

Popliteal Artery Aneurysm in a Young Intravenous Drug User: A Case Report

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Learning Point of the Article:

In cases of popliteal artery rupture in intravenous drug users, the use of an autologous reverse saphenous vein graft combined with temporary across knee external fixation is an effective strategy to achieve stable limb salvage while minimizing the risk of infection and graft tension in a high mobility joint zone.

Abstract

Introduction: Popliteal artery aneurysms (PAAs) are rare in young adults and typically associated with atypical etiologies such as trauma or infection.

Case Report: We report the case of a 35-year-old male intravenous (IV) heroin user presenting with a 1-week history of progressive left knee pain and a pulsatile mass in the popliteal fossa. Clinical examination revealed significantly diminished distal pulses and a cool extremity distal to the knee. Initial X-ray identified a retained foreign body (needle) in the popliteal soft tissues, and contrast enhanced computed tomography angiography confirmed a ruptured 5.8 × 3.0 cm PAA with active contrast extravasation and luminal compression. The patient underwent urgent surgical intervention through a posterior approach. Following resection of the diseased aneurysmal segment, vascular reconstruction was performed using an autologous reverse saphenous vein graft harvested from the ipsilateral limb. To protect the vascular repair and prevent mechanical stress on the graft in the high mobility popliteal zone, an across knee external fixator was applied with the knee maintained in 30° of flexion. The post-operative recovery was uneventful, with immediate restoration of distal perfusion. At the 6-week follow-up, repeat angiography confirmed excellent graft patency, allowing for the removal of the external fixator and the initiation of a mobilization program.

Conclusion: This case emphasizes the importance of maintaining a high index of clinical suspicion for vascular complications in IV drug users and timely surgical intervention to prevent limb-threatening complications.

Keywords: Popliteal artery aneurysm, Intravenous drug, Ruptured aneurysm, Popliteal fossa, Limb salvage surgery, Reverse saphenous vein graft, Artery aneurysm

Introduction

Popliteal artery aneurysms (PAAs) presents as the most frequently encountered peripheral arterial aneurysms, accounting for approximately 67% of all such cases in clinical practice [1]. The typical demographic for this pathology mainly

consists of males over the age of 65, with systemic atherosclerosis acting as the primary underlying etiology [2]. Due to this gradual atherosclerotic progression, true PAAs are exceptionally rare among younger populations. When an aneurysm or pseudoaneurysm presents in a patient under the age of 40, it universally indicates an atypical etiology, such as localized

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vascular trauma, congenital connective tissue disorders, or mycotic vessel manifestations [3].

In terms of recent years, the clinical profile of young patients presenting with severe, acute vascular complications has shifted significantly. This change is largely driven by the rising incidence of intravenous (IV) drug abuse, a trend increasingly documented in specific geographic regions, including Northern India [4]. In this demographic, repeated and inadvertent arterial injections of illicit drugs and their diluents can lead to direct endothelial trauma, periarterial extravasation, and hematoma formation. Later bacterial contamination of these hematomas rapidly erodes the arterial wall, resulting in the formation of infected mycotic pseudoaneurysms [5]. While the femoral artery stays the most common site of injury due to its accessibility, peripheral vessels like the popliteal artery are frequently implicated as proximal veins become sclerosed from chronic abuse [6].

The rupture of a popliteal aneurysm is a profound clinical emergency characterized by limb-threatening ischemia and potential exsanguination. While the stable PAAs are primarily known for causing distal thromboembolism, an acute rupture can alter the patient's prognosis; literature indicates that delayed or missed diagnoses of ruptured PAAs can lead to amputation rates as high as 100% [7]. In the context of IV drug abuse, the presence of localized tissue necrosis, soft-tissue infection, and systemic bacteremia can severely complicate the standard revascularization efforts [8].

This case report describes the successful surgical management of a ruptured PAA in a 35-year-old male with a history of chronic IV drug use. It highlights the need for a high index of clinical suspicion, rapid diagnostic evaluation, and decisive operative intervention to prevent ischemia and achieve limb salvage in this high risk demographic.

Case Report

A 35-year-old male presented to the emergency department with a 1-week history of progressive pain and swelling in the left popliteal fossa. The patient had a known history of chronic IV heroin use, specifically reporting repeated self-injections into the left popliteal region. He denied any recent acute trauma or constitutional symptoms such as fever or weight loss. Physical examination revealed a firm, tender, and pulsatile mass in the left popliteal fossa. Distal pulses (dorsalis pedis and posterior tibial) were significantly diminished compared to the contralateral limb, and the leg was cool to the touch distal to the knee. Sensory and motor functions were intact, and there were no signs of compartment syndrome. Initial radiographic evaluation included anteroposterior and lateral X-ray views of the left knee. Notably, the lateral view revealed a retained foreign

body appearing to be a needle in the soft tissues of the popliteal region, correlating with the patient's history of self-injection (Fig. 1).

Color Doppler ultrasonography of the left lower extremity showed normal venous flow but revealed dampened, monophasic arterial waveforms in the posterior tibial artery and biphasic flow with reduced velocity in the popliteal artery. These findings indicated a significant proximal arterial lesion. Subsequent contrast-enhanced computed tomography angiography (CTA) confirmed a large PAA measuring 5.8×3.0 cm (Fig. 2). The CTA demonstrated active contrast extravasation into a surrounding hematoma, confirming a rupture and significant luminal compression. The patient was taken for urgent surgical intervention. Utilizing a posterior approach, the popliteal artery was exposed. Intraoperative findings confirmed a true aneurysmal sac with a focal wall rupture and an associated large, compressive hematoma (Fig. 3). Following systemic heparinization, the diseased aneurysmal segment was resected. Due to the length of the resulting arterial defect, a primary anastomosis was not feasible. Therefore, a reverse saphenous vein graft (RSVG) was harvested from the ipsilateral limb to reconstruct the popliteal artery. To protect the vascular repair and prevent mechanical stress on the graft during the early healing phase, an across knee external fixator was applied with the knee maintained in 30° of flexion. Local debridement of the inflamed tissue, hematoma, and foreign body (needle) was completed. Total tourniquet time was 45 min. The post-operative recovery was uneventful. The patient received a brief course of heparin and was transitioned to



Figure 1: Anteroposterior and lateral X-ray views of the left knee showing needle in lateral view.



Figure 2: Computed tomography angiography of the left knee region showing a large popliteal artery aneurysm (arrow) with contrast extravasation and adjacent hematoma in the popliteal fossa.

enoxaparin. The external fixator provided stable immobilization, and distal pulses remained palpable and symmetric throughout the admission. At the 6-week follow-up, a repeat angiography confirmed excellent potency of the RSVG with no signs of stenosis or leakage. Consequently, the external fixator was removed, and the patient began a structured physical therapy program for knee range of motion. He was further advised to cease the IV drug to use to prevent recurrence or other vascular insults. Relevant substance use treatment was started as a part of his care plan.

Discussion

PAAs are predominantly degenerative and atherosclerotic, typically occurring in males over the age of 60. Their manifestation in a 35-year-old is exceptionally rare, as this demographic lacks the systemic atherosclerotic risk profile associated with traditional aneurysmal disease [9]. While trauma and mycotic infections are known causes in younger

populations, this case highlights a distinct etiology repetitive arterial wall trauma from chronic IV heroin injection. Clinically, PAAs often remain asymptomatic until complications such as thrombosis or rupture occur. In our patient, the pulsatile mass and diminished distal pulses were classic signs of a vascular emergency. While Duplex ultrasound serves as an excellent initial screening tool, contrast-enhanced CTA remains the gold standard for surgical planning [10]. It accurately delineates the aneurysm's dimensions, the site of rupture, and the status of the distal run off vessels [10]. The management of a ruptured PAA is strictly surgical. In this case, the extent of the arterial wall destruction required resection rather than simple repair. While primary end-to-end anastomosis is ideal, the resulting gap often requires interposition grafting. We used an autologous RSVG, which remains the gold standard for peripheral arterial reconstruction, especially in potentially contaminated fields common in IV drug users. Unlike prosthetic grafts, autologous veins offer superior potency rates and a higher resistance to infection [11]. Furthermore, the application of an across knee external fixator in 30 degrees of flexion was a critical adjunct. In the popliteal region, extreme extension or unpredictable joint movement can jeopardize the integrity of a fresh venous graft. Temporary rigid immobilization ensures a tension-free environment for the anastomosis to mature. Our protocol of maintaining fixation until patency was confirmed through



Figure 3: Intraoperative vascular reconstruction – Surgical exposure through a posterior approach revealing the aneurysmal sac and the site of focal wall rupture.

angiography at 6 weeks allowed for a safe transition to mobilization without compromising the vascular reconstruction.

Conclusion

PAA in young adults are rare and should prompt immediate investigation into atypical etiologies, such as localized trauma from IV drug abuse. Early clinical suspicion and advanced imaging (CTA) are essential for definitive surgical planning. Prompt surgical resection followed by RSVG and temporary stabilization with an across-knee external fixator is an effective strategy for limb salvage. This comprehensive approach restores distal perfusion while protecting the vascular repair in the high-mobility popliteal zone.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

Clinical Message

A pulsatile popliteal mass with diminished distal pulses in a young intravenous drug user must be regarded as a vascular emergency until proven otherwise, as a ruptured popliteal artery aneurysm carries a limb threatening and also potentially life threatening prognosis. It is necessary to do a prompt contrast-enhanced CT angiography which is essential to define the lesion and plan reconstruction accordingly. In the contaminated high mobility popliteal zone, aneurysmal resection with an autologous reverse saphenous vein graft, protected by across knee external fixator provides a durable & infection resistance limb salvage. Additionally, addressing the underlying substance use is integral to prevent recurrence of such events.

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