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<th><strong>Title</strong></th>
<th>Radiological conference. Right upper lobe collapse due to bronchogenic carcinoma</th>
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Clinical History:
A 71-year-old woman presented with dyspnoea and cough. She also had recent weight loss and anorexia.

Figure 1: Frontal chest radiograph

What is the diagnosis?

a) Right upper lobe collapse due to bronchogenic carcinoma
b) Lung infarction
c) Progressive massive fibrosis
d) Radiation pneumonitis
e) Lobar pneumonia.

This radiology case was prepared by: Dr. Wilfred C.G. Peh, Associate Professor, Department of Diagnostic Radiology, The University of Hong Kong, Queen Mary Hospital.

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Answer:

a) Right upper lobe collapse due to bronchogenic carcinoma.

Radiological findings

The frontal chest radiograph (Figures 1 and 2) shows a homogeneous opacity in the upper zone of the right lung field. It has a sharply-defined lower border formed by elevation of the horizontal fissure. Other evidence of volume loss includes deviation of the trachea to the right and compensatory hyperinflation of the right middle and lower lobes. The cause of the right upper lobe collapse was a proximally-located bronchogenic carcinoma, which produces the reverse S-shaped curve (S sign of Golden) seen on the frontal radiograph.

Figure 2: This figure is identical to Figure 1 with addition of arrows. The displaced horizontal fissure (small white arrows) forms the upwardly-convex lower border of the collapsed right upper lobe. Bulging of the medial end of the displaced horizontal fissure, from mass effect of the causative bronchogenic carcinoma (curved arrow) produces the S sign of Golden. Deviation of the trachea towards the right (arrowheads) is present.

Discussion

Collapse (or atelectasis) refers to partial or complete loss of volume in a lung with diminished volume of air. In contrast, consolidation implies a reduced amount of air associated with normal lung volume. Paré and Fraser described 4 mechanisms of lung collapse, namely:

1. Passive collapse secondary to air or fluid collection in the pleural space;
2. Cicatrization collapse due to decreased lung compliance e.g. in pulmonary fibrosis;
3. Adhesive collapse from decreased alveolar surface tension e.g. respiratory distress syndrome; and
4. Resorption collapse resulting from bronchial obstruction where gases in the distal alveoli are continuously resorbed without being replenished. Bronchogenic tumours are an important cause of the last-mentioned type of collapse.

On chest radiographs, the only direct sign of collapse is displacement of the interlobar fissure. In right upper lobe collapse seen in our patient, the horizontal fissure, which is usually horizontally-orientated at the level of the anterior end of the right fourth rib, is elevated and bowed upwards. The upper half of the oblique fissure is displaced forwards, pivoting about the hilum; this latter sign may be appreciated on the lateral radiograph. Indirect signs of lobar collapse include:

1. Loss of aeration, seen as increased density of the collapsed lung;
2. Crowding of blood vessels in partial lobar collapse;
3. Crowding of bronchi, best appreciated where an air bronchogram is present;
4. Mediastinal displacement, evidenced by tracheal deviation in upper lobe collapse;
5. Compensatory hyperinflation of the adjacent normal lung; and
6. Elevation of the hemidiaphragm, usually seen in lower lobe collapse.

Lung collapse can be caused by various types of tumours, inflammatory conditions, mucous plugging from...
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Radiation pneumonitis

Acute changes of radiation pneumonitis are usually seen a month or so post-treatment, taking up to 6 months to appear. Consolidation, corresponding to shape of the radiation portal, develops initially. This is followed by fibrosis, which is complete by 9-12 months. If severe, fibrosis may produce significant volume loss and mediastinal shift. The diagnosis of radiation pneumonitis is based on the history and its characteristic radiographic shape, features not present in this case.

Lobar pneumonia

Lobar pneumonia is demonstrated radiographically as consolidation involving the air spaces of an anatomically recognizable lobe. The commonest causative organism is Streptococcus pneumoniae, which produces unilobar pneumonia. Klebsiella pneumoniae tends to involve multiple lobes, often cavitate and causes lobar enlargement. Staphylococcus aureus affects children, with pneumatoceles, empyema and pneumothorax being common complications. If the entire lobe is not involved or if there is associated segmental collapse, lobar pneumonia may superficially resemble lobar collapse. In this case, the lack of clinical features of infection and typical radiographic signs of an upper lobe collapse due to obstructing tumour excludes this condition.

References