

Surgical repair of deep femoral artery aneurysm complicated by deep vein thrombosis and pulmonary embolism

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ABSTRACT

Isolated deep femoral artery aneurysms are rare and tend to be large at the time of diagnosis owing to their deep anatomic location. Deep femoral artery aneurysms are often complicated by rupture, with subsequent lower limb amputation. However, a large aneurysm can compress the surrounding deep femoral vein, leading to thrombosis. In the present report, we have described a rare surgical case of deep femoral artery aneurysm complicated by deep femoral vein thrombosis and pulmonary embolism. Preoperative inferior vena cava filter placement was effective for preventing perioperative worsening of the pulmonary embolism in this particular circumstance. (*J Vasc Surg Cases Innov Tech* 2021;7:408-10.)

Keywords: Deep femoral artery aneurysm; Deep femoral vein thrombosis; Pulmonary embolism; Vena cava filters

Isolated deep femoral artery aneurysm (DFAA) is a rare condition.^{1,2} Because of the deep localization, DFAAs can grow extensively and remain undetected. The high incidence of rupture is associated with high rates of lower extremity amputation.² DFAAs can also compress the surrounding tissues and structures, causing deep vein thrombosis (DVT) and subsequent pulmonary embolism (PE), which are life-threatening complications.³ However, reports on this entity are very limited, and the treatment strategy is controversial. In the present report, we have described a successful surgical intervention for a large DFAA complicated by DVT and subsequent PE. The patient was treated with preoperative placement of a nonpermanent inferior vena cava (IVC) filter. The patient provided written informed consent for the report of the details and images related to his case.

CASE REPORT

A 62-year-old man had presented with dull pain and pulsatile masses in the left groin near the thigh 1 week before his referral to our institution. Pulses in the left dorsalis pedis and posterior tibial arteries were palpable. The ankle brachial index was

normal (1.03). However, left lower leg edema was noted, although the patient had no history of any infection, previous cardiac catheterization, drug abuse, trauma, autoimmune disease, or collagen vascular disease. He was a current smoker and had been hypertensive (systolic blood pressure, >180 mm Hg). However, he had discontinued his medical treatment of his own volition. Computed tomography revealed an 80 × 90-mm aneurysm in the mid-portion of the deep femoral artery (Figs 1 and 2). In addition, no affected areas in the superficial femoral artery or popliteal artery and no other peripheral aneurysms were detected. The outflow vessel divided into four branches at the distal end of the DFAA, the thickest of which was ~3 mm in diameter and was nearly uncalcified. The lateral circumflex femoral artery as the collateral source was well-developed, with a diameter of 6 mm. The femoral vein was markedly compressed by the aneurysm and was thrombosed longitudinally. Asymptomatic PE was detected in the lower lobe branches of the pulmonary arteries, bilaterally (Fig 3). Anticoagulation therapy with heparin was started immediately, and a nonpermanent IVC filter was implanted to avoid worsening PE resulting from intraoperative manipulation of the thrombosed deep femoral vein. The patient showed no evidence of fever or other signs of infection before or after admission.

After the diagnosis of the DFAA with impending rupture, aneurysm repair was performed through a longitudinal groin incision on day 3 of hospitalization. The DFAA was exposed without technical difficulty. However, the deep femoral vein was firmly adherent to the anterior surface of the aneurysm. The femoral vein was compressed and stretched by the DFAA. The preoperative examination had confirmed superficial femoral–popliteal artery patency and showed that the distal deep femoral artery was perfused by the lateral circumflex femoral artery through the collateral arteries. Therefore, we considered that distal deep femoral artery revascularization was not necessary after aneurysm resection. After ligation of the proximal neck of the aneurysm (Fig 4), the aneurysm sac was opened, and the

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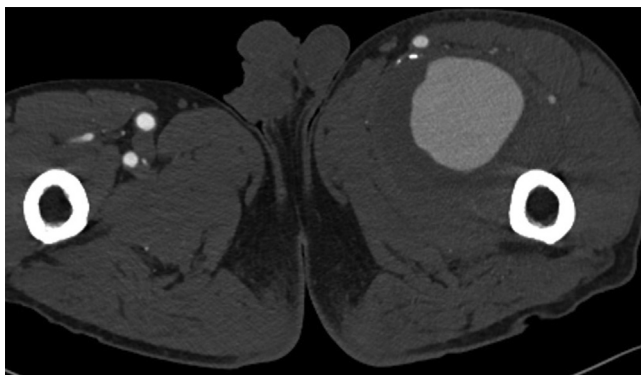


Fig 1. Preoperative computed tomography scan demonstrating a left deep femoral artery aneurysm (DFAA) of 80 × 90 mm.

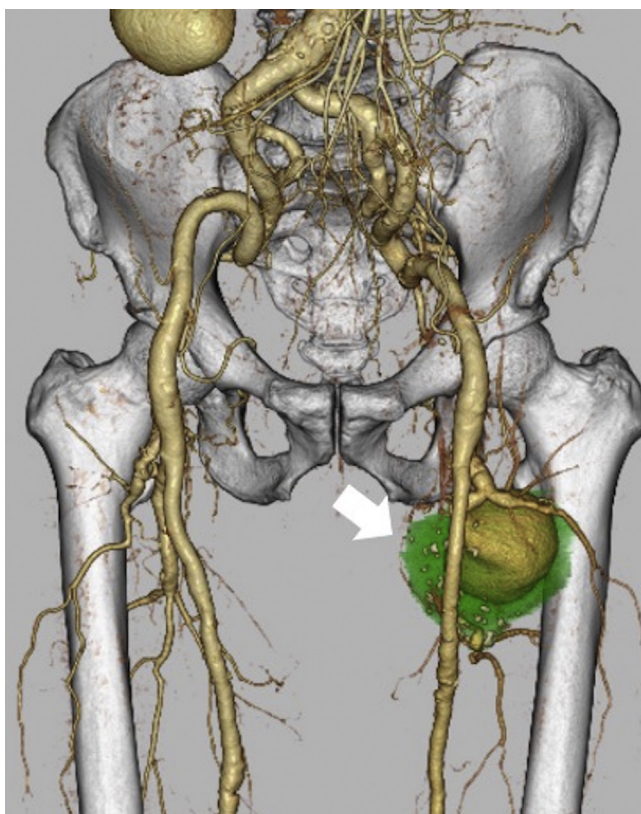


Fig 2. Three-dimensional computed tomography scan showing a deep femoral artery aneurysm (DFAA) with thick mural thrombus.

opening of the distal outflow vessel was closed from the inside of the aneurysm. After aneurysm decompression, the deep femoral vein was fully dilated. Pathologic examination of the aneurysm wall revealed no infected tissue. No worsening of the PE occurred during the postoperative period. A postoperative computed tomography scan demonstrated a small thrombus trapped in the IVC filter. Just as in the preoperative period, the dorsalis pedis and posterior tibial pulses were palpable, and the ankle brachial index on the left side was

normal (1.16). The IVC filter was removed, along with the trapped thrombus at 2 months postoperatively. After ultrasound confirmation of the disappearance of most of the thrombotic masses from the deep femoral vein at 6 months postoperatively, anticoagulation therapy was discontinued, with no DVT recurrence observed at the last follow-up examination.

DISCUSSION

Isolated DFAA is a rare disease, with a reported frequency of 0.5% to 2.6%² and a high lifetime rupture rate of ~30% to 45%.^{4,5} Because of the deep anatomic location, clinical symptoms, including pulsating groin swelling and pain or paralysis of the leg, are unlikely to appear, and DFAAs tend to remain undiagnosed until a catastrophic event has occurred.⁵ DFAAs are more common in men than in women. Atherosclerosis has been reported as the DFAA etiology in 82% of cases. Other typical etiologies include infection, trauma, and as a complication of cardiac catheterization.⁵ Moreover, 6% of cases have been considered related to an inflammatory disorder, such as Behçet disease.⁵ In addition, 45% to 51% of cases will be associated with other peripheral aneurysms. However, isolated cases are rare.⁵ The most common complication of DFAA is rupture, which can result in lower limb amputation. In contrast, few studies have reported DVT associated with DFAAs.^{3,4,6} The pathogenesis of DVT is considered to be venous compression by a large DFAA.

Although revascularization of the deep femoral artery is still controversial, the cornerstone of DFAA treatment is to prevent rupture and relieve venous compression. Exclusion of the DFAA by simple ligation and surgical resection were performed in the present patient. In this era of evolving endovascular treatment, transcatheter embolization and stent graft placement have been reported to treat DFAAs.⁷ According to the necessity for revascularization, surgical treatment of DFAA will sometimes be followed by graft interposition between the aneurysmal inflow and outflow using autologous saphenous vein or prosthetic material.⁸ However, anastomosis to the distal deep femoral artery is technically demanding owing to the severe atherosclerotic changes and limited surgical field. Furthermore, deep femoral artery reconstruction will not always be necessary in patients with a patent superficial femoral connection to the popliteal artery.⁶ In our patient, the aneurysm was exceedingly large and localized at the mid-portion of the deep femoral artery, and distal blood flow was maintained by the collateral arteries, even after simple ligation. In contrast, deep femoral artery reconstruction is recommended, especially for elderly patients with significant atherosclerotic changes.⁶

To prevent worsening of PE by intraoperative manipulation of the thrombosed deep vein, IVC filter placement is considered effective. Ishihara et al³ reported their clinical

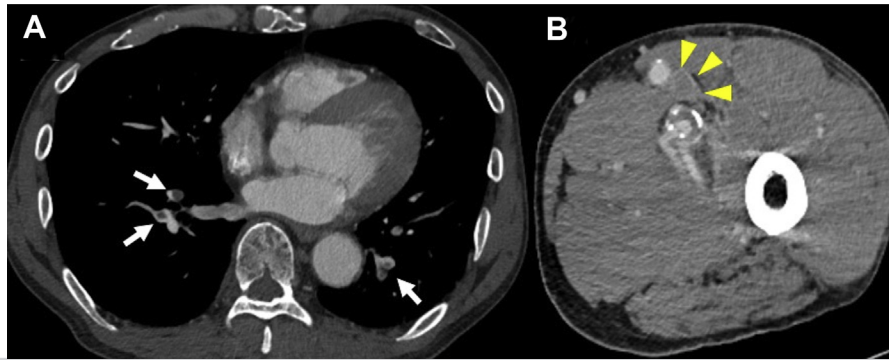


Fig 3. Preoperative computed tomography scan revealing a left deep femoral vein thrombosis (*yellow arrowhead*) and pulmonary artery embolism of the lower lobe branches of bilateral pulmonary arteries (*white arrow*).

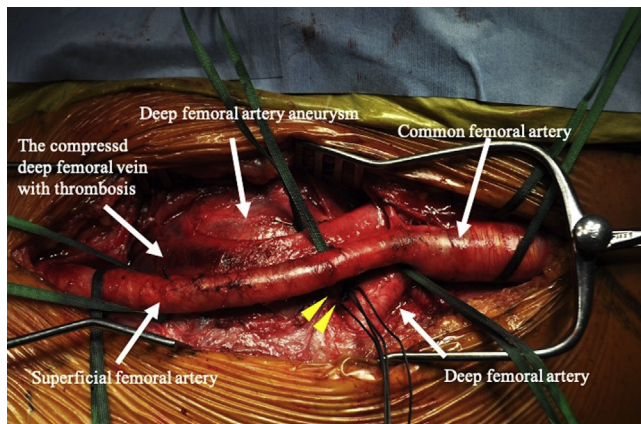


Fig 4. Intraoperative photograph showing a deep femoral artery aneurysm (DFAA) ligation at the proximal neck (*yellow arrowhead*), compression of the deep femoral vein by the aneurysm, and thrombus.

experience of nonpermanent IVC filter implantation before aneurysm repair in patients who had developed DVT owing to compression by the DFAA. Postoperative PE was not observed in any patient. Furthermore, warfarin discontinuation was achieved without thromboembolic complications after successful aneurysm repair and subsequent IVC filter removal. When performing repair of a DFAA complicated by DVT, vascular surgeons should consider, not only the optimal treatment, but also the prevention of PE and a worsening prognosis.

CONCLUSIONS

We have reported a case of open surgery to treat a DFAA. Although the surgical strategy for DFAA is still controversial, simple ligation is a useful method for patients with well-preserved collateral arteries. In addition, IVC filter implantation is worth considering in cases complicated by DVT and/or PE.

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