Use of thoracic endovascular aortic repair for management of aortobronchial fistula

Salim Lala, MD,[a] Mira Tanenbaum, MD,[a] Samyuktha Ravikumar, BA,[a] Bao Ngoc-Nguyen, MD,[b] *and* Elizabeth S. Pocock, MD,[b] *Washington, DC*

ABSTRACT

We report the case of a 66-year-old man who had been emergently transferred to our institution with hemoptysis and hemodynamic instability. His computed tomography findings were consistent with the presence of an aortobronchial fistula. The patient had undergone open repair of coarctation of aorta via thoracotomy 20 years previously, and he was not deemed a suitable candidate for open repair. He was successfully treated with thoracic endovascular aortic repair with successful exclusion of the fistula. The patient was discharged home, and the subsequent follow-up imaging study at 12 months showed the graft in a stable position without evidence of infection, pseudoaneurysm, or endoleak. This case has demonstrated the successful use of thoracic endovascular aortic repair for urgent management of an aortobronchial fistula. (J Vasc Surg Cases Innov Tech 2022;8:443-6.)

Keywords: Aortobronchial fistula; Thoracic endovascular repair

Aortobronchial fistula (ABF) is a pathologic communication between the aorta and bronchial tree, and patients often present with hemoptysis and hemodynamic instability. The vast majority of ABFs will be secondary in nature, occurring most often after implantation of a previous prosthetic vascular graft or stent in the thoracic aorta. Primary ABF, without any history of surgical or endovascular intervention, is exceedingly uncommon. When an ABF is left untreated, it confers 100% mortality.[1]

At present, thoracic endovascular aortic repair (TEVAR) is indicated for the management of thoracic aortic aneurysms, pseudoaneurysms, and aortic dissections. TEVAR can also be used for the treatment of ABFs in high-risk patients not suitable for open definitive repair. TEVAR for this indication of ABFs can result in high technical success with a relatively low mortality rate.[2] The disadvantage, however, is that TEVAR cannot treat the underlying cause, and the new stent graft will be exposed to the respiratory tract with the risk of future infection and ABF recurrence. Few studies have properly defined the 1-year outcomes after TEVAR for repair of ABFs. In the present case report, we have detailed the successful management of an ABF using TEVAR in a patient who was deemed unsuitable for open repair. The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

A 66-year-old-man had been transferred from an outside facility directly to our intensive care unit following an isolated episode of hemoptysis with hemodynamic instability. His medical history included hypertension, hyperlipidemia, coarctation of the aorta with proximal aneurysmal dilatation just past the left subclavian artery after open repair with an interposition graft 20 years previously, cerebrovascular accident with residual right-sided hemiparesis, and an aortic aneurysm. He had initially presented to an outside hospital, where he had been found to be hypertensive with a systolic blood pressure of 157 mm Hg and leukocytosis (white blood cell count, 18,000/μL). Computed tomography (CT) revealed a 4.4-cm pseudoaneurysm of the descending thoracic aorta with focal outpouching, an ABF (Fig 1), and dissection of the lower thoracic aorta at the level of the diaphragm extending into the left iliac artery. The chronic type B dissection of the distal thoracoabdominal aorta was distal to the ABF and was asymptomatic, with a maximum diameter of 4.5 cm. Given the imaging characteristics, the ABF was at the level of his interposition graft, most likely adjacent to a previous suture line. Because of his previous open repair, he was deemed unsuitable for repeat thoracotomy and open repair and was transferred to our institution for possible endovascular intervention. He was taken to the hybrid operation room with intravenous nicardipine to maintain his systolic blood pressure at <120 mm Hg.

The initial aortogram revealed a large pseudoaneurysm with communication to a left chest bronchiole, confirming a known ABF without active extravasation just distal to the takeoff of the left subclavian artery (Fig 2). An emergency TEVAR was performed with a Valiant Navion thoracic stent graft (25 × 25 × 96 mm; Medtronic, Dublin, Ireland), with successful

From the Department of Surgery, George Washington University[a]; and the George Washington University School of Medicine.[b]

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Correspondence: Salim Lala, MD, Division of Vascular Surgery, Department of Surgery, The George Washington Medical Faculty Associates, 2150 Pennsylvania Ave NW, Ste 6B, Washington, DC 20037 (e-mail: salimlala@gwu.edu).

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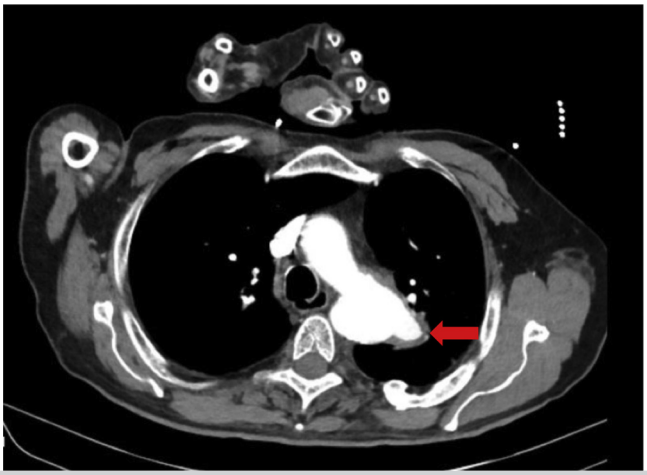

Fig 1. Representative computed tomography (CT) scan demonstrating 4.4-cm pseudoaneurysm with focal outpouching concerning for aortobronchial fistula (ABF).

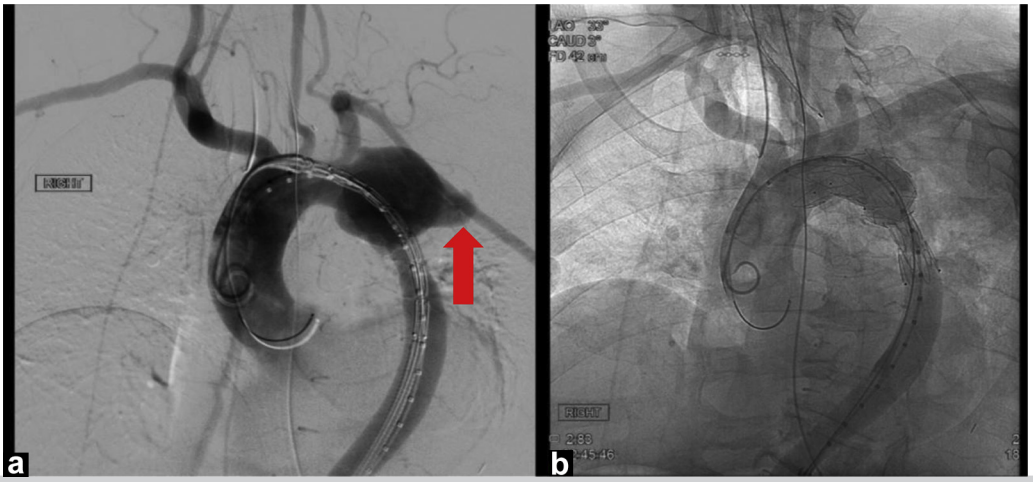

Fig 2. **a,** Intraoperative aortogram demonstrating aortobronchial fistula (ABF) just distal to the takeoff of the left subclavian artery. **b,** A stent graft was deployed with landing in zone 2 without evidence of a type Ia or Ib endoleak.

deployment in zone 2 of the thoracic aorta and covering the left subclavian artery. The final angiogram showed no evidence of endoleak type Ia or type Ib (Fig 2). Evidence was seen of a small type II endoleak from the left subclavian artery; however, the left brachial artery appeared chronically occluded and could not be accessed for left subclavian coiling. The patient tolerated the procedure well and was extubated and transferred to the intensive care unit for hemodynamic monitoring.

His postoperative course was complicated by increasing leukocytosis and hypoxic respiratory failure secondary to pneumonia that required reintubation on postoperative day 2. This was likely caused by a retained hematoma from aspiration during the initial hemoptysis, identified on bronchoscopy. His blood cultures and respiratory cultures were negative, and, in consultation with the infectious disease team, his broad-spectrum antibiotics were narrowed to amoxicillin, because it was believed it would provide the best empiric long-term coverage against respiratory flora. The patient was ultimately extubated on postoperative day 7. The remainder of his hospital course was uneventful. He was discharged to a subacute rehabilitation facility on postoperative day 12 and, ultimately, returned home. He will continue taking lifelong amoxicillin, given the nidus of a potential infectious source at the side of the fistula. CT angiography at the 12-month postoperative follow-up examination (Fig 3) showed the graft in a stable position without evidence of infection, pseudoaneurysm, or endoleak and with a stable, known, chronic type B aortic dissection.

DISCUSSION

ABF is a rare complication and occurs due to a pathologic communication between the aorta and bronchial tree. The most common presenting symptom is hemoptysis, followed by pain, shortness of breath, and, eventually, hemodynamic instability. An ABF is usually

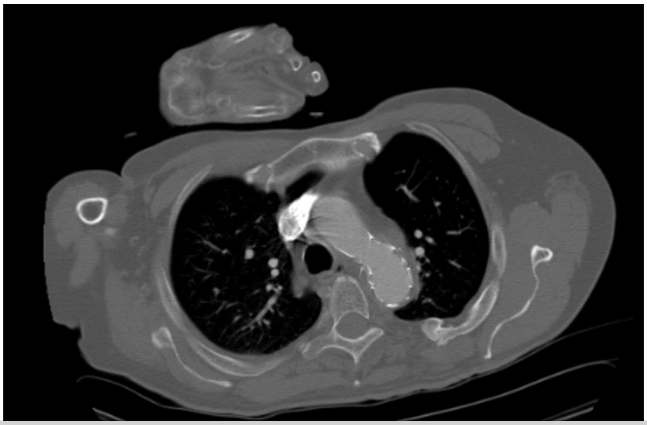

Fig 3. Follow-up computed tomography (CT) scan at 12 months showing the stable position of the endograft with no evidence of infection, pseudoaneurysm, or recurrent aortobronchial fistula (ABF).

Table. Management of aortobronchial fistulas (ABFs) with procedure-related results

Procedure	Treated fistulas	Successful treatment	Procedure-related mortality
Endovascular procedures	15 (100)	15 (100)	0 (0)
Surgical procedures for DTA	50 (100)	42 (84)	8[a] (16)
Surgical procedures for AA	5 (100)	5 (100)	0 (0)
n-Butyl-cyanoacrylate occlusion	1 (100)	1 (100)	0 (0)
Total procedures	71 (100)	62 (87.3)	8 (11.2)

AA, Aortic aneurysm; *DTA*, descending thoracic aorta.
Data presented as number (%).
Data from Piciche et al.[5]
[a]Intraoperatively, n = 6; early postoperatively, n = 2.

diagnosed through a combination of history taking, facilitated by the use of imaging tools such as CT and bronchoscopy. When an ABF is left untreated, the outcome is most likely fatal. In the past, ABFs resulted from mycotic aneurysms caused by infectious agents such as tuberculosis; however, at present, these are exceedingly rare. More often, ABFs result from previous interventions such as open prosthetic graft placement or TEVAR for descending thoracic aortic pathology such as aneurysms and dissection.[3,4]

Definitive treatment of an ABF would be open surgery, with source control, wide debridement, and replacement of the involved descending thoracic aortic segment using an antibiotic-soaked prosthetic graft or extra-anatomic bypass.[5] However, because most cases of ABF are secondary, open surgery carries significantly high morbidity and mortality owing to the complexity of the procedure, emergency conditions, an infected field, and difficulties with exposure in the reoperative setting. Mortality has ranged from 16% to 24%, with mortality as high as 41% with secondary ABFs.[6]

TEVAR can be used for the urgent management of ABFs, with demonstrated success in the literature. Most of these studies reported no perioperative death, stroke, or paraplegia, with a recent review showing a perioperative mortality of 0% in the stent graft group vs 16% in the open surgical group (Table).[5] TEVAR allows for rapid control of hemorrhage from the ABF through a minimally invasive surgical approach. However, the main concern has been that of long-term durability. A risk exists for endoleak occurrence, recurrent infection with pseudoaneurysm development, and recurrent ABF formation and rupture. One of the largest studies reviewing TEVAR for ABFs was by Canaud et al.[7] They reviewed 134 patients and reported a technical success rate of 93.2% and 30-day mortality of 5.9%.[7] After a mean follow-up of 17.4 months, the aortic-related mortality was 14.3%.[7]

Our case has demonstrated the successful long-term use of TEVAR in a patient with an ABF secondary to previous prosthetic graft replacement of the descending thoracic aorta for coarctation repair performed years earlier. He was deemed unsuitable for open repair, and TEVAR was used for definitive management of his ABF, and not as a staged approach, followed later by open definitive surgical repair, given his underlying age and comorbidities. The decision was made for long-term suppressive antibiotics in conjunction with the infectious disease team. At his most recent follow-up at 12 months, CT had revealed the stent graft to be in a stable position, without evidence of recurrent infection, pseudoaneurysm, or endoleak (Fig 3).

Although TEVAR can be used for the management of ABF in the urgent setting, the risk of future infection and recurrent ABF warrants strict follow-up surveillance. Ultimately, most of these patients with ABF will present emergently and will be poor candidates for open surgery. TEVAR can be used to successfully treat ABFs in the short term and, as our case has demonstrated, with ongoing suppressive antibiotics and strict surveillance, can also be successful in the long term.

Ultimately, open surgery with wide debridement and in situ replacement vs extra-anatomic bypass remains the definitive approach for ABF. However, careful patient selection is warranted to achieve the best outcome. As is the case with most ABFs, for critically unstable patients such as our patient, an effective strategy relies on the emergent use of TEVAR, followed by staged open repair when the patient has achieved stability and been deemed to be an acceptable candidate for open repair vs continued strict surveillance and the use of suppressive antibiotics for life.[8]

CONCLUSIONS

The present case has demonstrated the successful use of TEVAR for the urgent management of an ABF. With ongoing surveillance and lifelong suppressive antibiotics, the patient has not required any further secondary reinterventions. Our findings help support the successful use of TEVAR for the long-term management of ABF in patients not deemed suitable for open repair.

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