Endovascular Treatment of Abdominal Aortic Aneurysm with Complete Iliac Occlusion: Case Series and Literature Review

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Abstract

Keywords

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- ▶ peripheral arterial disease

In patients with abdominal aortic aneurysms (AAA) and complete iliac occlusion, endovascular aortic aneurysm repair (EVAR) using a bifurcated stent graft has clear advantages over aortouniiliac stent grafts. Bifurcated stent grafts had improved hemodynamic flow and increased primary and secondary patency rates compared with aortouniiliac stent grafts. The use of aortouniiliac stent grafts with femorofemoral crossover bypass is associated with complications including infection of the prosthesis, steal phenomenon, and the associated difficulties for further endovascular access at the site of the femoral anastomosis. Recanalization of occluded iliac arteries at the time of EVAR avoids the complications mentioned above. We report three cases of patients with AAA and iliac occlusion who were successfully treated with iliac recanalization at the time of EVAR.

The advent of endovascular technology and the increasing experience and expertise of endovascular surgeons have had a profound impact on the management of aortic aneurysms and resulted in improved perioperative outcomes and late results.^{1–3} Endovascular management of abdominal aortic aneurysms (AAA) demonstrates a lower early mortality rate compared with conventional surgery.¹ Atherosclerosis of the iliac artery can result in a stenosis or occlusion complicating access for endovascular aortic aneurysm repair (EVAR). A range of open surgical and endovascular treatment options are available. Open surgical procedures have excellent patency rates but at the cost of substantial morbidity and mortality. Both percutaneous transluminal angioplasty and stenting are commonly used endovascular treatment strategies for iliac artery occlusive disease. Endovascular treatment has adequate safety and short-term efficacy with decreased morbidity, complications, and costs compared with open surgical techniques.⁴

When an AAA occurs concurrently with an iliac artery occlusion, EVAR using an aortouniiliac (AUI) stent graft with femorofemoral crossover bypass has traditionally been used.⁵ EVAR with a bifurcated stent graft has multiple advantages over AUI stent grafts including better hemodynamic in-line direct flow and increased primary and secondary patency rates compared with AUI stent grafts. The use of AUI stent grafts with femorofemoral crossover bypass is associated with postoperative complications including infection of the prosthesis in the groin, steal phenomenon, and complications related to the presence of the anastomosis at the common femoral artery.⁶ Bifurcated stent grafts eliminate the complications associated with the crossover bypass required to fully revascularize patients with AAA and an associated complete iliac occlusion but is impossible when one of the iliac arteries is completely occluded if that artery is not recanalized. We present a brief case series of complex EVAR with simultaneous revascularization of totally occluded iliac arteries.

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Case Presentations

Case 1

A 77-year-old male patient with a history of AAA and hypertension presented to the emergency department with hematuria and dysuria secondary to a kidney stone for 1 week. He was noted to have a 6.0 cm infrarenal AAA on computed tomography angiography (CTA) which had expanded from 5.2 cm 3 years prior. Physical examination was significant for a palpable abdominal mass. The peripheral vascular examination was normal on the right, but no palpable femoral pulse was present on the left, but Doppler signals could be obtained in the left femoral artery. After the hematuria had resolved, he was taken to the operating room for EVAR and left external iliac artery (EIA) revascularization. Angiogram demonstrated total occlusion of the left EIA (►Fig. 1). The left common femoral artery (CFA) was cannulated, and a guide wire was advanced through the occlusion, and standard sheaths for the EVAR were placed. The main body graft (Gore Excluder, W. L. Gore Flagstaff, AZ) was placed on the left, and the contralateral limb was inserted on the right. Balloon expandable stents, 7 mm × 57 mm and 7mm × 37 mm, (Express, Boston Scientific, Minneapolis, MN) were placed from the EIA to the CFA. The angiogram showed resolution of the occlusion with the adequate flow (►Fig. 2). Pulses were palpable bilaterally postoperatively.

Case 2

A 68-year-old male patient with a history of leukemia, AAA, and peripheral vascular disease (PVD) with right lower extremity wounds initially presented to the emergency department with worsening epigastric pain. On presenta-

Fig. 1 Case 1 AAA with occluded left external iliac artery (arrow). AAA, abdominal aortic aneurysms.

Fig. 2 Case 1 with endograft and left external iliac stent (arrow).

tion, his vital signs were stable and physical examination was significant for a pulsatile abdominal mass with mild tenderness. CTA demonstrated a 6.8 cm infrarenal AAA, occlusion of the right EIA and right CFA, and bilateral common iliac artery (CIA) aneurysms.

During EVAR the angiogram revealed total right EIA and CFA occlusions (►Figs. 3 and 4) as well as aneurysmal degeneration of both CIAs. A right CFA and distal EIA endarterectomy with the Bovine pericardial patch were performed. A wire could then be advanced through the right EIA occlusion and sheaths were placed bilaterally. An endograft (Gore Excluder) has been put with the main body on the left side. Iliac extension cuffs were placed covering the hypogastric artery into the EIA. A contralateral limb (16 mm × 12 cm × 12 mm) was placed on the right side with two extension cuffs (16 mm × 10 cm × 12 mm and 16 mm × 7cm × 10 mm) into the EIA. Angiogram revealed a patent right EIA with excellent flow through the CFA patch. On 6-month follow-up studies a stenosis of the right EIA with a dissection distal to the previous occlusion was noted (►Fig. 5). Via a left brachial artery approach, a 7 mm × 37 mm balloon expandable stent (Express) was placed for treatment (►Fig. 6) with an adequate resolution of the dissection and stenosis.

Case 3

A 72-year-old female patient with a history of PVD and AAA presented to the office with worsening right hip and lower extremity pain. She had a CTA that demonstrated occlusion of the right CIA and a 5 cm AAA. Angiogram confirmed the AAA and the right CIA occlusion with reconstitution of the distal right CIA (►Fig. 7). On presentation, vital signs were stable, and examination revealed dopplerable right lower extremity distal pulses.

Fig. 3 Case 2 AAA with occluded right external iliac artery (arrow). AAA, abdominal aortic aneurysms.

She proceeded to undergo EVAR with simultaneous treatment of the right CIA occlusion. The right CFA was percutaneously cannulated, and a wire could be advanced through the total occlusion. The main body (Gore Excluder) was placed on the left and then the right limb (16 mm $\times$ 14 cm $\times$ 12 mm) was extended to the distal CIA to treat the right total occlusion ($\rightarrow$ Fig. 8).

Fig. 5 Case 2 right external iliac artery dissection (arrow) and common femoral artery patch.

Discussion

Numerous trials have shown EVAR to have superior results compared with open surgical repair. The OVER (open vs. endovascular repair) trial demonstrated lower all-cause mortality with the EVAR group while other studies including the DREAM trial and EVAR1 trial have demonstrated EVAR to

Fig. 4 Case 2 AAA with occluded right external iliac and common femoral arteries (arrows). AAA, abdominal aortic aneurysms.

Fig. 6 Case 2 right external iliac artery stent (arrow) and common femoral artery patch.

Fig. 7 Case 3 right common iliac artery occlusion (arrow).

Fig. 8 Case 3 right common iliac artery endograft (arrow).

have less mortality in the short term, shorter procedure times, less blood loss, fewer intensive care unit days, and shorter length of stays.⁷⁻⁹ Systemic complications are higher in the open groups in these studies. However, the need for secondary intervention is higher in the EVAR group which is typically due to endoleak and graft migration.⁸ The benefits and durability of EVAR are well documented, however, with surgeons becoming more aggressive with endovascular therapies new challenges present themselves with EVAR.

Additional techniques and procedures need to be utilized to continue treating complex patients with endovascular therapies rather than open AAA repairs.

One such complex patient is the patient with an AAA and concomitant unilateral total iliac occlusion. Patients with these combined diseases have been excluded from EVAR as total iliac occlusive lesions are TransAtlantic Inter-Society Consensus (TASC) D lesions for which open repair is typically required for such lesions.¹⁰ These patients often have significant comorbidities making them high-risk candidates for open operations and endovascular therapy has proven benefits that should be capitalized on when possible. An AUI EVAR device with femoral-femoral bypass is an option for patients presenting with total iliac occlusion and AAA.¹¹ However, the results from AUI stent graft repairs with crossover bypass are inferior compared with bifurcated stent grafts. The former have decreased patency, additional risk of femoral graft infection, and graft failure inherent to extra-anatomic bypasses.¹²

A recent study examined outcomes of patients undergoing iliac recanalization and bifurcated EVAR in the presence of access vessel occlusion. EVAR was utilized following recanalization of an occluded iliac artery and was shown to be technically feasible with 93% success rate and with 100% patency at 28-month follow-up. The group had no major perioperative complications or mortality.¹³ An additional report demonstrated the placement of an EVAR with a bifurcated stent graft after recanalization of a completely occluded left CIA with adequate success.⁶

In our case series, at 1-year follow-up all stent grafts were patent. One patient required an external iliac stent at 6 months to maintain patency but has not required intervention since. This series demonstrates, along with prior reports, that EVAR is possible and durable in the presence of occluded outflow vessels when these vessels are repaired at the time of EVAR. When we encounter these challenging patients, we prefer to perform the EVAR before placing iliac stents to avoid possible injury or stent migration with the sheaths required for EVAR. The use of endovascular recanalization techniques of access vessels should be pursued to continue offering EVAR to patients with even the most difficult access vessel anatomy.

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