Successful management of infected thoracoabdominal graft and aortobronchial fistula using a hybrid approach

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We present the case of a 72-year-old patient who underwent successful management of a thoracoabdominal aortic graft infection. The patient was diagnosed with infected distal anastomotic pseudoaneurysm and aortobronchial fistula after type I thoracoabdominal aortic aneurysm repair. The infection was caused by the enteric gram-negative bacterium *Proteus mirabilis*. The high-risk patient was successfully treated with visceral debranching, infrarenal aortic reconstruction, and stent graft coverage of the pseudoaneurysm. The success of this case suggests that endovascular treatment of thoracoabdominal aortic graft infections may be a viable option in some high-risk patients. (J Vasc Surg Cases 2015;1:239-41.)

Treatment of aortic graft infections continues to be a challenge for surgeons. Graft infections after thoracic aortic surgery occur at a rate of 0.9% to 2.0%.[1] Débridement of infection and graft explantation followed by vascular reconstruction remain the "gold standard." This approach is not a viable option in high-risk patients; therefore, endovascular management and muscle flap or omental wrap have been suggested as treatment options for mycotic aneurysms and aortobronchial fistulas (ABFs).

This article presents a case of an infected distal anastomotic pseudoaneurysm (PSA) and ABF from extent I thoracoabdominal aortic aneurysm (TAAA) successfully treated with visceral debranching and stent graft coverage. The patient consented to the publication of this case report.

CASE REPORT

A 72-year-old man presented to an outside hospital with hemoptysis. He reported lower back pain (8/10) and night sweats. He denied dyspnea, fevers, chills, and weight change. Past medical history was significant for hypertension, type B aortic dissection, hyperlipidemia, congestive heart failure, obesity, diverticulitis, automatic implantable cardioverter-defibrillator, and former smoking. Past surgical history was aortic valve replacement and type I TAAA repair (2008) for degeneration of chronic dissection. The distal anastomosis from the repair was approximately 2 cm above the celiac artery, and the surgical dissection extended to the superior mesenteric artery (SMA).

The patient reported a persistent cough for 1 month before admission that progressed to hemoptysis. Computed tomography angiography (CTA) showed circumferential soft tissue density 8.7 × 8.0 cm at the level of the diaphragm, with PSA at the distal graft anastomosis site with left lower lobe involvement. These findings (Fig 1) raised concern for ABF and infection of his thoracoabdominal graft.

The patient was transferred for surgical evaluation. He was hemodynamically stable and afebrile. Laboratory results showed white blood cell count of 15, creatinine concentration of 1.02, and erythrocyte sedimentation rate of 99. Blood and sputum cultures grew *Proteus mirabilis*. Cefepime, vancomycin, and metronidazole (Flagyl) were initiated. The patient's diagnosis was infected distal anastomotic PSA from type I TAAA repair.

The patient was taken to the operating room for a debranching procedure and stent graft coverage of the PSA. He was explored through a midline incision. The abdominal aorta was exposed in standard inframesocolic fashion. The renal arteries, SMA, and hepatic artery were mobilized. The infrarenal aorta was replaced with a tube graft because of chronic dissection extending from the celiac artery to the common iliac arteries. The renal arteries, SMA, and common hepatic arteries were debranched with bypass grafts. All arteries were ligated at their origins. Two Gore TAG devices (W. L. Gore & Associates, Flagstaff, Ariz) were placed over the ruptured descending aorta, with the proximal seal zone at the level of the proximal TAAA graft and the distal seal within the new infrarenal graft. The visceral grafts were wrapped with omentum, and the abdomen was closed.

The patient remained on broad-spectrum antibiotics for a week. He was converted to intravenous ceftriaxone and metronidazole for 2 weeks, then prescribed 500 mg of ciprofloxacin indefinitely. He was discharged on postoperative day 19. At a 4-month follow-up, CTA revealed nearly complete resolution of his PSA. Three years after the procedure, he is asymptomatic, and CTA shows no signs of infection or inflammation (Fig 2). The patient

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Author conflict of interest: none.

Presented as an e-Poster at the Forty-third Annual Symposium of the Society for Clinical Vascular Surgery, Miami, Fla, March 30-April 2, 2015.

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The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2352-667X

http://dx.doi.org/10.1016/j.jvsc.2015.07.006

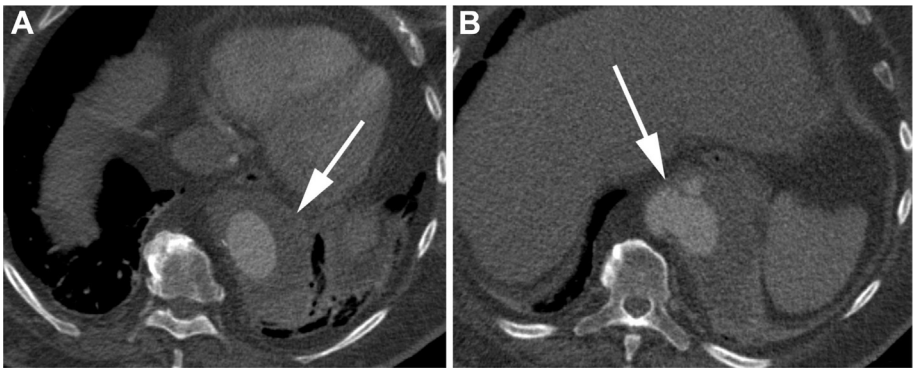

Fig 1. Preoperative axial computed tomography angiography (CTA) images. **A,** Axial CTA image showing the phlegmon (*arrow*) and lung involvement around the distal thoracoabdominal graft. **B,** Axial CTA image showing the distal anastomotic pseudoaneurysm (PSA).

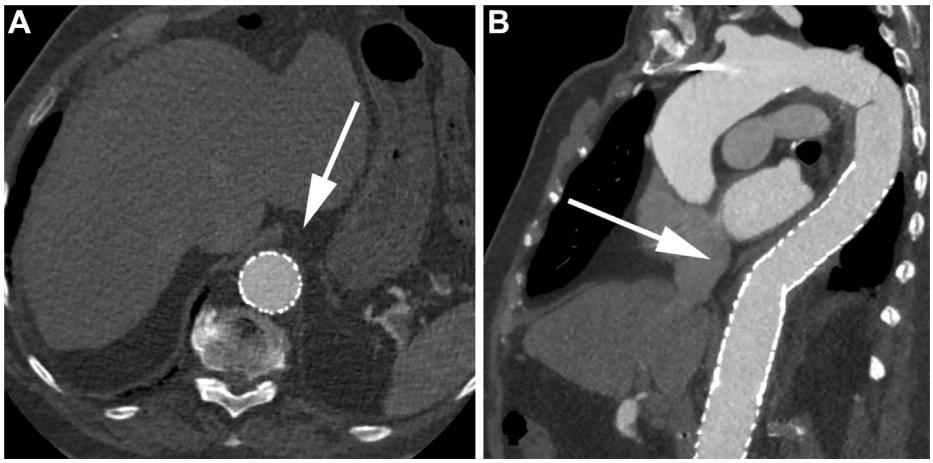

Fig 2. Computed tomography angiography (CTA) images at 3-year follow-up showing complete resolution of inflammation and infection. **A,** Axial image at level of distal thoracoabdominal graft. **B,** Candy cane digital reconstruction.

remains on ciprofloxacin and continues to undergo annual follow-up.

DISCUSSION

Management of aortic graft infections varies. Classical treatment is resection of the graft, débridement of the infected aorta and surrounding tissue, and arterial reconstruction followed by long-term antibiotic therapy.[1-3] Treatment has shifted to in situ reconstruction with an antibiotic-impregnated graft, omental wrap, and long-term antibiotic suppression.[4-6] This approach is not always a viable option, and choosing the appropriate therapy for high-risk patients is difficult.[7] For successful outcomes, surgeons treating aortic graft infections should be familiar with multiple treatment options, be experienced in complicated reconstructions, and provide long-term follow-up.[8]

There are alternative approaches for treatment of aortic graft infections. Cases report successful treatment of patients with muscle flap coverage or omental wrapping without graft resection.[1,2] The high vascularity and absorptivity of the omental tissue enhances immune reaction and decreases fluid collection, which decreases reinfection rates.[9] Another less invasive option for patients is removal of grossly infected tissue, washout, and placement of antibiotic-impregnated beads around the graft.[10]

Whereas thoracic endovascular aortic repair (TEVAR) has evolved as an important therapy for thoracic aortic diseases, treatment of graft infections with TEVAR contradicts general surgical principles. This approach results in placement of foreign material in an infected field, and measures to reduce infection (ie, débridement) are not used. Consequently, several studies suggest that endovascular procedures may be used to bridge resection and aortic reconstruction in high-risk patients.[3,6,11]

The use of TEVAR in treating ABFs is also debated. The literature reports 91% to 100% intraoperative technical success and 30-day mortality rates ranging from 1.5% to 40% for TEVAR of ABFs.[11-15] Studies reporting 100%

survival rates with no reintervention, no recurrence of ABF and hemoptysis, and no TEVAR failure suggest that TEVAR is a definitive treatment of ABF.[12,14] In contrast, retrospective reviews found high risk of infectious complications, recurrent bleeding, and recurrent ABF.[11,15] These reviews suggest that TEVAR initially controls hemodynamics, but risk factors must be assessed to determine if a second procedure is necessary. In this case of a mycotic PSA and ABF, risk factors were considered, and treatment of ABF with TEVAR was intended as a bridge procedure.

Our patient presented with a thoracoabdominal graft infection and ABF. A two-stage surgical approach was selected because of the patient's clinical and physical deterioration before presentation. The stage one procedure consisted of visceral debranching, infrarenal aortic reconstruction, and stent graft coverage of the PSA. This procedure minimized technical risk and risk of prolonged visceral ischemia because vessels were dissected at locations removed from the infection, phlegmon, and prior surgical bed. The planned second-stage procedure consisted of excision of the newly placed TEVAR, affected aorta, and distal aspect of the old infected graft with in situ reconstruction using an antibiotic-impregnated graft. However, the patient did not appear clinically or physically ready for a major surgical resection at 4-month follow-up. Serial computed tomography follow-up continued to show improvement. CTA now shows complete resolution of infection. The patient is fully functional, is asymptomatic, and has normal erythrocyte sedimentation rate and white blood cell count. The bridge operation successfully treated the patient's ABF and PSA, and the second stage was unnecessary.

CONCLUSIONS

This article reports a successful hybrid repair of an infected distal anastomosis PSA and ABF caused by *P. mirabilis*. Complete resection of affected material with in situ reconstruction is the preferred treatment for aortic graft infection. However, the success of this case suggests that a hybrid endovascular and open approach may be a viable treatment option in similar high-risk patients with graft infections, ABF, or PSA. TEVAR is preferred in emergent ABF cases. Risk factors dictate whether TEVAR is a definitive treatment or a bridge procedure. Patients presenting with infection must be monitored after TEVAR because of risk of recurrent infection, ABF, and hemoptysis. Positron emission tomography/computed tomography imaging before or after intervention is suggested as it is reported to be more accurate in diagnosis of patients with suspected graft infection.[16-18] Flushing of the stent graft with rifampicin might also be considered to minimize reinfection.[6,12] After TEVAR, patients should be prescribed long-term suppressive antibiotic indefinitely. Bronchoscopy may be used to monitor infection in patients with persistent symptoms. However, patients with recurrent infection should be treated with a second-stage open procedure.

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Submitted Mar 30, 2015; accepted Jul 13, 2015.