CHAPTER 8

Chronic airways disease

Asthma

Most asthmatics have a normal CXR, but a few have large volume lungs.

Asthmatics are prone to spontaneous pneumothorax, pneumomediastinum (Fig 8.1) and mucous plugging which may cause lung opacification and collapse (Fig 8.2).

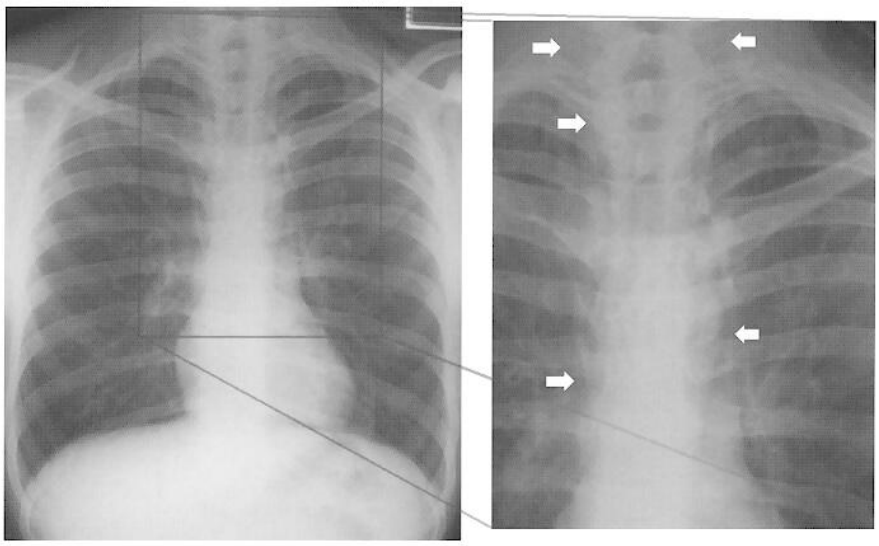

Figure 8.1
Frontal CXR of a patient with asthma who has developed a spontaneous pneumomediastinum. Note the air outlining the upper mediastinal structures and extending into the root of the neck (white arrows).

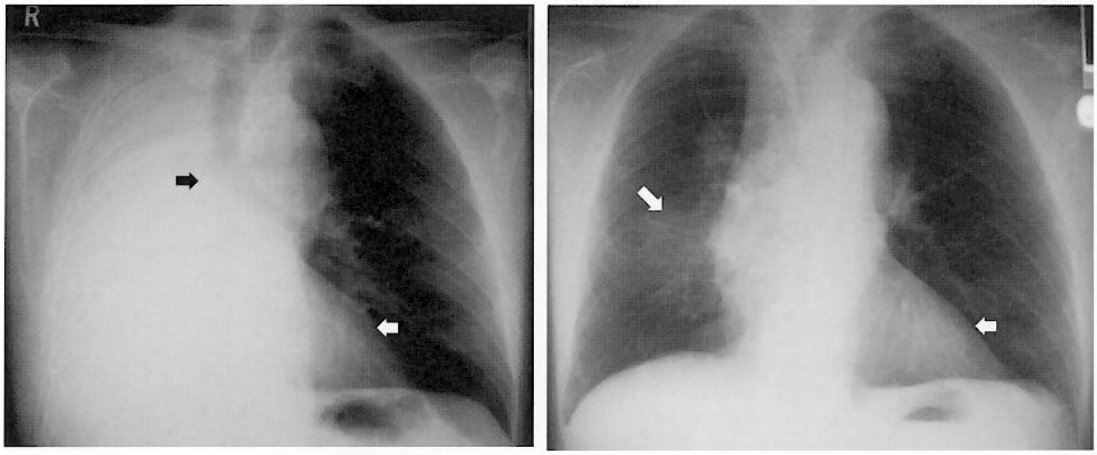

Figure 8.2
Two sequential frontal CXRs of a patient with asthma. Right image demonstrates complete opacification of the right hemithorax, but also mediastinal shift to the right (white arrow) indicating the cause is collapse of the lung and not a large pleural effusion, which would tend to shift the mediastinum the other way. The cause is a plug of mucous in the right main bronchus (black arrow) and following removal at bronchoscopy, there is re-expansion of the lung (left image) return of the mediastinum to a more central position (white arrow) and just a small residual area of consolidation (diagonal white arrow).

Chronic bronchitis

- Chronic bronchitis is a disease primarily associated with smoking and, when severe, may be evident on a CXR through the associated bronchial wall thickening, causing the bronchovascular markings to be more obvious and perceived further from the hila (Fig 8.3).

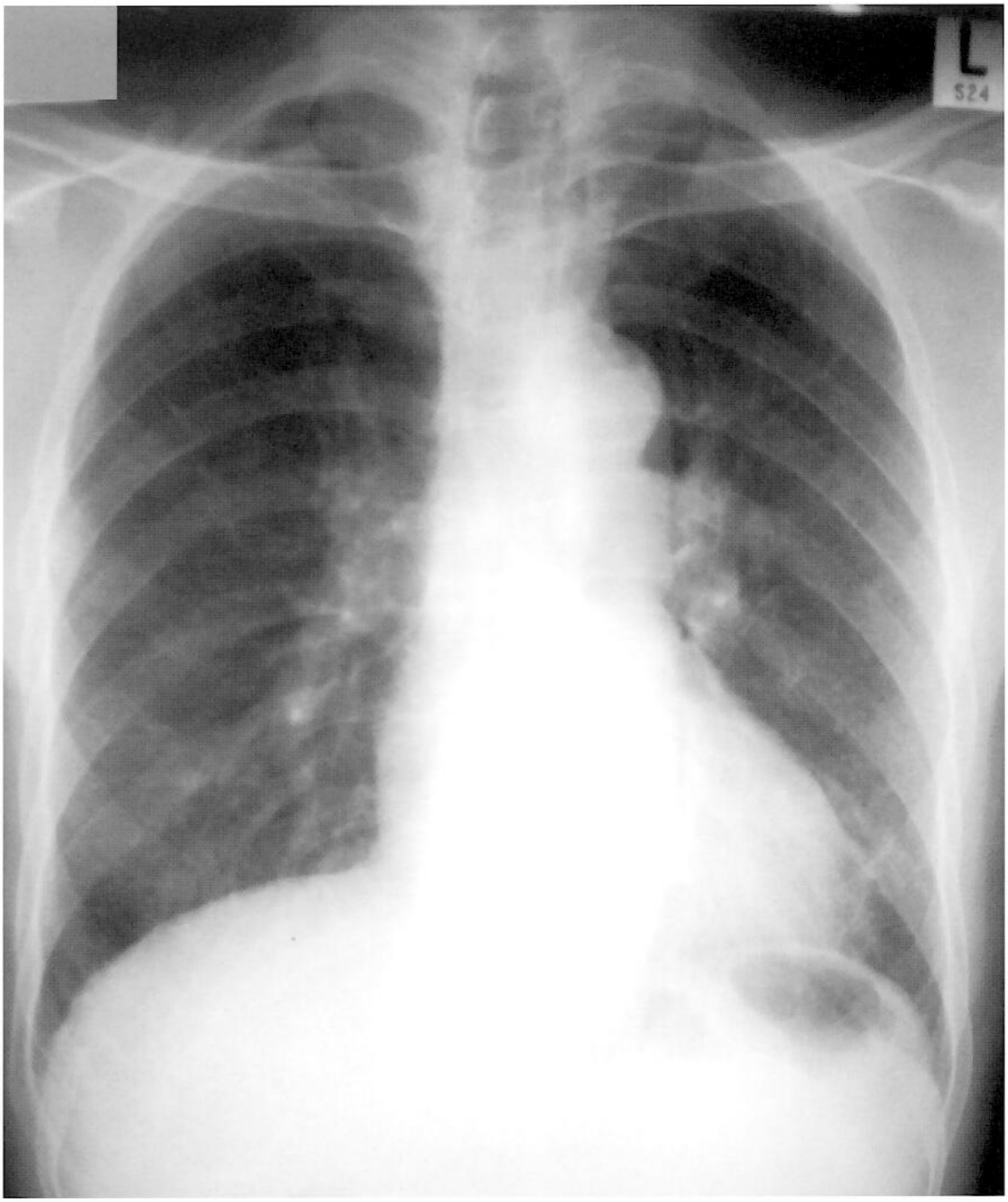

Figure 8.3
Frontal CXR of an adult male with a long history of cigarette smoking. Note the more obvious bronchovascular markings, large volume lungs, but lacking flattening of the hemidiaphragms or obvious signs of emphysema.

- Normally, the bronchi can be seen to segmental level, more peripherally, only the vessels are visible.
- In chronic bronchitis, the thickening of the bronchial wall results in extra lines adjacent to the vessels that increases the number of visible lung markings.
- As a disease of smokers, emphysema usually coexists with the chronic bronchitis and has the opposite effect on the appearance of the lungs on CXR.

Emphysema

Emphysema is divided into 4 overlapping presentations, centrilobular, bullous, paraseptal, and panacinar.

- Pathologically, there is destruction of lung tissue causing loss of the area over which gas exchange occurs and loss of the normal supporting structure of the lung.
- Destruction of lung tissue results in increased transradiancy, or a darker lung. In the area of emphysema, the vessels may be identifiably smaller and less numerous.
- The trapping of air has a space occupying effect in the thorax, which therefore holds a greater overall volume causing flattening of the diaphragms and expansion of the chest dimensions. Normal volume lungs extend over 6 anterior ribs. More than this suggests over-expansion (Fig 8.4), but flattening of the hemi-diaphragms should co-exist with pathological lung over-expansion.

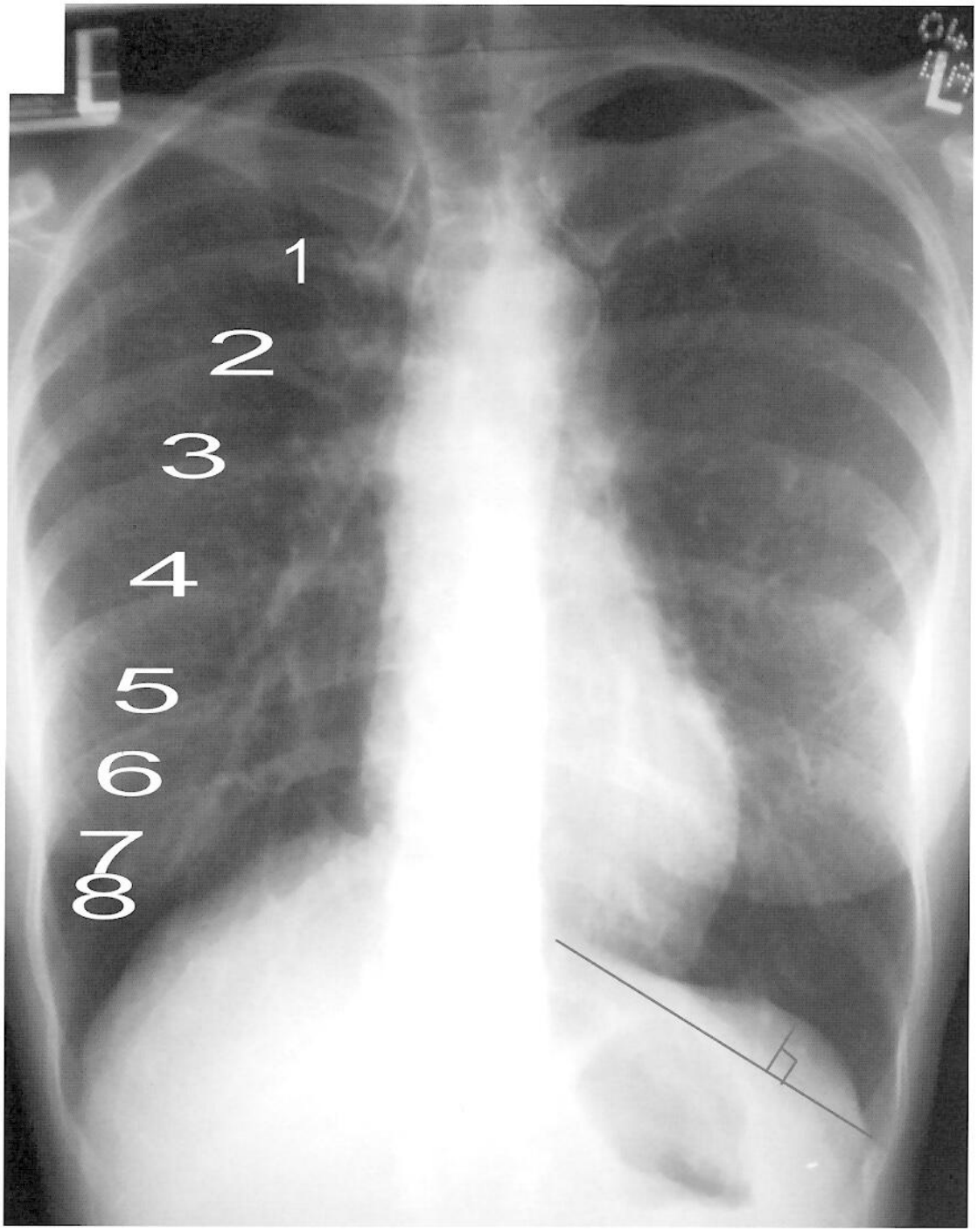

Figure 8.4
Frontal CXR of an adult male with a long history of cigarette smoking. Note the over-expanded lungs (8 anterior ribs above the hemi-diaphragm) due to emphysema. The flattening of the left hemi-diaphragm as judged by measuring the maximum perpendicular distance from a line drawn between the medial and lateral extents of the diaphragm to the diaphragmatic surface (appropriate line marked for left hemi-diaphragm). The measurement should be >1.5 cm.

Centrilobular emphysema

- Centrilobular is the commonest form of emphysema and is a condition found in smokers, typically affecting the upper and mid zones.
- Centrilobular emphysema can be difficult to appreciate on a CXR as the lung destruction is at the centrilobular level and only quite extensive disease will result in sufficient lung destruction to be appreciated on CXR through a reduction in lung markings and over-expansion (Fig 8.5).

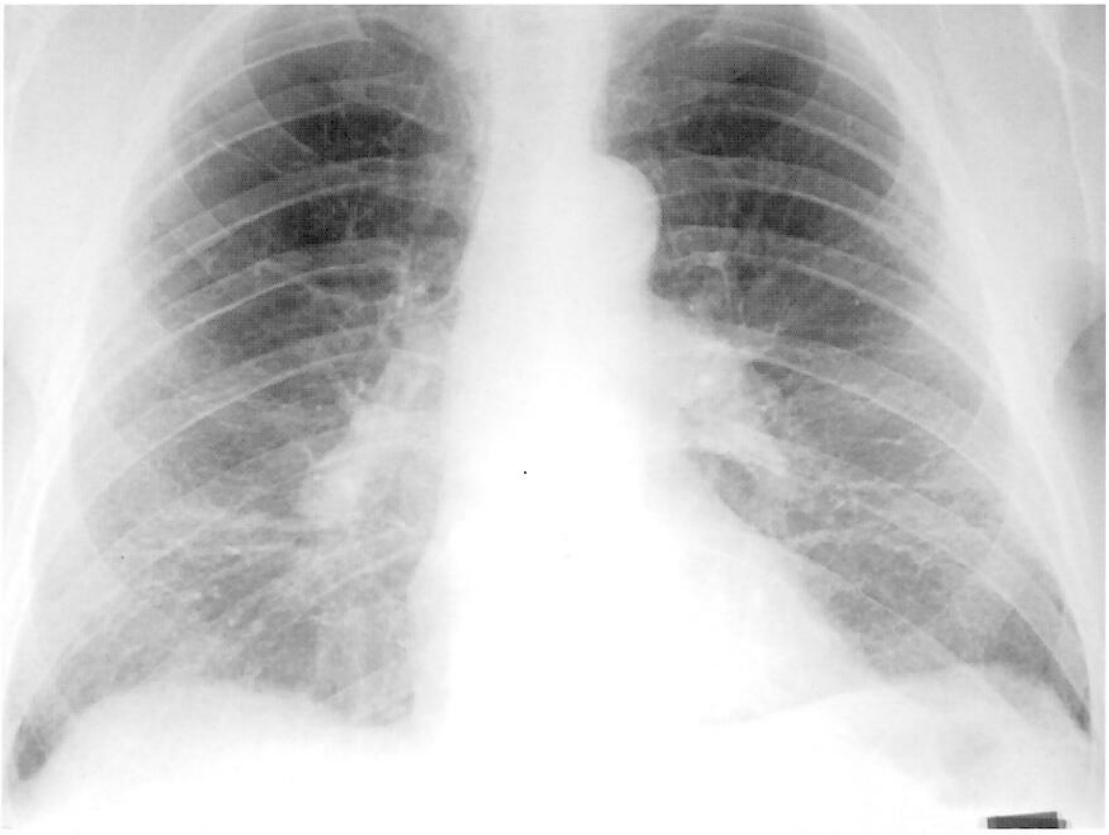

Figure 8.5
Frontal CXR of an adult male patient with a long history of cigarette smoking. Note the reduced lung markings in the upper zones due to centrilobular emphysema. High-resolution CT scanning confirmed this.

Bullous emphysema

- Bullous emphysema is characterized by bullae, which cause areas of absence or paucity of lung markings. Only a proportion of the wall of the bulla is usually visible creating thin curvilinear lines (see "pattern recognition") (Fig 8.6).

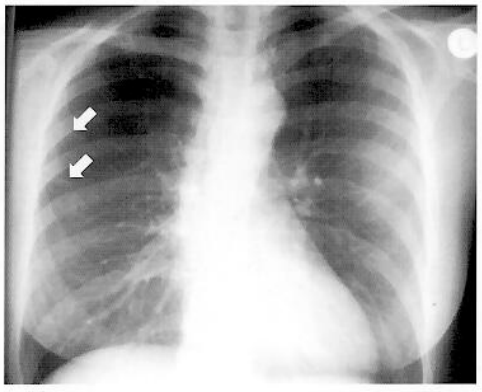

Figure 8.6
Frontal CXR of a patient with bullous emphysema. Note the curvilinear lines (arrows) formed by the walls of the bullae, but the entire wall is not visible.

Para-septal emphysema

- Para-septal emphysema is defined by distribution rather than by the type of lung destruction. The emphysematous destruction occurs in the subpleural regions and adjacent to the fissures.
- The appearances are those of both bullous and centrilobular emphysema and, as a pattern of disease para-septal emphysema, is not readily appreciated on CXR.

Panacinar emphysema

- On CXR, the distinction between panacinar and centrilobular emphysema is not possible, but the distribution may be revealing.
- Alpha-1 anti-trypsin deficiency, a relatively rare form of emphysema, causes panacinar emphysema and typically affects the lower zones of the lung rather than the upper/mid zone distribution of smoking related centrilobular emphysema (Fig 8.7).

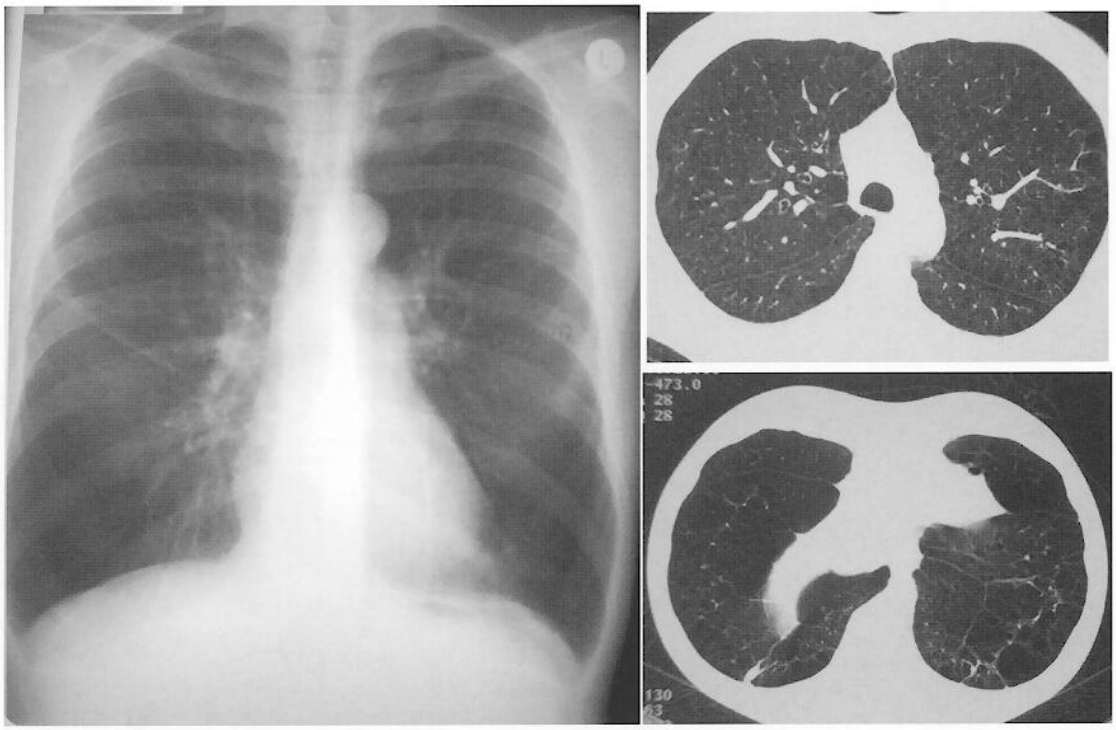

Figure 8.7
Frontal CXR of an adult male with alpha-1 antitrypsin deficiency. Note the reduced number and size of vessels in the lower zones compared to the upper and mid zones and over-expansion of the lungs with flattening of the hemidiaphragms. The inset HRCT images are from the mid zone (top image) and the lung base (bottom image) and display the difference in severity of the emphysematous destruction of the lung tissue.

Bronchiectasis

- Bronchiectasis is defined by the presence of dilated bronchi with thickened walls.
- CXR is insensitive for the detection of bronchiectasis with only severe disease being identified with any certainty.
- Bronchiectasis is descriptively divided into 3 types; cylindrical, varicose and cystic.

Cylindrical bronchiectasis

- Cylindrical bronchiectasis describes uniformly dilated, non-tapering airways.
- CXR reveals tramlines adjacent to lung vessels and rings when the dilated bronchi are seen end on (Fig 8.8).

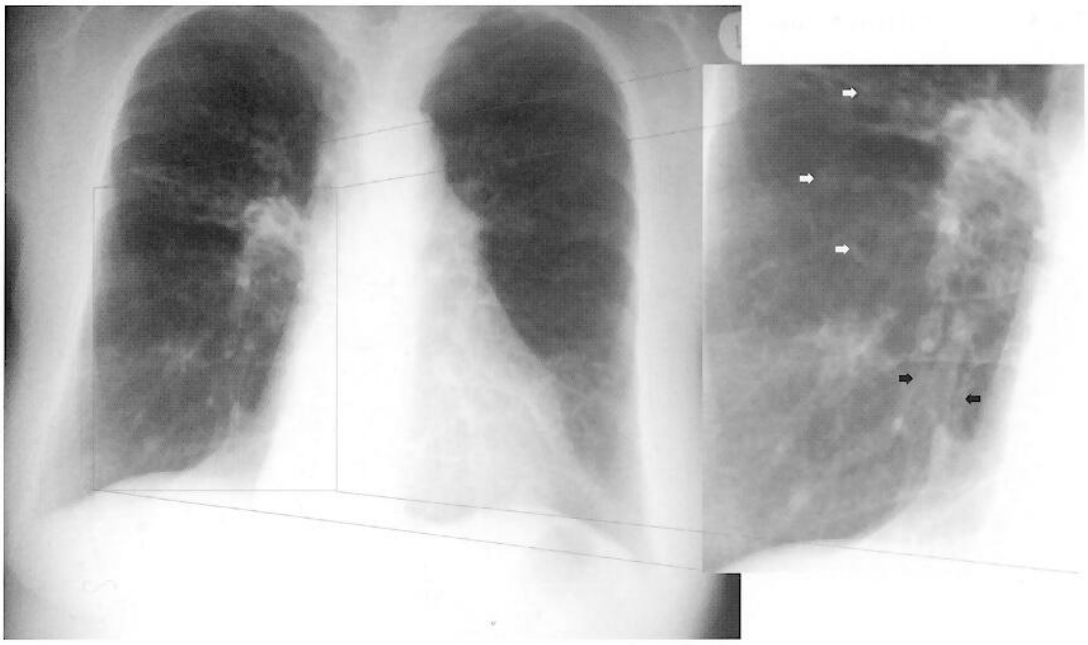

Figure 8.8
Frontal CXR of a patient with cylindrical bronchiectasis, on the magnified image are ring shadows (white arrows) and tram lines (black arrows), representing dilated bronchi end on and lengthways respectively.

Varicose bronchiectasis

- Varicose bronchiectasis describes a non-uniform dilatation of the bronchi forming multiple sequential bead-like dilatations which when viewed on a CXR, will appear cystic but in the plane of the CXR will have an undulating appearance.
- Varicose bronchiectasis is typically associated with allergic bronchopulmonary aspergillosis (ABPA) with a central mid and upper zone distribution (Fig 8.9).

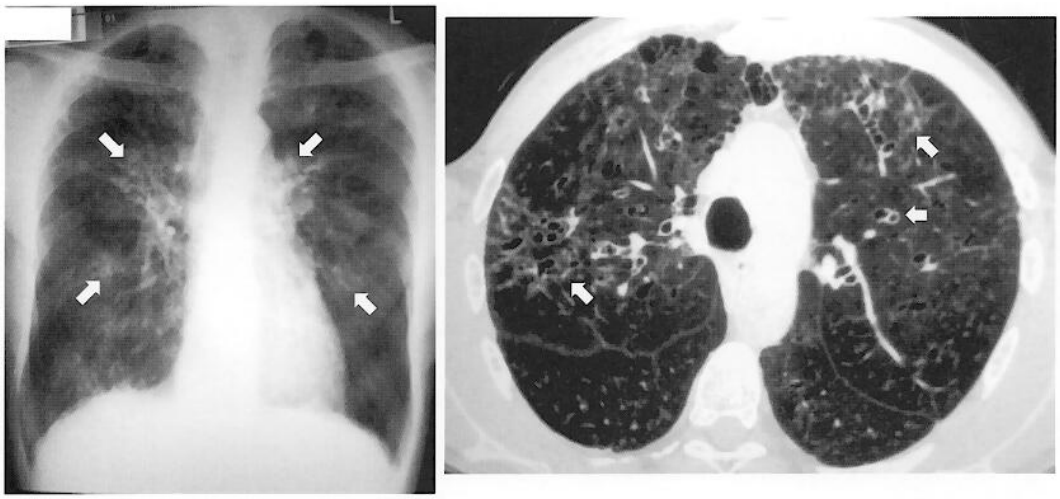

Figure 8.9
Left image is a frontal CXR of an asthmatic patient with ABPA. Note the patchy consolidation, bronchial wall thickening and bronchial dilatation (white arrows). The right image is an HRCT of the same patient demonstrating the bronchiectasis. The distribution is typically central in the mid and upper zones.

Cystic bronchiectasis

- Cystic bronchiectasis describes non-uniform dilatation of airways between which there are less dilated or even normal calibre airways (Fig 8.10).
- CXR reveals ring shadows that may contain fluid giving rise to air-fluid levels.

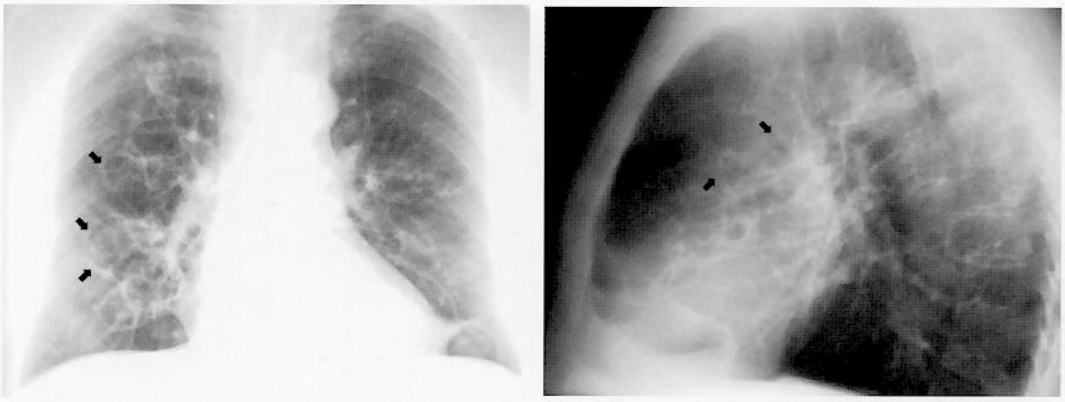

Figure 8.10
Frontal and lateral CXR of a patient with cyctic bronchiectasis secondary to a childhood infection and confined to the right middle lobe. Note the "cysts" with thin walls (black arrows). The "cysts are either focal dilatation of the bronchi or saccular out-pouchings from the bronchi.

- Cystic fibrosis is a congenital condition resulting in impaired ciliary motor activity and thickened secretions. In the lungs this results in bronchiectasis in a mid and upper zone distribution classically and the CXR is quite characteristic (Fig 8.11).

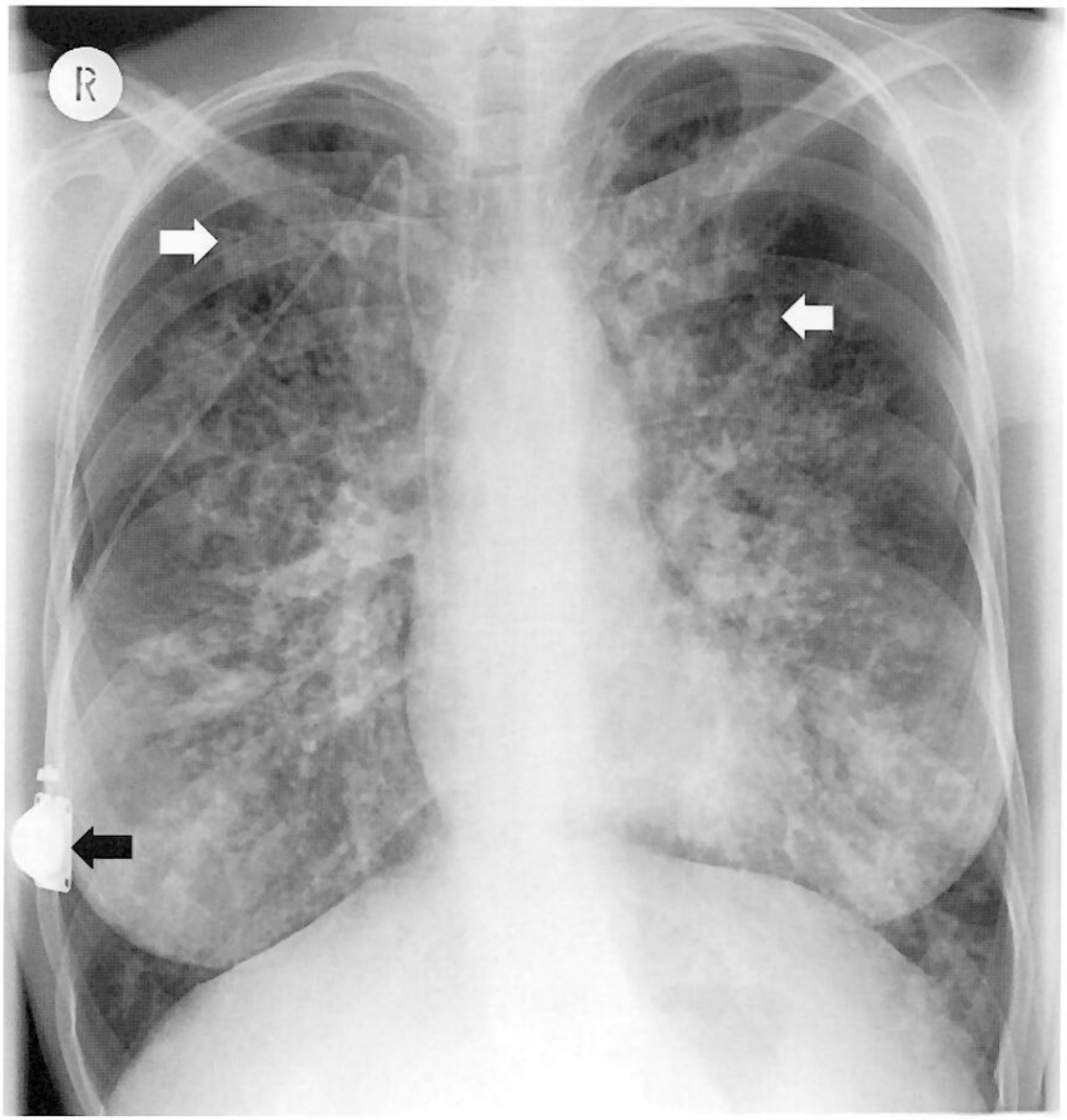

Figure 8.11
Frontal CXR of a young adult female with cystic fibrosis. Note the predominantly central bronchiectasis with ring shadows clearly evident (white arrows). The presence of a portocath (black arrow) indicates this patient is on long term intravenous medication like many cystic fibrosis patients are.