Aortoenteric/ Aortobronchial Fistulas:

Is TEVAR Acceptable?

Experts share their strategies for first-line treatment in these very challenging and often morbid presentations.

WITH ALI AZIZZADEH, MD, FACS; TIMUR P. SARAC, MD; VENITA CHANDRA, MD; AND RAGHUVEER VALLABHANENI, MD, FACS

Ali Azizzadeh, MD, FACS
Professor and Director, Division of Vascular Surgery
Vice Chair, Department of Surgery
Associate Director, Smidt Heart Institute
Cedars-Sinai Medical Center
Los Angeles, California
ali.azizzadeh@cshs.org
Disclosures: None.

Thoracic aortic ruptures in contaminated fields, such as aortoenteric or aortobronchial fistulas, represent some of the most catastrophic and challenging acute aortic syndromes to manage. They often go undetected until intermittent or massive hemoptysis or gastrointestinal bleeding develops and cause almost uniform mortality without aggressive treatment. They are almost equally distributed based on etiology: roughly half are primary, and the remainder are secondary to previous surgery (aneurysm, coarctation, dissection, patent ductus, valvular heart disease, etc). The factors that make management challenging include hemodynamic instability, emergency repair, and contaminated field. Thoracic endovascular aortic repair (TEVAR) is very attractive in these settings because the procedure is minimally invasive, uses minimal anticoagulation, and avoids thoracotomy, single-lung ventilation, and aortic cross-clamping.

There is accumulating evidence to support the feasibility and early success of TEVAR for aortoenteric or aortobronchial fistulas. Due to the rarity of this condition, the literature is limited to case reports or small series. Unfortunately, recurrence rates are high and can occur in up to 40% of patients despite antibiotic therapy. In summary, emergent TEVAR appears to be a suitable solution for managing aortoenteric or aortobronchial fistulas, but it may only serve as a bridge to a subsequent, definitive elective open repair based on the patient's overall health and risk profile.

Timur P. Sarac, MD
Professor & Chief, Section of Vascular Surgery
Director of The Aortic Center
The Ohio State University School of Medicine
Wexner Medical Center–The Ross Heart Hospital
Columbus, Ohio
timur.sarac@osumc.edu
Disclosures: Patent holder in TMT Systems.

Aortoenteric and aortobronchial fistulas are life-threatening conditions. Most are secondary to previous surgical procedures but can occasionally be primary for an aneurysm or tumor invasion. The etiology of aortoenteric/aortobronchial fistulas in the thorax are from the esophagus or the left bronchus or lung. Most aortoenteric fistulas in the abdomen are from erosion of the duodenum or bowel into an anastomotic line, or occasionally, some are primary (direct erosion into the aneurysm). They have been reported after both EVAR and TEVAR as well. Patients can present with infection or sepsis after an aortic procedure, as well as with hematemesis or hemoptysis. The mortality rates for aortoenteric and aortobronchial

fistulas have been reported to be up to 50% and, if left untreated, are uniformly fatal.

The traditional surgical teaching for treating aortoenteric/aortobronchial fistulas involves one of two conceptual management algorithms: (1) extra-anatomic revascularization followed by ligation of the aorta above and below, resection of the infected aorta and surrounding tissue, and repair of the visceral organ; and (2) in-line reconstruction of the aorta with a homograft or antibiotic-soaked graft with resection of infected and devitalized tissue, omental or pleural coverage, and repair of the visceral organ. Several observations warrant mentioning before undertaking the conventional surgical approach. First, the morbidity and mortality are significant, and many of the patients are frail and will not tolerate the extent of the procedure. Second, it is not uncommon for a patient with an aortobronchial/aortoenteric fistula to present in extremis with a herald bleed requiring emergent therapy to halt the bleeding. When doing in-line reconstructions, one has the choice of using a homograft or rifampin-soaked prosthetic graft. A Gelsoft graft (Terumo Interventional Systems) is the graft of choice, as it is hydrophilic and absorbs rifampin, whereas traditional HemaShield grafts (Maquet Medical Systems USA, a Getinge Group company) are hydrophobic and do not absorb rifampin.

Given the morbidity, mortality, and urgency that surgeons are confronted with in treating aortoenteric/aortobronchial fistulas, alternative options for a less invasive therapy have surfaced—endovascular stent grafts. Aortoenteric/aortobronchial fistulas frequently present with hemoptysis or hematemesis, and initial treatment with a thoracic stent graft can temporize the bleeding. Given that many of these patients are elderly and frail, it is not uncommon for this to be the only therapy as a palliative maneuver. However, many have also considered TEVAR and EVAR as a frontline therapy with the addition of long-term antibiotics. The reason for this approach is that it obviates the need for open surgery, as the technical challenges of entering an infected contaminated field are significant and finding normal tissue to sew an anastomosis or oversew the aorta can be quite challenging. My general practice is that for both in-line therapy or extra-anatomic bypass/resection and ligation, patients should be given lifelong antibiotics as a suppressive measure, because subsequent infections are usually fatal.

Venita Chandra, MD
Clinical Associate Professor
Surgery-Vascular Surgery
Stanford Medicine
Stanford, California
vchandra@stanford.edu
Disclosures: None.

Aortoenteric/aortobronchial fistulas are some of the most dreaded and life-threatening thoracic aortic pathologies. Without treatment, they are almost always fatal, and yet the traditional open repair, which involves aortic cross-clamping and sometimes cardiopulmonary bypass, surgical replacement, or repair of the thoracic aorta along with repair or resection of the involved pulmonary or bowel segments, has intraoperative mortality rates that can be as high as 78% in the acute setting.

As with all aortic pathology, there has been growing interest in the concept of endovascular management. Although there is no question that TEVAR is simpler, faster, and safer, particularly for acutely unstable patients in hemorrhagic shock, the key question remains as to the durability of this approach. Although TEVAR can rapidly stop the hemorrhage, it will then result in the placement of an endograft in communication with bowel and/or bronchus (ie, a contaminated environment) and thus incur a risk of fistula recurrence and stent graft infection.

As with any complex situation, the approach depends on the pathology as well as the overall status of the patient. I believe TEVAR should be considered a first-line treatment to obtain immediate control of aortic bleeding and to stabilize patients with both aortobronchial and aortoenteric fistulas. However, the approach differs between aortobronchial and aortoenteric fistulas and based on the patient's overall medical condition.

In general, the risks of further sepsis and stent graft infection are lower for aortobronchial fistulas when compared to aortoenteric fistulas. For patients with an aortobronchial fistula without signs of significant systemic infection, I believe it is reasonable to treat the fistula with TEVAR and close follow-up, including a long course of intravenous antibiotics. For patients with large fistulas or significant systemic infection, I recommend TEVAR to achieve stabilization, followed by traditional repair with aortic and bronchial repair/reconstruction. A third option for patients who have significant infection but who also have many comorbidities precluding them from aortic reconstruction is open washout and isolated bronchial repair to minimize the risk of recurrent aortobronchial fistula and stent graft infection in the future. Patients with mycotic aneurysms as the cause of aorto-

bronchial fistula seem to be at particularly high risk and should be treated with standard open repair without TEVAR whenever possible.

Patients with aortoenteric fistulas are much more challenging. The risks of stent graft infection, morbidity, and mortality after TEVAR are significantly higher than with aortobronchial fistulas. TEVAR remains a reasonable first-line option in the acute hemorrhagic shock situation; however, it really must be considered as a temporizing measure only. Once the patient is hemodynamically stable, and local infection and systemic sepsis is clinically controlled, the patient should be offered definitive repair with explantation and aortic repair, either with a homograft or rifampin-soaked graft along, with washout and repair of the fistulous connection and bowel management.

In summary, TEVAR can be a life-saving first-line therapy, particularly for unstable patients. In select patients with aortobronchial fistulas, one could consider TEVAR to be the definitive management, as long as the patient undergoes close observational follow-up. For all other patients, aggressive adjunctive operative measures are needed to treat ongoing infection/fistulous connections to prevent late related mortality.

Raghuveer Vallabhaneni, MD, FACS
Director of Vascular Surgery–Baltimore Region
MedStar Heart and Vascular Institute
Baltimore, Maryland
raghuveer.vallabhaneni@medstar.net
Disclosures: None.

Aortoesophageal and aortobronchial fistulas are life-threatening conditions that many of us will face during our careers. Patients with these conditions are typically very ill and often have concomitant sepsis and hypotension, making their management complicated and frequently emergent. Traditional surgical dogma of open operation and primary repair/resection of the esophagus or airway with wide surgical debridement and reconstruction of the aorta has been shown to have mortality rates of 45% to 55%. Therefore, TEVAR as primary bridge therapy or, in certain cases, definitive therapy has become an attractive alternative in my practice when treating these complex patients.

When a patient is suspected to have an aortoesophageal or aortobronchial fistula, I usually order a CTA of the chest, abdomen, and pelvis after initially assessing and resuscitating the patient. CTA may help to identify the etiology of the hemoptysis or hematemesis, but also provides some information on the extent of the problem. Although it may not be possible to visualize the fistula itself, inflammatory changes, fluid with air bubbles around the aorta, or air within the aortic wall or lumen itself are suggestive of a fistula. If a fistula is present, broad-spectrum intravenous antibiotics are instituted.

In my practice, TEVAR is generally the first-line treatment for these patients. With open primary surgical repairs having very high mortality rates, stabilizing an unstable or critically ill patient with a thoracic stent graft to stop the immediate risk of bleeding can be done with high technical success and a lower initial mortality. If an aneurysm is causing the fistula, complete endovascular exclusion is warranted. If the fistula is secondary to a malignancy, erosion from previous surgery, or foreign body ingestion, I try to get at least 3 cm of seal proximal and distal to the fistula or areas of inflammation. Aortobronchial fistulas tend to occur more proximally and may require cervical debranching procedures to get enough seal. After TEVAR, I generally continue intravenous antibiotics for 6 weeks followed by lifetime oral antibiotic therapy. In aortoesophageal fistula patients, if they are relatively healthy and continue to show signs of sepsis, I would recommend surgical debridement and either primary repair of the esophagus, resection, or drainage and placement of an omental or pleural flap depending on their clinical status while leaving the stent graft in place. If a patient does not show signs of sepsis and is in poor health, TEVAR is a palliative procedure with continued lifelong antibiotic therapy. TEVAR alone has been shown to have a reinfection rate of > 25%, but this is reduced with prolonged antibiotic use. In aortoesophageal patients, if there is minimal contamination, TEVAR and lifelong antibiotic therapy usually may suffice. Repair of the airway or lobectomy should be considered if the patient is able to tolerate these procedures.

I believe explantation of thoracic stent grafts with reconstruction of the thoracic aorta is reserved for those who are septic from continued infection of their graft. This is a morbid operation that many of these patients are too ill to tolerate. In conclusion, I believe TEVAR is an excellent first-line therapy for aortoesophageal and aortobronchial fistulas. Surgical drainage, primary repair, and/or resection of the esophagus or airway can be done if there are continued signs of sepsis once the patient is stabilized. Six weeks of intravenous antibiotic therapy followed by life-long oral suppressive therapy is necessary to help decrease rates of reinfection. Further studies are necessary to determine optimal management algorithms in this difficult patient population. ■