Chest x rays made easy

In the final part of the series, Elizabeth Dick looks at lung nodules and masses.

**The basics of looking at a chest x ray (recap):**

- First look at the mediastinal contours—run your eye down the left side of the patient and then up the right.
- The trachea should be central. The aortic arch is the first structure on the left, followed by the left pulmonary artery; notice how you can trace the pulmonary artery branches fanning out through the lung (see figure 1).
- Two thirds of the heart lies on the left side of the chest, one third on the right. The heart should take up no more than half of the thoracic cavity. The left border of the heart is made up by the left atrium and left ventricle.
- The right border is made up by the right atrium alone. Above the right heart border lies the edge of the superior vena cava.
- The pulmonary arteries and main bronchi arise at the left and right hila. Enlarged lymph nodes can also occur here, as can primary tumours. These make the hilum seem bulky—note the normal size of the hilum on this film.
- Now look at the lungs. Apart from the pulmonary vessels (arteries and veins), they should be black (because they are full of air). Scan both lungs, starting at the apices and working down, comparing left with right at the same level, just as you would when listening to the chest with your stethoscope. The lungs extend behind the heart, so look here too. Force your eye to look at the periphery of the lungs—you should not see many lung markings here; if you do then there may be disease of the air spaces or interstitium. Don’t forget to look for a pneumothorax.
- Make sure you can see the surface of the hemidiaphragms curving downwards, and that the costophrenic and cardiophrenic angles are not blunted—suggesting an effusion. Check there is no free air under the hemidiaphragm.
- Finally, look at the soft tissues and bones. Are both breast shadows present? Is there a rib fracture? This would make you look even harder for a pneumothorax. Are the bones destroyed or sclerotic?

**Abnormality: multiple discrete nodules in the lungs**

Discrete nodules do not have a reticular or linear component. They can be small (up to 5 mm) or large. The differential diagnosis is shown in box 1 and some of them are illustrated in figures 1, 2, and 3.

**Box 1—Differential diagnosis of small and large lung nodules**

**Small nodules (<5 mm)**

- Miliary tuberculosis (so called because they look like tiny seeds “milia”), due to haematogenous spread
- Sarcoid (which can also cause reticulo-nodular shadowing)
- Metastases (although they are usually bigger)
- Pneumoconiosis—for example, due to inhaling coal dust. This is rare nowadays
- Chickenpox pneumonia

**Larger nodules/masses (>5 mm)**

- Common: Metastases (especially breast, testis, gastrointestinal tract, kidney, and thyroid)
- Rare: Inflammatory nodules—for example, due to vasculitis of rheumatoid arthritis or Wegener’s granulomatosis
Abnormality: single nodule or mass in the lung

The two main causes of a single mass in the lung are: 

1. Infection—for example, tuberculosis and neoplasm—for example, primary bronchial tumour or single metastasis. In both cavitation may occur.

2. Other causes of single or multiple masses in the lung are rare. Only mention them if pressed by an examiner. They include hydatid cyst and pulmonary arteriovenous malformation.

Tuberculosis (TB)

Tuberculosis has various manifestations in the lung. In primary tuberculosis there is a peripheral lung mass (Ghon focus) with enlarged hilar lymph nodes (fig 4).

Fig 4 Previous primary tuberculosis. Both the peripheral lung nodule (Ghon focus, arrow 1) and the hilar lymph nodes (arrow 2), which have been infected with tuberculosis, have calcified.

Fig 5 Secondary tuberculosis. Some consolidation in the right upper lobe with a cavity (arrowed), typical of secondary tuberculosis.
Consolidation can also occur. In secondary tuberculosis there is patchy consolidation especially in the upper lobes (fig 5). This can cavitate. Other manifestations include pleural effusions and miliary tuberculosis. Mediastinal lymphadenopathy does not occur in secondary TB.

Other infections can cavitate, including pneumonias due to *Staphylococcus*, *Klebsiella*, and *Cryptococcus*. *Pneumocystis carinii*, as the name suggests, can form cysts which are air filled and have a similar appearance on an x-ray film to cavities (fig 6).

Lung carcinomas can also cavitate, squamous cell carcinomas are the typical histological subtype to do so (fig. 7).

**Box 2—Primary lung carcinoma—features to look for**

- Any site (from central to peripheral lung)
- May cavitate
- Spiculated, irregular outline
- Distal consolidation or collapse
- Pleural effusion
- Hilar lymphadenopathy
- Local bony destruction
- Multiple bony metastases

Apart from cavitation, other features of lung carcinomas are listed in box 2: they can occur in the periphery of the lung or centrally (in or near the mediastinum). The outline of the tumour may be spiculated. Look for associated pleural effusion or hilar lymphadenopathy. Proximal tumours can cause distal consolidation or collapse. Local rib destruction or multiple bony metastases can also occur so look for these.

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