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CASE REPORT

Endovascular Thoracic Aortic Repair for Catheter Associated Aortic Injury During Thoracostomy Tube Placement

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Background: Aortic injuries during non-aortic related procedures are rare but potentially catastrophic. Endovascular aortic repair has been described as a viable option in similar circumstances. However, most reports involve aortic injury from orthopaedic hardware after spine surgery or trocar injury during abdominal surgery.
Report: This is a report of a thoracic aortic injury during thoracostomy tube placement and summary of the management paradigm. The patient was treated with a thoracic stent graft and was seen at four-month follow up, with imaging showing the endograft in stable position.
Conclusion: Endovascular stenting can increase the treatment scope for management of emergent thoracic aortic pathology.

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INTRODUCTION

Iatrogenic injury to the aorta is a rare but potentially catastrophic event that can occur in a range of procedures. The most commonly reported cases involve hardware implantation for anterior or posterior spinal surgery.[1] Trocar injuries during laparoscopic abdominal and pelvic surgery have also been described and are likely underreported overall.[2] A major vascular injury during an unrelated procedure carries a significant risk of morbidity and requires urgent repair. Endovascular therapies have emerged in the past two decades with reduced peri-operative morbidity and mortality. This is a report of a case of thoracic aortic injury during thoracostomy tube placement for pleural effusion drainage, which was repaired with a thoracic stent graft.

REPORT

A 77 year old female smoker in remission from primary lung adenocarcinoma after a left lung lower lobectomy in the past was found to have a pleural effusion, thickening around the mediastinum, and new densities around the hilum and left upper lobe. An outpatient diagnostic and therapeutic thoracentesis was performed because of a concern for recurrent lung cancer. Using the Seldinger technique, a 7.5Fr thoracostomy tube was placed through a left paraspinal approach near the T10 vertebral body. On insertion, bright red blood was aspirated. Given the high suspicion of arterial puncture the catheter pressure was transduced, which matched the patient's systolic pressure of 130 mmHg with a corresponding arterial tracing. A computed tomography angiogram (CTA) confirmed the position of the catheter in the thoracic aorta (Fig. 1) with a peri-aortic hematoma (Fig. 2). The patient was expeditiously taken to the operating room for an endovascular repair. Fluoroscopic imaging showed the relative location of the catheter and intravascular ultrasound (IVUS) (Fig. 3) was used to plan the precise landing of the endograft and graft diameter measurement. A Zenith Alpha™ Thoracic Endovascular Graft proximal component 28 × 155 mm (Cook Medical, Bloomington, IN, USA) was deployed over the injury, with 4 cm of distal coverage and 11 cm of proximal coverage. The celiac artery was 5 cm from the distal end of the graft. Completion imaging was obtained, which showed no extravasation or endoleak. The thoracostomy tube was then safely removed and the patient remained hemodynamically stable throughout the procedure. The patient did well postoperatively and was discharged on day 2. A four-month follow up scan (Fig. 4) showed good graft wall apposition and no residual injury.

DISCUSSION

Iatrogenic thoracic aortic injuries are exceedingly rare and are most commonly caused by instrumentation during spine surgery. Few other procedures encroach onto the territory

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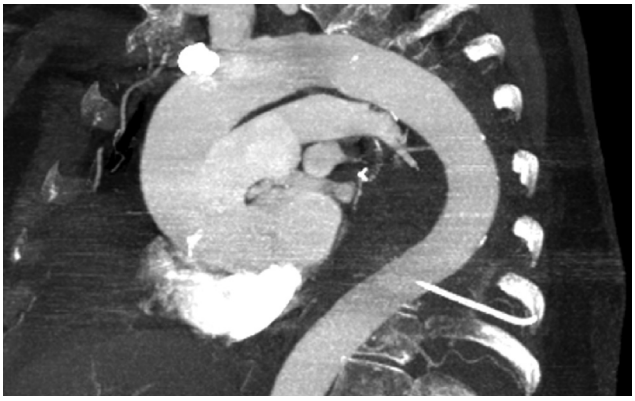

Figure 1. Pre-operative maximum intensity projection computed tomography scan showing the thoracostomy tube in the thoracic aorta.

of the thoracic aorta. There is a reported thoracic graft injury from trocar sternal puncture for diagnosis of leukemia in a patient with a prior supra-aortic transposition.[3] Other single case reports of thoracic injuries are during pacemaker insertion[4] and outpatient acupuncture.[5]

The abdominal aorta has proven to be more vulnerable with a possibility of injury during abdominopelvic laparoscopic or robotic procedures.[2] Trocar injury to the aorta is found scarcely in the literature, probably because of underreporting and may be discussed more anecdotally. The large instrument size and hollow shape make these injuries potentially devastating. Presentation of iatrogenic aortic injury varies from an acute hemorrhage to a chronic incidental finding.[6] Injuries from orthopaedic procedures are caused by screws, and can go unrecognized until the hardware erodes through the vessel after long term friction.[7–9]

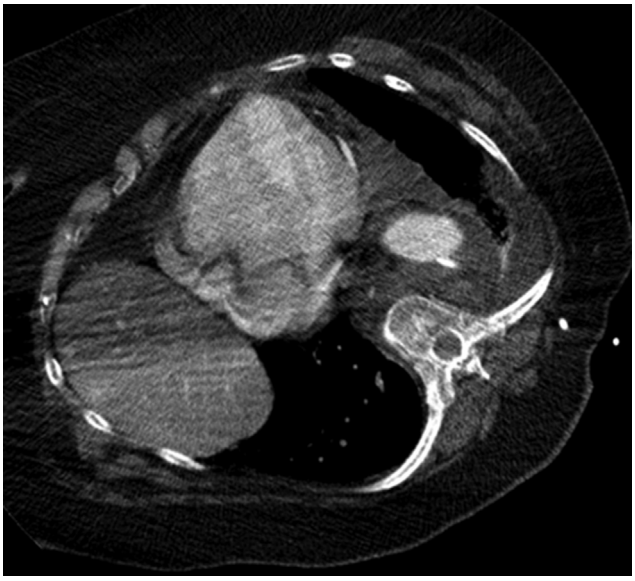

Figure 2. Pre-operative axial computed tomography scan displaying a peri-aortic hematoma at the entry site of the thoracostomy tube. The thoracic aorta measures 2.5 cm proximal and distal to the injury.

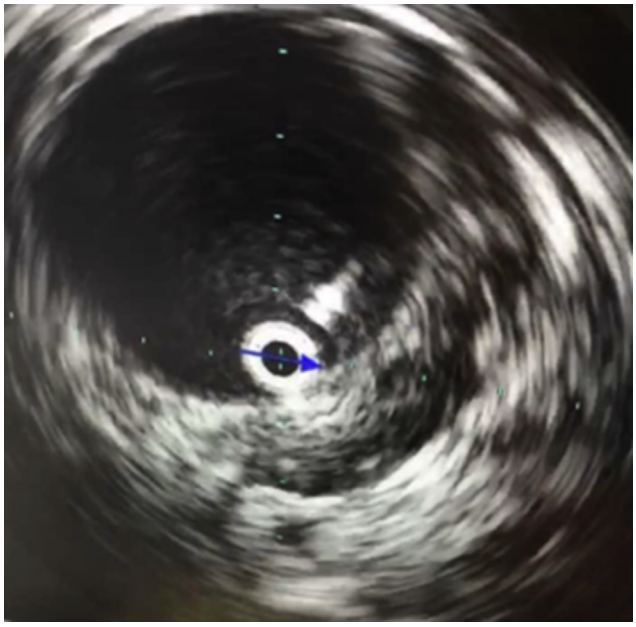

Figure 3. Intra-operative intravascular ultrasound scan showing peri-aortic hematoma.

This is a report of a penetrating thoracic aortic injury by a thoracostomy tube. The injury was astutely recognized immediately during the procedure and confirmed with an arterial pressure tracing. Given the size of the tube (7.5Fr) a repair was necessary; however, if it were only needle penetration one could argue for removal and close monitoring. A CTA was performed prior to proceeding to the operating suite for accurate sizing as the patient was hemodynamically stable. In the case of hemodynamic instability, IVUS can be used in the operating room for sizing instead. In this case, IVUS was instrumental intraoperatively to show the extent of the injury, accurate

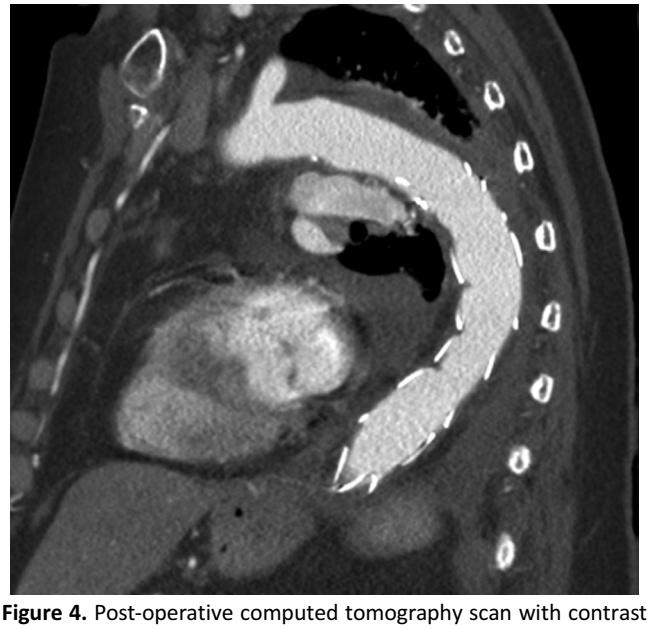

Figure 4. Post-operative computed tomography scan with contrast showing good apposition of the graft to the aorta with no endoleak. Stable aortic diameter of 2.5 cm.

diameter measurement, rule out a dissection flap, and define the borders of an intramural hematoma. In other cases,[6] IVUS was crucial in confirming aortic penetration when it was unclear even with pre-operative imaging. A 28 mm × 155 mm endograft was used for a short injury because of the off-the-shelf availability of this graft. It was chosen not to oversize the aorta because of the lack of aneurysmal disease and adequate proximal and distal seal. The thoracostomy tube was only removed after deployment of the endograft and sealing of the injury site was accomplished. Graft integrity may be of concern when deploying against a more sturdy metallic instrument such as a pedicle screw used in spine surgery.

Despite the length and coverage near the zone of the artery of Adamkiewicz, there was no need for a cerebrospinal fluid (CSF) drain as the patient had no additional risk factors. Overall, spinal cord ischemia is reported to occur in 1—10% of thoracic aortic repairs[10,11] irrespective of CSF drains. The present authors selectively place CSF drains in patients with multiple high-risk criteria as reported in the literature: >200 mm aortic coverage, prior aortic repair, coverage between T9 and T12, and compromised hypogastric or left subclavian circulation.[12—15]

Although this case is unique to the literature, it highlights multiple generalizable points. Iatrogenic injuries to the aorta are possible in a variety of procedures. Endograft availability off-the-shelf in multiple sizes and lengths is crucial for emergency situations to facilitate excellent outcomes. Aortic coverage should be as short as possible without compromising integrity of the repair. IVUS is a helpful and sometimes necessary adjunct to CTA and fluoroscopy.

CONFLICTS OF INTEREST

None.

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