

# Endovascular approach to thrombosed limb of aortoiliac endoprosthesis following abdominal endovascular aneurysm repair

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## ABSTRACT

The increasing use of endovascular aneurysm repair to treat abdominal aortic aneurysms has mandated solutions to the limitations of this operation, including the requirement for additional procedures. A 64-year-old man had presented with symptomatic thrombosis of the left iliac limb after endovascular aneurysm repair. We have reported the use of an innovative endovascular repair for our patient. (*J Vasc Surg Cases Innov Tech* 2022;8:494-5.)

**Keywords:** Aneurysm; Endovascular repair; Graft occlusion; Limb thrombosis; Thrombectomy

Endovascular aneurysm repair (EVAR) has been limited by a 20% reintervention rate for complications, including endoleak and limb occlusion.<sup>1</sup> The incidence of limb occlusion has been 2.3% after EVAR and has been linked to patient compliance and anatomic or device factors.<sup>2,3</sup> Treatment of this condition will often require open surgery.<sup>2</sup>

## CASE REPORT

A 64-year-old man with hyperlipidemia, chronic obstructive pulmonary disease, and a 40-year history of smoking was found incidentally to have a 5.6-cm abdominal aortic aneurysm (AAA). He, therefore, underwent percutaneous EVAR with the use of Medtronic Endurant IIs (28 × 14 × 103-mm main body and 16 × 13 × 124-mm limbs). Intravascular ultrasound (IVUS) demonstrated adequate expansion of all stent graft components, and completion angiography demonstrated a patent endograft and no endoleaks. The patient returned home the next day.

However, he then presented to the emergency department 3 months later with a 1-week history of left leg claudication and episodic extremity coolness and numbness. Despite counseling for smoking cessation, the patient had continued to smoke regularly and was noncompliant with antiplatelet therapy. His physical examination revealed decreased left lower extremity pulses and a sensory deficit. Computed tomography angiography (CTA) demonstrated acute thrombosis of the left

iliac limb of the stent graft with preserved vasculature distally. Because of this thrombosis and the patient's symptoms, the preoperative plan was endovascular mechanical limb thrombectomy with possible graft revision.

Vascular and wire access was obtained via the bilateral common femoral arteries (CFAs) using ultrasound guidance. Next, 5F sheaths were placed to the bilateral CFAs with angiographic guidance to confirm adequate access. A 7F sheath was placed over the wire to the right CFA. The patient received intravenous heparin for systemic anticoagulation throughout the operation. Before preclosure device delivery at the left CFA, an occlusion balloon was placed over the wire to the proximal right limb. This balloon was deployed before delivery of the preclosure devices and maintained during thrombectomy to remove the possibility of an embolizing clot from the left limb to the right iliac system. A preclosure technique was used in the left CFA, followed by dilation and delivery of a 16F ClotTrievers sheath (Inari Medical, Irvine, CA).

Percutaneous transluminal catheter aspiration allowed for manual thrombectomy of the left stent graft limb via a 16F thrombectomy catheter through a 16F Inari FlowTrievers catheter (Inari Medical), with a ClotTrievers sheath at the left CFA, and a FlowSaver blood return system was used to return blood to the contralateral arterial access. This sheath was significant because it has a nitinol funnel extending from the distal extent, enabling simultaneous blood flow, thrombus capture, and distal embolization mitigation. Subsequently, transluminal thromboembolectomy using a 12 × 40-mm balloon was performed.

Both hypotheses regarding the complication of limb occlusion were confirmed by IVUS and angiography, enabling left limb treatment: (1) competitive flow due to contralateral limb deployment or proximal migration of 3 to 5 mm; and (2) underexpansion due to external compression from a common iliac artery requiring balloon-expandable stent placement and hypogastric coverage. Revision of the left stent graft limb was accomplished by placement of a 16 × 10 × 124-mm stent graft proximally, followed by deployment of a 7 × 39-mm balloon expandable stent to distal left graft limb. After angioplasty, the repair was

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**Fig.** Revascularized left iliac limb after endovascular repair.

visualized via IVUS, which demonstrated adequate stent graft expansion. Completion angiography revealed no evidence of thrombus within the sheath's funnel. The blood loss was 200 mL, and no thrombolytic agent was administered. A representative completion angiogram after revascularization is shown in the Fig. The patient returned home the following day without hematuria or acute kidney injury (AKI). At the 3-month outpatient follow-up, he was free of complaints and had not experienced access site complications. CTA at that time revealed no endoleak and a patent endograft. This postoperative CTA had also demonstrated no injury, dissection, or stenosis as a result of the funnel sheath. The patient had provided written informed consent for the report of his case details and imaging studies.

## DISCUSSION

The complication of endograft iliac limb occlusion after EVAR is typically treated by open surgery, allowing for

thrombectomy and/or bypass.<sup>2</sup> The risks of operative femoral cutdown include nerve injury and a 2.6% risk of wound complications with an associated extended length of stay.<sup>4</sup> The current knowledge of endovascular approaches to this complication includes case reports with thrombolytic use and expense, which also noted AKI, blood loss, and hematuria.<sup>5</sup> The approach we have reported did not require thrombolytic agents nor resulted in these complications, enabling technical and interval success of an endovascular approach to limb thrombosis after EVAR. Furthermore, the costs associated with this technique were less than those for 24 hours of thrombolysis or an attendant length stay after open surgery.

## CONCLUSIONS

The findings from the present case report have highlighted the successful endovascular repair of a thrombosed iliac limb after EVAR with decreased morbidity (lack of open vascular exposure, avoidance of AKI, limited blood loss, no hematuria) compared with existing and emerging operations. First order arterial iliac limb occlusion after EVAR and aortoiliac endoprosthetic stent graft limb thrombosis can cause patient morbidity and disability. Further investigation on the safety and efficacy of the approach we have presented is required.

## REFERENCES

1. Bohannon WT, Hodgson KJ, Parra JR, Mattos MA, Karch LA, Ramsey DE, et al. Endovascular management of iliac limb occlusion of bifurcated aortic endografts. *J Vasc Surg* 2002;35:584-8.
2. EVAR Trial Participants. Endovascular aneurysm repair versus open repair in patients with abdominal aortic aneurysm (EVAR trial 1): randomised controlled trial. *Lancet* 2005;365:2179-86.
3. Wang G, Zhai S, Li T, Li X, Lu D, Wang B, et al. Limb graft occlusion following endovascular aortic repair: incidence, causes, treatment and prevention in a study cohort. *Exp Ther Med* 2017;14:1763-8.
4. Trinidad B, Rybin D, Doros G, Eslami M, Tan TW. Factors associated with wound complications after open femoral artery exposure for elective endovascular abdominal aortic aneurysm repair. *Int J Angiol* 2019;28:124-9.
5. Han X, Liu C, Li T, Guo X. Application of the AngioJet ultra thrombectomy device for the percutaneous mechanical treatment (PMT) of iliac limb occlusion after endovascular aneurysm repair (EVAR). *Ann Vasc Surg* 2022;78:161-9.

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