cirugía* 2016;68:310–5.
- 7 Plagnol P, Diard N, Bruneteau P, *et al*. Case report: pseudoaneurysm of popliteal artery complicating a total knee replacement: a successful percutaneous endovascular treatment. *Eur J Vasc Endovasc Surg* 2001;21:81–3.
- 8 Setacci F, Galzerano G, Borrelli MP, *et al*. Endovascular treatment of popliteal aneurysm. *J Cardiovasc Surg* 2015;56:587–97.
- 9 Simões Ferreira Al, Gomes FV, Bilhim T, *et al*. Embolization with Onyx® of an arterial pseudoaneurysm with an arteriovenous fistula complicating a percutaneous nephrolithotomy: A case report and review of literature. *Urol Ann* 2018;10:225.
- 10 Rachakonda A, Qato K, Khaddash T, *et al*. Ultrasound-Guided thrombin injection of genicular artery pseudoaneurysm. *Ann Vasc Surg* 2015;29:1017.e11–1017.e13.

Copyright 2020 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <https://www.bmj.com/company/products-services/rights-and-licensing/permissions/>
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

Customer Service

If you have any further queries about your subscription, please contact our customer services team on +44 (0) 207111 1105 or via email at support@bmj.com.

Visit casereports.bmj.com for more articles like this and to become a Fellow