

The chest radiograph in heart disease

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Abstract

The chest radiograph – better known as the chest X-ray or CXR – remains one of the most important imaging tools in patients with suspected or known cardiac disease. This article provides a guide to the systematic interpretation of a chest radiograph and a review of the classic radiological signs of cardiac disease. Indications for use in cardiac disease are summarized.

Keywords Cardiac conduction devices; cardiac disease; cardiomegaly; chest radiography; chest X-ray; congenital heart disease; digital radiography; MRCP; pericardial effusion; pulmonary oedema

Introduction

Despite advances in various imaging modalities, the chest radiograph (chest X-ray (CXR) remains an important initial diagnostic tool in cardiac patients).

Interpreting the chest radiograph

Systematic inspection of the radiograph is vital for its accurate interpretation. The following routine is suggested:

1. **Check** the name, date and side markers – these are displayed on all analogue and digital CXRs.
2. **Determine the projection** – postero-anterior (PA), antero-posterior (AP) or supine? The standard projection is PA – this projects the scapulae off the lungs, allowing easier inspection of the mid and upper lung zones, and enables better assessment of the cardiac size and silhouette. All non-PA films should be annotated by the radiographer as either AP or supine. AP projections exaggerate the cardiac size, and make comparison of cardiac size between radiographs unreliable.
3. **Assess the technical adequacy of the film**
 - Adequate exposure? The spine and disc spaces should be just visible behind the heart.
 - Not rotated? The medial ends of the clavicles should be equidistant from the spinous processes.
 - Adequate inspiration? The dome of the diaphragm should lie between the anterior ends of the fifth and seventh ribs in the mid-clavicular line. The lungs can

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Key points

- A systematic approach is key to interpretation of the chest radiograph in heart disease
- Implanted medical devices and cardiac surgery artefacts are useful clues in interpretation
- Careful assessment of the heart and mediastinal contours, and familiarity with the normal chest radiograph, is required to discern subtle features of cardiac chamber pathology or congenital heart disease

appear more opaque with poor inspiration, and the heart may appear enlarged.

4. **Identify and assess the position of medical devices** (e.g. drains, catheters, pacemakers, valve prostheses), unknown devices or foreign bodies (e.g. swabs, broken pacing wires).
5. **Categorize detected abnormalities** and identify their cause or associated features. Assess each abnormality that cannot readily be categorized, in a standard manner:
 - Can it be explained by film quality or normal structures?
 - Is the abnormality in the heart, great vessels, lung or mediastinum? Is a lateral film required to localize it? Is a computed tomography scan needed? The ‘silhouette sign’ – the obliteration of a border that is normally visualized on the chest radiograph – may be used to localize the abnormality.
 - Describe its appearance in detail. What size is it, is it well defined, is it completely or partially calcified, etc?
6. **Review** the apices, hila, retrocardiac region, lungs below the hemidiaphragms and lung adjacent to the lateral chest wall.
7. **Compare with previous films**, if available.
8. **Suspect cardiac disease** if:
 - previous cardiac surgery is evident (e.g. sternal wires, coronary artery vein graft clips, valve prostheses)
 - the mediastinal silhouette is altered (e.g. small aortic knuckle in patients with an atrial septal defect)
 - the pulmonary arteries are enlarged (e.g. secondary to an intracardiac shunt), or
 - pulmonary oedema is present.

Cardiac abnormalities

Cardiac enlargement: the size of the cardiac silhouette can be assessed on a PA chest radiograph by measuring the:

- transverse cardiac diameter: <13.5 cm in men and <12.5 cm in women, or
- cardiothoracic ratio: up to 0.5 in adults and 0.6 in neonates (Figure 1).

Left ventricular enlargement – the left ventricle forms the left heart border and cardiac apex. Features of enlargement comprise:

- rounding of the cardiac apex (early)
- downward and leftward elongation of the ventricular axis.

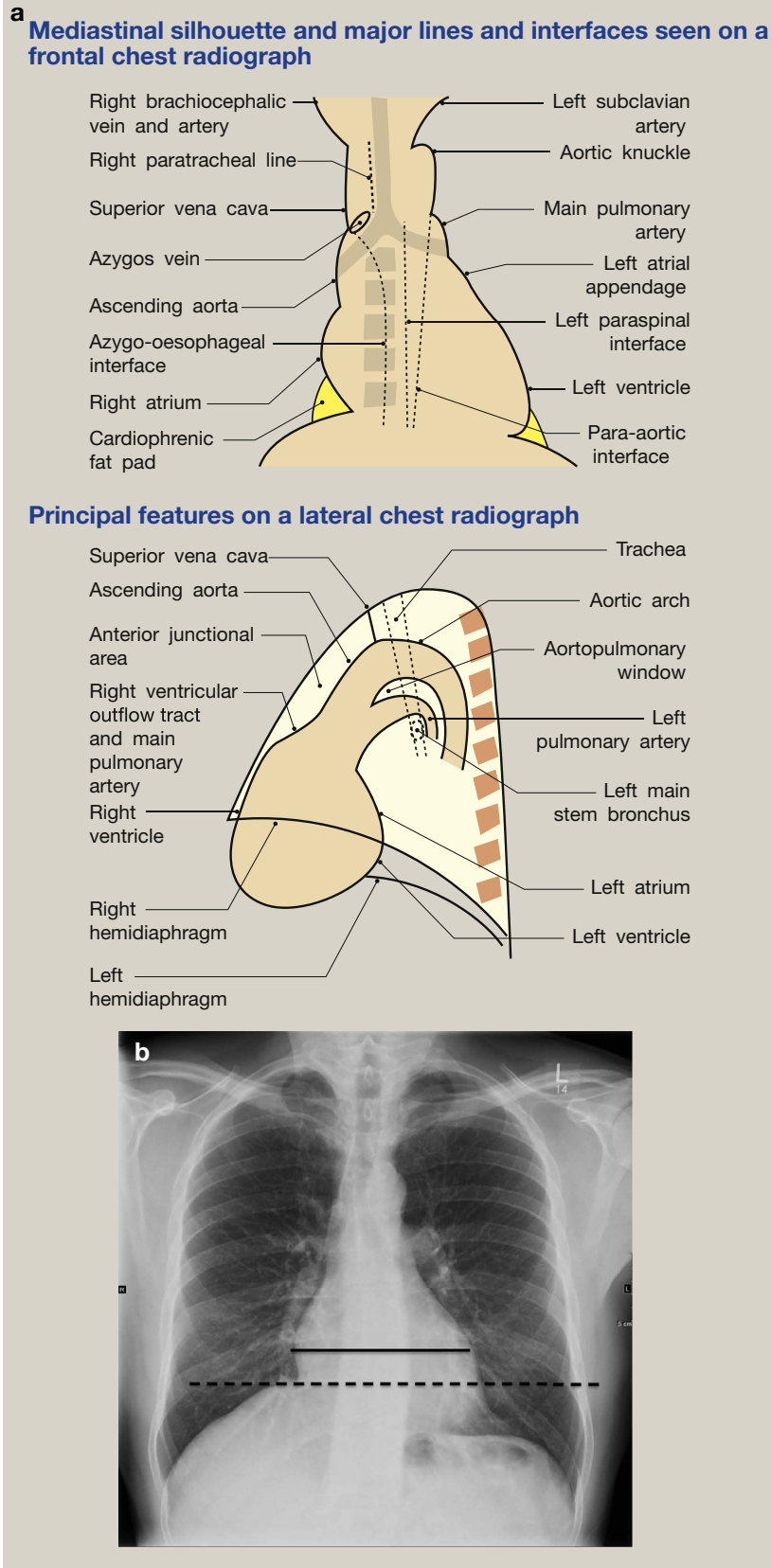


Figure 1 (a) Principal structures on frontal and lateral chest radiographs. (b) Example of normal chest radiography with measurement of cardiac size: the solid line depicts the maximum transverse diameter, the dotted line the thoracic width. The cardiothoracic ratio is the ratio of maximum transverse diameter to thoracic width.

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