

## TECHNICAL NOTES

# A new endovascular approach to treatment of acute iliac limb occlusions of bifurcated aortic stent grafts with an exoskeleton

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Endovascular aneurysm repair continues to become increasingly popular. As the number of implanted endografts increases, complications will increase as well. We report a new approach to endovascular treatment in two patients with acute iliac limb occlusions of a bifurcated aortic endograft with an endoskeleton. Neither patient required femoral-femoral bypass grafting because of unilateral limb ischemia. We believe this is the optimal primary approach in patients with a bifurcated stent graft with an endoskeleton. (*J Vasc Surg* 2003;37:1329-31.)

Endovascular aneurysm repair continues to become more popular with both physicians and patients. Improvements in endograft technology have allowed a more diverse patient population to be eligible for stent graft repair. As more devices are inserted, complications will be observed more frequently. However, with new approaches such as herein described, difficult complications such as acute limb thrombosis will become amenable to easier and less invasive treatment.

Delayed iliac limb occlusions occur with variable frequency based on the device used.<sup>1-9</sup> In some patients iliac limb occlusions are treated with femoral-femoral bypass with a prosthetic graft for treatment of unilateral limb ischemia. This approach has the downside of inserting a prosthetic device as well as extra-anatomic repair. Moreover, bilateral lower limb ischemia can occur if the remaining patent iliac limb serving as inflow to the femoral-femoral graft is compromised by stenosis or kinking. A recent report demonstrated successful management of iliac limb occlusions with a combination of the Angiojet rheolytic device, thrombolytic therapy, and stent insertion in the affected limb.<sup>10</sup>

We believe iliac limb occlusions that occur in bifurcated devices with an exoskeleton also can be managed endovascularly, without the inherent dangers of thrombolytic therapy. We report an endovascular technique used in two cases

that did not require use of the Angiojet device, thrombolytic agents, or brachial artery access.

### CASE REPORT

**Case 1.** An 85-year old man underwent repair of an infrarenal abdominal aortic aneurysm with the Zenith Endovascular Graft (Cook, Bloomington, Ind). The operative course and hospital stay were unremarkable. The patient was seen at an outside institution 2 weeks postoperatively with complaints of acute development of pain and numbness in the left lower extremity, and was urgently transferred to our institution. Physical examination revealed a Doppler signal only in the dorsalis pedis artery, where previously there had been an easily palpable pulse. Heparin therapy was initiated, and the patient was taken to the operating room. A left femoral cutdown was performed. Proximal and distal arterial control was obtained. An 18-gauge puncture needle and Benston wire were used for access. A glide wire was used to cross the thrombosis, and an Amplatz Super Stiff wire was inserted. A 16F sheath (Cook Inc, Bloomington, Ind) was placed within the occluded limb. The radiopaque tip and long tapered dilator of this sheath make it particularly well suited for this procedure. In very tortuous iliac arteries, the dilator may be advanced independent of the sheath, followed by slight serial advancement of the sheath over the dilator. This maneuver may be helpful to decrease risk for pushing the iliac limb proximally in tortuous arteries. A 60 mL syringe was used to aspirate clot through the sheath. The sheath and its dilator were passed through the entire length of the iliac limb while performing the aspiration maneuver from distal to proximal. A combination of aspiration and thrombectomy with a 6F Fogarty device (Edwards Lifesciences, Irvine, Calif) through the sheath was added. The 6F Fogarty device was placed through the sheath rather than over the wire. Amplatz wire access was maintained throughout the procedure. Contrast medium-enhanced angiography revealed removal of the thrombus but residual kinking of the device within the common iliac artery. An 18 × 70 Wallstent

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Competition of interest: none.

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**Fig 1.** Thrombosed left iliac limb of Zenith endovascular graft.

(Boston Scientific, Boston, Mass) was inserted in the limb. A completion angiogram revealed a widely patent endograft limb and resolution of the kink. The arteriotomy was repaired, and a palpable pulse was regained in the foot. Postoperatively, the patient was given intravenous heparin therapy, which was changed to full anticoagulation therapy with warfarin sodium before discharge. After 17 months of follow-up the endograft limb has remained patent and the patient has been free of other complications, with no readmission.

**Case 2.** A 72-year-old man underwent repair of an infrarenal abdominal aortic aneurysm with the Zenith Endovascular Graft (Cook). The operative course and postoperative recovery were unremarkable. Three months after endovascular aneurysm repair

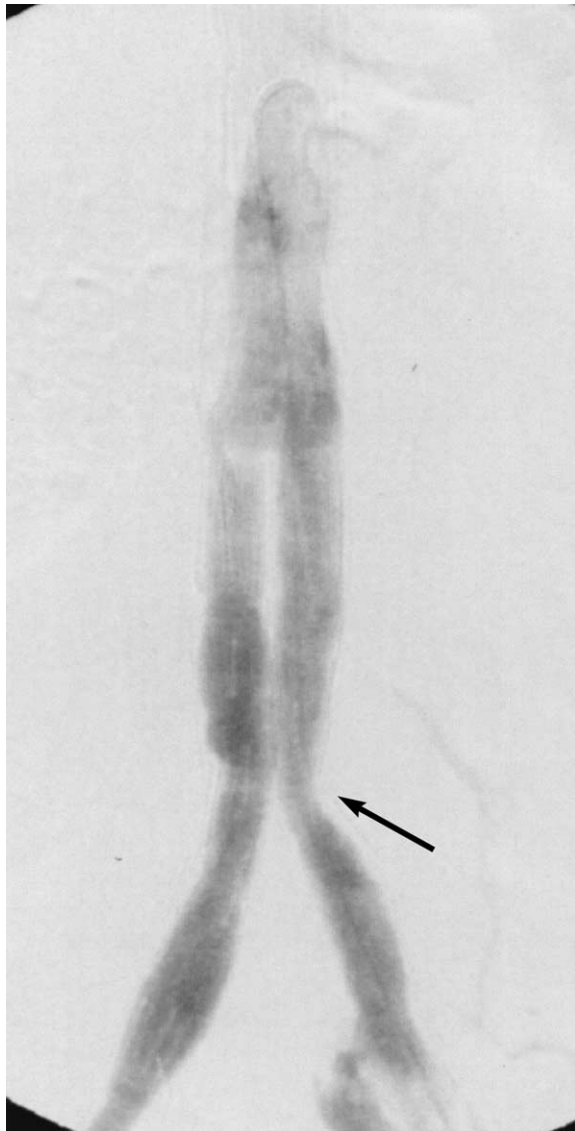
the patient underwent total left hip arthroplasty at another institution. Decreased pulse developed in the left lower extremity postoperatively, and the patient was urgently transferred to our institution. Physical examination revealed a Doppler signal only in the dorsalis pedis artery, compared with palpable pulse after the aneurysm repair. Heparin therapy was initiated, and the patient was taken to the operating room. The same approach was used through the left femoral artery with proximal and distal control. Thrombus was found throughout the left iliac limb (Fig 1). A combination of 16F sheath and 6F Fogarty device was used to successfully remove the thrombus (Fig 2). Plain films revealed a limb kink at the level of the native aortic bifurcation. A 14 × 40 Wallstent was inserted. A completion angiogram revealed no residual clot and resolution of the stenosis at the aortic bifurcation. The arteriotomy was closed, and a palpable pulse was restored. The patient was given intravenous heparin therapy postoperatively. He was discharged after achieving a therapeutic level with warfarin sodium. The endograft limb has remained patent at 14 months of follow-up without repeat intervention.

## DISCUSSION

Acute iliac limb occlusion after endovascular aneurysm repair is not unusual, and can be limb-threatening and difficult to manage. Femoral-femoral bypass grafting is a method used to resolve the problem, but can lead to further complications. Successful endovascular approaches to limb occlusions have previously been reported and have used an Angiojet rheolytic device, thrombolytic therapy, and brachial artery access.<sup>10</sup> The risks of these adjuncts to endovascular management are not insignificant. Hemorrhagic complications of thrombolytic therapy are potentially fatal.

We report a new endovascular approach to management of iliac limb occlusions in patients with a bifurcated aortic stent graft. The 16F sheath allows a large amount of thrombus to be mechanically aspirated from the thrombosed limb. The addition of the 6F Fogarty device through the sheath provides additional efficacy. Passing the Fogarty device through the 16F sheath is essential for success. The sheath maintains safe access to the endograft limb and allows suctioning as an added mechanical method to extract the clot from the graft limb. This added mechanical advantage has a key role when it is not possible to fully engage the thrombectomy balloon against the wall of the endograft limb because doing so would risk migration complications. Wire access is maintained through the iliac limb at all times. Completion angiography to search for an underlying reason for limb thrombosis is essential as well. Stenosis of an iliac limb can be easily treated with an uncovered vascular stent.

The limitation to this technique is its use in any device that has an endoskeleton, such as the Endologix device. It is easy to pass a wire or catheter through the wire interstices of the endoskeleton. This inappropriate passage can lead to disruption of the fabric if an angioplasty balloon is inflated or a vascular stent is inserted. If the fabric of the device is disrupted, an endoleak will develop, leading to a new problem to correct.



**Fig 2.** Residual stenosis within left limb after thrombectomy. Stenosis occurred at the site corresponding to native aortic bifurcation (*arrow*), likely as a result of a distal aortic neck that was too narrow to easily accommodate the two limbs.

The immediate postoperative period is another potentially vulnerable time. Disruption of the modular junction with a Fogarty balloon device could occur during this time and must be prevented. Great care was taken in both of these cases to prevent this complication and any distal migration of the body of the graft. Management of the subsequent endoleak would require another covered extension. To prevent migration complications, we fill the Fogarty balloon with radiopaque contrast medium for visualization, and avert inflation of the balloon to any degree

when it appears to be actively engaging the walls of the stent-graft limb.

The success of this technique for management of iliac limb occlusions is enhanced by its efficacy without thrombolytic therapy. We still give these patients anticoagulation therapy postoperatively. We have empirically opted to use heparin followed by warfarin sodium therapy, because there may be a small amount of residual acute thrombus within the stent-graft limb with a propensity to serve as a nidus for further clotting. However, antiplatelet therapy may be a safe alternative.

Iliac artery tortuosity, stent-graft limb kinking, and narrow aortic bifurcation are all known to contribute to the risk for acute iliac limb occlusion after endovascular repair of abdominal aortic aneurysms.<sup>6,9,10</sup> One or more of these risk factors were present in these two patients. Of interest, while unsupported endograft limbs are at higher risk for kinking, acute limb occlusion occurs in both supported and unsupported endograft limbs.<sup>6</sup> We believe that complications of endovascular aneurysm repair will continue to become more prevalent and that acute iliac limb occlusions can be managed successfully with an endovascular approach.

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