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Radiology

Not Just Another Acute Aortic Syndrome: CT Angiography Diagnosis a Penetrating Aortic Ulcer

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Abstract **Case Report**

Penetrating aortic ulcer [PAU] is an uncommon but potentially life-threatening entity within the spectrum of acute aortic syndromes [AAS]. Early diagnosis is essential to prevent complications such as intramural hematoma, pseudoaneurysm formation, dissection, or rupture. We report the case of a patient presenting with acute chest pain in whom computed tomography angiography [CTA] revealed a penetrating ulcer of the descending thoracic aorta. The imaging findings, differential diagnoses, management considerations, and literature review are discussed with emphasis on the radiologist's role in early recognition and follow-up.

Keywords: penetrating aortic ulcer; acute aortic syndrome; CT angiography; thoracic aorta; radiology case report.

INTRODUCTION

Penetrating aortic ulcer [PAU] represents a focal ulceration of an atherosclerotic plaque that penetrates through the internal elastic lamina into the media of the aortic wall. It belongs to the spectrum of acute aortic syndromes [AAS], alongside aortic dissection and intramural hematoma. PAU accounts for approximately 2–7% of all acute aortic syndromes and most frequently involves the descending thoracic aorta in elderly patients with significant cardiovascular risk factors [1,5,6].

Computed tomography angiography [CTA] plays a central role in diagnosis due to its rapid acquisition, availability, and excellent spatial resolution, allowing accurate evaluation of ulcer morphology, associated hematoma, and complications.

We present a case of descending thoracic PAU diagnosed on CTA with emphasis on imaging features and differential diagnosis.

CASE PRESENTATION

A 68-year-old male with hypertension, dyslipidemia presented with acute retrosternal chest pain radiating to the back. Vital signs were stable except for elevated blood pressure [170/95 mmHg], with no ischemic ECG changes and normal cardiac enzymes.

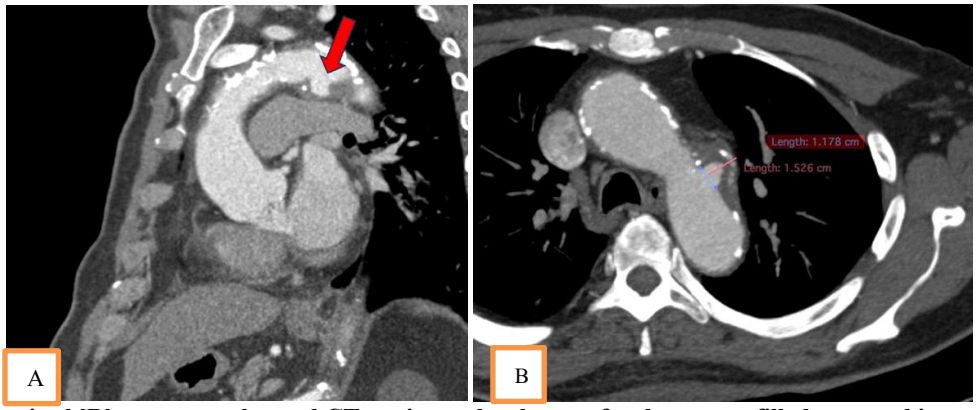
Given the suspicion of acute aortic syndrome, contrast-enhanced CT angiography of the thoracic aorta was performed. It demonstrated a focal contrast-filled outpouching arising from the aortic arch, measuring 15 × 12 mm**,** extending beyond the expected aortic lumen contour and penetrating into the aortic media, without intimal flap or double lumen.

These findings were consistent with a symptomatic penetrating aortic ulcer of the aortic arch**.** The patient subsequently underwent thoracic endovascular aortic repair [TEVAR] with stent graft placement, with favorable early postoperative evolution and no immediate complications.

Imaging Findings

Computed tomography angiography [CTA] is the imaging modality of choice in suspected penetrating aortic ulcer. Typical imaging features include a focal contrast-filled outpouching extending beyond the expected contour of the aortic lumen, corresponding to an ulcer crater that penetrates the intimal layer and reaches the media. This lesion is frequently associated with localized aortic wall thickening and may be accompanied by intramural hematoma. In complicated forms, pseudoaneurysm formation or signs of impending rupture may be observed.

In the present case, CTA demonstrated a well-defined ulcer crater arising from the aortic arch no evidence of intimal flap or double lumen. The maximal aortic diameter at the lesion site measured 40 mm, and the distance between the lesion and the supra-aortic trunks was approximately 2.3 cm, relevant for endovascular planning. These imaging findings strongly supported the diagnosis of penetrating aortic ulcer rather than classical aortic dissection,



Axial[A] and sagittal [B] contrast-enhanced CT angiography shows a focal contrast-filled outpouching arising from the aortic arch [arrow] , consistent with a penetrating aortic ulcer
The lesion measures approximately 15 × 12 mm and is associated with focal aortic wall irregularity without an intimal flap

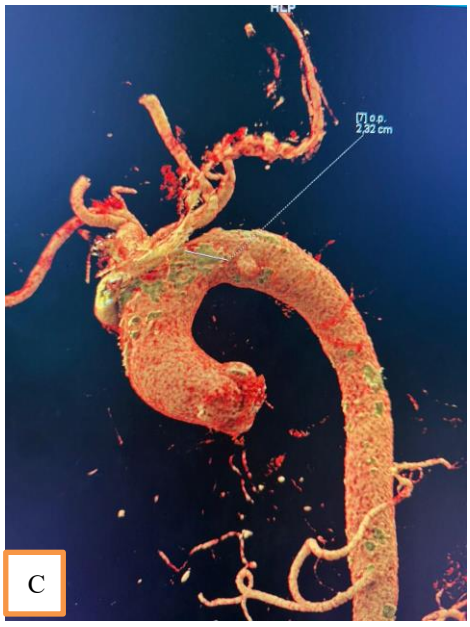


Image C: 3D volume-rendered CT angiography reconstruction shows a penetrating aortic ulcer arising from the aortic arch on a diffusely atheromatous aorta
The distance between the ulcer and the supra-aortic trunks is approximately 2.3 cm, relevant for endovascular treatment planning

DISCUSSION

PAU results from progressive atherosclerotic disease leading to ulceration of the intimal layer and penetration into the media [5,6]. It may remain localized or progress to intramural hematoma, pseudoaneurysm formation, dissection, or rupture. Rapid evolution toward acute aortic dissection has been described in the literature, emphasizing the dynamic and potentially unstable nature of this entity and the need for close imaging surveillance in symptomatic patients [2].

CTA plays a key role not only in diagnosis but also in risk stratification by evaluating ulcer depth, ulcer diameter, aortic diameter, the presence of intramural hematoma, associated pleural effusion, and lesion progression on follow-up imaging [1,4,5,10].

High-risk imaging features include ulcer depth greater than 10 mm, width greater than 20 mm, associated intramural hematoma, or increasing aortic diameter [4,5,10].

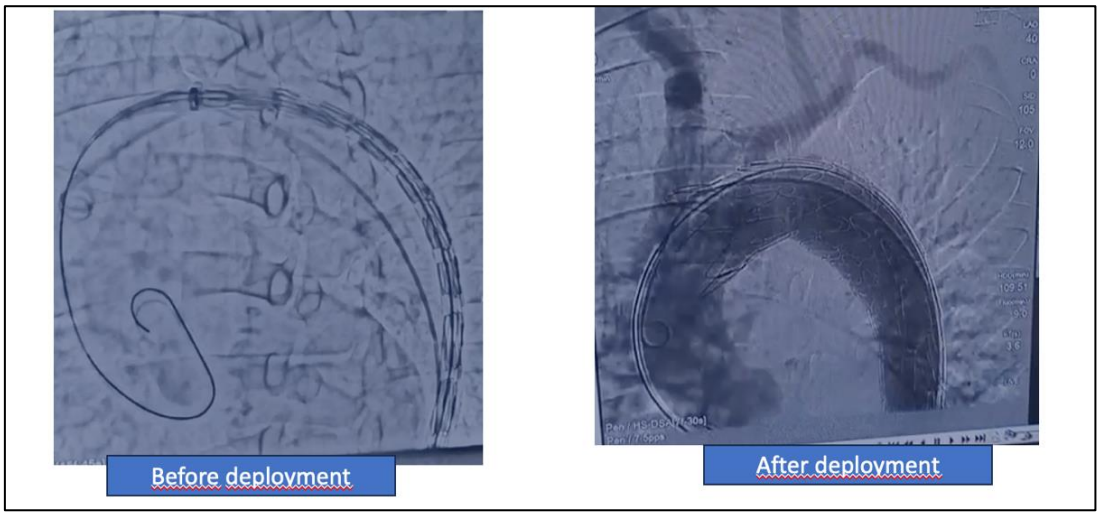
Management depends on symptoms, lesion morphology, and complication risk. Symptomatic or complicated PAU generally requires thoracic endovascular aortic repair [TEVAR], whereas uncomplicated lesions may be treated conservatively with strict surveillance.

Reported cases of rapid progression from PAU associated with intramural hematoma to overt aortic dissection further support the indication for early intervention in selected high-risk presentations [2].

Treatment

Given the symptomatic nature of the penetrating aortic ulcer and the associated intramural hematoma, endovascular treatment was indicated. The patient benefited from thoracic endovascular aortic repair [TEVAR] with deployment of an aortic stent graft covering the ulcerated segment of the descending thoracic aorta.

Post-procedural CT angiography confirmed correct positioning of the endoprosthesis with complete exclusion of the ulcer crater and no evidence of endoleak. Clinical evolution was favorable with resolution of symptoms and recommendation for imaging follow-up.



Fluoroscopic images demonstrate thoracic endovascular aortic repair [TEVAR] with successful deployment of an aortic stent graft across the aortic arch covering the penetrating aortic ulcer.
post-deployment control shows appropriate positioning of the endoprosthesis with preserved patency of the supra-aortic trunks and exclusion of the ulcer.

CONCLUSION

Penetrating aortic ulcer is an important entity within acute aortic syndromes requiring early radiologic recognition. CTA remains the cornerstone imaging modality for diagnosis and follow-up [1,5]. Identification of high-risk imaging features is essential to guide management decisions between conservative therapy and endovascular intervention.

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