Pneumothorax

It is important to view around the periphery of the lungs to look for a pneumothorax (air in the pleural space with associated collapsed lung). It is very easy to miss a pneumothorax. Watch out for the following signs:

- One half of the lung may seem blacker—that is, more radiolucent—than the other, which will be more radio-opaque or whiter. In particular, the area beyond the collapsed lung will be very radiolucent because there are no pulmonary vessel markings.
- You should be able to identify the edge of the collapsed lung (see fig 1).

Having identified a pneumothorax you need to look for several more associated abnormalities:
- Most importantly—this is a pass or fail observation—is there evidence of a tension pneumothorax? This occurs when air can enter the pleural space (via a hole in the lung surface or the chest wall) but, because of a ball-valve effect, air cannot leave by the same route. So more and more air accumulates in the pleural space. This pushes the mediastinum over to the opposite (normal) side and eventually compresses the normal lung so that less inspiration occurs on the normal side, with compression on the heart and decreased venous return until finally the patient arrests (see fig 2). Always look for this and say: “There is no shift of the mediastinum and therefore no tension pneumothorax” or “There is...
shift of the mediastinum away from the side of the pneumothorax indicating a (right/left) tension pneumothorax. This is a medical emergency which I would treat immediately by inserting a large bore cannula into the (right/left) pleural space.”

- The cause of the pneumothorax may be apparent—for example, fracture of the ribs.
- There may be associated surgical emphysema—that is, air in the soft tissues—and air in the mediastinum (see fig 3).

**There is extra shadowing in the lungs**

It may be difficult to work out what is causing extra shadowing in the lungs, especially near the mediastinum where normal structures may overlay the extra shadowing. It is useful to look at the periphery of the lungs because normally the outermost edge of the lungs should be fairly black with a few tapering blood vessels. If you do see more shadowing in the periphery then there may be either **interstitial or air space disease**. As examiners often show films with one of these two types of shadowing, understanding the difference between these two is worth while because it will help you to interpret what you see and lead you to the correct differential diagnosis.

The lung is made up of bronchi, which branch, at the end of which are alveoli. The interstitial space (or potential space) surrounds the alveoli. The whole of the lung from bronchi to alveoli is the air space—that is, it normally contains air. But the air spaces can fill up—with **fluid** (such as in severe pulmonary oedema), with **pus** (as in infection), with **blood** (as in rare diseases such as Goodpasture’s syndrome, associated with renal failure), or with **tumour cells** (alveolar carcinoma).

**Fluid and pus** are more common than the second two. When the air spaces fill up, the alveoli fill first, with the bronchi being relatively spared. Therefore the bronchi, which are still air filled, stand out against the alveoli, which are filled with pus or fluid. This is called an air bronchogram and is simply a sign that there is air space disease. Consolidation is another term for air space shadowing (see figs 4 and 5). If there is air space disease then you need to work out which part of the lungs it is affecting. A quick way is to use the word “zone” to describe which part of the lung is affected. Say something like “There is shadowing in the air spaces of the right mid and lower zone.” You can then take your time to work out which lobe is affected. You can
find out more about lobar anatomy in the later section on collapse and consolidation.

Let's turn to the interstitial space. This surrounds bronchi, vessels, and groups of alveoli. When there is disease in the interstitium it manifests itself by reticulo-nodular shadowing (criss cross lines or tiny nodules or both). The main two processes affecting the interstitium are accumulation of fluid (occurring in pulmonary oedema or in lymphangitis carcinomatosa) and inflammation leading to fibrosis (occurring in industrial lung disease, inflammatory arthritides such as rheumatoid arthritis, inflammation of unknown cause such as cryptogenic fibrosing alveolitis and sarcoidosis). If you see criss cross lines or tiny nodules or both say: “There is reticulo-nodular shadowing within the lower zones.” (See figure 6.)

Use the table to work out whether the extra shadowing you can see is air space or interstitial.

Next month: we will look at collapse, consolidation, and pleural effusions.

I would like to thank Dr Anju Sahdev, Dr Brian Holloway, and Dr Robert Dick for contributing some of the films which are illustrated.

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**Features of air space and interstitial lung disease**

<table>
<thead>
<tr>
<th>Zones</th>
<th>Air space disease</th>
<th>Interstitial lung disease</th>
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</thead>
<tbody>
<tr>
<td>Appearances</td>
<td>Any</td>
<td>Linear/reticular/nodular shadowing</td>
</tr>
<tr>
<td>Causes (differential diagnoses)</td>
<td>Confluent shadowing Air bronchograms</td>
<td>Fluid (pulmonary oedema, adult respiratory distress syndrome) Fluid (pulmonary oedema/lymphangitis carcinomatosa)</td>
</tr>
<tr>
<td>Blood (Goodpasture’s syndrome)</td>
<td>Inflammation leading to fibrosis (industrial lung disease, inflammatory arthritides, inflammation of unknown cause, sarcoid)</td>
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<td>Tumour cells (alveolar cell carcinoma)</td>
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</tbody>
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Erratum: see p407.

See Web Extra at studentbmj.com for our web-based x ray quiz.