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CASE REPORT

The paravertebral panto: it's behind you!

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Summary

This case report highlights the utility of paravertebral (PV) imaging in the diagnosis of aortic dissection, the evaluation of left ventricular systolic function and drawing the distinction between pleural and pericardial effusions. In this case, less attenuation of the ultrasound beam, reduced lung viscosity due to pleural effusions and less impedance mismatch between media led to images of superior quality and high diagnostic value. This supports the use of paravertebral imaging as an adjunct to conventional echocardiography windows, particularly when conventional transthoracic imaging proves challenging.

Key Words

- paravertebral
- pleural effusion
- pericardial effusion
- aortic dissection
- lung ultrasound

Learning points:

- PV images provide superior resolution when interrogating the descending aorta and thus can reveal incidental findings such as aortic dissection.
- PV imaging provides clearer delineation between pericardial and pleural effusions.
- Additional information may be obtained from the PV window in relation to left ventricular systolic function particularly in the setting of suboptimal transthoracic image quality.

Background

This case is of interest to clinicians and sonographers as it highlights the utility of the paravertebral imaging window. Paravertebral imaging is a useful addition to conventional diagnostics, facilitating best practice through innovative and interesting imaging for patients undergoing echocardiography evaluation.

Case presentation

A 62-year-old female presented to her local district general hospital with sudden onset of severe central chest pain (rated by the patient as 10/10 in severity) radiating to the scapula and abdomen. At this time, she was hemodynamically stable with a heart rate of 85 bpm and respiratory rate of 16 resps/min. Her blood pressure was 155/50 mmHg on the right and 148/80 mmHg on the left.

Investigation

She underwent chest x-ray and computed tomography (CT) (Fig. 1A and B), which confirmed a widened mediastinum and a type A acute aortic dissection. She was transferred to our institute and underwent an urgent ascending aorta and hemi-aortic arch replacement. During recovery, she was referred for a transthoracic echocardiogram (TTE) for the assessment of aortic valve competency and pericardial effusion.

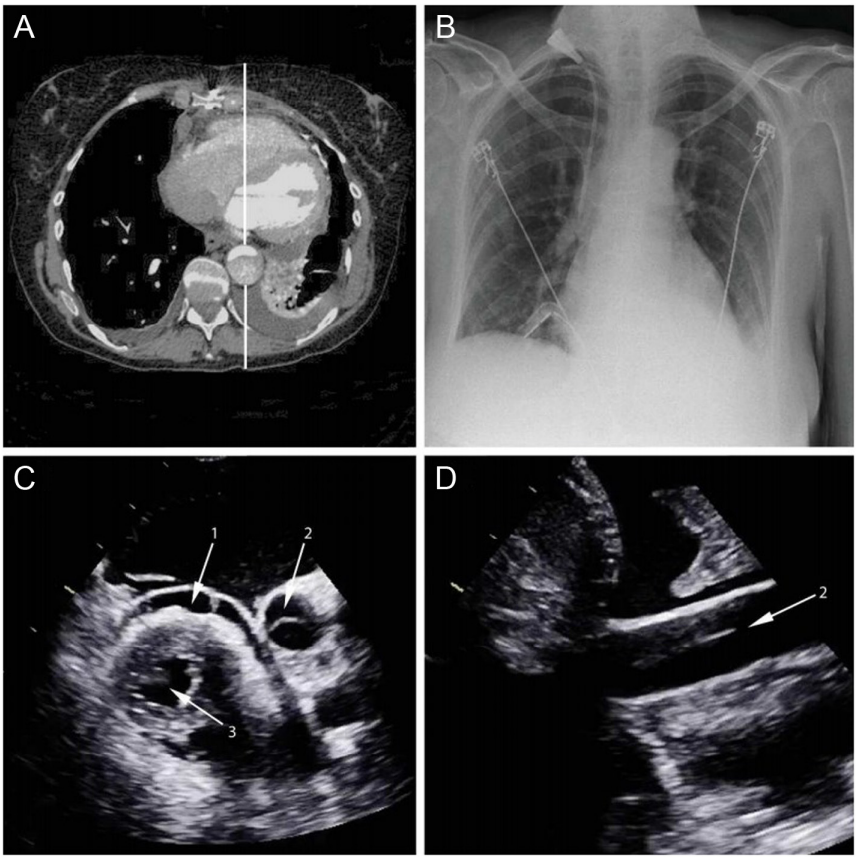

Figure 1
(A) CT demonstrating a dissection flap consistent with an aortic dissection, pericardial and pleural effusions; lines mark the distance to both the paravertebral window and the conventional transthoracic window. (B) Chest x-ray showing a widened mediastinum; (C) and (D) paravertebral echocardiographic images demonstrating a pericardial effusion (1), a dissection flap in the descending aorta (2) and the left ventricle (3).

Echocardiographic examination was complicated by a narrow anterior-posterior dimension and small acoustic windows, making parasternal and apical images technically challenging with suboptimal quality. Additional paravertebral images (PV) were taken from the right and left posterior lung fields in the fifth intercostal space just lateral to the spine with the imaging notch directed to 12 o'clock and toward the spine. Images from the lung fields clearly demonstrated the presence of a pleural and pericardial effusion, normal left ventricular systolic function and a dissection flap in the descending aorta with excellent image quality obtained (Fig. 1C and D).

Treatment and outcome

Surgical intervention included ascending aorta and hemi-aortic arch replacement (as outlined earlier).

Discussion

Imaging from the paravertebral (PV) position has long been recognised as useful in identifying pleural effusions (1, 2). However, the utility of this imaging technique beyond the scope of pleural effusion is not well known and is thus under-utilised (3, 4). The current case demonstrates three important points regarding the application and usefulness of paravertebral echocardiography.

Firstly PV imaging has the ability to provide superior definition of the descending aorta (5, 6). Due to the close proximity between vessel and acoustic window, the distance traveled by the ultrasound signal is reduced. Consequently, there is less attenuation of the ultrasound beam and enhanced definition of the structures of interest. Figure 1A showed the relationship between the position of the descending aorta relative to both the conventional transthoracic window and the PV acoustic window. In this case, PV imaging additionally facilitates the identification of a dissection flap in both a short and long axis view, a significant abnormality if yet undetected (Fig. 1C and D). Current literature suggests that TTE does not perform well in the diagnosis of acute aortic dissection of the descending aorta with specificity and sensitivity reported at as low as 71% and 74% respectively (7). This underscores the value of PV echocardiography with better morphological characterisation of the aorta and suggests this neglected imaging window should be considered a standard view when aortic dissection is suspected, improving sensitivity and further assisting with correct diagnosis (3).

Secondly, in the presence of pleural effusion, image quality is further enhanced by decreased absorption. This is as a consequence of the lower viscosity of the lungs and reduced reflection as a result of limited variation in acoustic impedance between media (8). As a result, paravertebral echocardiography provides superior characterisation of the pericardium and associated effusions. Cardiac tamponade is a frequent complication of aortic dissection occurring in one of five patients (9). Figure 1B and C demonstrate the echogenic pericardial effusion with clear borders defining the pericardial space. These alternative images further assist in distinguishing between pleural and pericardial effusions, which in practice often proves challenging when conventional TTE images do not yield optimal visualisation of the descending aorta.

Finally, the current case also supports the use of PV imaging in the assessment of left ventricular systolic function. From this window, in the presence of a pleural effusion, a short axis view of the left ventricle can reliably be obtained. This view offers the potential to evaluate systolic function, by examining both global and regional myocardial abnormalities (8). A thorough assessment of left ventricular systolic function is vital for the postoperative patient, and the PV window can further assist in providing additional high-quality information.

PV echocardiography plays an important role in providing enhanced image quality and offers a useful approach for the identification of aortic dissection, pericardial and pleural effusions and left ventricular systolic function. We suggest this imaging approach may prove valuable as a routine adjunct to conventional transthoracic imaging.

Declaration of interest
The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this case report.

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Patient consent
Written informed consent has been obtained from the patient in regard to publication of the submitted article and accompanying images. .

Patient's perspective
It was interesting to see the pictures and although, with no medical expertise, I needed them explaining to me, I can see that they are incredibly clear. I hope this education and learning advances the use of imaging work in this area.

Author contribution statement
All authors have contributed equally to the writing and revisions of this manuscript. The named physician of the patient is one of the authors and has thus given permission for this case to be written up and published.

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