An Uncommon Approach Through a Profunda Collateral

Utilizing a transcollateral approach to revascularize a superficial femoral artery chronic total occlusion.

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The most severe form of peripheral arterial disease (PAD) is critical limb ischemia (CLI), which is often a result of a chronic total occlusion (CTO) in the peripheral circulation. These complex lesions impair distal perfusion and, if not restored, may result in amputation.[1,2] Symptoms indicative of CLI include nonhealing wounds, tissue necrosis (gangrene), and pain at rest.[2,3] Invasive options include surgical bypass, endovascular revascularization, and, as a last resort, limb amputation. Not all patients with PAD or CLI are surgical candidates, and endovascular therapy is often the treatment of last resort before amputation. Endovascular revascularization is also more cost-effective and less invasive than bypass surgery, resulting in shorter recovery times and increased quality of life, but may be difficult in the presence of complex lesions due to their location or configuration.[4]

When attempting to access these complex lesions, interventionists may be required to think outside the box, exhausting all available approach options in an attempt to avoid amputation and its associated morbidity and mortality risks. If initial antegrade approaches are unsuccessful, further attempts using retrograde approaches obtained through pedal, popliteal, or collateral accesses must be considered. The success of percutaneous revascularization may depend on an operator's ability to apply their understanding of the peripheral vasculature and CTO crossing techniques to achieve common and/or exotic access to the occluded segments.[5]

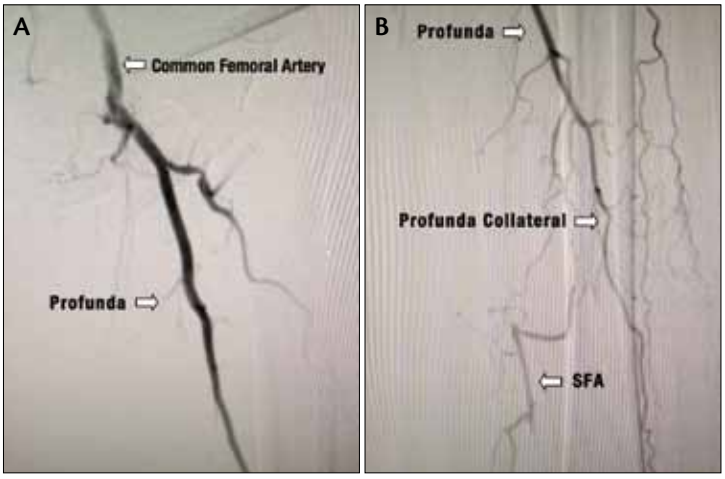

Figure 1. Left lower extremity angiogram showing the common femoral artery and profunda (A). Profunda, profunda collateral, and SFA (B).

The present case describes a 76-year-old woman with a history of a left below-knee amputation (BKA) and a nonhealing ulcer at the flap preventing her from wearing her prosthesis during daily activities. This case highlights an uncommon (exotic) endovascular approach, traversing through a profunda collateral to open a superficial femoral artery (SFA) CTO.

CASE REPORT

A 76-year-old woman presented with a history of a left BKA, former smoker, coronary artery disease (CAD), diabetes mellitus, hypertension, and hyperlipidemia. She had a left BKA flap ulcer that prevented her from wearing her prosthesis, hindering her mobility during daily activities and exercise.

Figure 2. Retrograde approach with an 18-gram Cook CTO wire through the profunda.

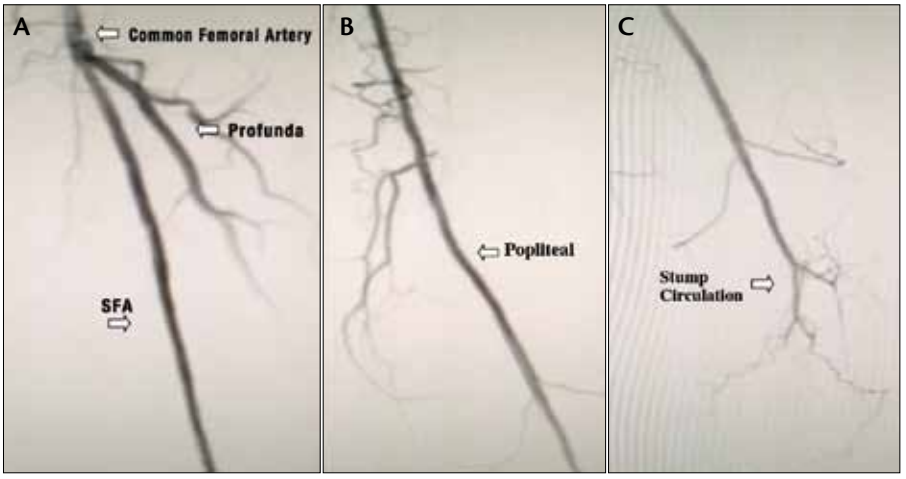

Figure 3. Common femoral artery, profunda, and SFA (A); popliteal (B); popliteal and stump circulation (C).

Considering her nonhealing ulcer, angiography of her left lower extremity was performed (Figure 1). The angiogram displayed an occluded SFA at the level of the ostium with no obvious stump that reconstituted at the left distal SFA. The vessel then reoccluded at the proximal popliteal artery and reconstituted at the midpopliteal supplying the stump.

An antegrade approach could not be performed because no obvious stump was found in the SFA at the level of the profunda. Instead, a transcollateral

Combining antegrade and retrograde approaches through transcollateral access has shown the potential to assist in the revascularization of complex lesions associated with CLI.

approach (Figure 2) was performed; a Whisper wire (Abbott Vascular, Santa Clara, CA) was advanced through a profunda collateral to the mid-SFA. The Whisper wire was then exchanged for an 18-gram Approach CTO wire (Cook Medical, Bloomington, IN) through an 0.018-inch Quick-Cross support catheter (Spectranetics Corporation, Colorado Springs, CO) and in a retrograde fashion, the SFA occlusion was traversed. The CTO was treated with a 4- X 160-mm Advance 14LP balloon (Cook Medical) through the collateral, resulting in approximately 60% residual stenosis. This enabled antegrade crossing with an Asahi Prowater wire (Abbott Vascular) to the distal SFA. This was followed by successful placement of a 5- X 15-mm Herculink balloon-expandable stent (Abbott Vascular) at the SFA ostium without impeding flow through the profunda artery. Two 6- X 80-mm Zilver self-expanding stents (Cook Medical) were then placed in the proximal and mid-SFA, reducing the stenosis to < 30%.

We then turned our attention to the popliteal CTO and used a 30-gram, 0.018-inch Astato wire (Asahi Intecc USA, Inc., distributed by Cardiovascular Systems, Inc., Santa Ana, CA) to cross the lesion with the support of an 0.018-inch Quick-Cross. A 4- X 220-mm Coyote balloon (Boston Scientific Corporation, Natick, MA) was then inflated followed by a 5- X 80-mm Zilver self-expanding stent (Cook Medical), resulting in < 30% residual stenosis and improving blood flow to the stump with obvious blushing on angiography. There was now inline flow to the wound (Figure 3).

DISCUSSION

Advanced age, diabetes, and renal insufficiency have been shown, both individually and collectively, to predispose patients to PAD, an epidemic that currently affects 8 to 12 million Americans.[6-8] It is estimated that 25% of PAD patients with CLI will die in the first year alone, while 30% will require an amputation; of these amputees, 40% will die within 2 years.[9,10] Endovascular techniques that incorporate improvised or exotic approaches to complex occlusions are beneficial in preventing amputation. A transcollateral approach can be utilized both above and below the knee to increase blood flow and heal wounds.

In the presented case, procedural success—defined by stenosis reduction and distal reperfusion—was dependent on crossing the lesion. The occluded SFA ostium presented no obvious stump, hindering antegrade access to the occluded vessel and potentially increasing the risk of complications. A creative transcollateral approach using collateral vasculature and a retrograde orientation was required to achieve access to the diseased segment. As a result of the successful PTA and stenting procedures, the BKA ulcer flap healed, allowing the patient to use her prosthesis daily during routine activities and exercise.

CONCLUSION

This case may provide further confidence in utilizing transcollateral approaches to treat CTOs. Although further research is needed, combining antegrade and retrograde approaches through transcollateral access has shown the potential to assist in the revascularization of complex lesions associated with CLI. ■

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1. Ohno T, Kaneda H, Nagai Y et al. Regenerative medicine in critical limb ischemia; current and future directions. J Atheroscler Thromb 2012; published online June 8. http://dx.doi.org/10.5551/jat.12906.
2. Santilli JD, Santilli SM. Chronic critical limb ischemia: diagnosis, treatment, and prognosis. Am Fam Physician. 1999;59:1899-1908.
3. Dohmen A, Eder S, Euringer W, et al. Chronic critical limb ischemia. Dtsch Arztebl Int. 2012;109:95-101.
4. Marinescu V, Mirowska KK, Schreiber T, et al. Insights into endovascular revascularization in limb salvage procedures: "antegrade-retrograde" technique in chronic total occlusion. Rev Cardiovasc Med. 2011;12:42-47.
5. Adams GL, Gardner SJ, Gardner J, et al. Exotic access, techniques, and devices for infrapopliteal CTOs. Endovasc Today. 2012;5:44-49.
6. US Department of Health and Human Services. National Heart, Blood, and Lung Institute. Facts about peripheral arterial disease (P.A.D.). NIH Publication No. 06-5837. Accessed August 5, 2012.
7. Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011. http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf. Accessed August 5, 2012.
8. Floege J, Ketteler M. Vascular calcification in patients with end-stage renal disease. Nephrol Dial Transplant. 2004;19:59-66.
9. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-society consensus for the management of peripheral arterial disease (TASC II). J Vasc Surg. 2007;45:1.
10. Fisher RK, Harris PL. Epidemiological and economic considerations in the critically ischemic limb. Critical Limb Ischemia. Armonk, NY: Futura Publishing Company; 1999:19-25.