

# A Different Approach

Employing a bidirectional technique for treating an iliac CTO.

BY ROBERT M. BERSIN, MD

**C**hronic total occlusions (CTOs) are frequently encountered in the evaluation of patients with symptomatic lower-extremity leg claudication. Estimates vary, but in some series, CTOs are observed in up to 50% of patients undergoing lower-extremity arteriography. The following case involves a 64-year-old man with lifestyle-limiting bilateral exertional calf claudication. He was equally symptomatic in both lower extremities, and his ankle-brachial indices were 0.65 to 0.67 bilaterally. The patient had a long history of tobacco abuse and a history of coronary artery disease, previous coronary bypass surgery, previous renal stent implantation, and carotid artery disease.

The diagnostic lower-extremity arteriograms demonstrated a small infrarenal aortic aneurysm, a chronic occlusion of the right external iliac artery, and a chronic occlusion of the left superficial femoral artery with two-vessel runoff (Figures 1 and 2). Selective angiography of the right iliac artery demonstrated a proximal stump to the right external iliac artery with a favorable meniscus for percutaneous intervention (Figure 1).

Collateralization at the level of the common femoral artery was observed at a level just above the acetabulum of the right femur. Selective angiography of the left femoral artery demonstrated a chronic occlusion of the superficial femoral artery near its ostium with a relatively unfavorable tapered proximal cap at a small side branch (Figure 2). The occlusion length was approximately 25 cm with collateralization from the left profunda femoris artery.

Because the patient was equally symptomatic in both lower extremities, percutaneous recanalization of both chronic occlusions was recommended. Because

the left superficial femoral artery occlusion was near the ostium, there would be insufficient space for a sheath to pursue an antegrade approach, so the recommended approach would be contralateral from the right femoral artery. Accordingly, percutaneous recanalization of the right external iliac occlusion was recommended first, with a plan to stage the left superficial femoral artery intervention for a later date.

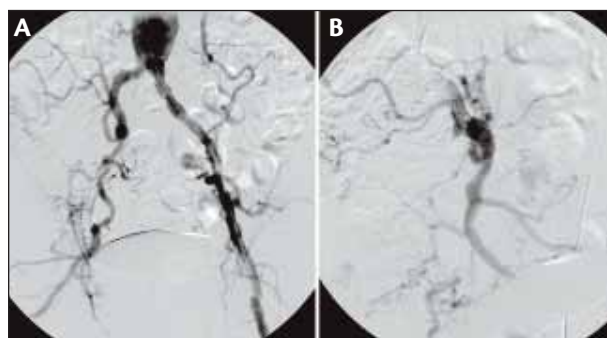


Figure 1. Abdominal and pelvic angiograms demonstrating a small abdominal aortic aneurysm and a right external iliac CTO with reconstitution at the common femoral artery (A, B).

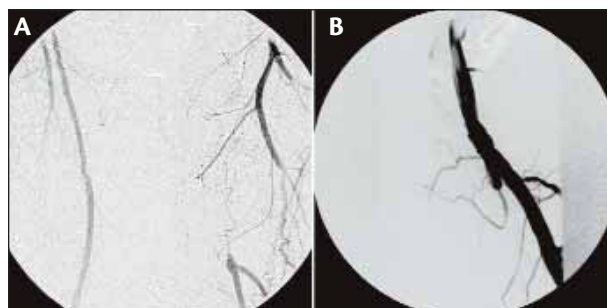


Figure 2. Lower-extremity arteriograms demonstrating a long-segment left superficial femoral artery CTO (A, B).

## INTERVENTIONAL APPROACH

Percutaneous recanalization of peripheral total occlusions is generally more successful from the antegrade approach rather than from the retrograde approach. Because the external iliac artery had a favorable proximal cap with a meniscus, and the reconstitution by collaterals was at the level of the common femoral artery, the percutaneous approach taken was antegrade from the left femoral approach using the Frontrunner XP device (Cordis Corporation, a Johnson & Johnson company, Miami, FL). The Frontrunner XP device traversed the proximal cap well, but deviated outside the lumen in the midexternal iliac artery on an angulated bend (Figure 3A). Although the device was successfully redirected (Figure 3B), the true lumen could never be identified distally in the common femoral artery. Because of the location of the distal cap at the common femoral artery, use of a re-entry device was believed to carry a high likelihood of need for adjunctive stenting of the femoral artery into the joint space and was therefore avoided.

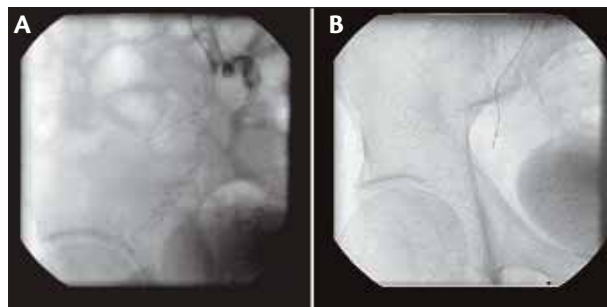
Instead, a 5-cm sheath was placed into the right common femoral artery, and the distal cap was successfully crossed in retrograde fashion with the Frontrunner XP device. Using the “bidirectional technique,” the proximal and distal catheters were able to meet in the middle of the external iliac artery to restore in-line luminal placement of a guidewire across both caps of the occlusion (Figure 4). Once crossed successfully, the occlusion was then ballooned and stented using a self-expanding nitinol stent from the retrograde femoral approach (Figure 5). The final result was excellent, with normal antegrade flow restored, and importantly, with no extension of disease or stenting of the vessel beyond the point of reconstitution at the common femoral artery (Figure 6).

## DISCUSSION

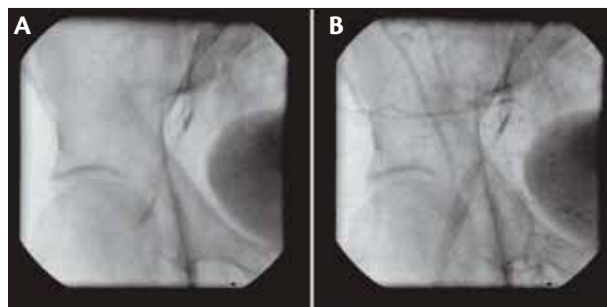
CTOs of the lower-extremity vessels are frequently encountered in exertional claudicants. The interventional techniques to revascularize CTOs include the looped wire technique (PIER technique), step-by-step laser technique, and specialty CTO devices such as the Frontrunner XP catheter. Subintimal re-entry devices also exist for when luminal re-entry cannot be accomplished at the distal cap when the previously mentioned techniques have been applied without success (eg, Outback LTD [Cordis Corporation] and Pioneer [Medtronic Inc., Santa Rosa, CA]). In the case of iliac and subclavian CTOs, the occlusion can be approached from both directions (antegrade and retrograde) using the “bidirectional technique” to improve the overall success to as high as 94% in iliac CTOs.

In this case, we utilized the bidirectional technique using the Frontrunner XP device at both caps of the CTO (ante-

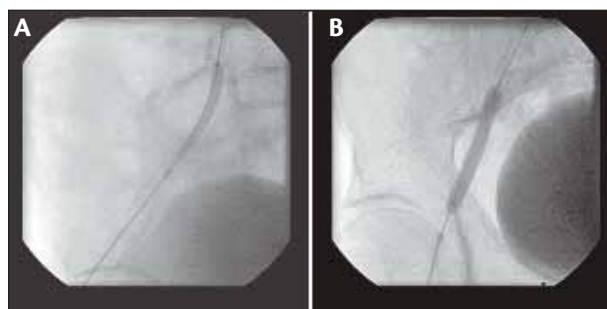
grade at the proximal cap and retrograde at the distal cap) to achieve luminal recanalization of the CTO without the need for adjunctive re-entry devices. This was felt to be especially important at the distal cap to minimize the need to stent the vessel distal to the occlusion given its proximity



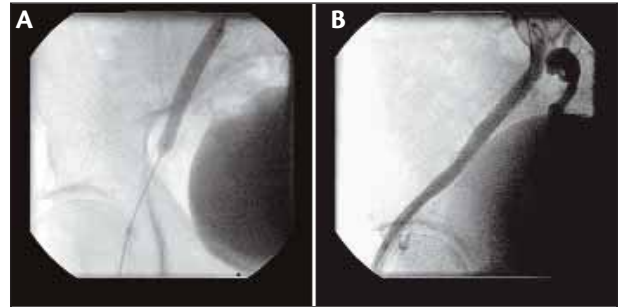
**Figure 3.** Right external iliac CTO Frontrunner XP catheter. An improper course of the device due to vessel angulation is shown (A). Proper reorientation of the device along the path of the external iliac vessel (B).



**Figure 4.** Intimal dissection of the external iliac artery due to subintimal passage of the Frontrunner XP device (A). Late phase collateral filling of a relatively normal right common femoral artery (B).



**Figure 5.** Placement of a retrograde sheath in the right common femoral artery with successful passage of the Frontrunner XP device at the distal cap, meeting the proximal entry plane in the middle of the external iliac artery using the “bidirectional technique” to pass a guidewire and balloon successfully through both caps of the CTO. Note the contralateral guiding sheath in the right common iliac artery adjacent to the balloon catheter (A). Balloon dilation from the retrograde femoral approach after successful recanalization (B).



**Figure 6.** Balloon postdilation (A) and final result (B) after placement of a self-expanding nitinol stent in the external iliac and common femoral arteries.

to the flexion point of the common femoral artery at the hip joint. Stenting of the CTO is often needed to obtain an optimal result; dissection flaps are commonly seen in the body of the CTO, as wires and specialty devices commonly pass in and out of the subintimal space on the way through the occlusion. Crossing the CTO properly at the proximal and distal caps at least maximizes the chance of crossing the ends of the CTO in a luminal position. Where they meet in the middle is usually not important.

## CONCLUSION

Creative use of specialty CTO devices and techniques to access the occlusions from multiple directions, as illustrated by use of the bidirectional technique in this case, have greatly increased the success rates of percutaneous interventions for complex CTOs. Success rates of more than 90% are now observed using these devices and techniques, making an interventional approach the therapy of choice for these otherwise tough cases. ■

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## SUGGESTED READING

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