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Daniel Silverberg, MD¹, Moshe Halak, MD¹,
Dmitry Yakubovitch, MD¹, Emanuel-Ronny Reinitz, MD¹,
Alex Garniek, MD², Uri Rimon, MD², and Jacob Schneiderman, MD¹

Abstract

Purpose: We report a single-center experience with the endovascular management of mycotic aortic aneurysms. **Case reports:** Four cases of mycotic aortic aneurysms are described; all treated with endovascular stent graft with variable configurations. All patients underwent successful placement of stent grafts for their aneurysms. No 30-day perioperative mortality was observed. One patient died during the follow-up period from a cause unrelated to the aneurysm. **Conclusion:** Repair of mycotic aneurysms can be accomplished with endovascular repair. This may be a valid alternative to open repair particularly in patients who are not candidates for conventional open repair.

Keywords

aorta, mycotic aneurysm, endovascular, stent graft

Introduction

Mycotic aneurysm (MA) of the aorta is an uncommon but potentially fatal disease because of its risk of rupture and septic complications. Conventional treatment includes wide debridement of the infected aorta and surrounding tissue followed by revascularization via in situ or extra-anatomic bypasses. Surgical management has been associated with high surgical morbidity and in-house postoperative mortality in up to 36% of the cases.¹ Recently, several cases of MA have been reported to be treated with endovascular methods as an alternative to open repair of these aneurysms, resulting in reduced perioperative mortality and morbidity. We report our experience with 4 patients diagnosed with MAs, all of whom underwent endovascular repair of their MA using stent grafts. All patients were not considered candidates for open surgery due to their significant comorbidities and high operative risk.

Case Reports

Case #1

An 81-year-old male was admitted with a 38.9°C fever. Blood cultures grew methicillin-sensitive *Staphylococcus aureus*. On admission, he was treated with intravenous (IV) Cefamizine. Initial workup did not reveal a source of infection. He subsequently underwent a computerized tomography (CT) scan of the chest, which revealed a pseudoaneurysm of the descending thoracic aortic wall. The finding was confirmed by magnetic resonance angiography ([MRA]; Figure 1). Three days later, the patient underwent endovascular repair of the aneurysm

using a thoracic stent graft (Figure 2A, B). The patient had an uneventful operative and postoperative course. He was discharged with oral antibiotics. The patient is currently doing well, 8 months following the surgery. He remains afebrile on oral antibiotics. A chest CT performed during the follow-up period revealed a small type 2 endoleak with no sac expansion.

Case #2

A 69-year-old male was admitted with a 38.5°C fever, and blood cultures were positive for *Salmonella* species. He was treated empirically with IV Augmentin. The fever workup did not reveal a source of infection. One month after discharge, he was readmitted with a large pulsatile mass in the left neck. A CT angiogram of his neck and chest revealed a large aneurysm of his left common carotid artery and an additional aneurysm of his descending thoracic aorta. He underwent open drainage of a large neck abscess followed by ligation of his left common, internal and external carotid arteries, which were grossly involved in the infection. Two days later, he was again taken

¹ Department of Vascular Surgery, The Chaim Sheba Medical Center, Tel Hashomer, Israel

² Unit of invasive radiology, The Chaim Sheba Medical Center, Tel Hashomer, Israel

Corresponding Author:

Moshe Halak, The Chaim Sheba Medical Center, Department of Vascular Surgery, Tel Hashomer, Israel

Email: moshe.halak@sheba.health.gov.il



Figure 1. Magnetic resonance angiography (MRA) showing large mycotic aneurysm of the descending thoracic aorta.



Figure 3. Computed tomography (CT) showing large mycotic aneurysm of the aortic bifurcation and left common iliac artery.

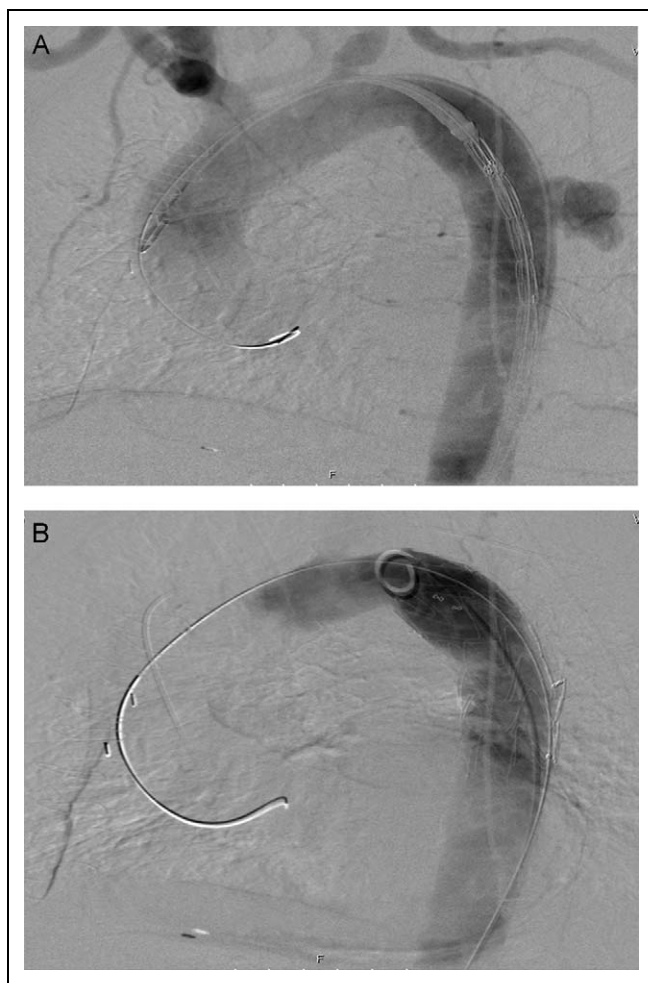


Figure 2. A. Aortogram showing mycotic aneurysm prior to the placement of stent graft. B. Aortogram showing sealing of aneurysm after deployment of stent graft.

to the operating room where he underwent stent grafting of his descending thoracic aorta. His recovery was uneventful. A chest CT performed prior to his discharge showed good position of the graft with no endoleak. The patient recovered well after the surgery but expired 5 months later from a cardiac event.

Case #3

An 81-year-old male was admitted with a 38.5°C fever and dysuria. Blood cultures grew *Hemophilus influenza*. Urine cultures were negative. He was treated with IV Cefamizone. A CT of his abdomen revealed a large inflammatory retroperitoneal mass involving the wall of the aorta at the level of the aortic bifurcation and left iliac artery (Figure 3). He was taken to surgery and underwent endovascular repair of his aortic aneurysm with an aortic right uniiliac stent graft and a right-to-left cross-over femoral bypass with exclusion of the left iliac artery. His postoperative course was uneventful. After a follow-up of 10 months, the patient is currently alive, asymptomatic, and afebrile. He is still taking oral antibiotics. A CT abdomen performed during the follow-up period revealed almost complete resolution of the inflammatory changes around the aorta. The graft was in good position with no evidence of an endoleak (Figure 4).

Case #4

A 66-year-old male underwent a fever workup as an outpatient. Blood cultures grew *Salmonella* species. He was treated for 10 days with oral antibiotics. Three weeks later, he was admitted to the hospital with back pain. A CT of his abdomen revealed a 56-mm infrarenal abdominal aortic aneurysm. He was taken urgently to the operating room and underwent endovascular stent graft repair of his aneurysm with a bifurcated device. At the end of the procedure, the flow from the right iliac artery was impaired requiring a femoral

Table 1. Summary of Follow-Up of 4 Cases of Mycotic Aneurysms Treated by Endovascular Repair

Case	Aneurysm Location	Device	Follow-Up (months)	Endoleak	Need for Reintervention	Outcome
1	Thoracic aorta	Talent (tube)	8	Yes (type II)	No	Alive
2	Thoracic aorta	Talent (tube)	5	No	No	Expired
3	Abdominal aorta and left iliac artery	Talent (aortouniliac)	10	No	No	Alive
4	Abdominal aorta	Endurant (bifurcated)	7	No	No	Alive

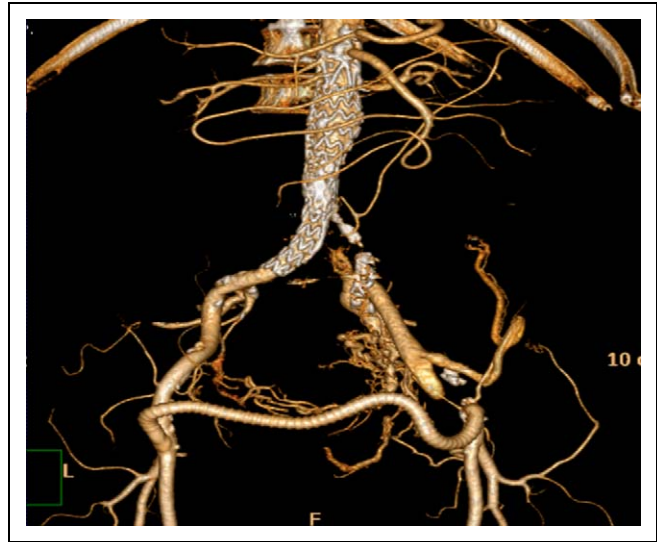


Figure 4. Three-dimensional computed tomography (CT) angiogram after 5 months follow-up showing aortouniliac stent graft with patent cross femoral bypass. No flow was seen in the aneurysm sac.

crossover bypass. His postoperative course was uneventful. One month following the procedure, he was readmitted with high fever. A CT revealed good position of the graft with no endoleak. Positron emission tomography (PET)-CT revealed uptake in the wall of the aneurysm, but no uptake in the sac or along the stent graft. The patient was reevaluated at 7 months after the surgery. He was asymptomatic and afebrile. A recent PET-CT showed shrinkage of the aneurysm sac, with no evidence of infection along the stent graft.

Discussion

Mycotic aortic aneurysm is an uncommon cause of aneurysmal aortic disease. Its incidence is 0.65% to 2% of all aortic aneurysms.² These aneurysms may involve any arterial vessel but have been described most commonly in the thoracic and abdominal aorta. The disease is typically caused by a bacterial infection of the aortic wall, resulting in its gradual degeneration and destruction. The majority of cases are caused by *S aureus*, *Salmonella* species, and *Pseudomonas*; however, rare cases of fungal infection of the aortic wall have been described.³

Open repair of MAs has been considered the standard procedure for the repair of these aneurysms. These are extensive operations requiring wide debridement of the infected aorta and surrounding tissue followed by revascularization via in situ or

extra-anatomic bypasses and administration of long-term antibiotics. These procedures carry a significant mortality rate of up to 36%, with significant short- and long-term morbidity following the surgery.^{1,4,5}

Endovascular aneurysm repair (EVAR) of MAs is emerging as an alternative to open surgery for the treatment of these aneurysms, particularly in high-risk surgical patients. This less invasive modality carries significant advantages over open surgery. It avoids the need for a large abdominal incision, cross clamping of the aorta, and massive blood transfusion. It can be performed under regional or local anesthesia, thus avoiding the need for endotracheal intubation and general anesthesia. There are, however, several disadvantages of this method. The procedure involves placement of synthetic material in an infected environment. The infected tissue is not removed and together with the synthetic graft may provide a focus of infection. As opposed to open repair, tissue of the infected aorta is not obtained for microbiologic cultures. In addition, there is lack of data regarding mid- and long-term durability of the repair.

In a recent review of all reported cases treated with EVAR, the overall 30-day survival rate was 89% and the 2-year survival rate was 82%.⁶ In our current series, delivery and deployment of the stent graft was successful in all patients. No patient died within 30 days of surgery. One patient expired within 5 months of the surgery from a cardiac event. The remaining 3 patients were alive at the time of writing of this manuscript (Table 1).

Kan et al reported that on univariate analysis, age (65 years or older), rupture of the aneurysm, and fever at the time of operation were identified as significant predictors of persistent infection.⁶ In our series, all patients were treated with antibiotics for a minimum of 3 days prior to the surgery. Preoperative administration of antibiotics appears to have a significant effect on long-term survival, and preoperative use of antibiotics for longer than 1 week prior to surgery has been identified as a significant protective factor for persistent infection.⁷ Some authors have suggested that it is necessary to achieve negative blood cultures prior to surgery.⁸ Prolonged administration of antibiotics following surgical repair is considered the standard of care in most reported series. Although the benefit of this practice has not been proven, it seems reasonable. Although the infected aneurysm is excluded from the blood stream by the graft, the focus of the infection is not removed and may therefore provide a source of continuous infection, as may the graft itself. Interestingly, 1 patient from our series underwent a PET - CT during his follow-up, which showed increased uptake of the

wall of the aneurysm sac with no uptake of the stent graft itself. This finding may suggest that despite placing the graft in an infected environment, the graft itself may not continue to provide a focus for ongoing infection. It seems reasonable to consider EVAR as a bridge to definitive open surgery that may be completed after resolution of the initial ailment. This has been suggested in prior manuscripts however, to our knowledge is seldomly performed.

There is no data on the long-term durability of endovascular repairs of MAs. Sörelius et al⁹ recently reported their experience treating 11 patients having MA with stent grafts and reported short- and mid-term results. The reported mean follow-up was 27 months. One patient died within 30 days. Three patients died during the period of follow-up: 1 each of sepsis, 1 from stent migration that caused intestinal ischemia, and 1 from an unknown cause.

Conclusion

Repair of MAs can be accomplished with endovascular repair, particularly in patients who are not candidates for conventional open repair. It offers an acceptable rate of perioperative morbidity and mortality for these high-risk patients. Long-term data regarding the durability of these repairs remains to be established.

Declaration of Conflicting Interests

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