Recent Advances in Percutaneous Management of Iliofemoral and Superficial Femoral Artery Disease

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KEYWORDS

- Peripheral arterial disease • Endovascular treatment
- Iliac artery • Superficial femoral artery
- Percutaneous transluminal angioplasty • Stent

Unrevascularized lower-extremity peripheral arterial disease (PAD) is the most common cause of lower-extremity amputation.[1] Over the past decade, the number of endovascular procedures has nearly quadrupled for patients with critical limb ischemia (CLI). This increase in procedural volume has fortunately coincided with a decrease in amputation rates.[2] Improvements in device technology and the skill-sets of the interventionist have facilitated the treatment of complex lesions, including long-segment chronic occlusions. The goal of this article is to describe the latest advances in endovascular therapy of aortoiliac and femoral arteries and to review the clinical outcomes and costs associated with the use of these treatments.

ADVANCES IN ENDOVASCULAR TREATMENT FOR AORTOILIAC DISEASE

Endovascular revascularization of infrarenal aortic and iliac obstructive disease can be performed with a high rate of technical success and with lower morbidity and mortality than open bypass surgery (**Fig. 1**). Traditionally, endovascular therapy was the preferred modality for treatment of patients with Trans-Atlantic Inter-Society Consensus Document (TASC) II type A and B lesions, whereas surgical revascularization was preferred for patients with TASC type C and D lesions.[1] However, in contemporary practice, surgery is reserved for failure of endovascular approach.

Advances in Stent Technology for Aortoiliac Disease

The design of both balloon-expandable and self-expanding bare metal stents has remained fairly constant over the past decade with little impact from stent architecture and composition on restenosis rate in location.[3] Bare metal stents such as the Zilver (Cook Inc, Bloomington, IN, USA) placed in the common and external iliac artery demonstrate a 2-year patency rate of 90% by duplex ultrasound.[4] Covered stents use expanded polytetrafluoroethylene (ePTFE), a synthetic material that may reduce the incidence of restenosis by acting as barrier to neointimal proliferation.[5] The iCAST stent (Atrium Medical Corp, Hudson, NH, USA),

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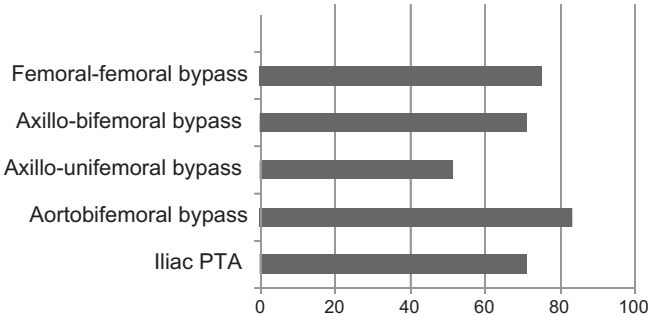

Fig. 1. Five-year patency (%) of aortoiliac revascularization. (*Data from* Norgren L, Hiatt WR, Dormandy JA, et al. Inter-society Consensus for the Management of Peripheral Arterial Disease (TASC II). J Vasc Surg 2007; 45(Suppl S):S5–67.)

a balloon-expandable stent made of 316 L stainless steel covered with microporous PTFE, is being evaluated in the Atrium iCAST Iliac Stent Pivotal Study (NCT00593385).

Advances in Treatment of Aortoiliac Occlusions

The inability to cross an occlusion with a guidewire or to reenter the true lumen beyond the occlusion remains the most common cause for technical failure in interventions of chronic total occlusions (CTOs). A number of devices have been introduced to improve the technical success in patients with long-segment arterial occlusions in the aortoiliac and femoropopliteal segments.

FrontRunner device

The FrontRunner XP CTO catheter (J & J Cordis, New Brunswick, NJ, USA) uses small, hinged jaws for controlled microdissection through a chronic occlusion. The device was evaluated prospectively in 36 patients with 44 CTOs, mainly in the iliac and femoral arteries.[6] The mean occlusion length was 9.5 plus or minus 7 cm. Angiographic success was achieved in 40 (91%) of the CTOs. Fourteen (35%) of the recanalizations required a reentry catheter to regain the true lumen. There were no complications related to the device itself. In a recent retrospective study,[7] the FrontRunner was used in CTOs located in the aortoiliac (11 arteries, 13%), infrainguinal (72 arteries, 83%), and infrapopliteal (4 arteries, 5%) arteries. The mean lesion length was 14.2 plus or minus 8 cm. The technical success rate of the procedure was 84%. The mean time required to cross the occlusive lesion was 6.7 minutes. In 53% of cases, use of the FrontRunner device alone was successful for lesion traversal and reentry, whereas the remaining 47% of cases required use of a wire or reentry device. The FrontRunner may be used as an adjunctive means of crossing a CTO when the usual guidewire techniques have failed.

Crosser catheter

The Crosser device (Flowcardia Inc, Sunnyvale, CA, USA) delivers vibrational energy to mechanically recanalize the CTO. The catheter tip measures 1.6 mm and is delivered over a 0.014-in wire. In a series of 25 patients[8] with 27 CTOs, the success rate of crossing the CTO after failed conventional wiring was only 41% with one small perforation directly attributable to the use of Crosser catheter. Recent data from the PATRIOT trial suggest a higher success rate, but the results have not yet appeared in the peer-reviewed literature.

Reentry devices

In treatment of CTO, a subintimal angioplasty technique is commonly used in which the guidewire is redirected from the subintimal space into the true lumen distal to the site of occlusion. Two devices are available to facilitate reentry into the true lumen.

The Outback LTD reentry catheter (J & J, Cordis New Brunswick, NJ, USA) is a single lumen 6F-compatible catheter that can be tracked over a 0.014-in guide wire. Reentry is achieved with a 21-gauge needle guided by a marker at the tip (**Fig. 2**). In iliofemoral interventions, the catheter has been successful in regaining the true lumen in 88% to 100% of cases.[6,9] The Pioneer catheter (Medtronic, Menlo Park, CA, USA) is a 6.2 F rapid exchange catheter integrated with a 20 MHz phased-array intravascular ultrasound (IVUS) transducer at the catheter tip. Under IVUS guidance, the true lumen is punctured with a 24-gauge needle that allows delivery of a second 0.014-in wire. In most cases, the average time to recanalize the occluded vessel is less than 10 minutes.[10,11] In a recent retrospective study, the true lumen could not be regained in 23 of 87 patients with CTO of iliac or femoral artery using standard catheter wire technique.[10] The Pioneer catheter (n = 20) or Outback catheter (n = 3) was used successfully to reenter the true lumen. Bleeding at the site of