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Spontaneous Rupture of Superficial Femoral Artery Treated Endovascularly Using CO_2 Angiography

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Abstract

Spontaneous rupture of the superficial femoral artery (SFA) is extremely rare. We report an interesting case of an elderly man presented with a history of hearing a click sound in his left lower thigh followed by sudden onset pain, swelling, and discoloration in the left lower limb while coming back from the bathroom. He was a known case of chronic kidney disease, and cirrhosis of the liver with moderate left ventricular (LV) dysfunction. We treated the ruptured SFA using overlapping stent grafts with CO_2 angiography. The pseudoaneurysm got thrombosed. The pain and swelling of the left lower limb gradually subsided. The patient went home walking.

Keywords

- spontaneous rupture of superficial femoral artery
- stent graft
- carbon dioxide angiography

Introduction

Spontaneous rupture of the superficial femoral artery (SFA) is extremely rare, with only a few cases described in the literature. Our patient had no history of trauma, signs of connective tissues, or inflammatory disorders, which were considered the most common causative factors.[1] Atherosclerosis being the etiology in our patient with multiple comorbidities, we decided to manage the patient by endovascular method by overlapping stent grafts using CO_2 angiography in achieving thrombosis of pseudoaneurysm (PSA). The patient had an uneventful course postprocedure. The endovascular technique always scores better than open surgical technique in a nonagenarian with multiple comorbid conditions.

Case Report

A 90-year-old elderly man presented to the department of orthopaedics with a history of sudden onset of pain and swelling of the left leg while returning from the bathroom. There was no history of falls or trauma to the left lower limb. The patient described a clicking sound over the lower thigh, which preceded the onset of the symptoms. On general examination, the patient was pale and unable to walk with a blood pressure of 110/70 mm Hg. Local examination revealed a diffusely swollen and tender lower thigh with discoloration and induration of the skin on the ventral aspect. There were no signs of compartment syndrome. Upon further examination, the left common femoral artery pulse was palpable with absent distal pulses. Laboratory evaluation revealed low hemoglobin of 5.6 g/dL and elevated creatine of 2.3 (glomerular filtration rate [GFR]: 4.5). X-ray of the left lower limb did not reveal any fracture of the femoral bone. Superficial femoral arterial wall calcification was seen with focal interruptions. Ultrasonography (USG) duplex study revealed a large PSA from the left distal SFA with no demonstrable neck with irregular hematoma extending to the popliteal fossa and calf region along the deep fascial

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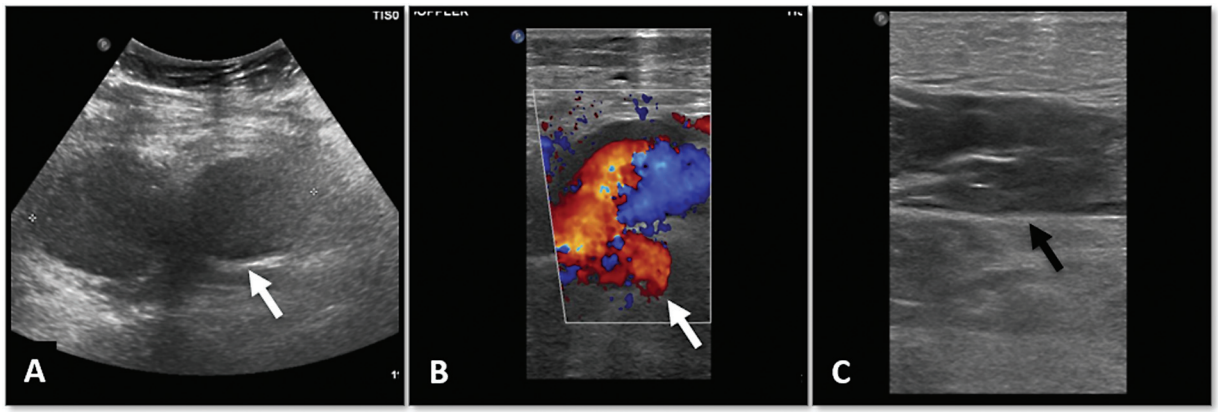

Fig. 1 (**A**,**B**) Duplex ultrasonography (USG) shows a hypoechoic collection in the thigh that was continuous with the superficial femoral artery and shows color filling (*white arrow*), suggesting a pseudoaneurysm. (**C**) Hypoechoic collection in the muscular plane (*black arrow*) suggesting possible hematoma.

plane (►**Fig. 1**). A low-velocity monophasic flow was seen in the left anterior tibial artery (ATA) and posterior tibial artery (PTA). The lower limb veins were patent. Abdominal USG revealed a grade II chronic kidney disease associated with a cirrhotic liver. Two-dimensional (2D) echocardiography showed global hypokinesia of the left ventricle with moderate dysfunction. A calcified SFA, patients' age, and associated comorbidities warranted endovascular management.

Procedure

Under local anesthesia and strict aseptic precautions, right common femoral arterial access was obtained with a 10-Fr introducer sheath. Given the deranged renal parameters, carbon dioxide was chosen as the contrast agent. We preferred a crossover technique for the case. The left SFA was accessed, and angiograms were obtained, which revealed a large PSA arising from the left distal SFA (►**Fig. 2A**). The delayed phase showed slow antegrade flow in the popliteal artery. There was a tight narrowing of the SFA proximal to the rupture site with an acute bend toward the distal segment of the vessel (►**Fig. 2B**). Further distally, there was acute angulation between the ruptured segment and the popliteal artery. The ruptured segment and the acute bends in the SFA were navigated with a 4-Fr vertebral glide and 0.014-inch command wire combination (►**Fig. 2C**). The angulated and stenosed segments of the vessel were first angioplastied using a balloon catheter (6 mm diameter × 20 mm length; Submarine balloon catheter, Medtronic, Inc., United States). The 0.014-inch wire was subsequently exchanged for a 0.035-inch stiff wire. Following this, a 10 × 60 mm stent graft (Fluency, BD, United States) was deployed across the rupture point (►**Fig. 2D**). However, check angiograms revealed persistent opacification of the PSA. A second stent graft of size 10 × 4 0 mm was deployed in an overlapping manner but with a persistent filling of the PSA. In-stent angioplasty was performed with a 10 × 40 mm balloon. There was a reduction in the endoleak with a minimal filling of the PSA sac. A third stent graft of size 12 × 80 mm across the rupture site sealed the leak and obliterated the PSA (►**Fig. 3**). A repeat duplex scan revealed complete thrombosis of the sac. The patient received 4 units of packed red cells, which improved his hemoglobin level to 10 mg/dL. The left lower limb pain and swelling improved gradually over a week, and the patient could walk subsequently.

Our patient received dual antiplatelets, which were tapered to a single antiplatelet at 6 months. A follow-up duplex USG scan study revealed a patent stent graft with a hematoma resolution and maintained distal flow.

Discussion

Traumatic, iatrogenic, infective, and inflammatory causes of PSA of the peripheral arteries are the most common causes and described in the literature. Association of connective tissue disorders like Ehler–Danlos syndrome with peripheral arterial aneurysms and rupture in young patients has been described.[1] Atherosclerosis with vessel wall weakness has been described in a few publications as a probable cause for spontaneous rupture of peripheral arteries in the elderly, which may have been the cause in our case.[2–4]

Further assessment of hemogram and inflammatory markers was within normal limits except for a decrease in hemoglobin level. We hypothesize akin to the bone, calcified vessels can fracture under extreme stress, with rupture of the vessel resulting in PSA formation, and hematoma in the surrounding soft tissue, which we presume in our patient. Associated kidney disease would have accelerated vessel atherosclerosis and wall calcification in the patient, as described in various studies.[5] The available treatment options include percutaneous thrombin injection, stent grafting, and open surgery.[2,6,7] Indiscernible neck is a contraindication for percutaneous thrombin injection into the PSA, which was the case in our patient. A heavily calcified vessel, old age, and associated comorbidities warranted an endovascular-first approach. Severe vessel wall calcification hinders the surgical treatment and hence can be difficult to tackle the PSA, especially in elderly patients.[8] We considered open surgical repair as the second option in case endovascular management became difficult or unsuccessful. Emergency surgical exploration is necessary for patients developing compartment syndrome, nerve compression, deep venous thrombosis, or signs of

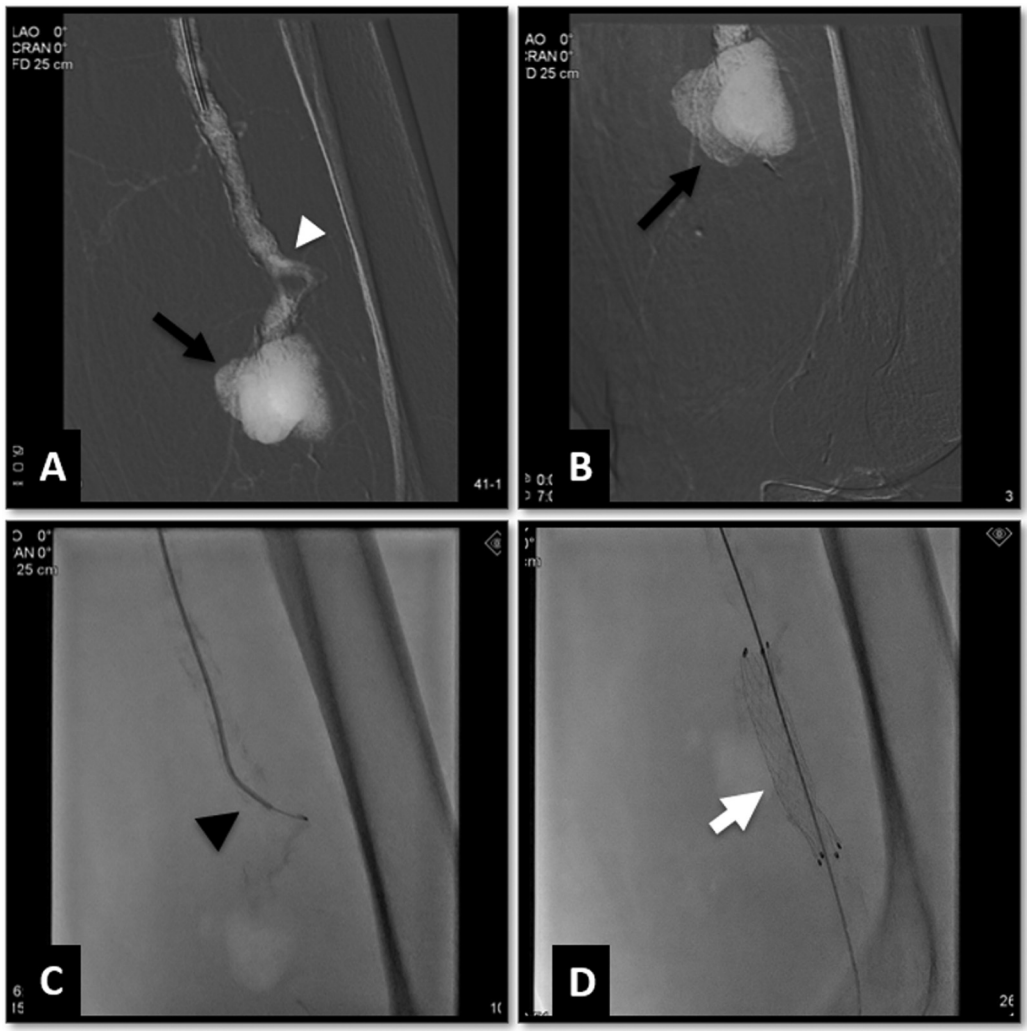

Fig. 2 (**A**,**B**) CO_2 angiography in anteroposterior and lateral views revealed the filling up of the superficial femoral artery with a discontinuity in the distal segment ending in a pseudoaneurysm (*black arrow*). Acute angulation with a stenotic segment can be observed in the distal superficial femoral artery (SFA; *white arrowhead*). (**C**) The stenotic segment was crossed with a catheter and microwire combination (*black arrowhead*). The extensively calcified femoral artery can be visualized in the same picture. (**D**) Deployment of stent graft across the lesion.

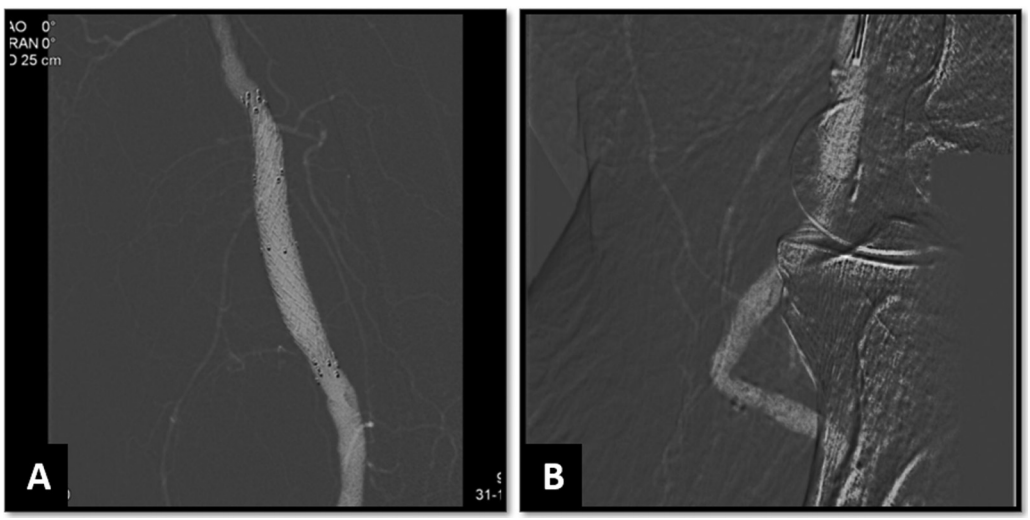

Fig. 3 (**A**) Final angiography shows complete exclusion of the pseudoaneurysm with reconstructed superficial femoral artery (SFA) using stent grafts. (**B**) Residual acute bend and narrowing in the popliteal artery post-stent grafting.

infections. Successful treatment of peripheral arterial PSA with stent graft with good long-term outcomes has been described in various studies and hence can be offered as a nonsurgical option for patients unfit for surgery.[6,7] Carbon dioxide angiography can be used in patients with renal diseases to prevent contrast nephropathy.[9] However, CO_2 angiography requires special CO_2 angiography and delivery system in the angiography suite, which can hinder its usage in special circumstances. We used an indigenous makeshift CO_2 angiography system using a CO_2 cylinder, blood bag for CO_2 storage, and intravenous (IV) lines for delivery of the gas, which provided an easy, cost-effective CO_2 angiography system.

Conclusion

Spontaneous rupture of the SFA, if unrecognized or mismanaged, can result in significant morbidity and even lead to mortality. We treated an elderly male by the endovascular method, which is an alternative to open surgical repair and is minimally invasive, safe, and effective, especially when there is diffuse atherosclerosis of the artery.

Funding
None.

Conflict of Interest
None declared.

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