Staged approach for surgical management of a true femoral artery aneurysm combined with bilateral iliac artery aneurysms

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Abstract
True femoral artery aneurysm is a rare vascular entity and is often associated with aortic or peripheral aneurysms. Life-threatening complications associated with peripheral arterial aneurysms include rupture, thrombosis, and embolization. In patients with multiple aneurysms, any symptomatic aneurysms should be treated first; in asymptomatic patients, the aneurysms can be repaired either simultaneously in a single operation or serially in a staged procedure. We report a case of concomitant true femoral aneurysm and bilateral iliac artery aneurysms, which were treated with a combination of open surgical and endovascular techniques.

Keywords
Aneurysm, endovascular procedures, femoral artery/pathology/surgery, iliac aneurysm/surgery

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Introduction
Aneurysm is defined as a focal dilatation of an artery to at least 1.5 times its normal diameter. True aneurysms involve all three layers of the arterial wall.¹ True femoral artery aneurysms are uncommon and are most often seen in male patients more than 70 years old. They are often associated with additional peripheral aneurysms.² We describe what is, to our knowledge, the first reported case of true femoral artery aneurysm concomitant with bilateral iliac aneurysms that was treated with a staged surgical and endovascular approach.

Case report
A 67-year-old man who was previously healthy was admitted because of a mass in his right groin. He was asymptomatic. Physical examination revealed a palpable, pulsating mass in the right groin. There was no history of distal embolization or trauma to the groin, and distal pulses were present in the right leg.

Ultrasonographic examination of the belly and groin showed an aneurysm of the right common femoral artery and bilateral aneurysms of the common iliac arteries. Blood parameters and biochemical and coagulation profiles were all within their normal ranges. Contrast-enhanced computed tomography confirmed multiple dilatations of both common iliac arteries and the right femoral artery. In addition, the external iliac arteries were highly tortuous and small in caliber (Figure 1). The thoracoabdominal aorta and popliteal arteries were of normal diameter, but the diameter of the left common femoral artery measured 2 cm.

Informed consent was obtained from the patient. The patient was treated with a staged procedure. In the first stage, the right femoral aneurysm was repaired in open surgical fashion. Under intratracheal general anesthesia, a vertical incision was performed in the right groin to expose the aneurysm. Operative findings confirmed that the aneurysm extended from the common femoral artery to the proximal parts of the deep and superficial femoral arteries (Figure 2). Then, the patient underwent aneurysmectomy, placement of
a knitted Dacron Y graft, and reconstruction of the superficial and deep femoral arteries (Figure 3). The proximal parts of the deep and superficial femoral arteries were resected and excluded, and all nondiseased distal parts were anastomosed to the arms of the Dacron graft in an end-to-end configuration. Another, 10-mm Dacron graft was anastomosed to the body of the Y graft in an end-to-side configuration to create an access point for planned endovascular repair of the iliac aneurysms (Figure 4).

In the second-stage procedure, the bilateral iliac aneurysms were repaired with stent grafts. A stiff guide wire was used because of the tortuosity of the external arteries. Stented grafts were passed through the side branch of the Y graft. The internal iliac arteries were embolized with coils. After the endovascular repair, the side branch of the Y graft was ligated and resected. There were no intraoperative or postoperative complications. Microbiological cultures of the aneurysm wall were negative for bacterial infection.

Discussion
True femoral artery aneurysms are often associated with other peripheral aneurysms. They co-occur with multiple aneurysms in more than 50% of cases and are bilateral in 36%–72% of cases. At least a quarter to a half of all patients...
with femoral artery aneurysms have an associated abdominal aortic or iliac aneurysm.\textsuperscript{3,4} After a peripheral artery aneurysm is diagnosed, all aortoiliac, femoral, and popliteal arteries should be evaluated by imaging studies to rule out other aneurysms before treatment is planned.

Most femoral artery aneurysms are seen in association with arteriosclerosis, although they have also been reported in patients with Behçet disease, Marfan syndrome, and acromegaly.\textsuperscript{5–7} Other related risk factors are smoking, hypertension, and trauma.

At the time of initial presentation, 30\%–40\% of patients are asymptomatic, whereas 10\%–65\% have complications. Symptoms may be local, resulting from pressure on surrounding structures (e.g., leg swelling, pain, and tenderness); in addition, limb ischemia may occur as a result of distal embolization.\textsuperscript{3} Rupture is uncommon, occurring in 10\%–14\% of cases.\textsuperscript{3,4}

Cutler and Darling\textsuperscript{4} classified true femoral artery aneurysms according to their relationship to the common femoral bifurcation. Type I aneurysms involve only the common femoral artery and terminate proximal to the femoral bifurcation, whereas Type II aneurysms involve the deep femoral artery.

All symptomatic femoral aneurysms should be repaired. Available data show that most of these aneurysms remain silent even after the onset of life-threatening complications such as limb ischemia or rupture, which elevates the mortality and morbidity rates associated with such aneurysms. Therefore, although there are no reports of a strong correlation between aneurysm size and complications, repair has been recommended for all common femoral artery aneurysms with a diameter greater than 2.5 cm.\textsuperscript{8} In patients with multiple aneurysms, any symptomatic aneurysms should be treated first; in asymptomatic patients, the aneurysms can be repaired either simultaneously in a single operation or serially in a staged procedure with a combination of open surgical and endovascular techniques. If the aneurysm involves the deep femoral artery and the patient may have distal emboli, every effort should be made to maintain deep femoral artery patency through bypass grafting or reimplantation.

In this case, we focused first on the femoral aneurysm in order to prevent embolic events during endovascular repair of the iliac aneurysms. We also attempted to maintain deep femoral artery patency by reimplantation.

The literature includes only a few reported cases of the treatment of femoral artery aneurysm associated with other peripheral arterial aneurysms.\textsuperscript{6,9} As far as we can ascertain, ours is the first reported case of a true femoral artery aneurysm combined with bilateral iliac artery aneurysms, which were repaired with a staged surgical and endovascular approach.

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