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CASE REPORT

Endovascular Treatment for Infra-inguinal Autologous Saphenous Vein Graft Occlusion Using Self Expanding Nitinol Stents

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Introduction: For patients with infra-inguinal autologous vein bypass graft occlusion, conventional open surgical repair or endovascular treatment (EVT) for native vessel occlusion have generally been performed.
Report: A 73 year old female with non-healing ulcer and gangrene of the left lower leg was diagnosed as having infra-inguinal autologous saphenous vein graft occlusion. In this case, surgical repair such as patch angioplasty, interposition graft, or replacement graft did not seem promising because of repeated previous infection in the polytetrafluoroethylene (PTFE) vascular prosthesis and absence of available autologous vein due to past surgery. Moreover, there was no chance of crossing the native vessel, since the proximal superficial femoral artery (SFA) had already been resected. Thus, EVT was performed for the occluded autologous vein graft, implanting multiple self expanding bare nitinol stents throughout the vein graft achieving complete revascularization, good medium term patency, and dramatically improved wound healing.
Conclusion: Endovascular recanalization using multiple bare stents could be an alternative treatment for infra-inguinal autologous vein graft occlusion.

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INTRODUCTION

For cases of infra-inguinal autologous vein bypass graft stenosis and occlusion, conventional surgical repair such as vein patch angioplasty, interposition grafting, or jump grafting have generally been performed.[1,2] Recent advances in endovascular devices and techniques have gradually enabled endovascular treatment (EVT) as a feasible alternative for native vessel occlusion or critical vein graft stenosis.[3] However, there are few reports demonstrating the utility of endovascular revascularization for occluded vein grafts.[4] Moreover, there are just a few previous reports of stenting vein grafts,[5,6] and no articles reporting full lining of the vein graft with stents. Here, a rare case of a patient with infra-inguinal autologous vein graft occlusion who underwent successful endovascular recanalization implanting multiple self expanding bare nitinol stents throughout the vein graft with good medium-term patency is reported.

CASE REPORT

A 73 year-old female with a 15 year history of hemodialysis presented with infection of the polytetrafluoroethylene (PTFE) vascular access between the left superficial femoral artery (SFA) and the left common femoral vein (CFV). Resection of the infected graft and subsequent venous patch closure of the anastomoses was performed. Subsequently she experienced repeated pseudo-aneurysm ruptures, and underwent partial proximal SFA resection and bypass grafting using autologous saphenous vein between the common femoral artery (CFA) and the mid-SFA. Periodic graft surveillance using ultrasound detected vein graft occlusion 6 months after the operation. She was referred for treatment of her non-healing left leg ulcer 12 months after the bypass. There was gangrene of the left second toe, and an ulcer in the left lower leg overlying the fibula (Fig. 1A and B).

For diagnosis and intervention a 6F low profile sheathless guiding catheter (Parent Plus, Medikit, Lincol, UK) was inserted in the contralateral right common femoral artery. Angiography identified the resected proximal SFA and complete occlusions in the bypass graft and mid-SFA (Fig. 1E and F). The distal SFA flow was supplied by collaterals from the deep femoral artery (DFA), which appeared to be insufficient to heal the wounds. In this case, surgical repair did not seem promising, because of repeated previous infection of the PTFE vascular prosthesis and absence of an available autologous vein because of past surgery. Moreover, there was no chance of crossing the native vessel, since the proximal SFA had already been resected. Thus, it was concluded that EVT might be the only

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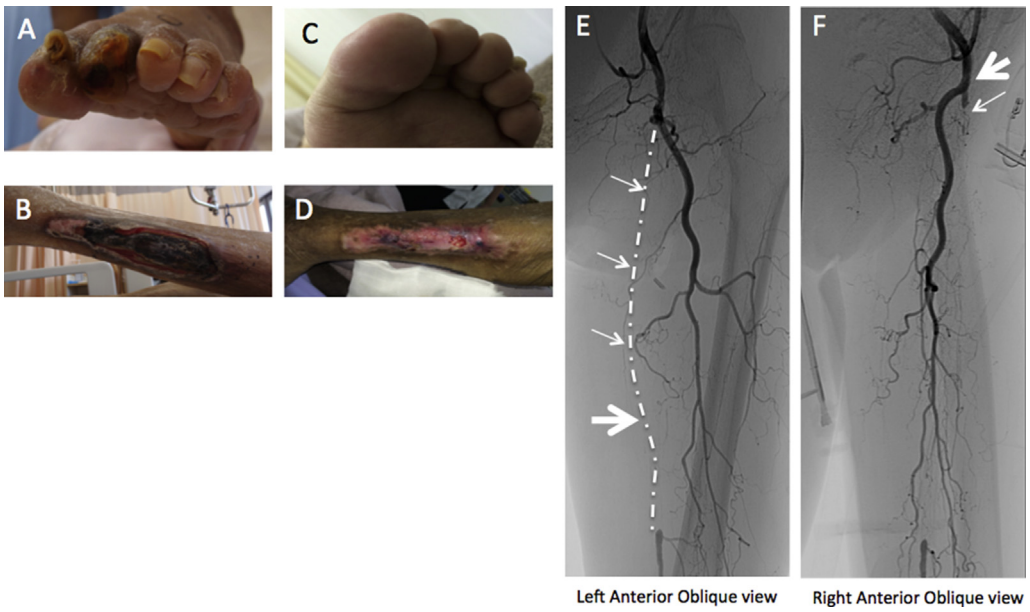

Figure 1. (A,B) Non-healing gangrene of the left second toe, and an ulcer in the left lower leg overlying the fibula, after occlusion of the infra-inguinal autologous saphenous vein graft. (C,D) The ulcer and gangrene have gradually healed after endovascular treatment. (E) Baseline angiography showed occlusion of the common femoral to mid superficial femoral artery (SFA) bypass graft (small arrow) and the distal arterial anastomosis in mid SFA (large arrow). (F) The small arrow indicates occlusion of the native SFA, and the large arrow indicates the proximal arterial anastomosis.

treatment for revascularization of the occluded autologous vein graft. A 4F intramuscular catheter, almost right angled at the tip, was used to engage the bypass graft ostium, and a 0.014 in soft hydrophilic guidewire (Chevalier Floppy, Cordis, Fremont, CA) supported by a microcatheter (Prominent, Tokai Medical Products, Kasugai, Japan) was advanced via the graft into the mid-distal SFA occlusion (Fig. 2A). Then, a 0.014 in stiff guidewire (Athlete Ruby Hard, Kaneka, Osaka, Japan) with a microcatheter that had a curved tip (CXI, 2.6F angle, Cook Medical, Bloomington, IN) successfully retrogradely penetrated the distal cap of the distal obstructed SFA lesion using multi-directional angiography (Fig. 2B). The guidewire was advanced intraluminally. Intravascular ultrasound (IVUS) showed vein graft shrinkage with no evidence of thrombus formation (Fig. 2C). The whole length of the occlusion was dilated with a balloon catheter (3.0 × 150 mm) (Fig. 2D), and then three self expanding nitinol stents (SMART, 6 × 80 mm, 6 × 100 mm, 6 × 150 mm, Cordis) were consecutively implanted from the distal SFA to the distal CFA throughout the vein graft (Fig. 2E). These stents were subsequently post-dilated with a balloon catheter (4.0 × 150 mm). The final angiogram showed excellent recanalization of the bypass graft without distal embolization (Fig. 2F). After the revascularization, peripheral angiography and duplex ultrasonography identified sufficient expansion of the nitinol stents, and the left ankle brachial index increased from 0.55 to 1.13. The ulcer and gangrene gradually healed with the assistance of intensive wound care, and the treated vessel has remained patent with no further intervention for 15 months (Fig. 1C and D).

DISCUSSION

Previous studies have reported that endovascular revascularization of critical infra-inguinal vein graft stenosis appeared to be safe and associated with acceptable early and medium-term patency rates, which were equivalent to open surgical repair.[3,7,8] In contrast, there have been very few studies that demonstrate the utility of endovascular therapy for occluded vein bypass grafts, which might lead to thrombus embolization.[4] In this case, given the IVUS images of vein graft shrinkage with no evidence of thrombus formation, the endovascular procedure was performed without distal protection. In cases with a high risk of distal embolization, distal protection devices might be considered.

It is also notable that self expanding bare nitinol stents were implanted throughout the vein graft. The clinical usefulness of stenting in infra-inguinal vein grafts is not yet established, and its safety and efficacy remain unclear. The bailout use of stents has chiefly been reported when balloon angioplasty fails. Mathur et al.[5] reviewed 18 implantations of bare and covered stents in infra-inguinal vein grafts after failure of EVT for treating graft stenosis, and reported a high overall technical success rate and primary patency rate at 1 year. Primary stenting for vein grafts used in the peripheral circulation has also been reported. Controneo et al.[6] described primary stent placement at the distal anastomotic stenosis in 21 patients and reported primary, assisted primary, and secondary patency rates at 1 year of 71%, 81%, and 86% respectively. In the present case, it was predicted that the residual stenosis in the arterial outflow including the mid-distal SFA, as well as severe shrinkage of the vein graft, might lead to insufficient flow