Annals of Internal Medicine
CLINICAL CASES

CASE REPORT

Recurrent Abdominal Aortic Aneurysm After Aortoiliac Endograft Stent Placement

Alexandra J. Toloczko, MBE[1]; Seher Berzingi, MD[2]; Benjamin V. Bailey, MD[3]; Lubna B. Wani, MD[3]; and Mayada H. Issa, MD[3]

[1]Virginia Tech Carilion School of Medicine, Roanoke, Virginia

[2]West Virginia University, Morgantown, Virginia

[3]Department of Internal Medicine, Carilion Clinic, Roanoke, Virginia

Published online at
https://www.acpjournals.org/doi/10.7326/aimcc.2023.1393

Publication date: 3 December 2024

Disclosures
Disclosure forms are available with the article online.

Corresponding Author
Mayada H. Issa, MD; Department of Internal Medicine, Carilion Clinic, 3 Riverside Circle, Roanoke, VA 24016; e-mail, mhissa@carilionclinic.org.

How to Cite
Toloczko AJ, Berzingi S, Bailey BV, et al. Recurrent abdominal aortic aneurysm after aortoiliac endograft stent placement. AIM Clinical Cases. 2024;3:e231393. doi:10.7326/aimcc.2023.1393

co-published by
ACP American College of Physicians | American Heart Association.

Keywords
Abdominal aortic aneurysm, Stent implantation, Aneurysms, Thrombosis, Musculoskeletal injury, Limb ischemia, Embolectomy, Blood, Aortic surgery, Surgical repair, AAA, EVAR, CTA

Abstract
We report a case of a 59-year-old man with multiple comorbid conditions who had endovascular aortic repair for an abdominal aortic aneurysm (AAA). Despite the procedure's initial success, the patient later presented with recurrent AAA as the result of an enlarged aneurysmal sac and a 90-degree angle kink at the midportion of the endograft stent, necessitating emergent open surgery. This case underscores the challenges in managing AAA post endovascular aortic repair and the potential for serious complications. Our experience highlights the importance of close surveillance and prompt intervention for optimal patient outcomes.

Background
Endovascular aneurysm repair (EVAR), pioneered by Juan Parodi in 1991, revolutionized the management of abdominal aortic aneurysms (AAAs), offering benefits of reduced perioperative mortality and shorter recovery time compared with open repair methods. Despite early benefits, long-term follow-up has revealed significant challenges such as endoleaks, occurring in up to 30% of cases, and device migration, which complicates approximately 21% of EVAR procedures (1, 2).

Case Report
A 59-year-old man with a medical history of coronary artery disease, ischemic cardiomyopathy with an ejection fraction of 25%, hypertension, hyperlipidemia, chronic kidney disease stage 3a, and AAA treated 6 years previously with EVAR using an Endo Logix stent, presented to the emergency department with a 2-week history of lower back pain and bilateral leg pain and numbness, without saddle anesthesia or loss of bladder/bowel control. The patient was evaluated by his primary care physician 10 days before presentation because of these symptoms, at which time findings on a lumbar radiograph scan were only notable for multilevel degenerative changes.

In the emergency department, the patient appeared ill but was hemodynamically stable and had normal findings on a neurologic examination, with no focal spinal tenderness. His laboratory test results were significant only for mildly elevated lactate. In addition, his Doppler examination findings of lower extremities were notable for modest dorsalis pedis and posterior tibial pulses on the right but a faint dorsalis pedis and absent posterior tibial on the left.

Computed tomography angiograms of the patient's abdomen (Figures 1–3) showed a large infrarenal AAA with an aortoiliac endograft stent originating at the level of the renal arteries, traversing an aneurysm with a diameter of 9 cm anteroposterior by 9.5 cm transverse by 12.24 cm craniocaudal. The endograft stent had a 90-degree angulation at the level of the endograft break. Bilateral internal iliac arteries demonstrated a partial thrombus to the midpelvic level, with preserved flow in the lower extremities.

Figure 1. **Endograft obstruction, coronal posterior view.**

The patient was diagnosed with migration and fractured endograft, otherwise classified as a type 3 endoleak, meaning a defect or misalignment of graft material. As such, he administered heparin and mannitol and underwent redo bilateral groin exposures. The common femoral arteries were clamped to prevent distal embolization, then the renal arteries and the supraceliac aorta were clamped. With the surgeon entering the aneurysm sac anteriorly with electrocautery, curved Mayo scissors were used to extend to the pararenal location as well as distally to the bifurcation. A large thrombus was visualized and removed. The distal portion of the endograft was removed. The proximal portion was adherent to the pararenal location. With wire cutters and curved Mayo scissors, that portion of the stent was slowly removed. The supraceliac clamp was replaced with a suprarenal clamp because of the proximity of the aortic neck to the pararenal location. A 16 $\times$ 8 mm Dacron graft was sewn in an end-to-end fashion. Once the renal arteries were reperfused, attention was directed to

Figure 2. **Endograft obstruction, coronal anterior view.**

Figure 3. **Endograft obstruction, sagittal view.**

the common iliac arteries, which were thrombosed. They were sewn in a 2-layer fashion at the bifurcation for occlusion from antegrade flow, then using a curved angled aortic clamp in the retroperitoneal area to sequentially tunnel each Dacron limb to the groin sequentially in the right followed by the left. In the right groin, the graft was distended, cut, and spatulated to adequate length, and opening the common femoral artery, a thrombus was found and excavated. Then, a 3F Fogarty catheter was placed within the profunda femoris, superficial femoral artery, and the popliteal artery with embolectomy followed by sewing of the right limb to the right common femoral artery. Similarly, in the left groin, the graft was distended, spatulated, and sewed to the common femoral artery, which was free of thrombus.

The patient's hospital course was complicated by hypotension requiring pressor support, type 2 myocardial infarction, and acute tubular necrosis requiring dialysis. He was transitioned to receiving warfarin and discharged on postoperative day 15. Dialysis was required for 2 more weeks, with steadily improvement noted in renal function. Repeat imaging at 1-year follow-up was performed using duplex ultrasound scanning to avoid contrast nephropathy. It showed a stable aortobifemoral repair, with a residual aneurysm sac of 5.5 $\times$ 5.8 cm (Figure 4). The patient was doing well and ambulating without an assistive device, and he will be due for follow-up imaging in few months.

Discussion

Despite the initial benefits of EVAR in reducing surgical risks and recovery time, long-term complications such as endoleaks and graft migrations can negate these early advantages. These complications often necessitate reintervention, highlighting the importance of continuous monitoring and management over time (3).

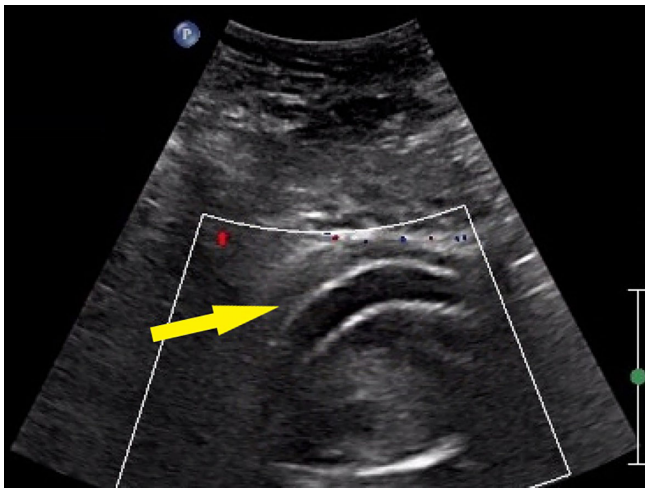

Figure 4. One-year postoperative abdominal ultrasound, sagittal view. The *arrow* shows the patient bypass graft.

The most prevalent complication is an endoleak, which is observed in up to 30% of cases and characterized by blood leakage into the aneurysm sac (1). Device migration occurs in about 21% of cases (2), and endograft stent limb kinking, although less common, presents significant risks such as thrombosis and limb ischemia, reported in approximately 1.5% of patients (4). Other ischemic complications include bowel ischemia related to mesenteric artery embolization and spinal cord ischemia, which usually presents with paraplegia within 12 hours from surgery in relation to intraoperative hypotension (5). Our patient developed hypotension, which was adequately treated with transfusion and pressor support, thus avoiding such complications.

The need for open repair in our patient, rather than endovascular technique, was attributable to the thrombus burden and occlusion at the fractured endograft site. The type 3b endoleak resulted from a severely deformed stent graft, making endovascular solutions like bridging with a new stent or using a thoracic endovascular stent graft unfeasible (6). Thus, open surgical repair was necessary. Unfractionated heparin was used to minimize thromboembolic events, although recent studies have questioned the optimal dosing for such scenarios (7). Mannitol was administered to reduce the risk for renal injury during suprarenal clamping, as highlighted by research indicating its efficacy in reducing postoperative dialysis requirements (8).

The presentation of low back pain in this patient was an indicator of potential AAA complications, necessitating thorough investigation. Diagnostic imaging, such as plain radiographs, although basic, play a crucial role in diagnosing complications like kinking, migration, and frame fractures but require a radiologist experienced with stents for accurate interpretation (9).

A significant concern was the patient's loss of follow-up for 2 years, which underscores the critical role of primary care physicians in ensuring patients understand the importance of ongoing surveillance. This case illustrates the need for a structured follow-up strategy to monitor for and address post-EVAR complications promptly.

In cases of AAA treated with an EVAR, lifelong clinical and imaging surveillance, with computed tomography angiography as the gold standard or duplex ultrasound if computed tomography angiography is contraindicated, is crucial for early detection and subsequent management (10).

References

1. Yanamaladoddi VR, Sarvepalli SS, Vemula SL, et al. The challenge of endoleaks in endovascular aneurysm repair (EVAR): a review of their types and management. Cureus. 2023;15:e39775. [PMID: 37398777] doi:10.7759/cureus.39775
2. Hogg ME, Morasch MD, Park T, et al. Long-term sac behavior after endovascular abdominal aortic aneurysm repair with the Excluder low-permeability endoprosthesis. J Vasc Surg. 2011;53:1178-83. [PMID: 21276679] doi:10.1016/j.jvs.2010.11.045
3. Schanzer A, Messina L. Two decades of endovascular abdominal aortic aneurysm repair: enormous progress with serious lessons learned. J Am Heart Assoc. 2012;1:e000075. [PMID: 23130133] doi:10.1161/JAHA.111.000075
4. Coelho A, Nogueira C, Lobo M, et al. Impact of post-EVAR graft limb kinking in EVAR limb occlusion: aetiology, early diagnosis, and management. Eur J Vasc Endovasc Surg. 2019;58:681-9. [PMID: 31514990] doi:10.1016/j.ejvs.2019.03.019
5. Daye D, Walker TG. Complications of endovascular aneurysm repair of the thoracic and abdominal aorta: evaluation and management. Cardiovasc Diagn Ther. 2018;8:S138-56. [PMID: 29850426] doi:10.21037/cdt.2017.09.17
6. Stoecker JB, Glaser JD. Review of type III endoleaks. Semin Intervent Radiol. 2020;37:371-6. [PMID: 33041482] doi:10.1055/s-0040-1715874
7. Teter K, Rockman C, Patel V, et al. Mannitol use is renal protective in patients with chronic kidney disease requiring suprarenal aortic clamping. Ann Vasc Surg. 2022;85:77-86. [PMID: 35452789] doi:10.1016/j.avsg.2022.04.018
8. Doganer O, Roosendaal LC, Wiersema AM, et al. Weight based heparin dosage with activated clotting time monitoring leads to adequate and safe anticoagulation in non-cardiac arterial procedures. Ann Vasc Surg. 2022;84:327-35. [PMID: 35248743] doi:10.1016/j.avsg.2022.01.029
9. Picel AC, Kansal N. Essentials of endovascular abdominal aortic aneurysm repair imaging: preprocedural assessment. AJR Am J Roentgenol. 2014;203:W347-57. [PMID: 25247964] doi:10.2214/AJR.13.11735
10. Smith T, Quencer KB. Best practice guidelines: Imaging surveillance after endovascular aneurysm repair. AJR Am J Roentgenol. 2020;214:1165-74. [PMID: 32130043] doi:10.2214/AJR.19.22197