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Case Report

Iatrogenic Deep Femoral Artery Pseudoaneurysm Causing Quadriceps Paralysis: An Indication for Open Surgery in an Endovascular Era

Thushan Gooneratne and Mandika Wijeyaratne

Department of Surgery, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka

Contemporary management of iatrogenic pseudoaneurysms is mostly performed using non-surgical techniques. Herein, we present a rare case of deep femoral artery (DFA) pseudoaneurysm with compression neuropathy, which required open repair. A 67-year-old female patient presented with increasing pain in the right groin, sensory neuropathy of the anteromedial thigh and upper leg, and quadriceps paralysis 4 days after coronary angiography via femoral puncture. Computed tomography angiography revealed a pseudoaneurysm of the DFA. The disabling compressive neuropathy warranted urgent open decompression rather than thrombin injection or endovascular therapy. Timely open evacuation of the hematoma, release of compression on the femoral nerve, and postoperative physiotherapy resulted in complete recovery of quadriceps power. The patient was pain free within 12 weeks and able to ambulate independently. This case report highlights the role of prompt open surgery for pseudoaneurysms with compression neuropathy.

Key Words: False aneurysm, Femoral artery, Femoral neuropathy, Paralysis

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Corresponding author: Thushan Gooneratne
Department of Surgery, Faculty of Medicine, University of Colombo, 25 Kynsey Road, Colombo 00800, Sri Lanka
Tel: 94-772004092
Fax: 94-112691581
E-mail: thushey@hotmail.com
https://orcid.org/0000-0003-2072-4586

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INTRODUCTION

Complications following percutaneous femoral arterial access have an incidence of 1.8% to 7% and 4% to 16% for diagnostic and therapeutic procedures, respectively [1,2]. Puncture site pseudoaneurysms commonly present as enlarging pulsatile swelling with pain or bruit. Femoral neuropathy following percutaneous arterial access is very rare, with a reported incidence of 3.8 per 100,000 population [3]. Nerve injury is attributed to either direct injury during needle cannulation or compression secondary to vascular complications, such as bleeding and pseudoaneurysm [3]. Noninvasive, nonsurgical interventions are replacing open surgical repair in selected cases [4]. Femoral neuropathy due to an overstretched nerve from an expanding hematoma demands prompt exploration and evacuation to prevent irreversible damage. We present a case of quadriceps paralysis due to an iatrogenic deep femoral artery (DFA) pseudoaneurysm that was successfully treated with urgent open surgery, with complete neurologic recovery. Written informed consent was obtained from the patient for anonymized information, including images, to be published in this article.

Since the manuscript was a case report based on an observational study of a patient, institutional review board approval wasn't required.

CASE

A 67-year-old female patient presented with increasing pain in the right groin and severe weakness in the ipsilateral lower extremity, rendering her unable to bear weight or walk for 4 days. She underwent coronary angiography via a right groin puncture 4 days prior to admission in another

hospital. She had a history of hypertension, coronary artery disease, and a body mass index of 32 (weight, 74 kg; height, 152 cm). She was not on anticoagulants. The medical records confirmed that femoral artery access was difficult and that it was performed without ultrasound guidance and required multiple puncture attempts. No closure device was used. However, it was noted that she was asymptomatic at the time of discharge.

Physical examination revealed tender induration and bruising in the right groin with no unusual pulsations or bruits. The patient was unable to extend her knee straight (Fig. 1) and demonstrated significant weakness of the quadriceps femoris muscles with only grade 1/5 power according to the Medical Research Council scale of muscle strength. Numbness and tingling were also noted on the anteromedial aspect of the thigh and upper leg, suggesting severe femoral nerve dysfunction. The adductor and extensor compartments of the thigh did not exhibit any dysfunction. The increasing severity of local pain despite four analgesics and the onset of paralysis at 4 days post-puncture were suggestive of an expanding pseudoaneurysm stretching the adjacent femoral nerve rather than an intraprocedural direct nerve injury. Computed tomography angiography confirmed a DFA pseudoaneurysm measuring 4 cm×5.5 cm deep to the proximal part of the DFA (Fig. 2).

Based on the perceived need to evacuate the hematoma and release compression on the nerve, we proceeded with urgent open surgery rather than an endovascular treatment. Surgical exploration confirmed that the underlying pseudoaneurysm had overstretched the entire femoral neurovascular bundle. The common femoral artery (CFA) and superficial femoral artery (SFA) were dissected off the floor of the femoral triangle and controlled with clamps. A direct incision was used to evacuate the bulging hematoma, and the bleeding DFA branch was sutured and ligated (Fig. 2). The surgical site healed without any complications. Following intensive rehabilitation with electrical stimulation and quadriceps strengthening exercises, complete muscle recovery was achieved in 12 weeks (Fig. 3).

Fig. 1. The patient was unable to extend her right knee against gravity.

Fig. 3. The patient demonstrated full recovery in her ability to extend her right knee after 12 weeks.

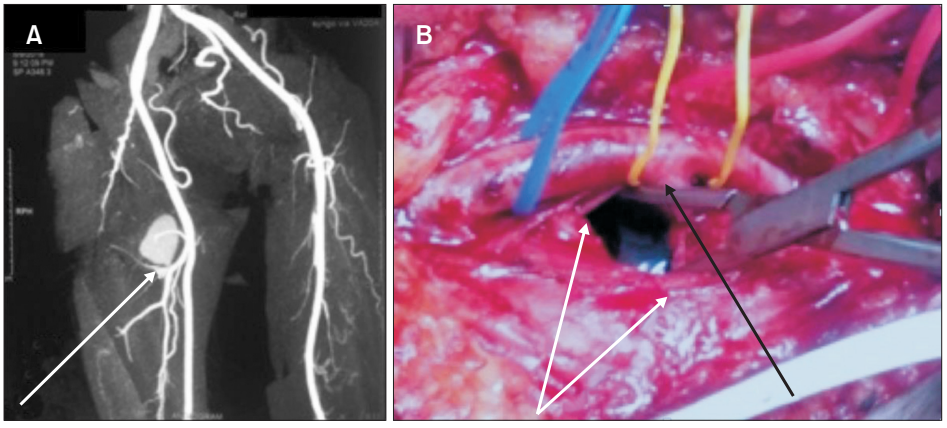

Fig. 2. (A) Computed tomography angiography with contrast showed a right deep femoral artery (DFA) aneurysm. The arrow indicates pseudoaneurysm originated from the DFA. (B) Operative image showed the DFA pseudoaneurysm with the underneath femoral nerve. The white arrows indicate branches of the femoral nerve stretched by the pseudoaneurysm (post decompression) and the black arrow indicates DFA.

DISCUSSION

The prevalence of iatrogenic pseudoaneurysms is increasing due to a marked increase in the number of diagnostic and interventional percutaneous vascular procedures. Risk factors include female sex, hypertension, obesity, and use of antiplatelet and anticoagulant therapies [2,3]. Complications from femoral arterial access often occur with too low or too high cannulation. Low cannulation below the bifurcation of the CFA, such as in our case, is associated with a greater propensity for ischemic arterial complications, pseudoaneurysms, and arteriovenous fistulae due to inadvertent cannulation into the SFA or DFA. High cannulation is associated with an increased risk of retroperitoneal hemorrhage due to the inability to perform effective compression [5]. The lack of ultrasound guidance in this case would have contributed to the inadvertent puncture of the DFA and the occurrence of complications. Details pertaining to the access regarding the lack of ultrasound guidance, reason for selecting the femoral artery over the radial artery for access, or reason for the absence of a closure device were not available as the procedure was performed by a cardiologist at another institution. Closure devices are not freely available in all institutions in our country and may have been a factor.

Hemorrhage is the most common complication, either as a stable or unstable hematoma, uncontrolled bleeding, pseudoaneurysm, or retroperitoneal bleeding [4]. Interestingly, this patient presented with increasing groin pain and quadriceps paralysis. A clinical diagnosis of femoral neuropathy was made based on the myotome and dermatome patterns of dysfunction along the femoral nerve distribution and sparing of other muscle groups. Unfortunately, confirmation of diagnosis via electromyogram and nerve conduction study was not possible because of limited infrastructure and resources due to the COVID-19 pandemic. A femoral pseudoaneurysm following percutaneous arterial catheterization presenting as femoral compressive neuropathy is rare and has been reported in isolated case reports [6-8].

Possible mechanisms of nerve injury during percutaneous femoral artery access include direct injury by the puncture needle, excessive mechanical or digital compression for hemostasis, bleeding into the femoral sheath increasing the pressure within the nerve compartment, and nerve ischemia or stretch injury by traction from an adjacent hematoma or pseudoaneurysm [6].

In the modern vascular armamentarium, several therapeutic strategies are available to manage femoral pseudoaneurysms, including ultrasound-guided compression, surgical repair, and minimally invasive percutaneous treatments (thrombin injection, coil embolization, and insertion of covered stents) [9]. Despite concerns regarding the anatomical difficulties in deploying stents, modern stent technology allows for safe stent or stent-graft extension of the CFA. Covered stents can be lifesaving procedures during active pelvic bleeding. However, covered stents may occlude important collaterals, including DFA, and secondary infection due to hematoma may result in painful conversion operations. Percutaneous thrombin injection under ultrasound guidance is the treatment of choice for femoral pseudoaneurysms with suitable size and anatomy of the neck [10].

While current nonsurgical options are adequate in most instances [9-11], open surgical repair still has an important role in selected cases, especially in concomitant distal ischemia, infection, compromised soft tissue viability, and compressive neuropathy. Even after successful endovascular therapy, the remaining hematoma continue to apply pressure on the nerve and compromise its recovery. Early relief of the tension is crucial for the early recovery of neuropraxia. Although the evidence and guidance on the optimal management of femoral neuropathy after femoral arterial access remains sparse, in the presence of a pseudoaneurysm, early identification and open surgical drainage to relieve compression is likely the most appropriate method of management. In conclusion, femoral neuropathy secondary to a DFA pseudoaneurysm after percutaneous femoral arterial access is rare but warrants decompression and arterial repair without delay. In an endovascular era when most pseudoaneurysms are managed successfully by nonsurgical means, this is a rare but important case in which open surgery is still the only option.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

ORCID

Thushan Gooneratne
https://orcid.org/0000-0003-2072-4586
Mandika Wijeyaratne
https://orcid.org/0000-0001-9073-5446

AUTHOR CONTRIBUTIONS

Concept and design: MW. Analysis and interpretation: all authors. Data collection: all authors. Writing the article: TG. Critical revision of the article: MW. Final approval of the article: all authors. Statistical analysis: none. Obtained funding: none. Overall responsibility: TG.

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