Unusual presentation of acute ruptured penetrating aortic ulcer of descending thoracic aorta with right hemothorax

Connor Eckholdt, MD, David Pennywell, MD, R. Keith White, MD, *and* Paul E. Perkowski, MD, *Shreveport, LA*

ABSTRACT

Right-sided hemothorax is a rare presentation of ruptured penetrating aortic ulcers. A 72-year-old female presented to the hospital with a penetrating aortic ulcer of the mid-thoracic aorta and a right-sided hemothorax. The patient was taken for thoracic endovascular aortic repair and right-sided tube thoracostomy. The diagnosis was complicated by the patient's history of pacemaker placement causing prominent venous collaterals in the mediastinum. The postoperative course was complicated by lower extremity weakness, requiring lumbar cerebrospinal fluid drain placement. The patient regained full function of her lower extremities. This case illustrates that patients with ruptured acute aortic syndromes may present with right hemothorax, so index of suspicion should remain high in this population. (J Vasc Surg Cases Innov Tech 2023;9:1-4.)

Keywords: Acute aortic syndrome; PAU; Penetrating aortic ulcer; Right hemothorax; Ruptured aortic ulcer

Acute aortic syndromes often present as complex diagnostic and therapeutic entities. The presence of cofounders, comorbid conditions, and unusual presentations may lead to diagnostic errors. When these patients present with rupture, accurate diagnosis becomes paramount so treatment can be rendered quickly. Our case shows a very rare entity in which a ruptured penetrating aortic ulcer caused a right hemothorax in a patient with a history of pacemaker, with prominent mediastinal venous collaterals. The patient's anonymized data was reviewed and approved by our institution's institutional review board, and the patient's consent was obtained for review and publication.

CASE DESCRIPTION

A 72-year-old female with a history of congestive heart failure and pacemaker placement presented for evaluation of acute onset right chest and back pain and shortness of breath. At an outside hospital, the patient underwent a computed tomography-pulmonary embolus study to rule out pulmonary embolism. The scan was significant for a small focus of contrast along the proximal descending thoracic aorta, with mediastinal hematoma and right hemothorax (Fig 1). The patient was transferred to our facility for definitive care.

On arrival, the patient was hemodynamically stable. The outside films did not image the entire thoracic aorta. In addition to the blush of contrast, there were also opacified collateral veins in the right mediastinum amid the hematoma (Fig 2). Due to incomplete imaging, she was taken for a computed tomography angiogram of the chest/abdomen/pelvis, which showed a penetrating aortic ulcer (PAU) in the distal descending thoracic aorta (Fig 3). This PAU was on the anterior surface of the aorta, and closely associated with the mediastinal hematoma and right hemothorax. It was also noted to be in a separate area from the extravasation noticed on the computed tomography-pulmonary embolus study (Fig 4). Previously noted periaortic blush and mediastinal collateral veins were no longer noted. Plans were made to take the patient emergently to the operating room for a thoracic endovascular aortic repair. Due to the extent of mediastinal hematoma and right hemothorax, and the inability to determine the exact location of aortic rupture, our operative plan was for coverage from the proximal descending aorta down to the supraceliac aorta.

The patient was taken to the operating room and underwent open left common femoral artery exposure and percutaneous ultrasound-guided right femoral access. After placement of the appropriate sheaths and wires, the patient was systemically heparinized. Digital angiography was performed. Medtronic Valient Thoracic Stent Graft (Medtronic Corp, Minneapolis, MN) was selected, and overlapping stent grafts were placed from the left subclavian artery down to the landing zone of normal aorta just above the celiac axis (Fig 5).

The left transverse femoral arteriotomy was closed with 6-0 prolene. The patient had palpable femoral pulses at completion. The access on the right side was closed with a MynxGrip Vascular Closure Device (Cordis, Miami Lakes, FL). At the conclusion of the procedure, the patient had a palpable left radial pulse and Dopplerable signals on both feet. She was then taken

From the Louisiana State University Health Shreveport, Department of Surgery, Division of Vascular and Endovascular Surgery and Division of Cardiothoracic Surgery.

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Correspondence: Paul E. Perkowski, MD, Associate Professor of Surgery, Department of Surgery, LSU Health Shreveport, 1501 Kings Hwy, PO Box 33932, Shreveport, LA 71103-3932 (e-mail: paul.perkowski@lsuhs.edu).

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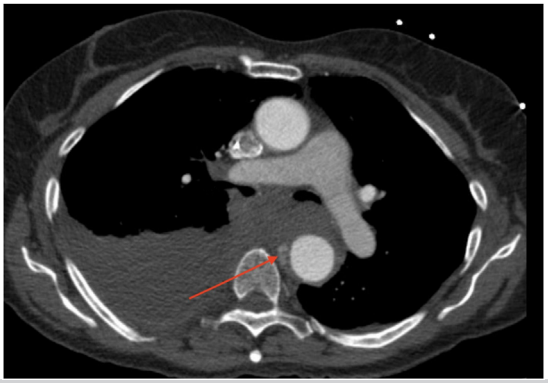

Fig 1. Blush of contrast/extravasation proximal descending thoracic aorta with hematoma in posterior mediastinum and right hemithorax (*red arrow*).

to the intensive care unit after right chest tube thoracostomy was performed. There was an immediate return of 400 mL of dark blood from the right chest.

The patient's intensive care unit course was unremarkable for the first 48 hours, with an additional 800 mL of chest tube output and normal mean arterial pressure and vital signs. On late evening postoperative day two, the patient noted acute onset bilateral leg weakness. Given the delayed presentation of paraparesis without obvious cause, the patient was taken urgently for a magnetic resonance imaging of the spine to assess for spinal ischemia vs epidural hematoma or other pathology. The magnetic resonance imaging showed an abnormal spinal cord T2 signal predominantly involving the central spinal cord and gray matter, consistent with spinal cord ischemia. The patient underwent urgent placement of a lumbar cerebrospinal drain. The patient noted improvement in her symptoms, and the drain was able to be removed 3 days later with no residual neurological effects noted. The patient was subsequently discharged after removal of the drain and chest tube, and after a short period of physical therapy. The patient was doing well at 30-day follow-up and continues to do well on follow-up visits over a year later.

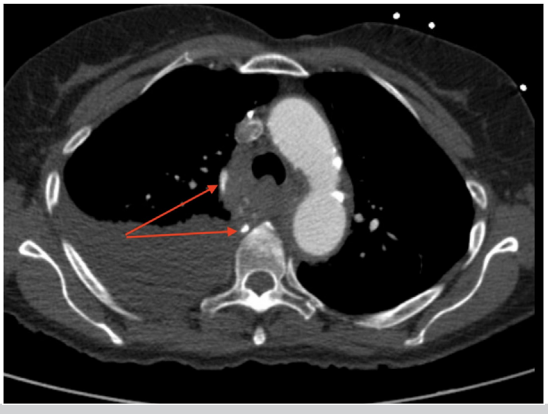

Fig 2. Venous collaterals in superior mediastinum closely associated with the right hemothorax (*red arrows*).

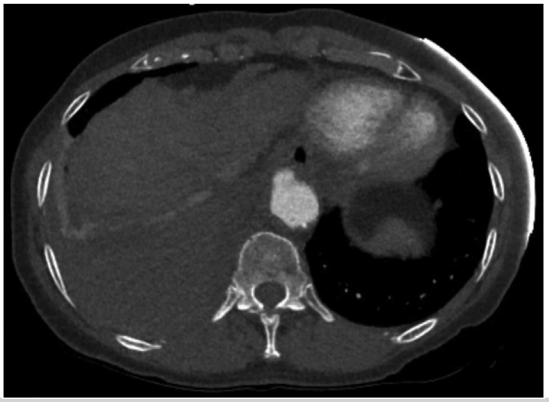

Fig 3. Large penetrating aortic ulcer (PAU) in the distal thoracic/diaphragmatic aorta with right hemothorax and mediastinal hematoma.

DISCUSSION

PAUs are a rare presentation of acute aortic syndrome, accounting for only about 5% of cases.[1] Increasing age, loss of intimal elasticity, and formation of atherosclerotic plaques leads to microperforations in the internal lamina layer. These perforations allow for the leakage of blood within the aortic wall, forming an intramural hematoma that can continue to expand and eventually lead to dissection or rupture.[2] Extension of the dissection, however, is often limited by surrounding atherosclerosis and intimal fibrosis, in the case of ulcers.[3] An important pathophysiological difference between ulcers and dissections is that when atheromatous plaques penetrate to the

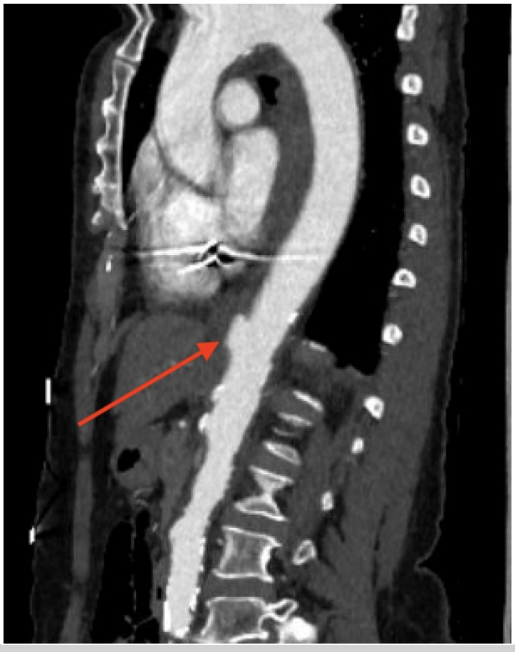

Fig 4. Reformatted images of descending thoracic aorta showing large penetrating aortic ulcer (PAU) in distal thoracic aorta (*red arrow*).

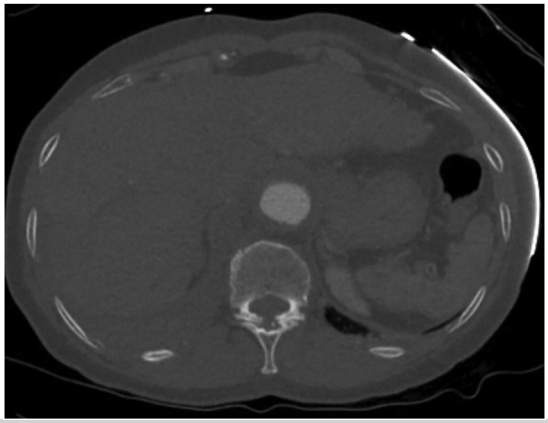

Fig 5. Right hemothorax with normal supraceliac aorta as landing zone.

medial layer of the vessel, the media is then exposed to pulsatile aortic flow, without the protection of an intimal flap.[4] The presence of an intramural hematoma increases the risk of rupture, as composite structural models designed to represent blood vessel walls have shown increased wall stress with enlarging hematoma size.[5]

Risk factors for penetrating ulcers include advancing age, hypertension, and hyperlipidemia, and are most commonly found in the mid-to-distal thoracic segments.[6] Nonspecific chest pain that radiates to the back or shoulder is one of the most common presenting symptoms, though many remain asymptomatic.[1,7] Chest radiographs are often the first diagnostic test obtained and may show a widened mediastinum or pleural effusion.[8] In one study that looked at 105 patients with aortic ulcers, pleural effusions were found in 37% of symptomatic patients and 12% of asymptomatic patients.[9] A computed tomography angiogram is the next diagnostic test of choice.[10] These often appear as areas of ulceration with hypodensity when compared with the contrast medium, often contained within the aortic contour, and may show extravasation of contrast in the case of leak or impending rupture.[11] Rupture or extravasation is generally found in the left chest, as a left hemothorax or pleural effusion. There are very few documented cases of a right-sided hemothorax secondary to acute aortic syndromes; only about 10 have been documented in the literature, and only one of these was secondary to a PAU.[12-14] In our case, we suspect that the location of the PAU on the right anterior surface of the aorta led to bleeding into the posterior mediastinum, eventually rupturing into the right pleural space.

Stable patients can be treated with beta-blockers aimed at reducing mechanical stress on the aortic wall; however, hemodynamic instability, increasing aortic diameter, and rupture with hemopericardium or hemothorax are all indications for surgical management.[2]

Surgical treatment is aimed at covering the aortic defect with a thoracic endovascular aortic repair.[15,16] One of the feared complications of aortic stent placement is spinal cord ischemia (SCI). Incidence of SCI varies from 0% to 14%, dependent on factors such as amount of aorta to be covered, left subclavian artery coverage, perioperative hypotension, and previous aneurysm repair.[17,18] SCI can potentially result in paraplegia if not treated quickly, most often through lumbar cerebrospinal fluid drainage to augment spinal cord blood flow.[19]

CONCLUSION

Right hemothorax is extremely uncommon with ruptured acute aortic syndromes, but its presence should not decrease the index of suspicion, especially when aortic pathology is present. Additional but unrelated findings can be confounders, as was the case in this patient, and may further delay diagnosis and treatment. The lack of a clear source of hemorrhage can require coverage of the entire thoracic aorta. When this is the case, vigilance must remain high to recognize and treat perioperative SCI. We were fortunate to obtain a good outcome with this uncommon presentation of ruptured PAU.

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