

Case Report

Transesophageal Echocardiography for Guidance of Endovascular Stent Exclusion of Thoracic Aortic Thrombi: A Case Series



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AORTIC THROMBUS IS a rare cause of distal arterial embolization.¹ The mainstay of invasive therapy for aortic thrombi, such as in the abdominal aorta, has been surgical thrombectomy or percutaneous stent graft placement under fluoroscopy.^{2–4} For the thoracic aorta, traditional fluoroscopic visualization of focal thrombus can be more challenging. Filling defects on angiography can be difficult to visualize due to the large size of the vessel, the shape and often-small size of the clot against the thoracic aortic wall, and the limitations of 2-dimensional imaging. This can make accurate and safe deployment of the stent and exclusion of the thrombus very challenging. Transesophageal echocardiography (TEE) is a highly effective diagnostic imaging modality for thoracic aortic thrombi.⁵ The use of TEE for guidance of endovascular balloon thrombectomy of aortic thrombi is documented in a case series.⁵ Although TEE recently was well described as a primary imaging modality for endovascular aortic aneurysm repair using deployable stents,⁶ the extent to which it can be used similarly for thrombus-excluding aortic stent graft deployment in the thoracic aorta has not been described. Here the authors describe 4 cases in which TEE was employed for thoracic aortic thrombus localization, guidance for stent graft deployment, and post-stenting confirmation of thrombus exclusion.

Case Presentation

Case 1

A 55-year-old female with a medical history of Grave's disease and diverticulitis presented with lower back and flank pain. Using computerized tomography-angiography (CTA) she was found to have bilateral renal and splenic infarcts as well as thrombus in the distal transverse aortic arch. The patient was taken the operating room for endovascular stent graft exclusion.

After induction of anesthesia and intubation, a TEE probe was inserted at the beginning of the case as an adjunct to angiography. A mobile thrombus was identified in the far distal aortic arch using the descending aorta short-axis view (Fig 1). TEE then was used in conjunction with fluoroscopy to guide stent placement and fully exclude the thrombus and to monitor for any dislodgement of thrombus. Using primarily short- and long-axis descending aorta views, a 23 mm × 3.3 cm EXCLUDER extension cuff (GORE, Flagstaff, AZ) was deployed with successful exclusion of the thrombus. Both TEE and fluoroscopy were then used to confirm the absence of further mobile thrombus after graft placement and patency of the left subclavian artery. The patient tolerated the procedure well and was discharged home with no evidence of further embolization.

Case 2

A 59-year-old female with a history of coronary artery disease, peripheral vascular disease, hypertension, and atrial

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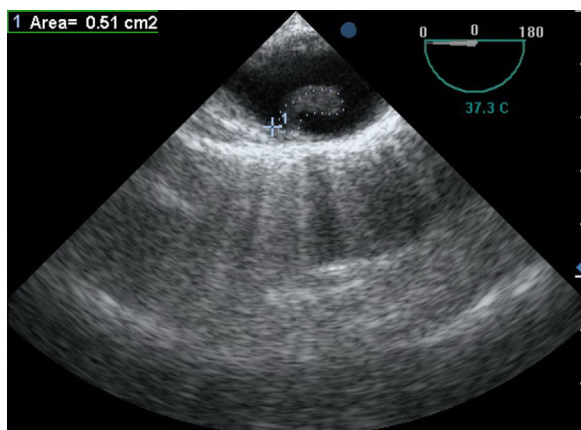


Fig 1. Descending aorta short-axis view at the junction of aortic arch and descending aorta. Thrombus visible in aortic lumen, image acquired before stent deployment (Case 1).

fibrillation presented initially with pain in her toes. Her lower extremities were viable without evidence of ischemia. Trans-thoracic echocardiography on admission showed no intracardiac thrombus, but CTA did reveal thrombi in the descending thoracic aorta, abdominal aorta, and right iliac artery. The patient was taken for percutaneous intervention in the operating room.

General anesthesia was induced, and TEE was employed initially to confirm the presenting diagnosis (Fig 2). No thrombus was discovered in the heart, ascending aorta, or the arch, but mobile thrombus was noted in the aorta just distal to the left subclavian artery. Angiographic visualization of the location and extent of the thoracic aortic thrombus was limited, and the thrombus was found to be better defined by TEE. A 26 mm EXCLUDER extension cuff was deployed using both TEE (using the same short- and long-axis descending aorta views) and fluoroscopic guidance beyond the origin of the left subclavian. A completion angiogram was performed, which showed good apposition, no occlusion of the left subclavian (as noted on TEE), and no evidence of distal embolization. Additional abdominal aortic and iliac portions of thrombus also were excluded via stent graft deployment under angiographic visualization, and the patient recovered successfully.

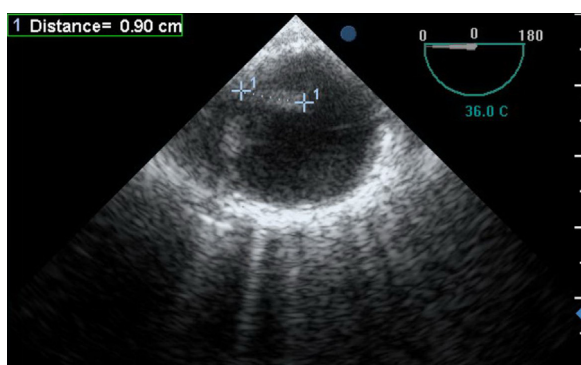


Fig 2. Descending aorta short-axis view of thrombus in aortic lumen before stent deployment (Case 2).

Case 3

A 49-year-old male with a history of obesity, insulin-dependent diabetes, hypertension, asthma, and dyslipidemia presented to the emergency department on postoperative day 1 after a knee replacement with duskeness in his left foot. After ultrasound identified a thrombus in the left femoral artery. The patient was taken to the operating room for embolectomy and was started on a heparin infusion postoperatively. Postoperative CTA revealed arterial embolic disease from a large thoracic aortic thrombus originating at approximately the T8 level. Exclusion of the aortic thrombus via endovascular stent was planned for the following day.

Initial TEE examination after induction of anesthesia revealed a thrombus in the lumen of the proximal portion of the descending thoracic aorta. Assessing the precise location and extent of the thrombus using angiography was particularly difficult; therefore, intraoperative TEE was the primary means of assessing the exact location of the thrombus (Fig 3A). A catheter was advanced, and an appropriate position within the descending thoracic aorta was confirmed (Fig 3B) before deployment of a 26 mm Conformable GORE TAG stent graft. TEE also was used to confirm proper exclusion of the thrombus and to ensure no occlusion of the left subclavian artery. The patient recovered from this procedure uneventfully.

Case 4

A 44-year old female with no major medical history presented to the emergency department with abdominal pain and was found on CTA to have an aortic thrombus at the level of the mid-descending thoracic aorta as well as in the superior mesenteric artery. She was taken to the operating room for mesenteric thrombectomy and endovascular graft deployment to exclude the aortic thrombus.

After arteriotomy and successful evacuation of thrombus from the superior mesenteric artery, intraoperative TEE was used to identify the mobile aortic thrombus (Fig 4A). Angiography directly in conjunction with TEE was used in conjunction to advance a stent graft into position in the descending aorta as angiography had failed to visualize the thrombus adequately. A 23 mm EXCLUDER extension cuff was deployed successfully. Further examination by TEE failed to reveal thrombus above or below the stent and showed no evidence of occlusion of the left subclavian artery (Fig 4B). The patient recovered uneventfully.

Discussion

Thrombi causing arterial embolization are usually intracardiac in origin.⁷ Aortic thrombi are much rarer, accounting for 5% of arterial embolic events.⁸ These thrombi can occur spontaneously or can arise from atheromatous disease, particularly in the context of a penetrating atherosclerotic ulcer or a hypercoagulable state⁹ such as Factor V Leiden,¹⁰ malignancy,^{11,12} or polycythemia vera.¹³ Interestingly, other than 1 patient presenting in the context of recent surgery and

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