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Case Report

Combined Direct Endarterectomy and Fogarty Thrombectomy with Endovascular Therapy for Subacute Occlusion of the Superficial Femoral Artery

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A 78-year-old woman with a prior history of a right femoropopliteal bypass 5 years before and a coronary artery bypass graft 3 months before was admitted for a non-healing ulcer on her right foot. A computed tomography angiogram revealed occlusion of her superficial femoral artery (SFA) from its orifice to the anastomotic site of the bypass graft. The lesion was thought to consist of a partial atherosclerotic plaque with a large number of relatively fresh thrombi, referring to an angiogram of her lower extremity 3 months ago. We recanalized the occlusive SFA by Fogarty thrombectomy, and endovascular therapy preceded by direct SFA endarterectomy.

Keywords: subacute limb ischemia, endarterectomy, endovascular therapy

Introduction

The onset of a lower extremity artery thromboembolism is sometimes unclear because the symptoms are relatively vague due to preserved collateral vessel flows that are usually coexistent in such lesions, and the delayed diagnosis leads to organization of the thrombi. Generally, the underlying atherosclerotic status of the occluded vessel is unknown; therefore, various revascularization techniques, such as bypass grafting, Fogarty thrombectomy, catheter directed thrombolysis (CDT), endovascular therapy (EVT), and a hybrid of these techniques are the preferred therapeutic options.[1–4] What is crucial is the proper choice of these techniques. We report a combination of revascularization techniques for the subacute thromboembolic occlusions of the lower limbs when prior angiography was available.

Case Report

A 78-year-old woman, who had undergone a right femoropopliteal saphenous vein (SV) bypass 5 years ago, underwent a coronary artery bypass graft (CABG) 3 months ago because of ischemic cardiomyopathy. An angiogram of the lower extremity arteries at the time of diagnostic catheterization, before CABG, showed severe stenosis of the right proximal superficial femoral artery (SFA) (**Fig. 1A**, arrow) and a patent vein bypass graft from the distal SFA to the popliteal artery (POPA) (**Fig. 1A**, arrowheads). The distal POPA, anterior tibial artery, and posterior tibial artery were occluded, but the proximal site of the peroneal artery was patent-filled by collateral perfusion. Her ankle blood pressure index (ABI) was unmeasurable, but she preferred conservative management because she did not have leg symptoms at the time. Three months later, she developed a non-healing ulcer on her right foot. A computed tomography angiogram (CTA) revealed occlusion of her right native part of SFA from its orifice to the anastomotic site of the SV bypass graft (**Fig. 1B**, *). Therefore, the occluded SFA was thought to consist of a partial atherosclerotic plaque with a large number of relatively fresh thrombi. We planned to perform revascularization using a combination of techniques (direct endarterectomy of the SFA and Fogarty thrombectomy with EVT) in the hybrid

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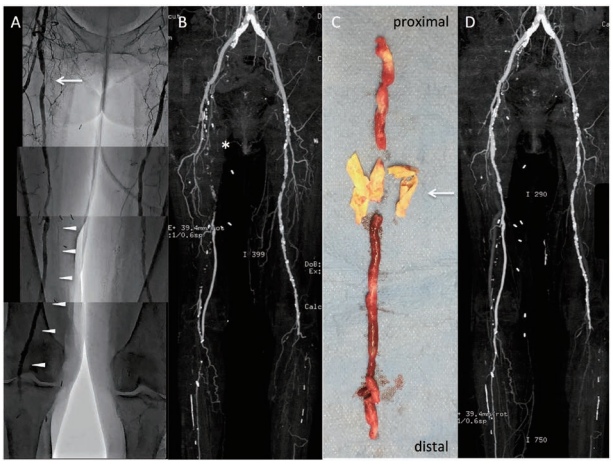

Fig. 1 (**A**) Angiography of lower extremity 3 months ago revealed short segment stenosis in the proximal SFA (arrow), and a patent vein graft from the distal SFA to the POPA (arrowheads). The distal POPA, anterior tibial artery, and posterior tibial artery were occluded but proximal site of the peroneal artery was patent-filled by collateral perfusion. (**B**) Computed tomography angiography showed occlusion of SFA from its orifice (*). (**C**) Gross appearance of extracted atherosclerotic lesion (arrow) and occluded bidirectional thrombi. (**D**) One-week follow-up CTA revealed good flow of 'one straight line.'
SFA: superficial femoral artery; POPA: popliteal artery; CTA: computed tomography angiography

catheterization laboratory under general anesthesia.

The procedure consisted of the following six steps. 1) The proximal SFA was exposed through a small longitudinal incision, after confirming the location of the atherosclerotic stenosis by referring to the previous angiogram. 2) An arteriotomy was performed and the atherosclerotic plaque was directly removed (**Fig. 1C**, arrow). 3) Under fluoroscopic guidance, a 4-Fr Fogarty catheter (Edwards Lifesciences, Irvine, CA, USA), equipped with a 0.018 inch guidewire (Halberd, Asahi Intecc, Tokyo, Japan), was advanced proximally and distally through the thrombus via the exposed vessel, and a huge thrombus was extracted bidirectionally (**Fig. 1C**). 4) The site of arteriotomy was closed with a polytetrafluoroethylene patch. 5) The patched proximal SFA was directly punctured, and a 6-Fr sheath was inserted. A 6-Fr guiding sheath (Mach-1, Boston Scientific, Natick, MA, USA) was placed at the distal POPA through the bypass graft. Under intravascular ultrasound guidance, a 0.014 inch guidewire (Gladius, Asahi Intecc, Tokyo, Japan) was passed through the occluded POPA to the peroneal artery, followed by dilatation using a 2.5 mm balloon (Bandicoot Rx, Kaneka Medical Products, Osaka, Japan). Thus, a straight-line flow to the foot was established. 6) The sheath was removed using a purse string suture.

At the 1-week follow-up, CTA revealed good flow through the SFA and POPA (**Fig. 1D**). The ABI improved to 0.72 immediately after the procedure and to 0.83 by the 2-month follow-up.

Discussion

Despite the tremendous advancement of various revascularization techniques for occlusive lower limb artery, classical autogenous vein bypasses have the highest patency rates and limb survival compared to all other revascularization options.[1] In fact, as it is often seen, even when the proximal side of native SFA was occluded, the past femoropopliteal SV bypass was patent. Unfortunately, in this present case, the patient received two bypass surgeries before: femoropopliteal SV bypass and CABG, so the vein graft was unavailable. Synthetic graft is a reasonable alternative option in femoropopliteal bypass grafting for whose SV graft was unprocurable. However, unlike the autogenous vein bypasses, the durability of synthetic graft for a patient with a critical limb ischemia with lesions below the knee failed to demonstrate its superiority compared to EVT.[5] The Fogarty catheter is a mighty instrument for removing large numbers of thrombi from an extremity, especially for acute embolic occlusions.[2] However, sometimes it is not suitable for thrombotic occlusions due to atherosclerotic lesions because it carries a potential risk for plaque disruption, intimal dissection, and arterial rupture.[6] So, to treat atherosclerotic thrombotic occlusions, several strategies, such as EVT alone, combined therapy involving EVT and surgical thrombectomy, and CDT are the preferred therapeutic options. EVT is less invasive, but not effective when a large number of fresh thrombi are present in the SFA; moreover, the development of a distal embolism is always a concern. Perhaps, SFA stent-graft has a potential for overcoming the weakness of EVT as mentioned above, although we have no data about the safety or efficacy of applying the SFA stent-graft to thromboembolic lesions. Combined surgical thrombectomy and EVT seems to be a reasonable strategy, and it has been reported to improve acute limb ischemia outcomes compared with surgical treatment alone.[3] Yet, this strategy may sometimes require deployment of a stent at the stenotic culprit lesion, and the long-term patency of a stent placed at the site of a femoropopliteal lesion is unsatisfactory.[7] CDT is beneficial for getting an overview of the underlying atherosclerotic lesions; therefore, a minimally invasive strategy, such as balloon angioplasty, short stenting, or segmental endarterectomy should be the treatment of choice after the successful thrombolysis.[4] But of course, we cannot underestimate the bleeding risk associated with CDT in elderly patients. Therefore, we chose three revascularization techniques of direct endarterectomy of the SFA and Fogarty thrombectomy followed

by EVT for below the knee occlusive lesion. To the best of our knowledge, only one cohort study, published in 1981, has investigated the long-term clinical results of SFA endarterectomy.[8] The study reported extremely good patency (92% at 15 years) when limited to the proximal segment of the SFA.

The onset of a thromboembolism is sometimes difficult to determine because of symptom vagueness caused by the collateral vessels; further, a delayed diagnosis favors organization of the thrombi. Especially in elderly populations of whom comorbidities such as atrial fibrillation and atherosclerosis are not uncommon, it is more difficult to clearly define the etiology. Of course the detailed history taking is an important clue for speculating underlying etiology, and some non-invasive imaging, such as sonography, computed tomography, or magnetic resonance may be helpful for us because these imaging modalities have a potential to identify the age of the thrombi. Even though it is uncertain if we can apply the qualitative information to estimating and considering the risk of revascularization therapy, the freshness of the thrombi must be a key for planning the strategy, and may sometimes yield us to change the methods. More investigation is required in this field. On the other hand, for such delayed admission cases, the time limit for adopting Fogarty thrombectomies is not well understood. Some previous case reports have suggested expansion of the indications for Fogarty thrombectomies by also performing balloon dilatation in the occluded organized thrombi for maceration or detachment from the arterial wall.[9,10] This present case also demonstrated the usefulness of a Fogarty catheter during the subacute phase of thrombosis.

Conclusion

For selected patients with subacute thrombotic occlusions of the lower extremity artery, a combination therapy involving direct endarterectomy and Fogarty thrombectomy with EVT might be an additional therapeutic option. More research is needed to evaluate the long-term effects of this combined technique.

Disclosure Statement

None of the authors have any conflicts of interest.

Author Contributions

Study conception: MK, HK
Writing: MK
Critical review and revision: all authors
Final approval of the article: all authors
Accountability for all aspects of the work: all authors

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