Case report

Endovascular repair of spontaneous popliteal artery pseudoaneurysm

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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, hypointensal 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 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 examined for 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 thrill and decreased pulses. However, the clinical picture is not always this typical, and imaging modalities play an important role in diagnosis.

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. 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).

DISCUSSION

Pseudoaneurysms of the popliteal artery are unusual. They are usually associated with arterial wall injury1–4 as a result of femoral exostosis (63%),3 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 commonly used radiological modalities are arteriography (49%) and CT angiography (27%).

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

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. Endograft repair of popliteal aneurysms has also been described, with variable outcomes.

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,
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

Marin et al6 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.

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.

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