Durable Results with In Situ Graft Repair of Ruptured Salmonella Aneurysm in a Patient with Autoimmune Deficiency Syndrome

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Int J Angiol 2016;25:e131–e134.

Abstract

Keywords

- ▶ abdominal aortic aneurysm
- ▶ mycotic aneurysm
- ▶ AIDS
- ▶ infection
- ▶ ruptured aneurysm
- ▶ in situ repair
- ▶ salmonella

We describe a case of a 42-year-old male patient with advanced autoimmune deficiency syndrome (AIDS) (CD4 count of 16 cells/mm³) found to have a ruptured infected infrarenal aortic aneurysm. Emergent in situ repair was performed with a Hemashield Dacron graft (Boston Scientific, Natick, MA). Aortic tissue cultures grew group D *Salmonella*. Patient was placed initially on intravenous ciprofloxacin followed by lifelong oral levofloxacin and trimethoprim. Over 2 years following repair, he remains asymptomatic, with repair intact and no recurrent infection. This case is the first reported successful long-term repair of a ruptured salmonella infected abdominal aortic aneurysm in the setting of advanced AIDS.

A 42-year-old male smoker with medical history of autoimmune deficiency syndrome (AIDS) and coronary artery disease presented to our institution with a three day history of lower back pain and fevers. The patient had not been on antiretroviral therapy for the past 2 years. His most recent CD4 count was 16 cells/mm³. On presentation, he was pale, febrile to 101°F, tachycardic to 140 beats per minute and hypertensive with a systolic blood pressure of 147 mm Hg. His laboratory values revealed a white blood cell count of 2,700 with 14% bands, hematocrit 40 mg/dL, and platelets 8,000. Chest, abdominal, and pelvis computed tomography showed a 5.4 cm ruptured infrarenal abdominal aortic aneurysm (AAA) with periaortic inflammation and blood in the pelvis (▶ Fig. 1).

The patient was taken emergently to the operating room for repair. Because there was a high suspicion for an infected AAA, broad-spectrum antibiotics including vancomycin, trimethoprim-sulfamethoxazole, aztreonam, and fluconazole were initiated. We chose open repair over an endovascular approach because of the possibility of aortic infection or periaortic purulence that would require open debridement. Transperitoneal exploration revealed free blood in the peri-

toneal cavity and pelvis. A dense inflammatory reaction was seen around the entire abdominal aorta, but there was no purulence. Intraoperatively, the appearance was judged to be more consistent with an inflammatory AAA rather than an infected AAA. After obtaining proximal and distal aortic control, the aneurysm was exposed and the area of rupture was noted on the anterior aspect of the aorta just above the iliac bifurcation. The inner aortic wall was swabbed and a stat Gram stain was negative. Aneurysmorrhaphy was then performed using a 14 mm Dacron tube graft. Despite a negative-gram stain, the potential for infectious etiology was considered and aortic tissue was sent for aerobic and anaerobic microbial and fungal culture. In the setting of rupture, no cadaveric conduit was immediately available and time constraints did not permit impregnation of the graft with rifampin. Aortic ligation and resection with extra-anatomic bypass was considered but not chosen as the best therapy given the emergent status of the operation and negative-gram stain. The graft was covered with the aneurysm sac, but the extensive inflammation prevented additional coverage with retroperitoneal tissue.

Fig. 1 (A) There is an ill-defined enlargement of the distal abdominal aortic aneurysm, which measures up to 5.4 cm in its widest transverse dimension. There is a hyperdense material along the left ventral aspect of the aorta with surrounding inflammatory changes. (B) There is extensive free fluid throughout the left paracolic gutter and pelvis with a density value consistent with acute hemorrhage.

Postoperatively, the patient developed pulmonary edema, which was medically managed in the surgical intensive care unit. Perioperative blood cultures and the aortic tissue culture grew group D *Salmonella*. Infectious disease consultation initially recommended ciprofloxacin 400 mg IV twice daily. On postoperative day 8, the patient was transitioned to oral levofloxacin 500 mg orally once a day, the recommendations of the infectious disease consultants. He was discharged to a rehabilitative facility on postoperative day 13 in good condition. He remains on lifelong oral levofloxacin 500 mg orally once a day and trimethoprim-sulfamethoxazole 160 mg orally twice daily. In addition to routine clinical examinations, surveillance computed tomography angiography (CTA) was performed at 1 week, 7 months (–Fig. 2), and 2 years postoperatively. Two years following repair, he remains asymptomatic with CTA demonstrating intact repair and no recurrent infection.

Discussion

Infected aneurysms account for 1.5% of all aortic aneurysms.¹ The most common causative organisms are *Staphylococcus*

aureus, *Streptococcus pyogenes*, and *Streptococcus pneumoniae*.² *Salmonella* is seen in only 35% of infected AAA in the western hemisphere, but it is especially virulent with a mortality as high as 80%.^{1–3} Its predilection for atherosclerotic plaques leads to a high degree of arterial wall invasion and high propensity for rupture as seen in our patient with a ruptured aneurysm measuring 5.4 cm.^{2,4} In-hospital mortality following repair of any ruptured AAA is reported to be between 40 and 60%.⁵

Patients with infected AAAs can present with any combination of abdominal pain, back pain, fever, leukocytosis, weight loss, or even hemodynamic instability if the aneurysm has ruptured. Patients often present late in the disease process, with 48 to 64% of patients presenting with rupture in various reports.^{1,6} Impaired immunity is thought to be a significant risk factor for these aneurysms, as Oderich et al demonstrated that up to 70% of patients with infected aneurysms are found to be immunocompromised.⁷ As seen in our patient, underlying immunosuppression can make differentiating an inflammatory process from infection difficult.

Abdominal CTA is the most sensitive imaging technique for diagnosis. The pathognomonic finding on CTA, although rarely seen, is air within the wall of the aorta.¹ Other signs on CTA that may be indicative of infected aneurysms include perivascular inflammation, peripheral nodes, and shunts between the aorta and IVC.¹ In addition to evidence of rupture, our patient had perivascular inflammation and lymphadenopathy on imaging but no other overt radiologic signs of infection.

Even in intact aneurysms, mortality approaches 100% for infected AAA without surgical excision.^{8,9} When infection is clearly present, wide resection of aneurysmal tissue is performed. Vascular reconstruction can be performed via in situ replacement or extra-anatomical bypass. In situations where infection is confirmed or strongly suspected, traditional management has been to use extra-anatomical bypass to avoid placing a prosthetic graft in an area of known infection.⁹ Recently, in situ repair of infrarenal infected aneurysms with

Fig. 2 Stable postsurgical changes 7 months after repair without signs of infection or graft dilatation.

a variety of conduits has gathered favor due its superior patency and the lower rates of future reconstruction as compared with extra-anatomical bypass.^{9,10} Conduit options include rifampin-impregnated grafts, cryopreserved arterial allografts, autogenous superficial femoral vein (SFV).¹¹ Graft impregnation with rifampin may reduce early graft seeding and prevent early graft infection, specifically for *S. epidermidis*, but its role is limited against more virulent organisms due to limited susceptibility.¹² Utilization of SFV is disadvantageous in unstable patients given longer operative times for vein harvest and lower extremity morbidity secondary to deep vein harvest.¹ In this case, alternative conduits were not available given the emergent nature of the operation for this ruptured aneurysm.

Endovascular repair of infected AAAs has been reported and might be suitable in select infected AAA.¹³ However, unlike open repair, endovascular repair does not offer the opportunity to debride infected tissue or obtain tissue culture, which directs antibiotic therapy. Endovascular repair was not chosen in this case because of the potential for infected tissue requiring debridement. In addition, given the patient's relatively young age and hemodynamic stability, despite the evidence of rupture, we believed open repair to be the best treatment.

Multiple reports have demonstrated the efficacy of long-term antibiotics after in situ prosthetic reconstruction in patients without severe immunocompromised states. Recommendations for antibiotics traditionally range from limited 4 to 6 week regimens to lifelong oral therapy.^{2,8,10,14,15} Others have demonstrated that lifelong antibiotic therapy is not required in select patients.¹⁰ However, the optimal treatment after infected AAA repair in a patient with AIDS is not known as only one previous case report described in situ reconstruction and antibiotics to treat salmonella infected aneurysms in patients with AIDS.¹⁶ Moreover, the efficacy of such an approach has not been demonstrated in the setting of advanced AIDS and results beyond the short term have not been previously reported. For our patient, infectious disease consultants recommended treating this patient with 1 week of targeted intravenous antibiotics followed by oral antibiotics. Salmonella sensitive to levofloxacin was the sole pathogen isolated from cultures. Because of the excellent equivalent bioavailability of oral levofloxacin, this was recommended in lieu of the traditional 6 weeks of intravenous antibiotics and recommended to be continued lifelong.

Close follow-up of these patients is mandatory to monitor graft reinfection, pseudoaneurysm formation, or development of limb ischemia.⁷ Now over 2 years following his repair on lifelong antibiotic therapy, clinical and radiologic surveillance has revealed no signs of recurrent infection, pseudoaneurysm, or other vascular complication.

Conclusion

In the setting of AAA rupture in patients with advanced AIDS, a high index of suspicion for infected AAA needs to assumed, especially in those without tradition risk factors for degener-

ative AAA. Existing literature demonstrates that treatment of infected aneurysms, particularly in an immunocompromised patient, is associated with high morbidity and mortality.^{7,10,17} Nevertheless, good results in the repair of infected aortic aneurysms can be achieved with prosthetic grafts accompanied by aggressive directed antibiotic coverage against the infecting organism. We provide the first report of extended success in a patient with advanced AIDS after in situ prosthetic repair of a ruptured AAA secondary to salmonella infection. Our experience suggests that in patients with advanced AIDS, successful midterm outcomes can be achieved with in situ prosthetic repair and long-term antibiotic therapy.

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