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Case report

Case report: Retrogenicular popliteal artery pseudoaneurysm following trivial knee hyperextension

Sriskantharajah Varothayan [a,*], Satchithanantham Vinojan [b], Rajahram Dhadchayini [b], Sivakumaran Gobinath [c], Paramanathan Shathana [b]

[a] Interventional Radiology Unit, Teaching Hospital, Jaffna, Sri Lanka
[b] Department of Surgery, Faculty of Medicine, University of Jaffna, Sri Lanka
[c] University Surgical Unit, Teaching Hospital, Jaffna, Sri Lanka

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ABSTRACT

Introduction: Popliteal artery pseudoaneurysm is rare after blunt trauma without associated bone fracture, usually presenting in a delayed fashion. We present a case of early presentation following minor civilian trauma.
Case presentation: A 66-year-old man presented with left leg pain and swelling after a trivial knee hyperextension injury. Ultrasound revealed a popliteal artery pseudoaneurysm, confirmed by CT angiogram. Open surgical repair with interposition graft was successful. Intraoperatively, a 3 cm linear laceration in the retrogenicular popliteal artery and ipsilateral hamstring tear were noted.
Discussion: Delayed presentation is typical, making early detection challenging. Our case emphasizes maintaining suspicion for popliteal artery pseudoaneurysm, especially after trivial knee injuries. Prompt imaging and intervention are crucial to mitigate potential complications.
Conclusion: Popliteal artery pseudoaneurysm from minor knee trauma is rare but should be considered in patients with leg pain and swelling. Early detection and surgical intervention are vital to prevent complications.

1. Introduction

Popliteal artery pseudoaneurysm occurs subsequent to arterial injury, usually caused by a laceration of the arterial wall and hematoma formation within the adjacent tissues. Associated arterial injury is infrequent in the absence of severe crush injury and can often be missed. However, when it does occur, it may present in a delayed fashion with potential limb-threatening complications [2]. Blunt traumatic injury to the popliteal artery is uncommon and typically requires significant force applied to the anterior knee resulting in posterior knee dislocation [1]. Early detection and repair are crucial due to potential complications such as rupture, thromboembolic events, high risk of limb dysfunction, and amputation [2].

So far only a single case has been reported following isolated hyperextension of the knee thus far, presenting in a delayed fashion after a month. Here in, we share our first experience of successfully managing an unusual early presentation of a popliteal artery pseudoaneurysm that developed after an isolated hyperextension of the knee. The work has been reported in line with the SCARE criteria [3].

2. Case report

A 66-year-old previously healthy South Asian man arrived at the Accident and Emergency unit with complaints of pain and swelling in his left leg, following a minor fall two days earlier. The incident occurred as he was ascending stairs and experienced a slight hyperextension injury to his left knee. Soon after the fall, his leg began swelling noticeably. He denied any fever, chills, or rigors.

Upon examination, his left leg exhibited significant swelling extending up to mid-thigh. However, there were no indications of fracture, dislocation, or ligament damage. Despite the swelling, his pedal pulses were palpable, and neurological function remained intact. Notably, the patient was a current smoker and had a history of heavy alcohol consumption.

Upon admission, laboratory tests revealed a white cell count of 2300/mm^3 with a predominant neutrophil count (84.9 %), a hemoglobin level of 6.1 g/dl with a slightly reduced mean corpuscular volume (MCV) of 83.3 fl and mean corpuscular hemoglobin (MCH) of 28.4 pg, along with a markedly elevated C-reactive protein (CRP) level of 306

* Corresponding author at: Hospital Road, Jaffna, Sri Lanka.
E-mail address: Sri.varo19@gmail.com (S. Varothayan).

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mg/dl.

Initially, the leading differential diagnosis was cellulitis, and the patient was promptly started on intravenous antibiotics. However, despite treatment and efforts to elevate the leg, the swelling continued to worsen. An ultrasound scan ruled out abscess formation, revealing an unexpected finding: a pseudoaneurysm of the retrogenicular popliteal artery.

To confirm the diagnosis and plan management, a CT angiogram (CTA) was conducted. With the pseudoaneurysm remaining symptomatic, surgical intervention was deemed necessary. Following the optimization of his hemoglobin levels, the patient underwent open surgical repair. Intraoperatively, a 3 cm linear defect was discovered in the retrogenicular popliteal artery, accompanied by tearing in the hamstring muscles. The pseudoaneurysm was excised and repaired using an interposition graft.

Postoperatively, the patient's distal pulses were successfully restored, and he was discharged after a week of recovery. During follow-up appointments, he reported a complete recovery, with the ability to walk without difficulty.

3. Discussion

The popliteal artery begins at the adductor hiatus and passes into the popliteal fossa, where it is lateral to the medial head of the gastrocnemius; it runs down posterior to the knee joint and superficial to the popliteus muscle. It is fixed at the proximal and distal ends with the adductor hiatus and soleal fascia, respectively. Throughout its course, it is the deepest structure of the neurovascular bundle of the popliteal fossa. It divides into the anterior tibial artery and tibioperoneal trunk at the lower border of the popliteus [4].

Throughout its course, though anteriorly and laterally it is protected by resistant structures such as ligaments, bones, and muscles, posteriorly is mostly composed of soft tissues, which lead to vulnerability for the major nerves and vessels in the region [2].

Trauma to the knee can result in a spectrum of popliteal arterial injuries from minimal laceration with an anterior dislocation to complete transection with posterior dislocation and lead to serious limb-threatening peripheral arterial injuries as it is a true end artery which responsible for perfusion to the whole lower limb (Fig. 1), with a minimal collateral supply [5,6].

The formation of a pseudoaneurysm is highly unusual, with an incidence of less than 3.5 % of all popliteal aneurysms [2]. It may also result from arterial reconstructive surgery, invasive surgical orthopedic procedures, and perigenicular neoplasia [7].

Open knee popliteal arterial injury is usually diagnosed quickly as a physical examination reveals the signs where most of the patients (70 %) present with pulseless limb extremities (Fig. 2), and other signs of ischemia lead to an immediate diagnosis and intervention but the rest of the patients (30 %) present with less obvious signs, but half of them have wounds proximate to the vessels [8]. Most penetrating popliteal injuries can be identified by following the principle of arteriography or operative exclusion of suspected arterial trauma [9]. The diagnosis of close knee blunt injury is often less obvious, and generally involves high-velocity posterior dislocations of the knee causing a major stretch of the artery to cause shearing and avulsion [10]. This scenario explains that most treatment delays and results in popliteal artery injury can be more difficult to recognize and delayed treatment results in amputation in up to 40 % cases [11]. For this reason, arteriography is recommended to exclude acute blunt arterial injuries in following patients who had knee dislocation, knee instability, or displaced fractures near the knee with circulatory deficits that resolve after reduction, compression injuries from automobile bumpers, or fractures near the knee requiring an operation, particularly if a tourniquet is to be used [10].

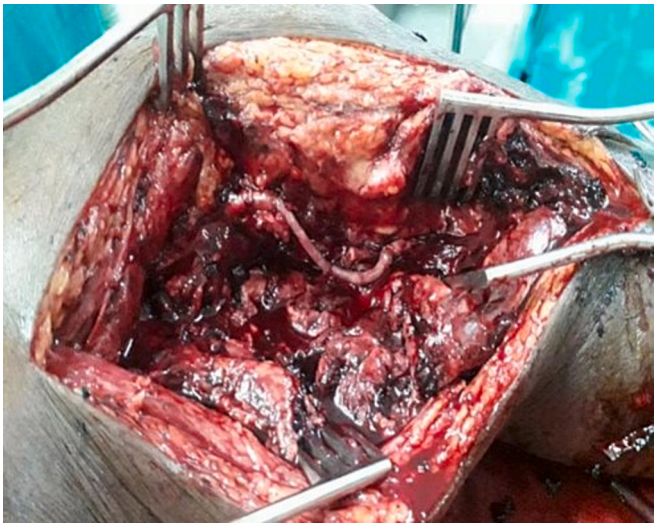

Fig. 2. After surgical excision of pseudoaneurysm and repaired with an interposition graft in semi flexed knee position.

In 1963 Mr. Kennedy demonstrated that at 50° of hyperextension, the popliteal artery could be ruptured using a stress machine and in cadaver knees with a stress machine. This would account for the injury of the popliteal artery in our patient [10]. We excluded the knee joint dislocation by the X-ray and ligamentous injury by the clinical examination. Even though MRI would be ideal to diagnose ligamentous injury, we didn't consider it in our resource-limiting setup.

Popliteal pseudoaneurysms can cause a range of symptoms and usually present as a painful, tender, pulsatile mass or chronic painful lower extremity swelling due to ischemia caused by peripheral thromboembolism but rupture and infection are rare [12,13].

The initial finding, in this case, was lower extremity cellulitis that had spread to the thigh. CT detected a thickening of the subcutaneous fat layer from the popliteal region to the buttocks, and an increase in fat tissue density [12] (Fig. 3).

Imaging modalities to help in the diagnosis of a popliteal artery pseudoaneurysm due to blunt knee injury include duplex

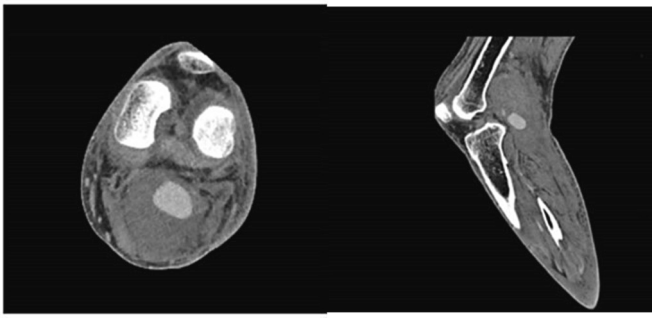

Fig. 1. Axial view and sagittal view of CECT of L/lower limb respectively.

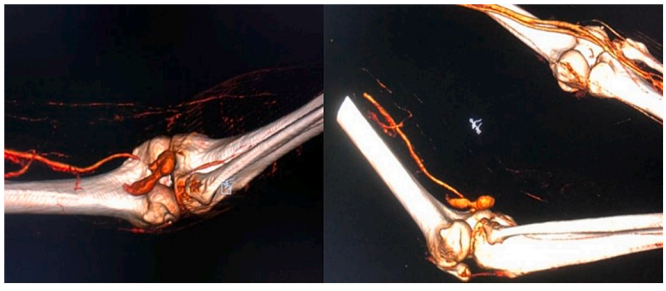

Fig. 3. Lateral and posterior view of left lower limb CT angiogram showing pseudo aneurysm.

ultrasonography, computed tomography angiography, MRA, and digital subtraction angiography. Although angiography is the gold standard for diagnosis, recent studies stated, routine diagnostic angiography should only be considered if an abnormal physical examination finding or ankle-brachial index is less than 0.80–0.90 [1].

In this case, the presence of the distal pulse on physical examination has given the impression that the popliteal artery was patent in continuity. However further investigations led us to confirm the diagnosis.

The decision regarding treatment modalities of PPA depends on multiple factors size, underlying cause, and patient factors. Small pseudo-aneurysms can be managed conservatively or treated by ultrasound compression, embolization, or fibrin injection [13]. For iatrogenic traumatic injuries, endovascular treatment with stent grafts is considered an alternative treatment to open surgery as is minimal invasive with lower morbidity rates and a short duration of hospital stays but long-term patency remains elusive and may not be ideal for popliteal artery repair because of the location of the artery and mobility of the knee joint leads to stent fracture or migration. Surgical open repair with the excise of the aneurysm and placement of a saphenous vein graft bypass should consider evacuating large hematomas [1,14,15]. In this case, open surgical repair was preferred as a symptomatic pseudoaneurysm.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval

A written consent was received from the patient. In such case, the anonymized presentation of case report does not require a separate approval by the ethics committee.

4. Patient perspective

The day before yesterday after I fell while climbing the stairs, I had difficulty in moving my leg and felt some swelling over the back of my left knee, but I could walk. After initial investigations, doctors gave me some medications despite my symptoms persisting. Then after imaging, they decided to do an operation as I have some injuries in my arteries. I gave consent for surgery after hearing all the pros and cons of available treatment modalities and I can do daily activities as usual within a few weeks after surgery.

Guarantor

Dr. S. Varothayan.

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Interpretation — SSV, SV, SG, and RD.
Manuscript preparing — SSV, SG, and PS.

Conflict of interest statement

The authors have no competing interests.

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