



Case Report

Retrograde Approach for Endovascular Salvage of an Infrapopliteal Vein Bypass

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Endovascular treatment through femoropopliteal and infragenicular percutaneous transluminal angioplasty, both in native vessels and in bypass salvage, has been an emerging technique in recent years. However, in some cases, a difficult antegrade access in distal occlusions has limited the technical success of this procedure. Combined subintimal arterial flossing with antegrade–retrograde intervention is used as a resource technique to obtain precise recanalization in these cases. Here, we present the case of a retromalleolar access of the posterior tibial artery, based on subintimal arterial flossing with antegrade–retrograde intervention technique, to achieve femoral–posterior tibial bypass salvage.

CASE REPORT

Critical limb ischemia is the final state of peripheral artery disease. Preventing limb amputation is the principal goal in these patients, and this is why any type of revascularization that can prevent amputation should be used as a therapeutic alternative.

Endovascular treatment through femoropopliteal and infragenicular percutaneous transluminal angioplasty (PTA), both in native vessels and in bypass salvage, has been an emerging option in recent years.^{1,2} However, in some cases, a difficult antegrade access in distal occlusions has limited the technical success of this procedure.^{1,3,4}

Here, we present the case of a retromalleolar access of the posterior tibial artery for femoral–posterior tibial bypass salvage.

The patient is a 48-year-old man who is a heavy smoker and has a personal history of hypertension, dyslipidemia, and chronic ischemic cardiopathy. He was treated a year ago for grade IV chronic limb ischemia

with a femoral–posterior tibial bypass with an “in situ” right internal saphenous vein on his right lower limb. The patient was readmitted to the vascular surgery department owing to pain at rest and trophic lesions in the same limb. On physical examination, the patient had a femoral pulse, with absent popliteal and distal pulses on his right lower extremity. Initial ankle-brachial index was 0.38. An echo Doppler study showed a patent bypass with a diminished flow velocity, which suggested a runoff problem in the bypass.

An endovascular procedure was performed. As the durability of the procedure was initially not clear and owing to patient’s history of cardiopathy and rest pain, the anesthesiologist chose an intradural anesthesia technique to keep the patient stable, more comfortable, and to gain his cooperation. Using a contralateral access through the left common femoral artery and under systemic heparinization with 5,000 IU of sodium heparin, a 6-F sheath (Blakin; Cook, Bloomington, IN) was placed. On angiography, a short thrombosis, measuring approximately 1 cm, of the bypass outflow was evidenced, which recanalized in the same artery (Fig. 1A). After an unsuccessful attempt to make an antegrade access, and owing to an inability to enter the true lumen after canalizing the subintimal space, the decision is made to attempt a retrograde access of the lesion. After dissecting the posterior tibial artery in the retromalleolar region, the obstruction is canalized with a 0.014-inch guidewire (Spartacore; Abbott, Redwood City, CA) and without a distal introducing sheath; the guidewire is recovered with an intravascular snare device (Angiotech EN Snare System;

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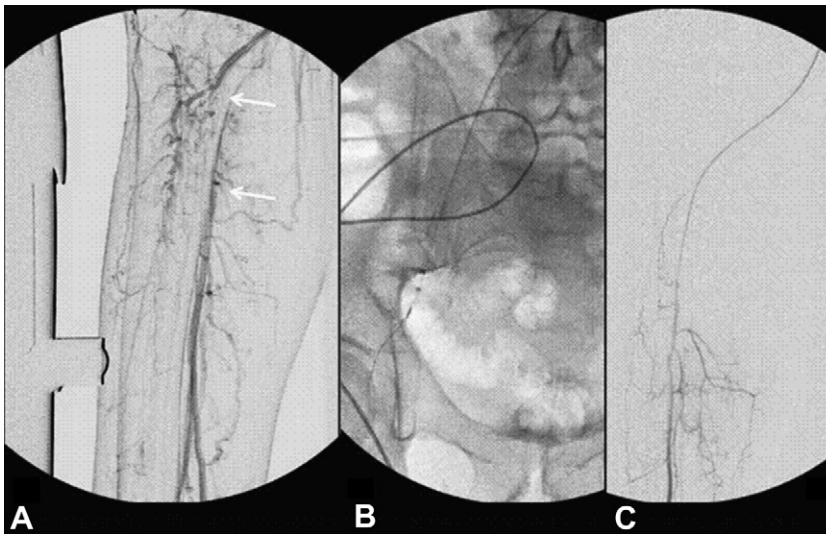


Fig. 1. (A) Intraoperative angiography. (B) Recovery of the guidewire with an intravascular snare device. (C) Lesion already canalized.

Medical Device Technologies Inc., Gainesville, FL) from the contralateral sheath (Fig. 1B). After the lesion was canalized (Fig. 1C), the procedure was carried out in an anterograde fashion. Initially, an angioplasty was performed with an Amphirion 3 × 60 mm balloon (Invatec, Roncadelle, Italy); although repetitive angioplasties were done, even increasing inflation pressure, the result was suboptimal (with a residual stenosis of >30%), and therefore, a 3.5 × 38 mm Chromis Deep stent (Invatec, Roncadelle, Italy) was placed (Fig. 2).

During the immediate postoperative period, the patient recovered a distal pulse, and ankle-brachial index reached 0.92. The patient was previously prescribed 100 mg aspirin daily because of his cardiovascular history; he continued with it during the procedure, and we added 75 mg of clopidogrel for the first 4 weeks. During a 3-month follow-up consult, an improvement of the patient's lesions was observed, and an echo Doppler study revealed a triphasic Doppler flow in the bypass outflow and in the posterior tibial artery, without evidence of any hemodynamically significant stenosis.

DISCUSSION

The success rate for an infrapopliteal stenosis treated with endovascular techniques is close to 100%; nonetheless, the failure rate for occlusive lesions can rise to between 20% and 40%.^{5,6} The success rates are also lower in the case of endovascular techniques for bypass salvage—78.9% for Mofidi et al.¹ In these patients, the surgical alternative through a distal bypass is not a feasible option owing to their elevated comorbidities, the absence of an adequate vein, or the absence of an adequate runoff flow.^{7,8}

In our patient, the decision was made to try every possible endovascular treatment modality, given the type of lesion, the comorbidities, and the absence of an autologous vein for a sequential bypass. After an unsuccessful attempt at crossing the lesion through an anterograde access, the retrograde access was considered the best option, as the patient had a patent distal vessel (posterior tibial artery) that entered the foot.⁹ Nonetheless, owing to the severe calcification, and after echographic and fluoroscopic studies of the posterior tibial artery, it was decided that a surgical dissection had to be made.¹⁰ However, the guidewire was introduced through the distal vessels without using an introduction sheath, in an attempt to lower the arterial wall trauma and to avoid the usual vasospasm.³

Combined subintimal arterial flossing with antegrade–retrograde intervention is usually used as a resource technique to obtain precise recanalization of the patent portion of a distal runoff vessel for critical limb ischemia in diabetic patients with long occlusions involving the popliteal trifurcation.^{3,7,9–12} However, to our knowledge, this is the first time that it has been used for the rescue of a bypass.

The main advantage of this technique is that it provides a new tool to the therapeutic arsenal for patients who are difficult to treat with traditional methods. Retrograde recanalization of distal vessels is being used every time more frequently, and its indications are being expanded.^{4,13} It is important to keep in mind a series of technical details and to use this resource with caution.^{10,13} In this case, as

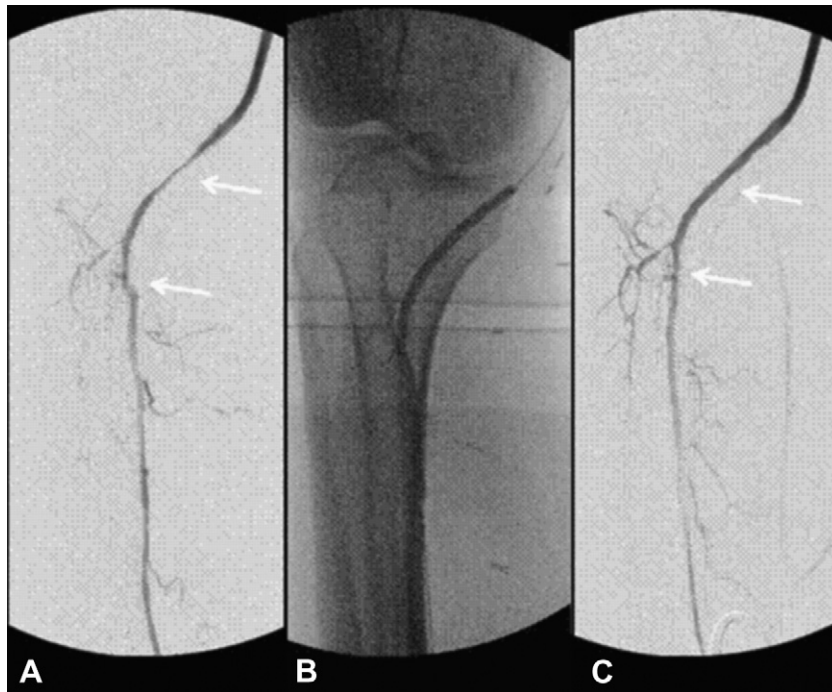


Fig. 2. (A) Suboptimal result of angioplasty. (B) Stent placement. (C) Final angiography.

in other published reports, a 0.014-inch guidewire was adequate to cross the lesion with minimum damage or vasospasm to distal vessel¹³; however, in case this fails, some authors recommend using a 0.018-inch hydrophilic wire or even a 0.035-inch hydrophilic wire to increase success rate.^{3,4} After crossing the bypass outflow, the guidewire is advanced retrogradely through the occlusion into the popliteal artery. Then, the wire is captured with a gooseneck snare and exteriorized at the femoral access to continue the procedure in a standard fashion. By doing this, we minimized the trauma to the tibial vessels. Moreover, in this case, we needed to place a stent because of suboptimal PTA at the level of bypass outflow, higher profile is needed to place the stent, and it is preferable to use an antegrade approach.⁷ Maximum care must be taken to not detach the wire tip during the snare maneuver.⁷

Owing to the presence of a post-PTA residual stenosis of >30%, it was decided to place a stent. Higher-profile balloons or higher inflation pressures were not considered convenient to avoid some damage in an anastomotic area. Neither was it considered convenient to perform the PTA with a cutting balloon, owing to the high probability of a subintimal recanalization.¹⁴ The durability of suboptimal infragenicular PTA through stent placement has been reviewed in recent studies.^{4,15} In this case, we decided to use

a balloon-expandable stent, aiming to its more precise deployment.¹⁶

In the infragenicular region, to avoid restenoses, we considered use of double antiplatelet therapy with clopidogrel and aspirin during the first 4 weeks to be convenient⁴; some authors go even further and use cilostazol or even anticoagulation if an infrapopliteal stent has been placed.^{3,7}

Although a single case is far too little to reach a significant conclusion, we consider the retrograde access of distal vessels to be a useful resource for outflow-impaired bypass salvage.

REFERENCES

1. Mofidi R, Flett M, Nagy J, et al. Balloon angioplasty as the primary treatment for failing infra-inguinal vein grafts. *Eur J Vasc Endovasc Surg* 2009;37:198–205.
2. Marks NA, Hingorany AP, Ascher E. Duplex guided balloon angioplasty of failing infrainguinal bypass grafts. *Eur J Vasc Endovasc Surg* 2006;32:176–81.
3. Hansen A, Krawczynski H, Lacher F. Retrograde transpedal recanalization of tibial artery occlusion. *Vasa* 2009;38:249–53.
4. Rogers RK, Dattilo PB, Garcia JA, et al. Retrograde approach to recanalization of complex tibial disease. *Catheter Cardiovasc Interv* 2011;77:915–25.
5. Soder HK, Manninen HI, Jaakkola P, et al. Prospective trial of infrapopliteal artery balloon angioplasty for critical limb ischemia: angiographic and clinical results. *J Vasc Interv Radiol* 2000;11:1021–31.
6. Montero-Baker M, Schmidt A, Bräunlich S, et al. Retrograde approach for complex popliteal and tibioperoneal occlusions. *J Endovasc Ther* 2008;15:594–604.

7. Spinosa DJ, Harthun NL, Bissonette EA, et al. Subintimal arterial flossing with antegrade-retrograde intervention (SAFARI) for subintimal recanalization to treat chronic critical limb ischemia. *J Vasc Interv Radiol* 2005;16:37–44.
8. Graziani L, Silvestro A, Bertone V, et al. Vascular involvement in diabetic subjects with ischemic foot ulcer: a new morphologic categorization of disease severity. *Eur J Vasc Endovasc Surg* 2007;33:453–60.
9. Gandini R, Pipitone V, Stefanini M, et al. The “Safari” technique to perform difficult subintimal infragenicular vessels. *Cardiovasc Intervent Radiol* 2007;30:469–73.
10. Lupattelli T, Clerissi J, Losa S, Faglia E. Regarding the “Safari” technique: a word of caution. *Cardiovasc Intervent Radiol* 2009;32:197–8.
11. Botti CF, Ansel GM, Silver MJ, et al. Percutaneous retrograde tibial access in limb salvage. *J Endovasc Ther* 2003;10:614–8.
12. Spinosa DJ, Leung DA, Harthun NL, et al. Simultaneous antegrade and retrograde access for subintimal recanalization of peripheral arterial occlusion. *J Vasc Interv Radiol* 2003;14:1449–54.
13. Graziani L, Morelli LG. Combined retrograde-antegrade arterial recanalization through collateral vessels: redefinition of the technique for below-the-knee arteries. *Cardiovasc Intervent Radiol* 2011;34:S78–82.
14. Cotroneo AR, Pascali D, Iezzi R. Cutting balloon versus conventional balloon angioplasty in short femoropopliteal arterial stenoses. *J Endovasc Ther* 2008;15:283–91.
15. Donas KP, Torsello G, Schwindt A, et al. Below knee bare nitinol stent placement in high-risk patients with critical limb ischemia is still durable after 24 months of follow-up. *J Vasc Surg* 2010;52:356–61.
16. Duerig TW, Tolomeo DE, Wholey M. An overview of superelastic stent design. *Minim Invasive Ther Allied Technol* 2000;9:235–46.