

Popliteal pseudoaneurysm from suspected mechanical stress injury secondary to stent fracture and perforation: A case report

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Abstract

Popliteal artery aneurysms may be divided into true and false aneurysms (pseudoaneurysms). We present a case of a right popliteal pseudoaneurysm. A 67-year-old male presented to the hospital with significant pain in the right calf. A peripheral angiogram revealed extensive stent thrombosis in the right lower extremity. A thrombectomy and balloon angioplasty were done to reestablish blood flow. 2 weeks later the patient presented after a driving trip, with a peripheral angiogram revealing a popliteal pseudoaneurysm. Vascular intervention was performed, replacing the right popliteal artery with a 6 mm polytetrafluoroethylene graft. There is a high degree of suspicion for mechanical stress injury from prolonged knee flexion. The etiology of the pseudoaneurysm was most likely from mechanical stress, despite its historical association with true aneurysms. Although differentiating between true and false aneurysms is important in determining etiology, these are not all-inclusive and overlap of causation may occur.

Keywords

Pseudoaneurysm, false aneurysm, mechanical stress, peripheral vascular disease, acute limb ischemia

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Introduction

A pseudoaneurysm develops when there is a disruption in the integrity of the vessel wall, leading to blood leakage through the wall. Pseudoaneurysms can occur due to iatrogenic causes including blunt or penetrating trauma, orthopedic procedures like tibial nailing or ankle orthoscopy, and sports injuries.¹ Pseudoaneurysms are also the most common vascular complication of osteochondromas, a benign bone tumor occurring in the distal femur. The constant pressure and pulsatile friction within the popliteal artery cause damage to the arterial wall.² The incidence of pseudoaneurysms has been reported as 0.6%–4.8%, developing primarily from access-related evaluations including catheter-based procedures. The reported incidence is varied based on the method of evaluation (clinical vs routine ultrasonography).³ A popliteal artery pseudoaneurysm is clinically diagnosed by a pulsatile mass with an audible bruit and swelling over the popliteal region.⁴ True and false aneurysms have been associated with limb-threatening ischemia following thrombus formation and distal embolization.⁵ In the current report, we

describe a case of a popliteal artery pseudoaneurysm secondary to stent fracture and perforation.

Case presentation

A 67-year-old male with a past medical history of hypertension, hyperlipidemia, peripheral artery disease, and stage 2 chronic kidney disease presented to the hospital with acute limb ischemia staged at Rutherford IIa. A peripheral angiogram revealed stenting done at an outside facility, extending from the right common femoral artery to the entire length of the superficial femoral artery, continuing through the entire

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Figure 1. This peripheral angiogram depicts a popliteal artery pseudoaneurysm with arrows denoting the extravasation of contrast.

popliteal artery, and involving the proximal portion of the right peroneal artery, with occlusion at the proximal superficial femoral artery. He underwent a thrombectomy with a penumbra catheter (Penumbra Inc. from Alameda, CA, USA) followed by balloon angioplasty, reestablishing blood flow. In 2 weeks' status post thrombectomy, he presented to the clinic with severe pain in the right calf and foot, a warm right leg, and no gangrene. The patient stated that he had an onset of pain after going on a trip, in which he was driving for an extended period. He denies any falls, injury, or trauma. He was told to continue clopidogrel 75 mg daily, apixaban 2.5 mg twice daily, valsartan 160 mg daily, and pravastatin 40 mg daily. About 2 months later, he had a bilateral lower extremity arterial duplex ultrasound, which demonstrated a significant increase in velocity of the right popliteal artery, indicating greater than 90% stenosis. On physical exam, there was a very large and firm mass behind the popliteal fossa, with no evidence of ischemia. He was advised to proceed with a peripheral angiogram, which showed malalignment of the popliteal artery stent with extravasation of contrast behind the knee and likely perforation of the stent through the arterial wall (Figure 1). A vascular ultrasound demonstrated a large pseudoaneurysm behind the right popliteal artery. The patient had an immediate vascular intervention with right popliteal artery replacement with a 6 mm polytetrafluoroethylene graft. The patient was placed on aspirin and clopidogrel to prevent graft thrombosis. Post-operatively, dorsalis pedis pulses were

present bilaterally and the patient was discharged to a rehabilitation facility. Several months after the surgery, the patient developed an infection of the graft that later led to an above-the-knee amputation.

Discussion

This case demonstrates the rare occurrence of a popliteal artery pseudoaneurysm after stent fracture and perforation. It has an unusual presentation, due to its lack of definitive cause. Due to the abrupt onset of symptoms and clinical presentation after going on a trip 2 weeks post-thrombectomy, there is high suspicion that the cause was mechanical stress from knee motion. Although mechanical stress is commonly associated with true aneurysms, this case demonstrates its association with a pseudoaneurysm.⁵

In a study done when examining healthy volunteers, the femoral and popliteal arteries became more tortuous with knee flexion.⁶ This tortuosity may be explained by arteries that tend to lose their elasticity and elongate with an increase in age.⁷ In volunteers, greater than 30 years old, the natural gliding of the femoral vessels in the double layer of the adductor canal fascia is impaired due to perivascular fibrosis. Thus, the significant deformations of the superficial femoral artery (SFA) during flexion of the knee suggest that they may lead to the fatigue and fracture of SFA stents.⁶ Therefore, the ideal stent should have a combination of high flexibility and high radial strength.⁸ Since this case demonstrated a popliteal pseudoaneurysm with irregular/malaligned stents, the etiology was most likely caused by mechanical stress with stent fracture from repetitive knee motion. The stenting of the popliteal artery is not recommended due to the anatomical location of the stent and the high degree of a stent perforation, as demonstrated in this case.

Conclusion

This is a clinical case of a popliteal artery pseudoaneurysm with suspected mechanical stress secondary to a stent fracture and perforation likely due to knee flexion and extension. Popliteal aneurysms may present as true or false aneurysms (pseudoaneurysms). True aneurysms commonly develop from mechanical stress from knee flexion and extension with movement. Pseudoaneurysms can occur due to blunt or penetrating trauma, orthopedic procedures like tibial nailing or ankle orthoscopy, and sports injuries. The given case demonstrates a popliteal artery pseudoaneurysm with a high likelihood of causation from mechanical stress, even though mechanical stress is associated with true aneurysms. Although differentiating between true and false aneurysms is important in determining etiology, it is imperative to understand that these are not all-inclusive and overlap of causation may occur.

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Author contributions

L. H. Medical student responsible for writing and revising the manuscript, under the guidance of J. Also, the corresponding author. S.J. Interventional cardiologist responsible for managing the patient's care and discovering the popliteal pseudoaneurysm. He also edited and reviewed the manuscript, addressing revisions.

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