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Case Report

Left Subclavian Artery Occlusion: Femoro-Axillary Artery Retrograde Bypass

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The treatment tactics for subclavian artery occlusion include the more commonly used endovascular therapy rather than surgical intervention. We present a case of a 61-year-old woman with dialysis-dependent chronic renal failure who experienced left finger necrosis in the left upper extremity. To salvage the limb, we performed femoro-axillary (fem-ax) artery bypass using an autologous saphenous vein graft. However, 10 months later, she experienced coldness in the left forearm. Angiography revealed chronic total occlusion of the venous bypass. Despite emergent thrombectomy, redo fem-ax artery bypass operation was performed using a prosthetic graft. Upper limb salvage can be achieved by fem-ax artery retrograde bypass.

Key Words: Subclavian artery occlusion, Artery bypass, Upper limb salvage

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INTRODUCTION

Subclavian artery (SCA) occlusion is not so rare. Although SCA occlusion results in insufficient blood flow, it is mostly observed without any symptoms. The therapeutic treatments include angioplasty and stent insertion into the SCA to treat stenosis and occlusion. However if these interventions are not feasible, surgical options must be considered. We performed femoro-axillary (fem-ax) retrograde arterial bypass to prevent left finger necrosis. This report discusses the relationship between endovascular therapy and surgical procedure for upper limb ischemia resulting from left SCA occlusion.

CASE

A 61-year-old woman with dialysis-dependent renal failure experienced coldness in her left upper extremity with left finger pain. Two years earlier, she underwent aortic valve reconstruction and coronary artery bypass graft (CABG) with a right great saphenous vein (GSV) graft. Native vascular access (arteriovenous fistula) had been constructed on the left forearm.

Angiography revealed total left SCA occlusion and more than 75% stenosis of the left common iliac artery (CIA) (Fig. 1). Ankle brachial index (ABI) was 0.86 on the right and 0.68 on the left. Doppler ultrasound of the carotid artery showed severe calcification and increased intramedial thickness in the bulb region. She was diagnosed as having left SCA occlusion and arteriosclerosis obliterans.

First endovascular treatment was utilized to revascularize the left upper extremity. Endovascular methods to target the lesion of the left SCA were attempted, but the catheter and guide wire could not pass through the orifice of the SCA occlusive lesion (30 mm length of SCA). Unfortunately 1 month later, septic shock caused by Methicillin-resistant Staphylococcus aureus infection of the GSV necessitated amputation of the right leg, above the right knee, to remove the necrotic tissue and source of infection. Following amputation, angiography showed 75% stenosis

Fig. 1. Preoperative aortic angiography shows the left subclavian artery occlusion.

of the left CIA, and thus a self-expandable nitinol stent was inserted into the left CIA. Although post-stenting ABI changed from 0.68 to 0.81 in the left lower extremity, the left finger necrosis gradually worsened (Fig. 2). Considering the possibility of arteriovenous graft hemodialysis shunt reconstruction for the contralateral right upper extremity, and the presence of ipsilateral carotid arterial calcification and sclerosis, we selected the fem-ax artery retrograde bypass operation. Under general anesthesia, we successfully performed a left femoral to left axillary artery bypass. To accomplish successful bypass, we utilized the left GSV free-graft through a covered 6 mm ringed expanded polytetrafluoroethylene (ePTFE). (Fig. 3A). Ten months later, coldness recurred in the left arm and angiography revealed chronic total occlusion of the GSV bypass. This was caused by thrombotic occlusion of the GSV graft. Thrombectomy did not cause reperfusion of the artery. To salvage the left upper limb, fem-ax bypass was performed using a prosthetic graft. In order to bypass the right femoral artery to the left axillary artery bypass, we used an 8 mm polytetrafluoroethylene graft (Gelsoft, knitted; Terumo, Tokyo, Japan). Postoperative blood pressure was 158/72 and 146/62 mmHg, respectively in the right and left arms. After the second bypass surgery, ABI was 0.91 on left lower extremity. Postoperatively, finger necrosis was completely cured. Follow-up angiography revealed sufficient arterial flow through the prosthetic graft (Fig. 3B).

Salvage of the upper limb affected by SCA occlusion was successful through the use of a fem-ax artery retrograde bypass. As the patient's course was favorable, she remained free of any symptoms 3 years after the last operation.

Fig. 2. Left index, middle finger necrosis.

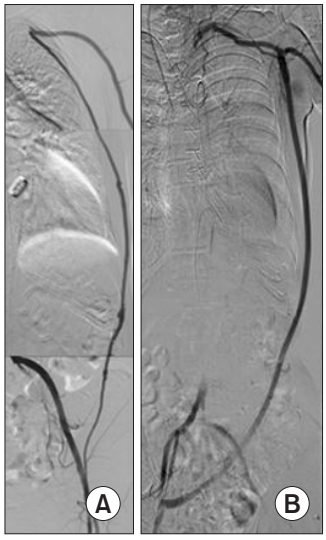

Fig. 3. Postoperative angiography. (A) In the first stage, left femoro-axillary artery bypass using a great saphenous vein graft covered with expanded polytetrafluoroethylene (ePTFE). (B) In the final stage, right femoro-axillary artery bypass with ePTFE graft.

DISCUSSION

SCA occlusion causes insufficient blood flow with various symptoms such as vertigo, arm weakness or numbness. We often encounter non-cardiac symptoms occur prior to other systematic problems such as the blood pressure differences of more than 20 mmHg between each arm. Endovascular treatment is the first therapeutic option for SCA occlusive lesions, and generally provides positive results [1-3]. For patients requiring revascularization for left upper limb ischemia, intervention with contemporary endovascular devices for SCA occlusion is used. In this case, many underlying diseases prevented surgical reconstruction. However this treatment strategy should be

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tailored based on the patient by considering several factors including but not limited to age, daily activity and primary illness. This is important as recent reports have described that 6% to 12% of cases develop restenosis after SCA percutaneous angioplasty and stenting [1-4]. Although long-term consequences are unknown, recent studies have described stent grafts with the development of higher quality stents and enhanced operator techniques.

Curative measures often require surgical interventions; aorto-axillary, carotid-axillary, and bilateral SCA or bilateral axillary crossover arterial bypass. Axillary-femoral artery bypass has been usually selected in the treatment of high-risk patients with abdominal and iliac artery obstruction since it was first reported by Blaisdell and Hall in 1963 [5]. Extra-anatomical bypass is essential for various patients with infectious aorta, prosthetic arterial graft, and dissection or aorto-enteric fistulae. However, satisfactory peripheral perfusion and freedom from restenosis/occlusion are difficult to achieve after bypass. We chose an extra-anatomical bypass, despite the risk of a calcified carotid artery lesion, with expectations of a good long-term bypass graft patency. The patient also had the possibility of a secondary vascular access reconstruction in the contralateral upper limb because of regular hemodialysis dysfunction, and we also considered the risk of coronary steal syndrome post CABG [6,7]. The surgical procedure and approach should depend on the primary illness and anatomical location of the occlusion. Considering postoperative bypass patency, we first selected an autologous reverse GSV bypass graft, tapered with a PTFE graft. However, the small vessel size of the GSV could not allow sufficient blood flow for upper limb salvage, thus, we performed surgical revascularization with a prosthetic graft.

Fem-ax retrograde arterial bypass may be a valuable to salvage left finger necrosis when endovascular treatment is not available. Additionally, for successful arterial bypass reconstruction, it is essential to consider both bypass route and graft type.

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