

## Penetrating aortic ulcer manifesting as atypical chest pain

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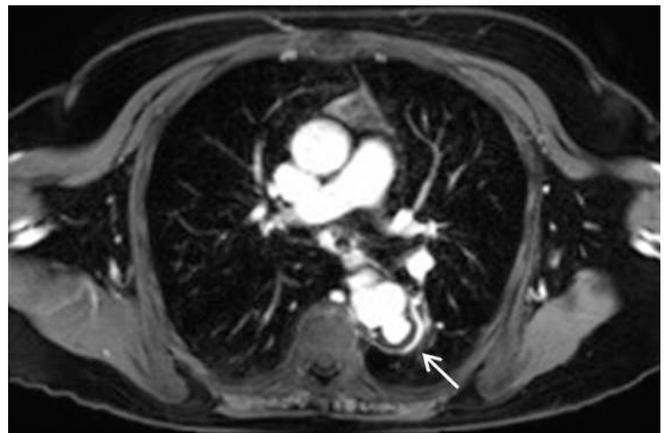
### Abstract

This is a case report of a penetrating aortic ulcer that presented as atypical chest pain. Imaging modalities for the diagnosis of aortic ulcers include computed tomography angiography, magnetic resonance angiography, and transesophageal echocardiography.

**Keywords:** penetrating aortic ulcer; aortic syndrome; chest pain; computed tomography angiogram (CTA)

### Case presentation

A 57-year-old woman presented to the emergency department with focal, sharp pain radiating to her back for one month. Past medical history was significant for hypertension, hyperlipidemia, tobacco use, and extensive peripheral arterial disease. A lateral chest X-ray revealed a posterior convexity projecting off the proximal descending aorta (Figure 1). Given her renal insufficiency, a magnetic resonance angiogram (MRA) was performed using ferumoxytol. It demonstrated a large 2.0 × 2.5 cm penetrating aortic ulcer on the lateral proximal descending thoracic aorta (Figure 2). Following hydration protocol, this was later demonstrated on a computed tomography angiogram (CTA) in anticipation of percutaneous repair (Figure 3a-c). The patient underwent repair with placement of an endoluminal aortic stent graft with immediate resolution of chest pain (Figure 4). She remained chest pain free at her one month follow-up appointment.



**Figure 2** Magnetic resonance angiogram using ferumoxytol in the transverse axial plane demonstrating a 2.0 × 2.5 cm penetrating aortic ulcer (arrow) on the lateral proximal descending thoracic aorta.



**Figure 1** Lateral chest x-ray with a focal posterior convexity (arrow) projecting from the proximal descending aorta.

### Discussion

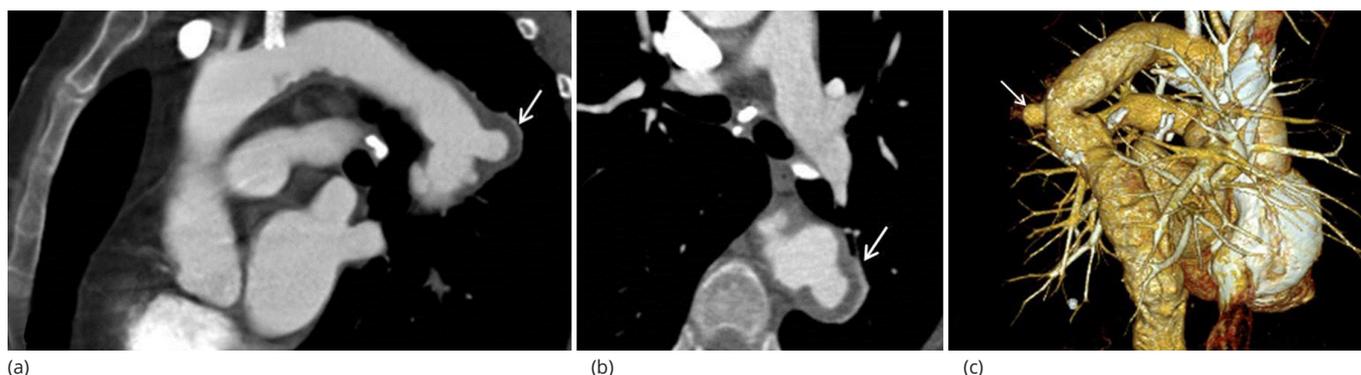
A penetrating aortic ulcer (PAU) is characterized by an atherosclerotic plaque that penetrates the internal elastic lamina into the aortic media and allows hematoma

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**Figure 3** a. Computed tomography angiogram (CTA) in the sagittal plane demonstrating a 2.0 × 2.5 cm penetrating aortic ulcer (arrow) on the lateral proximal descending thoracic aorta. b. CTA in the transverse axial plane demonstrating the penetrating aortic ulcer (arrow) on the lateral proximal descending thoracic aorta. c. CTA with 3-D processing demonstrating a penetrating aortic ulcer (arrow) off the proximal lateral descending thoracic aorta. There are diffuse luminal irregularities consistent with atherosclerosis.



**Figure 4** Computed tomography angiogram with 3-D processing obtained approximately one month after repair with an endoluminal aortic stent graft demonstrating resolution of the penetrating aortic ulcer.

formation within the aortic wall. Together with aortic dissection and intramural hematoma, it is one of the three acute aortic syndromes (AAS) [1]. When viewed tangentially, a PAU classically appears as a craterlike outpouching of the aortic lumen associated with atheroma. A PAU can appear similar to and should not be confused with a pseudoaneurysm, which is often associated with trauma. A pseudoaneurysm is characterized by penetration of the arterial wall with hematoma formation contained by periarterial connective tissue [2].

Imaging modalities for the diagnosis of AAS include CTA, MRA, and echocardiography, primarily transesophageal. Each has a sensitivity and specificity approaching 90-100% [1]. The advantages of CTA imaging are quick utilization, high resolution, and visualization of the entire aorta including its side branches and extraluminal structures. This facilitates the detection of fluid in the mediastinal or pleural space or a pseudoaneurysm [1]. CTA is also helpful to identify calcified atherosclerotic plaque surrounding an ulcer. The disadvantages of CTA include exposure to

radiation and contrast dye [2]. Similar to CTA, MRA provides a multiplanar evaluation of the thoracic aorta, but takes up to four times longer and restricts patients with metallic implants, pacemakers, or claustrophobia. Transesophageal echocardiography has difficulty visualizing the entire aorta, often requires conscious sedation, and can be operator dependent, but is usually quick and available at the bedside. Transesophageal echocardiography is generally superior to transthoracic for evaluation of the thoracic aorta [2].

The goals of treatment of a PAU are to prevent complications including progression to acute aortic dissection or rupture. Medical therapy is directed at heart rate and blood pressure control, and there are no strict guidelines for surgical management [2]. Indications include persistent symptoms, PAU diameter and depth, aortic wall penetration, aortic diameter expansion, or the presence of a saccular aneurysm [3].

## Conclusion

Multiple imaging modalities including CTA, MRA, and transesophageal echocardiography are effective for the detection of penetrating aortic ulcers. Surgical intervention with endoluminal stent grafting can be considered in patients with persistent symptoms.

## Conflicts of interest

Authors declare no conflicts of interest.

## Abbreviations

AAS: acute aortic syndromes; CTA: computed tomography angiogram; MRA: magnetic resonance angiogram

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