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INTERVENTIONAL RADIOLOGY

CASE REPORT

Management of an infected aortic graft with endovascular stent grafting

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ABSTRACT

Aortic graft infection, one of the most common fatal complications of aortovascular surgery, is managed mainly by the removal of infected graft material and re-establishment of vascular continuity using an extra-anatomical bypass or in situ graft replacement. Despite significant progress in perioperative, surgical, and medical treatments, the mortality and morbidity for this condition remain high. Here, we report the use of endograft implantation and prolonged intravenous antibiotics to successfully treat a life-threatening Dacron aortic tube graft infection and anastomotic leak. Although the gold standard is surgical removal of infected material and repair with a homograft, in certain extremely high-risk patients such as ours, an alternate strategy may be warranted when the risks associated with surgery are prohibitive. Endovascular repair of a surgical Dacron graft leak may provide a novel temporizing measure in the acute setting, allowing for delayed semi-urgent surgical intervention, or it may provide a definitive treatment, as in our case. At the four-year follow-up, our patient was well with a good quality of life and with no clinical, radiological, or biochemical evidence of infection.

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The incidence of graft infection ranges from 0.7% to 2.0% and is associated with a mortality of 10% to 25% (1). The main goals of management are the removal of infected graft material and re-establishment of vascular continuity using an extra-anatomic bypass or in situ graft replacement (1, 2). However, these methods carry a high mortality and re-infection rate. Conservative management comprising omental wrapping of infected grafts and long-term intravenous antibiotics has been reported in the literature (3, 4). Here, we report the use of endovascular stent grafting to treat an infected Dacron graft-associated anastomotic leak. The patient was well at the most recent follow-up and continues to receive self-administered intravenous antibiotics.

Case report

A 69-year-old man presented with a two-year history of epigastric pain. His medical history was unremarkable. An ultrasound scan revealed an abdominal aneurysm. Computed tomography (CT) confirmed a type III thoracoabdominal aneurysm. Further preoperative assessment revealed significant triple-vessel coronary disease. This necessitated urgent coronary artery bypass grafting with saphenous vein grafts to the left anterior descending, first obtuse marginal, and distal right coronary arteries. This was undertaken electively prior to the aneurysm repair.

Three months later, he was readmitted for open thoracoabdominal aneurysm repair, with a logistic European System for Cardiac Operative Risk Evaluation score (EuroSCORE) of 41.67%. A left thoracolaparotomy through the eighth intercostal space was used to approach the aorta. Left heart cardiopulmonary bypass was established through the left inferior pulmonary vein and left common iliac artery. The aorta was then clamped and transected, and the intercostal arteries were under-run with Prolene sutures. A proximal anastomosis was established with a 22-mm Dacron single side-arm branched graft (Vascutek Terumo, Ann Arbor, Michigan, USA). Visceral vessels were mobilized on a pedicle, and antegrade organ perfusion was employed. The vessels were then anastomosed to the graft, and a distal anastomosis was constructed. The patient was warmed and easily removed from cardiopulmonary bypass after a bypass time of 90 min.

On postoperative sixth day, the patient became septic with multiple infective foci, including pneumonia, cellulitis of the left thigh, and infection of a superficial thoracic wound. He was empirically started on intravenous gentamycin and amoxicillin/clavulanic acid. *Escherichia coli* (*E. coli)* was grown from blood cultures, thoracic wound swabs, and pleural fluid. Further antibiotic treatment was guided by the microbiology cultures, leading to combination treatment with metronidazole, meropenem, and cefuroxime. He eventually recovered fully and was discharged on day 30. At discharge, the patient had no clinical,

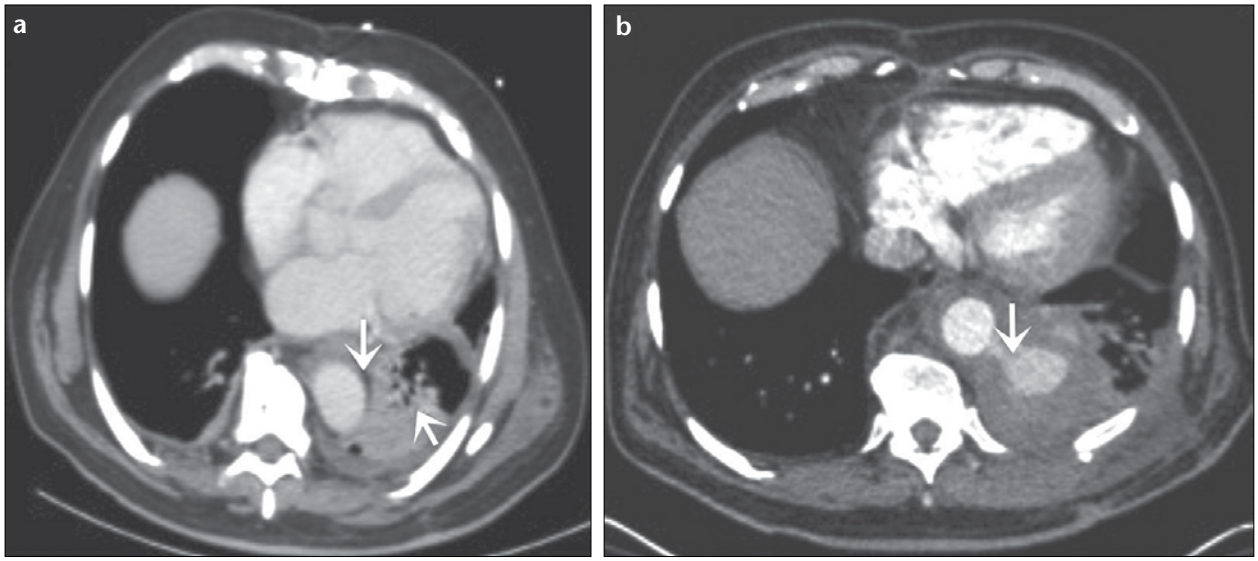

Figure 1. a, b. Axial CT scan demonstrates the air and fluid around the Dacron graft **(a,** *arrows***)**, suggestive for infection. Contrast leak **(b**, *arrow***)** from proximal anastomosis into left pleural cavity is seen on CT.

biochemical, or radiological evidence of infection.

Two months postdischarge, the patient was readmitted with severe abdominal pain and sepsis. CT showed a significant left pleural collection, and air and fluid around the graft (Fig. 1a). There was a proximal anastomotic leak arising from the aortic Dacron graft. Owing to his poor clinical state and imminent risk for catastrophic and fatal hemorrhage, the patient underwent emergency endovascular stent grafting to seal the leak (Fig. 1b). Three Gore TAG endografts of 35, 40, and 45×150 mm (W. L. Gore & Associates Inc., Flagstaff, Arizona, USA) were used to seal the proximal anastomotic leak (Fig. 2). To treat the pleural effusion, a left lung irrigation system was established by inserting two chest drains, apical and basal drains with a Y-shaped connection, under local anesthesia. The pleural space was continuously irrigated through the apical drain with 0.2% povidone-iodine solution at 100 mL/h for eight hours, the apical drain was clamped, and the pleural space was then drained through the basal drain. The patient remained septic with a failure of the lung irrigation system, probably due to chest wall adhesions. The patient subsequently underwent left lung decortication, and lung irrigation was reinstituted in situ for five days, until drainage was <200 mL/day and ceased to be macroscopically purulent.

Prolonged chest drainage was required with eventual drainage into

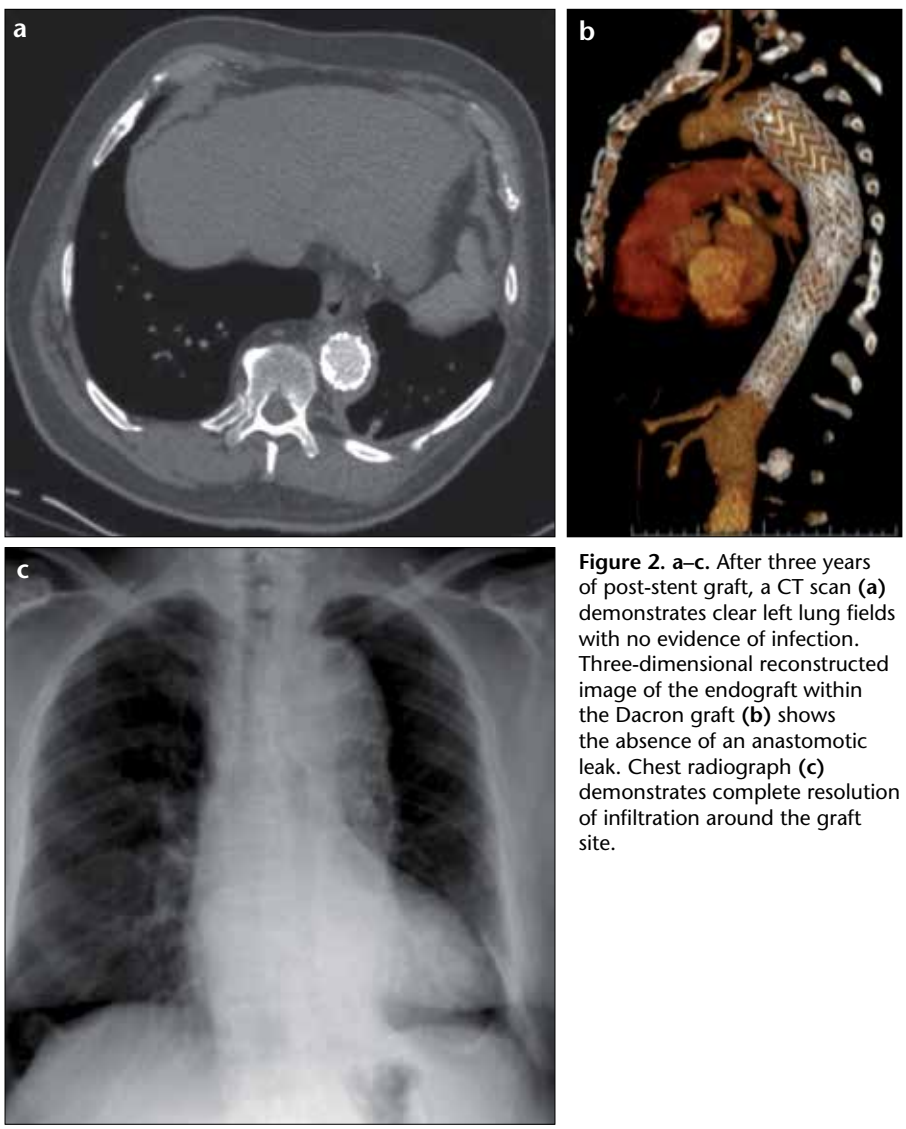

Figure 2. a–c. After three years of post-stent graft, a CT scan **(a)** demonstrates clear left lung fields with no evidence of infection. Three-dimensional reconstructed image of the endograft within the Dacron graft **(b)** shows the absence of an anastomotic leak. Chest radiograph **(c)** demonstrates complete resolution of infiltration around the graft site.

a stoma bag. The lung pleural fluid persistently grew *E. coli*. The patient remained in the hospital for 35 days after the second admission, until the sepsis completely resolved clinically, the white cell count normalized, and the C-reactive protein (CRP) level returned to <5 mg/L. The patient was discharged on intravenous meropenem self-administered via a portacath, with weekly monitoring of his white cell count and CRP level. The chest drain was removed eight months later. At four years postoperatively, the patient remains well with a good quality of life and without any clinical, radiological, or biochemical evidence of active infection. Upon discussion with the patient on the high risks associated with repeat surgery to explant the Dacron graft and endograft with complete thoracoabdominal aortic replacement, the patient elected to continue indefinitely on antibiotic treatment.

Discussion

We reported the insertion of an endovascular stent graft to successfully manage an infected aortic Dacron graft and associated anastomotic leak. The management of infected aortic grafts depends on several factors, including the underlying bacteriology, graft location, surgical risk and comorbidities, anastomotic bleeding, and graft enteric fistulas. Conservative management with antibiotics, peri-graft debridement with or without percutaneous drainage, or continuous irrigation and omental wrapping have been described in the literature (4). However, conservative measures are contraindicated in patients with anastomotic leaks, suture line hemorrhage, aortovenous fistulae, aortoenteric fistulae, or aggressive bacterial infection such as *Salmonella*, *Pseudomonas*, or *E. coli* (4). The usual management of infected grafts involves the excision of all infected material, followed by an extra-anatomical bypass or arterial reconstruction with autogenous tissue (2, 5). These approaches are associated with re-infection rates of up to 25%, mortality of 25% to 30%, and graft occlusion in 25% of cases. Previously, the use of percutaneous drainage was shown to be a successful primary therapy, with resolution of sepsis in 82% of patients compared with only 33% in the surgical group, although fluid collection was inaccurately measured in 67% of the patients in the surgical group (6). In addition, 45% of the patients in the percutaneous drainage group required open surgery due to abdominal aortic aneurysm, ruptured abdominal aortic aneurysm, or thoracoabdominal aneurysm, with no deaths reported within 30 days and one death occurring by the one-year follow-up (6). Aggressive drainage has been used as either the sole treatment or a bridge to surgical management, with an appropriate survival rate (4, 7). Omental wrapping has been shown to decrease the risk for secondary graft infections and to prevent recurrent episodes of infection (3). Infected graft irrigation with a concurrent intravenous antibiotics regimen has also been described in the literature (8, 9). This technique involves the surgical excision of necrotic peri-graft tissue, the collection of a peri-graft fluid or pus sample, and the placement of two to four silicone drains along the limb of the graft toward each anastomosis. The tubes are then used to irrigate with antibiotics according to a specific regimen, and fluid samples are taken at intervals to direct antibiotic therapy. The irrigation system is stopped following the acquisition of negative cultures. The 30-day survival rate with this technique was 90%, and the one-year survival was as high as 80%. The mean duration of the in situ irrigation system was reported to be 23 days (9). Cryopreserved human allografts may also provide an alternate strategy for aortic reconstruction (10). These were not useful in our case because multiple segments and anastomoses would have been necessary, with a high risk for further dehiscence and pseudoaneurysm formation.

Similarly, the management of a mycotic aneurysm in general remains challenging given the risk for catastrophic rupture (11, 12). Surgical excision is considered the mainstay of treatment. The presence of symptoms or aortic graft fistulae necessitates operative management. Surgical options, as with infected aortic grafts, include in situ graft interposition with debridement of infected tissue or extra-anatomic bypass with aortic ligation. Successful endovascular treatment has been reported for mycotic aneurysms (10) as well as in cases of aortodigestive tract and aortobronchial fistulas (13). Nevertheless, a recent systematic review demonstrated that endovascular stent graft repair of aortodigestive fistulae was associated with a high incidence of infection or recurrent bleeding postoperatively (14).

Endovascular stent grafting may provide an alternative strategy for managing high-risk patients or may serve as a bridge to open repair. Endoluminal stenting in the setting of distal-end leakage of the aortic graft and an aortobronchial fistula with methicillin-resistant *Staphylococcus aureus* graft infection also reportedly resulted in successful aberration of the aortobronchial fistula for two years, with further leakage requiring a conventional surgical approach (15). Lower postoperative mortality and morbidity have been associated with endografting in mycotic aneurysms (10–12). However, there is a need for long-term imaging surveillance to ensure that any disease progression is managed appropriately. A secondary infection would require open surgical excision of all prosthetic material, although the use of wire cutters for endovascular removal of an infected endoprosthesis in a high-risk patient has been described (16).

In our patient, suture line hemorrhage as a proximal anastomotic leak was an indication for immediate surgery. However, following extensive multidisciplinary discussions among the cardiac surgeons, vascular surgeons, interventional radiologists, and patient regarding the risks for catastrophic and fatal hemorrhage and the high operative mortality, we elected emergency endovascular repair in this case. The patient was subsequently treated with prolonged intravenous antibiotics, guided by the microbiology team based on culture and sensitivity results. After a lengthy discussion, the patient refused further surgery involving a high risk for death (logistical EuroSCORE of 34%) because of his good quality of life at 74 years of age.

In conclusion, endovascular stent grafting offers an alternative approach to the treatment of infected vascular grafts in high-risk patients. It is expeditious and minimally invasive, and it may provide a temporizing measure in the acute setting. In the vast majority of cases, this option allows semi-elective surgery to be performed for definitive treatment. In rare cases such as ours, this approach may well provide a definite treatment, although these patients require life-long vigilant

follow-up with biochemical and radiological assessments for any indication of re-infection, which may necessitate further surgical treatment.

Conflict of interest disclosure

The authors declared no conflicts of interest.

References

1. Perera GB, Fujitani RM, Kubaska SM. Aortic graft infection: update on management and treatment options. Vasc Endovasc Surg 2006; 40:1–10 .
2. Ali AT, Modrall JG, Hocking J, et al. Long-term results of the treatment of aortic graft infection by in situ replacement with femoral popliteal vein grafts. J Vasc Surg 2009; 50:30–39.
3. Samoukovic G, Bernier PL, Lachapelle K. Successful treatment of infected ascending aortic prosthesis by omental wrapping without graft removal. Ann Thorac Surg 2008; 86:287–289.
4. Lawrence PF. Conservative treatment of aortic graft infection. Semin Vasc Surg 2011; 24:199–204.
5. Mathes DW, Yaremchuk MJ, Isselbacher EM, Madsen JC. Successful in situ treatment of an infected ascending aortic graft. Ann Thorac Surg 2000; 70:1410–1412.
6. Bélair M, Soulez G, Oliva VL, et al. Aortic graft infection: the value of percutaneous drainage. AJR Am J Roentgenol 1998; 171:119–124.
7. Calligaro KD, Veith FJ, Yuan JG, Gargiulo NJ, Dougherty MJ. Intra-abdominal aortic graft infection: complete or partial graft preservation in patients at very high risk. J Vasc Surg 2003; 38:1199–1205.
8. François F, Thevenet A. Conservative treatment of prosthetic aortic graft infection with irrigation. Ann Vasc Surg 1991; 5:199–201.
9. Morris GE, Friend PJ, Vassallo DJ, Farrington M, Leapman S, Quick CR. Antibiotic irrigation and conservative surgery for major aortic graft infection. J Vasc Surg 1994; 20:88–95.
10. Brown KE, Heyer K, Rodriguez H, Eskandari MK, Pearce WH, Morasch MD. Arterial reconstruction with cryopreserved human allografts in the setting of infection: a single-centre experience with midterm follow-up. J Vasc Surg 2009; 49:660–666.
11. Clough RE, Black SA, Lyons OT, et al. Is endovascular repair of mycotic aortic aneurysms a durable treatment option? Eur J Vasc Endovasc Surg 2009; 37:407–412.
12. Clough RE, Taylor PR. Endovascular treatment of mycotic aortic aneurysms. Acta Chir Belg 2009; 109:149–154.
13. Kan CD, Lee HL, Yang YJ. Outcome after endovascular stent graft treatment for mycotic aortic aneurysm: a systematic review. J Vasc Surg 2007; 46:906–912.
14. Antoniou GA, Koutsias S, Antoniou SA, Georgiakakis A, Lazarides MK, Giannoukas AD. Outcome after endovascular stent graft repair of aortoenteric fistula: a systematic review. J Vasc Surg 2009; 49:782-789.
15. Nakao M, Lim SL, Tay KH, Chua YL. Posterior pericardial approach for ascending-to-descending aortic bypass for anastomotic leak of infected interpositional graft. J Thorac Cardiovasc Surg 2005; 130:946-947.
16. Dolmans DE, Ho GH, Te Slaa A, Vos LD, Geenen GP, Van Der Laan L. Surgical removal of an infected aortic endoprosthesis using a wire cutter. J Cardiovasc Surg 2009; 50:411–414.