Preservation of renal perfusion by hepatorenal and splenorenal bypasses before explantation of an infected abdominal aortic endograft

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ABSTRACT

We report the case of an 82-year-old patient with an infected abdominal aortic endograft who presented with a right psoas abscess and lumbar osteomyelitis. The psoas abscess was drained percutaneously. Fluid obtained grew *Fusobacterium nucleatum*. The patient, an active and highly functional individual, wished to pursue definitive management. The infected endograft was surgically removed, and the aorta was ligated above the renal arteries after staged axillary-bifemoral, hepatorenal, and splenorenal bypasses. (J Vasc Surg Cases and Innovative Techniques 2019;5:139-42.)

Keywords: Abdominal aortic endograft infection; Hepatorenal bypass; Splenorenal bypass; Axillobifemoral bypass; Aortic ligation

Endograft infection after endovascular aneurysm repair is rare, with an incidence of 0.6%[1]; however, it is associated with a 38% mortality rate.[2] We report a case of an infected abdominal aorta endograft removal in an 82-year-old man with subsequent ligation of the suprarenal abdominal aorta, which required staged axillary-bifemoral, hepatorenal, and splenorenal bypasses to preserve the perfusion to the lower extremities and kidneys. The patient's consent was obtained for publication.

CASE REPORT

An 82-year-old man with a history of endovascular aneurysm repair with a Gore Excluder (W. L. Gore & Associates, Flagstaff, Ariz) for a 5.5-cm abdominal aortic aneurysm 3 years earlier presented with 6 months of insidious back pain, lethargy, and decreased appetite. There was no fever, night sweat, leukocytosis, or bacteremia. Computed tomography scan showed right psoas muscle enlargement, which was confirmed to be psoas abscess on magnetic resonance imaging (Fig 1). The psoas abscess was percutaneously drained with a pigtail catheter, and the culture grew *Fusobacterium nucleatum*. Broad-spectrum antibiotics were started to cover a possible polymicrobial infection. A positron emission tomography-computed tomography scan showed hypermetabolic activity along the endograft and the aortic wall, suggesting an endograft infection (Fig 2).

The patient's medical history included hypertension, hyperlipidemia, and coronary artery disease. He was a highly functional and active individual. His physical examination was unremarkable, and he had palpable femoral and pedal pulses bilaterally. His echocardiogram showed normal left ventricular function with an ejection fraction of 65%, and a stress test revealed no reversible ischemia. His pulmonary and renal functions were also normal.

Because he is a highly functional octogenarian, we recommended endograft explantation, given the acceptable complication rates for open repair in this age group.[3] In the presence of the partially drained psoas abscess, we decided against an in-line reconstruction of his infrarenal aorta and planned to ligate the abdominal aorta after the endograft removal. However, magnetic resonance imaging showed severe inflammation and possible infection of the infrarenal aortic neck (Fig 3). Therefore, we decided to use the suprarenal aortic tissue just below the superior mesenteric artery (SMA) to better secure the aortic stump. In addition to the axillary-bifemoral bypass to preserve lower extremity perfusion, this required two additional bypasses to perfuse the kidneys: the hepatorenal and splenorenal bypasses.

A two-stage approach was executed. The axillary-bifemoral bypass and the hepatorenal bypass were done in the first stage. The authors prefer supra-SMA control of the aorta through a left thoracoabdominal incision; therefore, the hepatorenal bypass was done with great saphenous vein through a right subcostal incision, and the right axillary artery was chosen as the donor artery for the axillary-bifemoral bypass. The original plan was to return 48 hours later for the splenorenal bypass and endograft explantation and aortic ligation, but the second procedure was delayed 1 week to medically optimize the patient. As a result, several Amplatzer plugs (Abbott Vascular, Abbott Park, Ill) were placed in the iliac system on postoperative day 2 to

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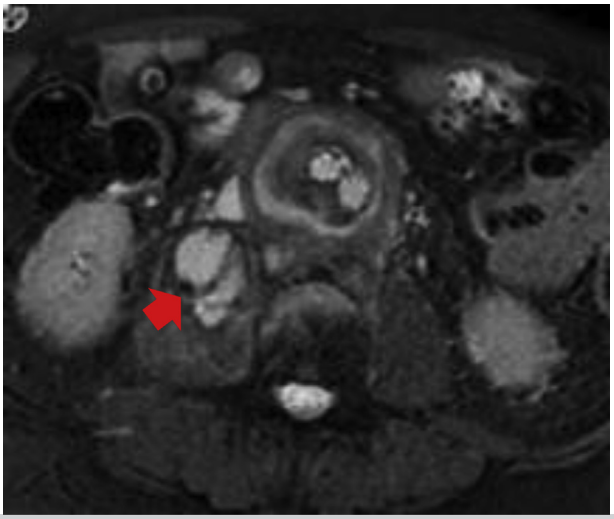

Fig 1. Magnetic resonance imaging demonstrating the right psoas abscess (*arrow*), which is contiguous with the severely inflamed aneurysm sac surrounding the endograft.

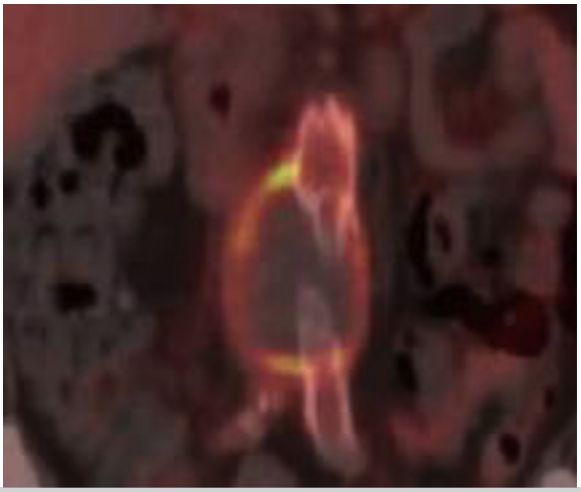

Fig 2. Enhancement of the endograft and aneurysm sac on positron emission tomography-computed tomography scan confirmed the clinical suspicion of an endograft infection.

prevent thrombosis of the axillary-bifemoral bypass from the competitive flow of the native aorta. One plug was placed in the endograft's left iliac limb, which was removed along with the endograft during the final procedure; one in the right external iliac artery; and one in the right hypogastric artery. The plugs on the right iliac system would remain because they served as a hemostatic measure preventing backbleeding into the open aortic sac from the right axillary-bifemoral bypass. Controlling and oversewing the right common iliac artery might be challenging from a right lateral decubitus position, especially given the inflamed aortic tissue, which was contiguous with the right psoas abscess.

During the second procedure, a thoracoabdominal incision was made at the left ninth intercostal space. Medial visceral

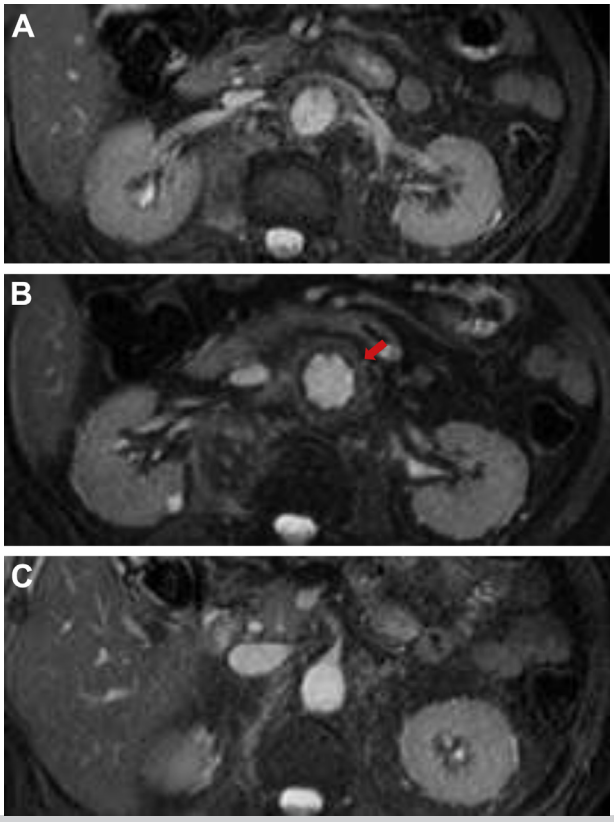

Fig 3. The pararenal **(A)** and juxtarenal **(B)** aortic tissues were severely inflamed (*arrow*), but the aortic wall below the superior mesenteric artery (SMA) was normal **(C)**.

rotation with a transperitoneal approach was performed, leaving the left kidney down. The splenic artery was ligated a few centimeters from the splenic hilum and was anastomosed to the left renal artery in an end-to-end fashion. The left kidney was then medially rotated to bring the splenorenal bypass and the left renal vein away from the suprarenal aorta. The proximal aortic clamp was placed between the celiac trunk and the SMA. The endograft was removed without difficulty. The juxtarenal aortic tissue was friable as anticipated. The aorta was ligated using the 2-cm suprarenal portion just distal to the SMA. To avoid potential reinfection, bovine pericardial pledgets were used to reinforce the aortic stump. The left common iliac orifice was oversewn in multiple layers for hemostasis. There was no backbleeding from the right common iliac orifice because of the previously placed Amplatzer plugs. The right flank was inspected and appeared to be clean; therefore, we did not débride the right psoas muscle. He recovered uneventfully and maintained good urine output after both procedures. His creatinine concentration peaked at 1.7 mg/dL on postoperative day 2 and returned to baseline at 1.1 mg/dL on postoperative day 4. He was discharged to a rehabilitation facility after 7 days and returned home 10 days after. A 1-month postoperative computed tomography angiography image of the new anatomy is displayed in Fig 4. At a 3-month follow-up visit, the patient reported that his appetite and energy were 75% of his baseline.

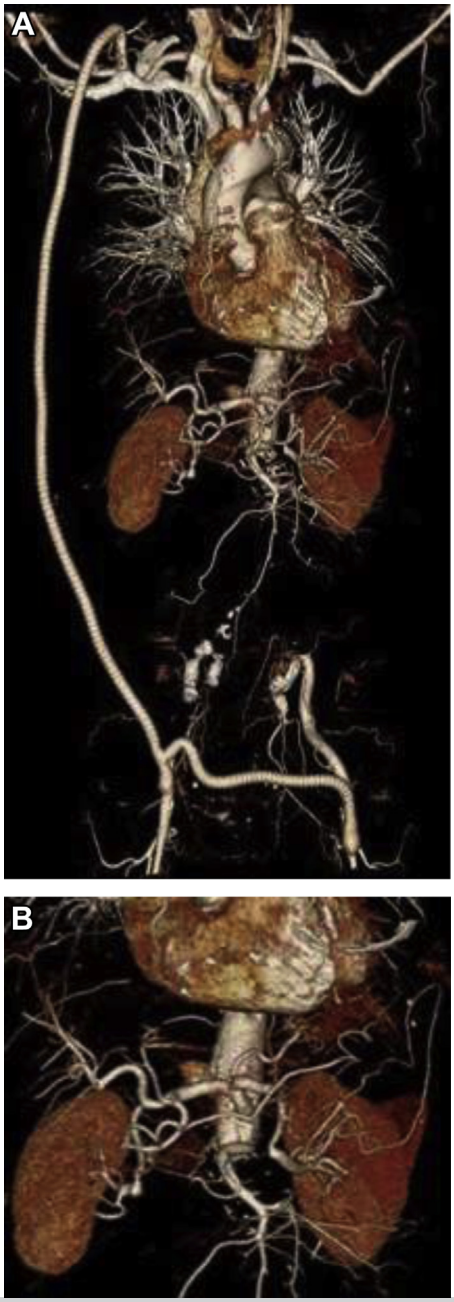

Fig 4. The patient's final anatomy after the removal of the infected endograft **(A)**. The two Amplatzer plugs are shown in the right external and internal iliac arteries. The perfusion to the pelvis is maintained by the left hypogastric artery. The abdominal aorta is ligated just below the superior mesenteric artery (SMA; **B**). Both kidneys are well perfused by the hepatorenal and splenorenal bypasses **(B)**.

DISCUSSION

Abdominal aortic endograft infection is a rare but highly morbid complication that is associated with high mortality. Complications of abdominal aortic endograft infection include aortoenteric fistula, sepsis, aneurysm sac expansion, and rupture.[4,5] Our patient had more indolent symptoms, including fatigue and weight loss, until the psoas abscess was discovered. In fact, a psoas abscess is reported in 20% of abdominal aortic endograft infections.[6] The psoas muscle can be seeded either through the bloodstream or from contiguous spread from nearby structures.

The definitive treatment of an endograft infection is removal of the endograft; however, if the patient is not a surgical candidate, lifelong suppressive antibiotics are needed. A recent meta-analysis reported a 58% survival rate with surgical treatment compared with 33% with antibiotics alone.[7] Younger patients without a heavy bacterial load are good candidates for an in-line reconstruction. Among the different conduits, such as a rifampin-soaked graft, a homograft, or an autograft harvested from the patient's lower extremity superficial and deep veins (neoaortoiliac system), the neoaortoiliac system procedure was associated with an improved 5-year survival compared with a rifampin-soaked graft, 71% vs 53%, respectively.[8] We decided against an in-line aortic reconstruction because of the potential reinfection from the heavy bacterial load as suggested by the purulent drainage from the psoas abscess; therefore, we chose the extra-anatomic axillary-bifemoral bypass and aortic ligation.

When an infected endograft is removed, the aorta is typically ligated below the renal arteries and renal revascularization is not necessary. When suprarenal aortic ligation is needed, the options are either renal bypasses from the supraceliac aorta or extra-anatomic bypasses. We chose the extra-anatomic bypasses because the exposure of the hepatic and splenic arteries was simpler and a shorter segment of saphenous vein conduit would be required. In one retrospective series, one patient received both hepatorenal and splenorenal bypasses with suprarenal aortic closure. This series, however, did not specify the patient's preoperative, intraoperative, or postoperative course.[9]

In summary, we report a successful explantation to treat an aortic endograft infection in an octogenarian despite the complexity of the procedures. This case re-emphasizes that selection of patients is crucial and that age alone is not a contraindication to complex surgery as long as it is well planned and staged.

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