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Ruptured Mycotic Thoracic Aortic Aneurysm in the Setting of *Streptococcus* Bacteremia with Underlying Colonic Malignancy

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Abstract

Ruptured mycotic thoracic aortic aneurysms (TAAs) pose complex clinical challenges which are often compounded by existing comorbidities of the typical patient. We present the case of an 85-year-old female presenting emergently with a ruptured mycotic TAA with underlying *Streptococcus* bacteremia who was successfully treated with a thoracic endograft and antibiotics.

Keywords

- penetrating aortic ulcer
- ruptured thoracic aortic aneurysm
- mycotic aortic aneurysm
- thoracic endovascular aortic repair
- *Streptococcus mitis*

Introduction

Mycotic thoracic aortic aneurysms (TAAs) are highly morbid entities that progress rapidly and carry a high risk of rupture.[1] Treatment is complex given the anatomic location and extent of infection. Affected patients often have multiple comorbidities and may present acutely with rupture, impending rupture, or sepsis. Historically, management of mycotic TAA consisted of thoracotomy, debridement, and revascularization—either in situ or extra-anatomic—under cardiopulmonary bypass with or without hypothermic circulatory arrest. Thoracic endovascular aortic repair (TEVAR) offers a less invasive and more expeditious strategy for patients deemed high risk for open surgical management or those presenting with rupture.[2,3]

Herein, we describe the case of an 85-year-old female presenting with contained rupture of a mycotic TAA with *Streptococcus mitis* bacteremia and underlying colonic adenocarcinoma successfully treated with thoracic endografting, antibiotics, and eventual colon resection.

Case Presentation

An 85-year-old female with coronary artery disease, atrial fibrillation on oral anticoagulation, congestive heart failure with preserved ejection fraction, hypertension, and Parkinson's disease presented to an emergency department at an outside health care facility with acute-onset abdominal and back pain. She was admitted to the hospital 1 month prior with coronavirus disease 2019 (COVID-19) pneumonia. She had been

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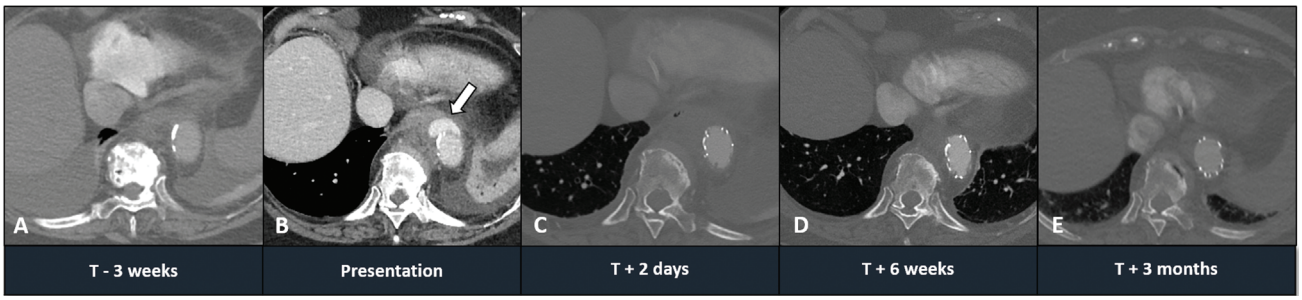

Fig. 1 Progression of thoracic aortic disease as visualized on computed tomography (CT) imaging: Normal descending thoracic aorta visualized on CT angiography with pulmonary embolism parameters during coronavirus disease 2019 hospitalization (**A**). Contained ruptured thoracic aortic aneurysm with contrast extravasation (*arrow*) and periaortic hematoma (**B**). Resolution of ruptured thoracic aortic aneurysm following endograft with reduction of periaortic hematoma and fluid collection at 2 days (**C**), 6 weeks (**D**), and 3 months (**E**) postoperatively.

diagnosed and was undergoing evaluation for iron-deficiency anemia in the outpatient setting. She was afebrile and hemodynamically normal upon presentation with a normal white blood cell count. C-reactive protein (CRP) was 127.2 mg/L.

Computed tomography (CT) of the abdomen and pelvis demonstrated an acute, zone 5 penetrating aortic ulcer with contrast extravasation, periaortic inflammation, and fat stranding suggestive of contained rupture (►**Fig. 1B**). Focal wall thickening and luminal narrowing of a segment of the ascending colon near the hepatic flexure, highly suggestive of malignancy, was also noted (►**Fig. 2A**). The appearance of her descending thoracic aorta was markedly different than 3 weeks prior, when CT pulmonary angiogram performed during COVID-19 hospitalization demonstrated a normal supraceliac aortic without evidence of aneurysm or ulceration (►**Fig. 1A**). Suspicion for an infectious etiology was raised given the rapid progression of disease, presence of periaortic fluid, recent pneumonia, and elevated CRP. Given her hemodynamic stability and lack of appropriate resources, she was transferred directly to the hybrid operating room at our institution.

Operative Management

Given the patient's age and medical comorbidities, a percutaneous endovascular strategy was planned. During transfer, the patient's anatomy was analyzed utilizing centerline software (TeraRecon Inc., Durham, NC). The celiac axis takeoff originated approximately 19 mm inferior to the aortic defect (►**Fig. 3**). Blood cultures were obtained prior to administration of perioperative antibiotics. To successfully exclude the diseased aorta while reducing the extent of supraceliac coverage and size of access sheath, a 30 × 108 mm Zenith Alpha endograft (Cook Medical, Bloomington, IN), which utilizes a 16-Fr outer diameter delivery sheath, was selected. This was successfully deployed in the distal descending thoracic aorta via percutaneous femoral artery access under general endotracheal anesthesia (►**Fig. 4**). On table, completion cone beam CT demonstrated a well-seated endograft without endoleak, successful exclusion of the contained aortic rupture, and a widely patent celiac axis inferior to the distal edge of the endograft (►**Fig. 4B**). Total operative and fluoroscopy time, including cone beam CT acquisition and interpretation, was 54 and 8 minutes, respectively. The patient was extubated and found to be neurologically intact with examination consistent with her preoperative baseline.

Postoperative Course

Blood cultures were positive for pan-sensitive *Streptococcus mitis*. Broad-spectrum polymerase chain reaction and atypical bacterial and parasitic antibody panels were

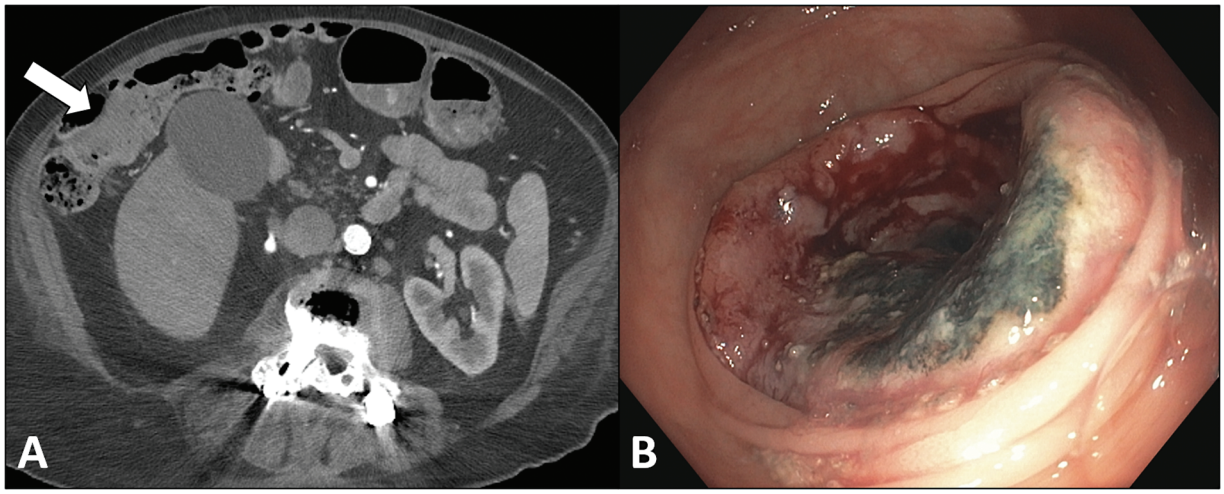

Fig. 2 Computed tomography on admission demonstrating ascending colonic soft tissue thickening and intraluminal mass at the hepatic flexure (*arrow*) (**A**) with subsequent colonoscopy confirming presence of adenocarcinoma (**B**).

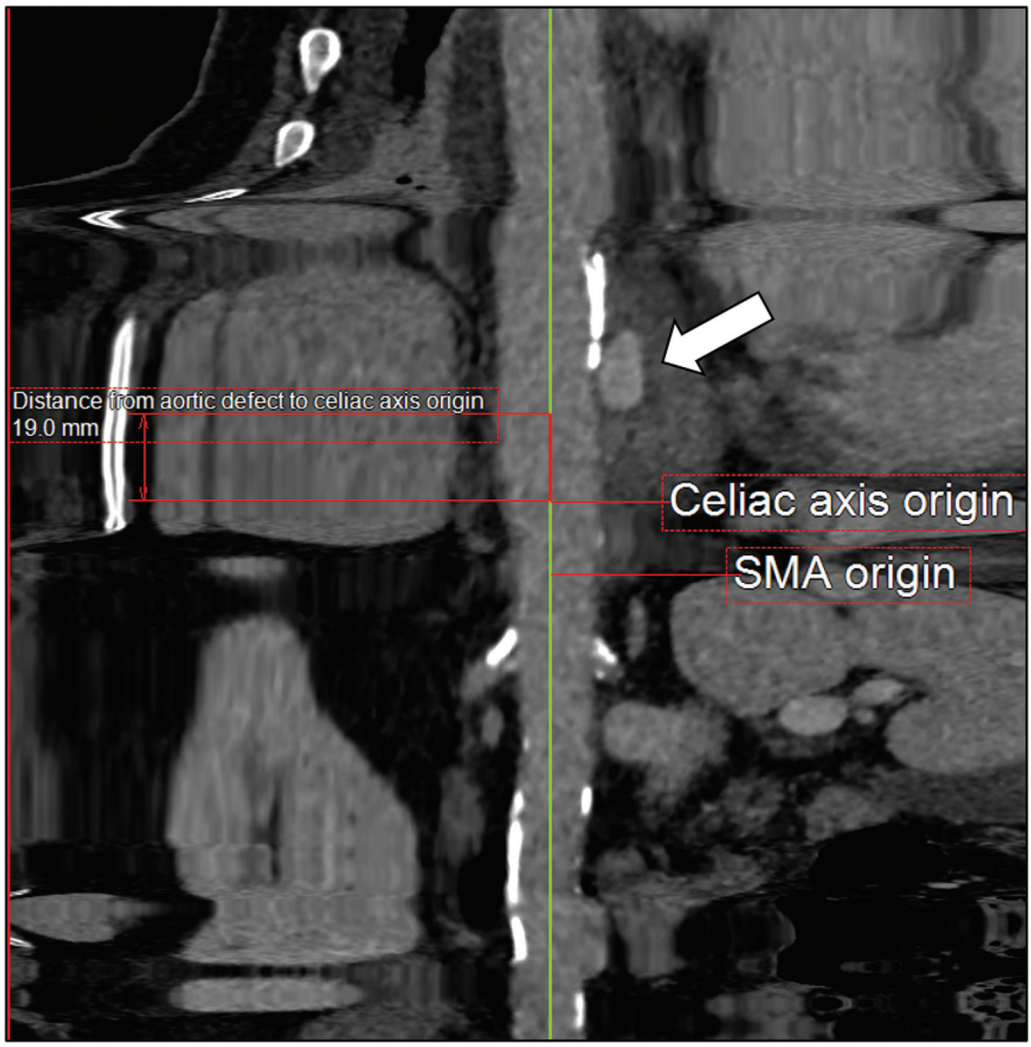

Fig. 3 Centerline reconstruction of contained ruptured thoracic aortic aneurysm (*arrow*) demonstrating seal zone of 19 mm between aortic lesion and celiac axis origin.

otherwise negative. CT angiogram on postoperative day 2 demonstrated decreased size of the periaortic fluid and inflammation (►**Fig. 1C**). She had an uneventful hospital course and was discharged on postoperative day 7, mostly due to planning purposes to organize homegoing parenteral antibiotics. She completed a 6-week course of intravenous ceftriaxone and was transitioned to lifelong, suppressive oral antibiosis with cefadroxil. She did not experience any new symptoms of graft infection or bacteremia following initiation of antibiotics or after the transition to oral agents.

Surveillance CT angiogram at 6 weeks and 3 months demonstrate near and complete resolution of periaortic fluid, respectively, no endoleak and a widely patent stent graft (►**Fig. 1D, E**).

Outpatient colonoscopy confirmed the diagnosis of ascending colonic adenocarcinoma (►**Fig. 2B**). The patient subsequently underwent uneventful laparoscopic right hemicolectomy approximately 3 months following TEVAR. Her recovery was uneventful with no current back pain and resolved periaortic fluid collection 11 months following TEVAR. At 2-year follow-up there were no aortic, procedural, or device adverse events and the patient demonstrated no evidence of systemic or endograft infection.

Discussion

This report describes successful endovascular management of a ruptured mycotic TAA, an aortic disaster with high rates of morbidity and mortality. TEVAR has become preferred therapy for ruptured TAA over open repair given the significant reduction in perioperative morbidity and mortality, expeditious nature of repair, and ability to avoid cardiopulmonary bypass and circulatory arrest.[4] A recent European multicenter investigation demonstrated that endovascular repair of mycotic aortic aneurysms is feasible and quite durable for most patients, especially considering the severe comorbidities that are often seen in the affected population.[2] Ten-year survival per Kaplan–Meier estimate was 40%, which is similar to the long-term survival of those undergoing TEVAR for noninfectious aneurysms.[5]

Conventional surgical management of mycotic aortic aneurysms adheres to the principles of native vessel or vascular graft infection: wide exposure, extensive debridement,

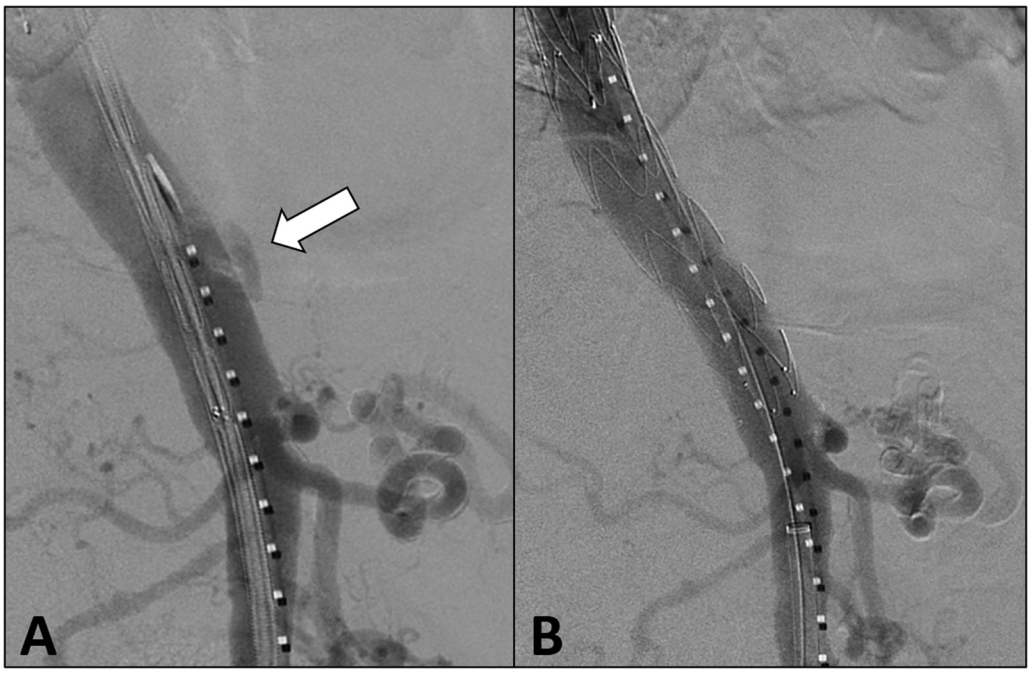

Fig. 4 Digital subtraction angiography in lateral projection demonstrating contrast extravasation in distal descending thoracic aorta (**A**) with successful resolution following endograft placement (**B**).

and reconstruction with either an in situ or extra-anatomic strategy. When presenting with rupture of a mycotic TAA, concern for "source control" and use of conduit must be abandoned to expeditiously prevent mortality. If anatomically feasible, TEVAR should be utilized to rapidly exclude the aneurysm and allow for resuscitation. TEVAR may act as a bridge to more definitive open therapy in young and healthy patients or may serve as definitive management in those too frail to undergo open reconstruction or those too healthy to justify such a morbid operation. Placement of prosthetic within an infected field is a controversial topic in the field of vascular and cardiovascular surgery. The use of antibiotic-soaked grafts in open reconstructions is well-described and efficacious, but the utility of endografts with antibiotic impregnation is less known.[6]

The presence of *Streptococcus* bacteremia was likely the inciting event for rapid progression of aortic ulceration and eventual rupture. Three weeks prior to presentation, the supraceliac aorta was visualized to have atherosclerotic disease, however, there was no evidence of ulceration or aneurysmal dilatation (►**Fig. 1A**). Mycotic aneurysms form when pathogens infiltrate and colonize the aortic wall. Mural thrombus or atheroma act as a nidus for infection due to disruption of the native endothelium and increased metabolic activity of the diseased tissue. Possible sources of the hematogenous spread include recent SARS-CoV-2 infection with superimposed bacterial pneumonia with associated pleural fluid or the presence of underlying colonic malignancy. Viridans group *Streptococcus* species, which includes *S. mitis*, are common pathogens implicated in the development of mycotic aortic aneurysms.[7] Furthermore, the presence of Viridans group Streptococci bacteremia is associated with underlying colonic malignancy.[8]

Mycotic TAA presenting urgently or emergently can be treated with thoracic endografting and may serve as definitive therapy in patients with extensive comorbidities. Long-term suppressive antibiotic therapy is recommended given the presumed inoculation of prosthetic graft material at the time of implantation. Those presenting with *Streptococcus* bacteremia should be evaluated for gastroenterologic malignancy.

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Conflict of Interest
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