

# Type A aortic dissection identified by point-of-care ultrasound but missed by CT angiogram

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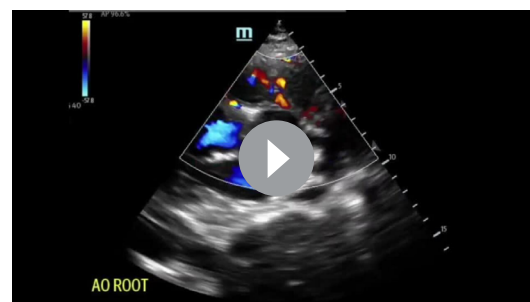
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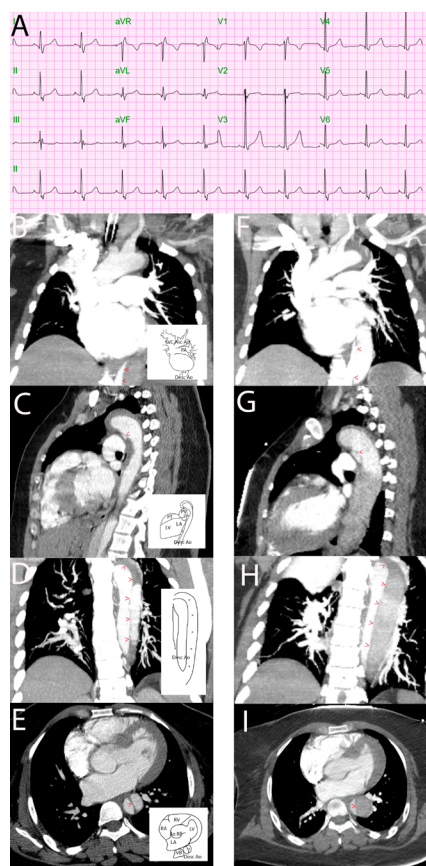
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## DESCRIPTION

Aortic dissection is an uncommon diagnosis that carries incredible morbidity and mortality if missed.<sup>1</sup> Differentiating Stanford type A dissections, involving the ascending aorta, from type B, which involves the thoracic or thoracoabdominal aorta distal to the left subclavian artery without involvement of the ascending aorta (online supplemental figure), carries life altering implications as the former requires immediate cardiothoracic surgical intervention.<sup>2</sup> For every hour that the diagnosis is missed, the mortality rate increases by at least 1% without treatment.<sup>3</sup> Although the traditional



**Video 1** Transthoracic echocardiography shows extension of an intimal flap with aortic regurgitation



**Figure 1** (A) Repeat ECG show ST segment changes with right bundle branch block. (B–E) CTA taken 8 months earlier ascending thoracic aortic aneurysm and thoracic and abdominal aortic dissection. (F–I) CTA taken at time of event showing redemonstration of the type B aortic dissection. >, intimal flap; \*, false lumen. Asc Ao, ascending aorta; Desc Ao, descending aorta; Ao Rt, aortic root; CTA, CT angiography; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle; PT, pulmonary trunk; PV, pulmonary vein; SVC, superior vena; cava; VB, vertebral body.

gold standard for diagnosis is CT angiography (CTA),<sup>4</sup> point-of-care echocardiography is a valuable adjunct. In this case report, we diagnosed type A dissection based on the presence of an ascending aortic intimal flap and aortic valvular regurgitation noted by sonographic investigation that was missed with CTA. The bedside sonographic assessment predicated the decision for operative intervention.

A patient with known connective tissue disorder and prior type B aortic dissection presented to the emergency department following cardiac arrest after three prehospital defibrillations with return of spontaneous circulation. On arrival, the patient was obtunded with the only meaningful history from family being 1 day of chest pain prior to collapse. Initial ECG revealed ST segment elevations in the inferior distribution and anteroseptal ST segment depressions, with right bundle branch block without ST segment changes on repeat ECG (figure 1A). Vital signs showed a temperature of 36.3°C, blood pressure of 106/52 mm Hg, heart rate of 56 bpm and oxygen saturation of 100% on 100% fraction of inspired oxygen (FiO<sub>2</sub>). In addition to continuous analgesedation, an esmolol drip was titrated considering the history of a type B aortic dissection (figure 1B–E).

Although clinical presentation and history were highly suspicious for an extension of a type A dissection into the coronary vasculature, we considered an acute coronary syndrome causing ventricular fibrillation and a spontaneous coronary artery dissection of the right coronary artery as alternative diagnoses.

Surprisingly, CTA radiologic interpretation revealed redemonstration of the type B aortic dissection without a type A component (figure 1F–I). As the current hospital did not have invasive cardiothoracic surgery capability but could medically manage type B dissections, the inconsistency of CTA results to the clinical picture presented a challenging dilemma. Point-of-care echocardiography was immediately performed by the emergency medicine team, demonstrating aortic



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## Images in...

regurgitation and an extension of a flap towards the aortic valve cusp in the area of an aneurysmal thoracic aortic root (video 1). The case was presented to the receiving invasive cardiothoracic surgical consultant with communication of both sonographic and CTA imaging. The radiology attending of record performed a review of the imaging and did not feel their report showed a type A component. In consideration of the point-of-care ultrasound findings, the patient was transferred for emergent operative intervention and noted to have type A dissection with extension and subsequent aortic valve cusp rupture. The patient survived to discharge.

The identification of direct sonographic signs, such as the presence of intimal flap or intramural haematoma with thickening of aortic walls greater than 5 mm, or indirect signs including ascending aorta enlargement 4 cm or greater, pericardial tamponade or effusion, or aortic valve regurgitation, can augment clinical decision making.<sup>5</sup> As this case report proves, situations where the CTA misses the type A component of an aortic dissection are notable. Although ECG-gating, a recent CTA innovation, improves image quality by reducing pulsatile motion during the cardiac cycle,<sup>6</sup> its similar diagnostic performance (ie, accuracy, sensitivity and specificity) to non-ECG-gating CTA for especially for ascending aortic dissection.<sup>7</sup> Therefore, this creates a novel situation where bedside ultrasound may be the only diagnostic tool that saves a patient's life. As emergency physicians further mature the application of bedside ultrasound as part of their practice, we implore cardiothoracic surgical consultants to use bedside sonographic findings when considering cases for transfer or intervention.

## Learning points

- In the Stanford classification of aortic dissection, type A involves a tear in the ascending aorta that extends from the heart and can be immediately life-threatening, while the more chronic type B occurs in the descending aorta beyond the arch and farther away from the heart (online supplemental figure).
- The gold standard for type A aortic dissection is CT angiography but is not always accurate.
- Direct sonographic sign of type A aortic dissection is the presence of intimal flap or intramural hematoma while indirect sonographic signs of type A aortic dissection are aorta enlargement, pericardial effusion or tamponade and aortic valve regurgitation.
- Review bedside ultrasound images and clips as part of the whole clinical picture in less straight forward cases.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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