

Spontaneous recanalization of a total occlusion of an infrarenal abdominal aorta after left axillary-bifemoral bypass

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ABSTRACT

Acute aortic occlusion is an infrequent clinical event with high morbidity and mortality. Management is determined by the cause of the occlusion, with thromboembolectomy used for embolic events and bypass for thrombotic events. After bypass, recanalization of a total aortic occlusion has been sparsely reported. We present a case of a total occlusion of an infrarenal abdominal aorta that was managed surgically with a left axillary-bifemoral bypass. Imaging performed 6 months postoperatively revealed a spontaneously recanalized aorta and occluded bypass graft. (J Vasc Surg Cases and Innovative Techniques 2020;6:195-8.)

Keywords: Aortic occlusion; Embolism; Thrombosis; Recanalization; Bypass

Acute aortic occlusion is a rare and emergent clinical event that is both limb and life threatening. Overall mortality in these cases can be as high as 50%.¹ Causes of aortic occlusions are embolic vs thrombotic, including saddle emboli to the aortic bifurcation, thrombosis of an atherosclerotic aorta, occlusion of an aortic aneurysm, and occlusion of an abdominal aortic endograft.²⁻⁴ Spontaneous recanalization of total aortic occlusions has been rarely reported, only previously witnessed in the case of an occlusion secondary to type B dissection and in the resolution of an intramural hematoma (IMH) after axillary-bifemoral bypass.^{5,6} We describe a case of a total occlusion of an infrarenal abdominal aorta, of indeterminate etiology, managed with a left axillary-bifemoral bypass and left femoral-popliteal Fogarty thrombectomy. Subsequent workup during an admission 6 months postoperatively revealed a patent abdominal aorta and occluded bypass graft. The patient's consent for publication was obtained.

CASE REPORT

A 65-year-old woman with a history of paroxysmal atrial fibrillation, compliant on apixaban, former smoking, diabetes, hypertension, obesity, bilateral breast cancer with bone metastases

status post bilateral mastectomy and irradiation to right breast, and right-sided middle cerebral artery ischemic stroke, likely cardiac related, presented in April 2019 with complaints of bilateral lower extremity pain, worse in the left leg. She presented within 24 hours of onset of symptoms and was diagnosed with acute limb ischemia (ALI), Rutherford class IIb on the left and Rutherford class IIa on the right. Intravenous heparin was started, and a computed tomography (CT) angiogram was obtained. The CT angiogram revealed a total occlusion of the infrarenal abdominal aorta with distal reconstitution at the level of the bifurcation of the internal and external iliac arteries bilaterally and occlusion of the left popliteal artery with no runoff to the left foot (Figs 1 and 2).

Because of the presence of heavy atherosclerotic plaque in the aorta, it was unclear whether the occlusion was embolic or thrombotic. The decision was made to proceed with immediate surgical revascularization. Given the patient's previous breast cancer interventions, we pursued bypass through the left axillary artery rather than the right. She underwent left axillary-bifemoral bypass using an 8-mm polytetrafluoroethylene graft with left femoral-popliteal Fogarty thrombectomy. Completion angiography demonstrated a patent bypass with good outflow. Doppler signals were confirmed.

The patient tolerated the procedure well. Creatine kinase concentration was monitored postoperatively. The patient did not develop compartment syndrome, receive hemodialysis, or require reintervention. Hospital course was complicated by refractory atrial fibrillation, acute kidney injury in the setting of hypovolemia and rhabdomyolysis, and hematoma. In addition, the patient was transitioned to argatroban on postoperative day 5 because of concerns of heparin-induced thrombocytopenia, which was ruled out on workup. Echocardiography showed no intracardiac thrombus. The patient was discharged on apixaban to a subacute rehabilitation facility 2 weeks after admission.

In October 2019, the patient presented with right lower extremity pain, swelling, and bilateral cool lower extremities. She was diagnosed with ALI, Rutherford class IIa bilaterally. CT scan showed a patent abdominal aorta with calcified atherosclerosis

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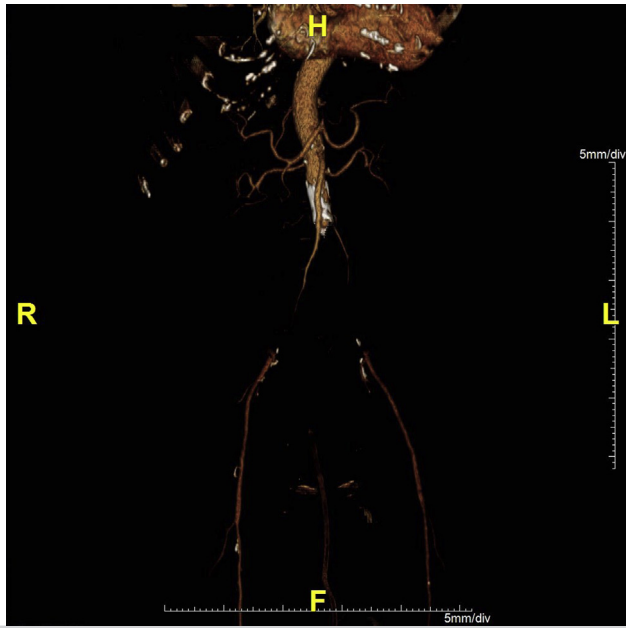


Fig 1. Anterior-posterior view of three-dimensional reconstruction of the total occlusion of the infrarenal abdominal aorta with reconstitution at the external and internal iliac bifurcations.

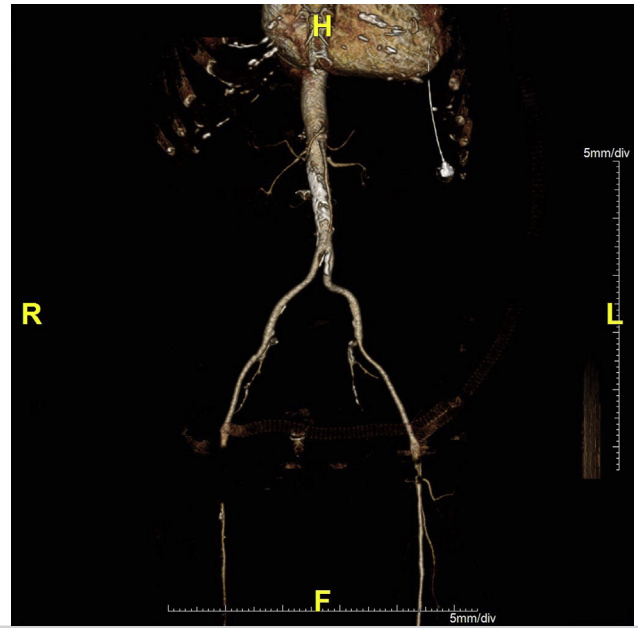


Fig 3. Anterior-posterior view of three-dimensional reconstruction of the spontaneously recanalized infrarenal abdominal aorta after left axillary-bifemoral bypass with occlusion of the femoral-femoral bypass graft, left common femoral artery, right common femoral artery, and right superficial femoral artery (SFA).

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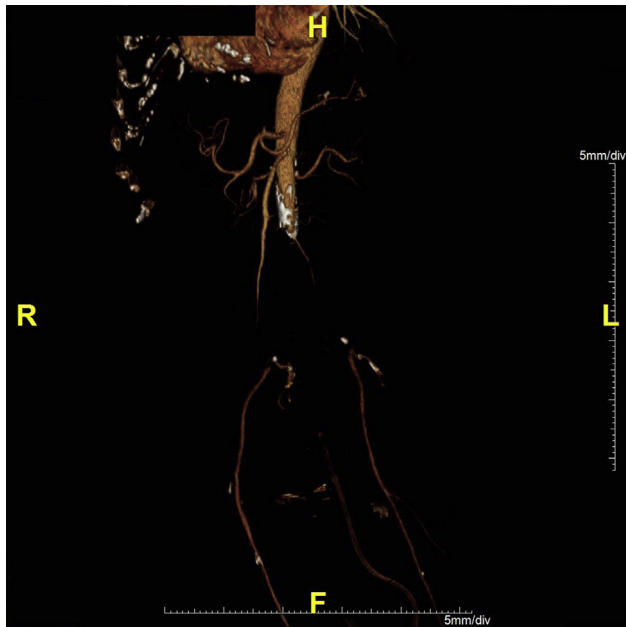


Fig 2. Left anterior oblique view of three-dimensional reconstruction of the total occlusion of the infrarenal abdominal aorta with reconstitution at the external and internal iliac bifurcations.

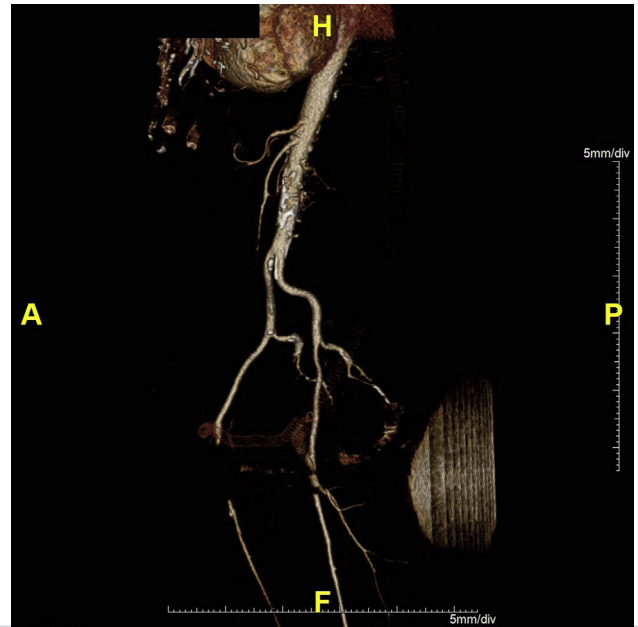


Fig 4. Left anterior oblique view of three-dimensional reconstruction of the spontaneously recanalized infrarenal abdominal aorta after left axillary-bifemoral bypass with occlusion of the femoral-femoral bypass graft, left common femoral artery, right common femoral artery, and right superficial femoral artery (SFA).

(Fig 3). Visceral branches and external and internal iliac arteries bilaterally were patent. CT displayed occlusion of the femoral-femoral bypass graft, left common femoral artery, right common femoral artery, and superficial femoral artery (SFA; Fig 4). The patient underwent bilateral femoral cutdown with bilateral Fogarty embolectomy, with clot removed from the

femoral-femoral graft, left SFA, right SFA, and right popliteal artery with bilateral lower extremity angiography. The residual femoral-femoral bypass graft was suture ligated and left in the

patient. No stents were placed. The patient tolerated the procedure, without postoperative complications, and underwent a hypercoagulable workup that was negative. She was discharged days after the procedure.

DISCUSSION

Spontaneous recanalization of an acute total aortic occlusion is a unique occurrence. A previous study witnessed an occlusion secondary to type B dissection in a patient who refused surgical intervention, which spontaneously recanalized 5 days after presentation.⁵ A second case noted an IMH that was treated with axillary-bifemoral bypass; imaging 6 months postoperatively revealed regression of the IMH and bypass graft thrombosis.⁶ The mechanism of aortic occlusion in both cases is different from that in the patient we describe. Our case is one of the first describing an aortic occlusion of embolic vs thrombotic origin that spontaneously recanalized after extra-anatomic bypass. We propose that after native vessel recanalization, competitive flow to the aorta resulted in occlusion of the bypass graft.

Competitive flow is a principal contributor to graft occlusion. This has been recorded in internal thoracic artery grafts used in coronary artery bypass procedures,^{7,8} with saphenous vein grafts demonstrating reduced occlusion risk.⁹ Competitive flow has also been recorded in femoro-femoral bypass and aortobifemoral bypass graft occlusion.¹⁰ Risk factors for graft occlusion include the smaller diameter inflow vessel, angled anastomoses, and use of prosthetic grafts.^{10,11}

At initial presentation, it was unclear whether the aortic occlusion was embolic or thrombotic. Thromboembolism is a known complication of atrial fibrillation, with annual incidence of AII estimated at 0.4%. Early diagnosis and intervention improve outcomes.¹² Intervention for saddle emboli includes retrograde balloon catheter embolectomy.¹³ Thrombolysis can be considered for embolic disease in AII, Rutherford class I or class IIa.¹⁴ However, the mechanism of aortic occlusion has trended toward thrombotic events, decreasing from 50% to 68% embolic in the 1990s^{3,13,15} to 7% embolic, 17% indeterminate, and 76% thrombotic in 2013.² Improved anticoagulation for atrial fibrillation¹⁶ has possibly decreased the incidence of embolic aortic occlusions.

Given the plaque at the aortic bifurcation, the lack of intracardiac thrombus on echocardiography, and the patient's pre-existing management of atrial fibrillation with rate control and compliance with apixaban, thrombotic occlusion was likely. Consequently, we pursued bypass for urgent revascularization. Surgical management of thrombotic occlusion is either direct reconstruction with an aortobifemoral bypass or extra-anatomic with axillary-bifemoral bypass.¹⁷ The use of extra-anatomic grafts is advantageous for patients determined to be at high risk for aortobifemoral bypass,¹⁸ and patency rates for patients undergoing axillary-bifemoral

bypass have improved to >70% at 5 years, closer to the patency rates of direct reconstruction, which exceed 80%.¹⁹ Given our patient's morbid obesity, risk of retroperitoneal bleeding with apixaban, and preference to promptly resume atrial fibrillation anticoagulation, she was a poor candidate for direct reconstruction. We chose axillary-bifemoral bypass as a safer and more rapid method of revascularization.

Based on the clinical course, we believe the initial aortic occlusion was embolic in origin. After bypass, the thrombus underwent autolysis, which resulted in recanalization of the native aorta and vessels. This created a scenario of competitive flow to native vasculature that resulted in the occlusion of the bypass graft. Autolysis of clot through endothelium-mediated release of fibrinolytic agents, including tissue-type plasminogen activator, is well known.²⁰ This mechanism has been described in the venous system after deep venous thrombosis and pulmonary embolism²¹ but in our case occurred in the arterial vasculature. The patient's anticoagulation could have improved the rate of recanalization²² of the occlusion, given enhanced endogenous fibrinolysis observed in patients with atrial fibrillation taking apixaban.²³ Bilateral femoral cutdown with embolectomy may have been a reasonable approach had the embolic nature of the aortic occlusion been identified at initial presentation.

CONCLUSIONS

This case represents a unique recanalization of a complete aortic occlusion after left axillary-bifemoral bypass and subsequent occlusion of the bypass graft due to competitive flow.

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