Late Lower Extremity Ischemia due to Thrombi in an Occluded Graft after Axillary-Femoral Artery Bypass

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We experienced a rare case of acute ischemia of the lower extremity due to embolism caused by an occluded prosthetic graft late after axillary-femoral artery bypass. A 67-year-old woman developed acute right lower extremity ischemia 7 years after axillary-femoral artery bypass, which had been performed for lower limb ischemia as a complication of acute aortic dissection (Stanford B). The graft was occluded, and the native vessel had re-canalized by the time of the present admission. She was successfully treated by disconnection of the graft followed by revascularization.

Keywords: axillary-femoral bypass, lower extremity ischemia, complication

INTRODUCTION

Axillary-femoral (ax-fem) artery bypass has been utilized in high-risk patients mainly with abdominal and iliac artery obstructive lesions because it is less invasive compared with an open abdominal approach. However, ax-fem artery bypass grafts are associated with a variety of upper extremity complications. Acute upper extremity embolism, steal syndrome and nerve damage are just a few of the reported complications specific to ax-fem bypass, with only sporadic reports of upper extremity embolism. We experienced a case of late embolism of the lower extremity rather than the upper extremity 4 years after ax-fem bypass occlusion. Graft disconnection from the native circulation and embolectomy were curative. The coexistence of an occluded graft and native circulation could carry a risk of late peripheral thromboembolism. Although unusual, this possibility must be kept in mind when assessing patients with peripheral embolization after known graft thrombosis.

CASE REPORT

A 67-year-old woman was referred to our hospital with severe pain in the right lower extremity. She underwent abdominal aortic replacement with a straight graft for a ruptured abdominal aortic aneurysm 10 years prior to the present admission. Three years later, she experienced acute aortic dissection (Stanford type B), leading to acute abdominal aortic obstruction just above the aortic conduit. Because the patient had bilateral lower extremity ischemia, a right axillary-bilateral femoral (ax-fem) artery bypass was performed with an 8-mm expanded polytetrafluoroethylene (PTFE) graft.

Two years after her bypass, computerized tomography (CT) revealed that the abdominal aorta had re-canalized, and the prosthetic graft to the right femoral artery remained patent while the left femoral artery was obstructed (Fig. 1). One year later, the patient experienced acute right lower extremity ischemia. CT showed thrombosis of the popliteal artery below the knee, which subsequently resolved with thrombolysis. At that time, CT also revealed occlusion of the right ax-fem graft, and good blood flow to the lower extremity arteries through

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imaging (MRI) revealed obstruction of the right popliteal and the right deep femoral artery (Fig. 2A). Because her symptoms were mild, the patient was treated with medical therapy using argatroban and prostaglandin E1 (PGE1). Her symptoms began to resolve with anticoagulant treatment, but 6 days later she was in worse pain, with a mottled and clearly ischemic limb. Therefore, emergency surgery was performed. An embolectomy of the popliteal artery was performed; however, there was no palpable pulse in the peripheral artery after embolectomy. Thus, her lower extremity blood flow was determined to be insufficient, and a popliteal-posterior tibial artery bypass with the greater saphenous vein was needed. She did well after the procedure and had a palpable pulse. However, on the 5th postoperative day, she again began experiencing pain at rest with pallor in the right lower extremity, prompting another MRI (Fig. 2B). The MRI showed a new embolism not observed previously at the origin of the superficial femoral artery (SFA).

the abdominal aorta and iliac arteries. The patient was free of lower extremity symptoms for the next 4 years.

The patient suddenly developed severe recurrent pain in the right lower extremity one day before the present admission. Although the arterial pulse of the right popliteal artery was palpable, pulses in the dorsal pedis and posterior tibial arteries were absent. Her right foot was cool compared with the left, and she had some difficulty with movement. The ankle-brachial index (ABI) value was low (0.45; normal range 0.9–1.3).

Electrocardiography showed normal sinus rhythm, with no evidence of cardiogenic embolism or other causes of embolic disorders by echocardiography, enhanced CT and appropriate blood tests. Magnetic resonance imaging (MRI) revealed obstruction of the right popliteal artery and the right deep femoral artery (Fig. 2A). Because her symptoms were mild, the patient was treated with medical therapy using argatroban and prostaglandin E1 (PGE1). Her symptoms began to resolve with anticoagulant treatment, but 6 days later she was in worse pain, with a mottled and clearly ischemic limb. Therefore, emergency surgery was performed. An embolectomy of the popliteal artery was performed; however, there was no palpable pulse in the peripheral artery after embolectomy. Thus, her lower extremity blood flow was determined to be insufficient, and a popliteal-posterior tibial artery bypass with the greater saphenous vein was needed. She did well after the procedure and had a palpable pulse. However, on the 5th postoperative day, she again began experiencing pain at rest with pallor in the right lower extremity, prompting another MRI (Fig. 2B). The MRI showed a new embolism not observed previously at the origin of the superficial femoral artery (SFA). Embolism from a descending thoracic aortic dissection

Fig. 1  CT revealed that the abdominal aorta had re-canalized and the prosthetic graft to the right femoral artery remained patent, while the left femoral artery was obstructed.

Fig. 2  (A) MRI obtained on admission reveals obstruction of the right popliteal and deep femoral arteries (arrows). (B) MRI obtained during an acute exacerbation of the thromboembolic condition shows embolism not previously observed at the origin of the superficial femoral artery (arrow).
and cardiogenic embolism were unlikely. The embolism was judged to be due to thrombus in her prosthetic graft, necessitating another emergency operation. Her groin was incised, and her previous graft was excised. Graft thrombosis was projected into the common femoral artery, likely causing this embolism. An embolectomy of the SFA and the popliteal artery was performed with a Fogarty embolectomy catheter, and the common femoral artery was repaired. Postoperative MRI showed a patent SFA and a smaller embolic lesion in the popliteal artery (Fig. 3). The ABI value rose to 1.10, and there was no right lower extremity ischemia. The patient was discharged from the hospital. There have been no further embolic events involving the right lower extremity after graft disconnection. The patient has been followed up for five years after surgery.

**Discussion**

Ax-fem artery bypass has been widely used in the treatment of high-risk patients with abdominal and iliac artery obstructive lesions since it was first reported by Blaisdell, et al. in 1963. As more extra-anatomic operations have been performed, more complications have been noted. Complications specific to the operative method include those related to axillary arteries providing blood flow, such as perioperative brachial artery embolism, steal syndrome and nerve damage. There have also been reports of rare cases of late embolism below the axillary arteries.

We experienced a rare case of acute ischemia of the lower extremity due to embolism caused by an occluded prosthetic graft late after ax-fem artery bypass. There have been no reports to date of lower extremity peripheral arterial embolism originating from thrombi in the graft after ax-fem bypass. Thus, to our knowledge, this is the first report of such an embolic process. Once occluded, these grafts are considered to be inert entities that are left in place owing to a higher morbidity as a result of explantation unless they are infected. However, the occluded grafts, although generally innocuous, can be a source of peripheral emboli, resulting in peripheral embolization and acute limb ischemia. In the present patient, the abdominal aorta, which had been obstructed by acute aortic dissection, had re-canalized. A bypassed arterial segment without an obstructive lesion is often seen in emergency scenarios similar to that observed in our patient with acute dissection. As with the present case, thrombus in the ax-fem graft could embolize to the lower leg arteries.

In the present case, it was not possible to identify the condition of the occluded grafts that resulted in late embolism, and whether these emboli originated from the proximal or distal anastomosis. However, lower as well as upper extremity arteries, even without recipient vessel deformation, are exposed to the threat of embolism by the co-existence of occluded grafts and a patent native circulation. Therefore, embolism in the peripheral portion of the femoral artery can be regarded as a complication that should be kept in mind during an acute exacerbation of lower extremity ischemia in patients with occlusion of the graft after ax-fem bypass.

Favorable operative results, in terms of the axillary arteries, were obtained with thrombus removal and surgical disconnection of the prosthetic graft. McLafferty, et al. and Mawatari, et al. recommended routine
disconnection of such grafts because of the high risk of embolization to the distal arterial tree.\textsuperscript{7,8} Recently, good results of endovascular treatment to occlude the graft stump with a covered stent have been reported.\textsuperscript{9} However, anastomotic sites of lower extremity arteries of ax-fem bypass are usually in the common femoral artery, and surgical disconnection is considered to be the first treatment choice.

In our patient, treatments such as thrombolysis and thrombus removal were time-consuming because early recognition of thromboembolism originating from the graft thrombus was difficult. Fortunately, the present patient did not experience tissue necrosis nor was lower extremity amputation required. However, this case does provide an important reminder that if embolism occurs in the periphery of a known occluded prosthetic graft, graft disconnection should be considered.

**Conclusions**

We experienced a rare case of late lower extremity arterial embolism originating from a thrombosed ax-fem bypass.

If acute lower extremity ischemia occurs in the presence of an occluded prosthetic graft and native circulation exists after an ax-fem bypass, thromboembolism from the graft should be considered, and the prosthetic graft should be promptly disconnected from the native circulation in those patients.

**Disclosure Statement**

Yamato Tamura and other co-authors have no relevant or other potential conflicts of interest.

**References**


