Education

Chest x rays made easy

In the second of a five part series, Elizabeth Dick begins to look at chest abnormalities, starting with the mediastinum and heart.

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, with 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?

Fig 1 Normal chest x ray film

Presenting the film

You can summarise your findings in a few sentences: “The trachea is central, the mediastinum is not displaced. The mediastinal contours and hila seem normal. The lungs seem clear, with no pneumothorax. There is no free air under the diaphragm. The bones and soft tissues seem normal.”
The trachea and mediastinum are deviated

The trachea can be pulled or pushed, almost always by one of three processes (two that push, one that pulls). A right sided pleural effusion will push the trachea and mediastinum to the left (fig 2). Similarly, a left sided tension pneumothorax will push the mediastinum to the right, as air builds up in the left pleural space and cannot be released (fig 3).

On the other hand, if there is collapse on the left this will pull the trachea and mediastinum to the left side (fig 4). Most other processes (consolidation, non-tension pneumothorax, etc) have little effect on the mediastinum. If you see the mediastinum is shifted then you need to think of these three things and look for them (see future article).

An enlarged heart

The most common reason for the heart to be enlarged is congestive cardiac failure, so look for signs of left ventricular failure on the rest of the film (fig 5). These are:

1. Upper lobe blood diversion. The pulmonary veins running from the upper lobes seem more prominent than those running from the lower lobes.
2. Kerley B lines. These are tiny horizontal lines from the pleural edge and are typical of fluid overload with fluid collecting in the interstitial space.
3. “Bat’s wing” haziness around the hila.
4. Alveolar shadowing. In very severe pulmonary oedema fluid collects not only in the interstitial space but in the air spaces or alveoli. You can recognise this by seeing hazy shadowing throughout the lungs, and possibly air bronchograms (see future article).
There are only a few occasions when there may be the appearance of left ventricular failure (LVF) but a normal sized heart—in an acute myocardial infarct (sudden onset of LVF), or lymphangitis carcinomatosa may mimic the appearances of LVF and be accompanied by a normal sized heart.

Enlarged hila
This could be due to an abnormality in any of the three structures which lie at the hilum.

- The pulmonary artery—for example, pulmonary artery hypertension, secondary to mitral valve disease; chronic pulmonary emboli; or primary pulmonary hypertension (fig 6).
- The main bronchus—carcinoma arising in the proximal bronchus (fig 7).
- Enlarged lymph nodes—caused by infection, such as tuberculosis—spread from a primary lung tumour; lymphoma; or sarcoidosis (fig 8).

Next month: we will look at lung abnormalities.

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