

Diseases of the Respiratory System

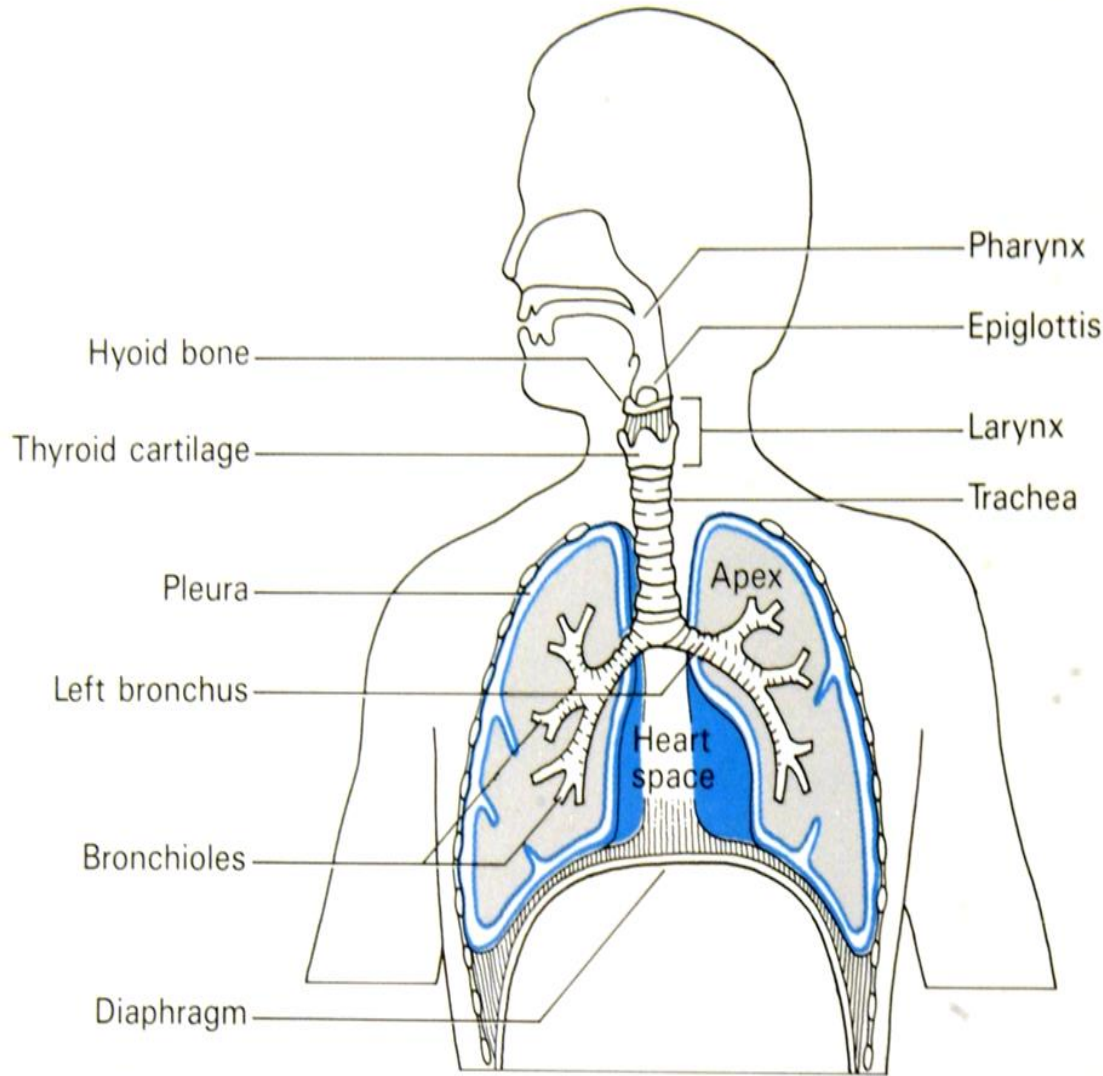


Dr. Ammar C. Al-Rikabi

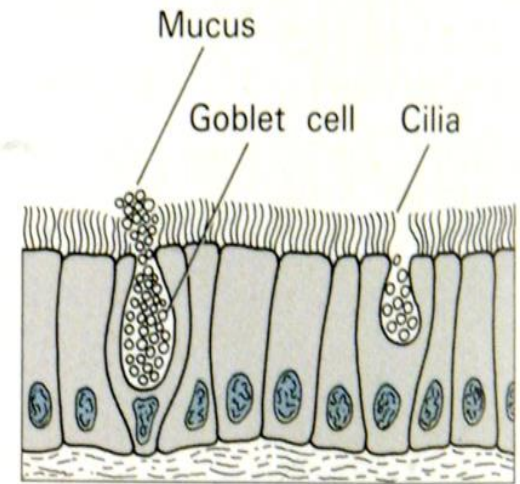
Diseases of the Respiratory System

**Review of the normal Anatomy and
Histology of the Respiratory System**

Diseases of Lung



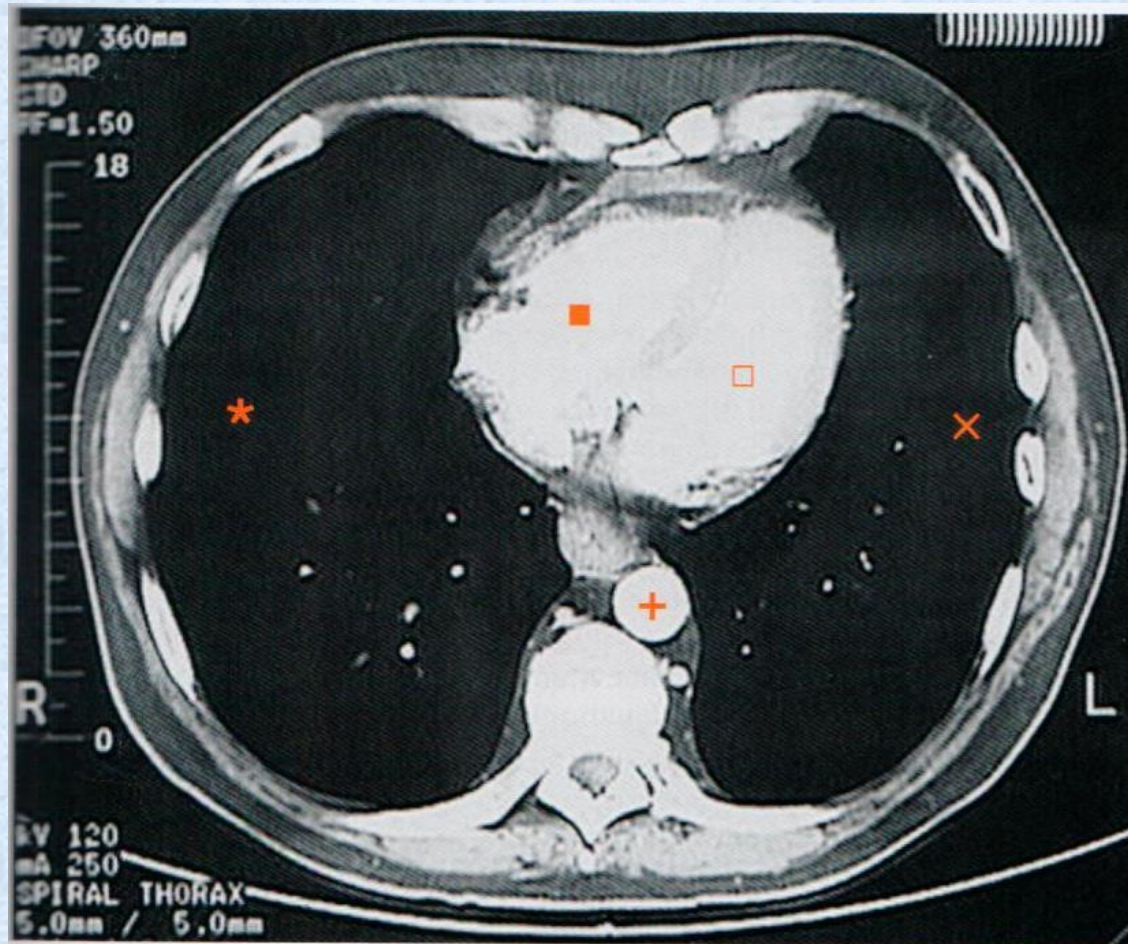
A



B

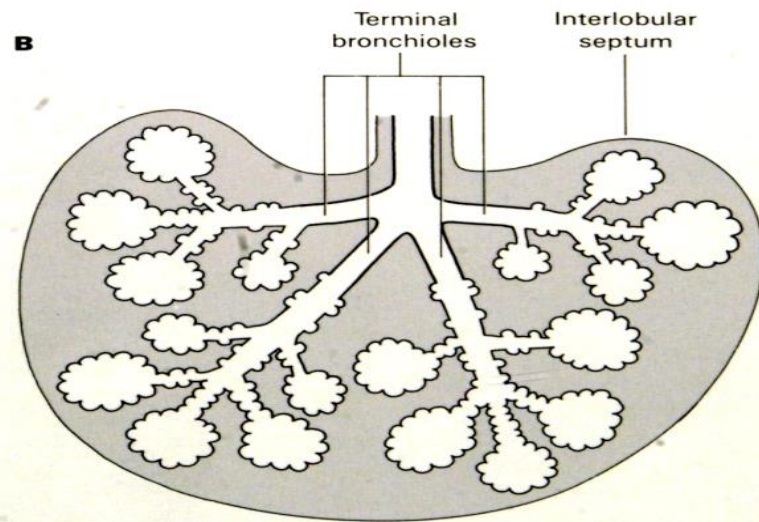
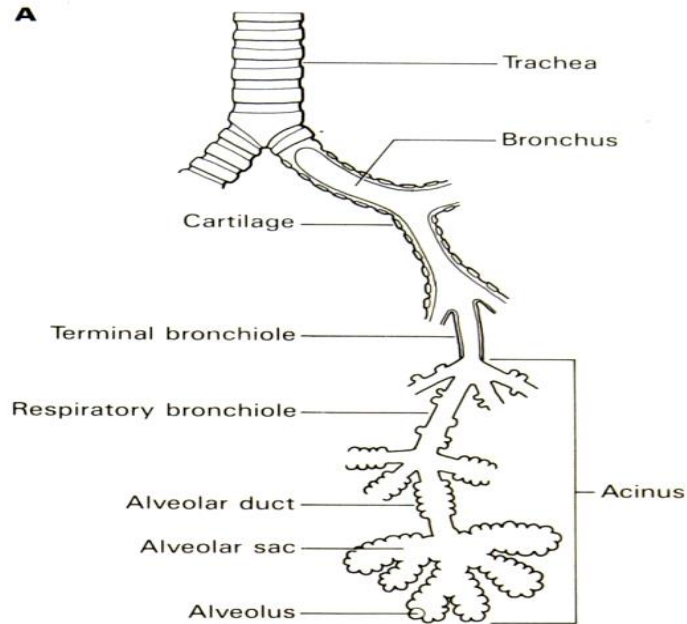
Respiratory epithelium

The respiratory system

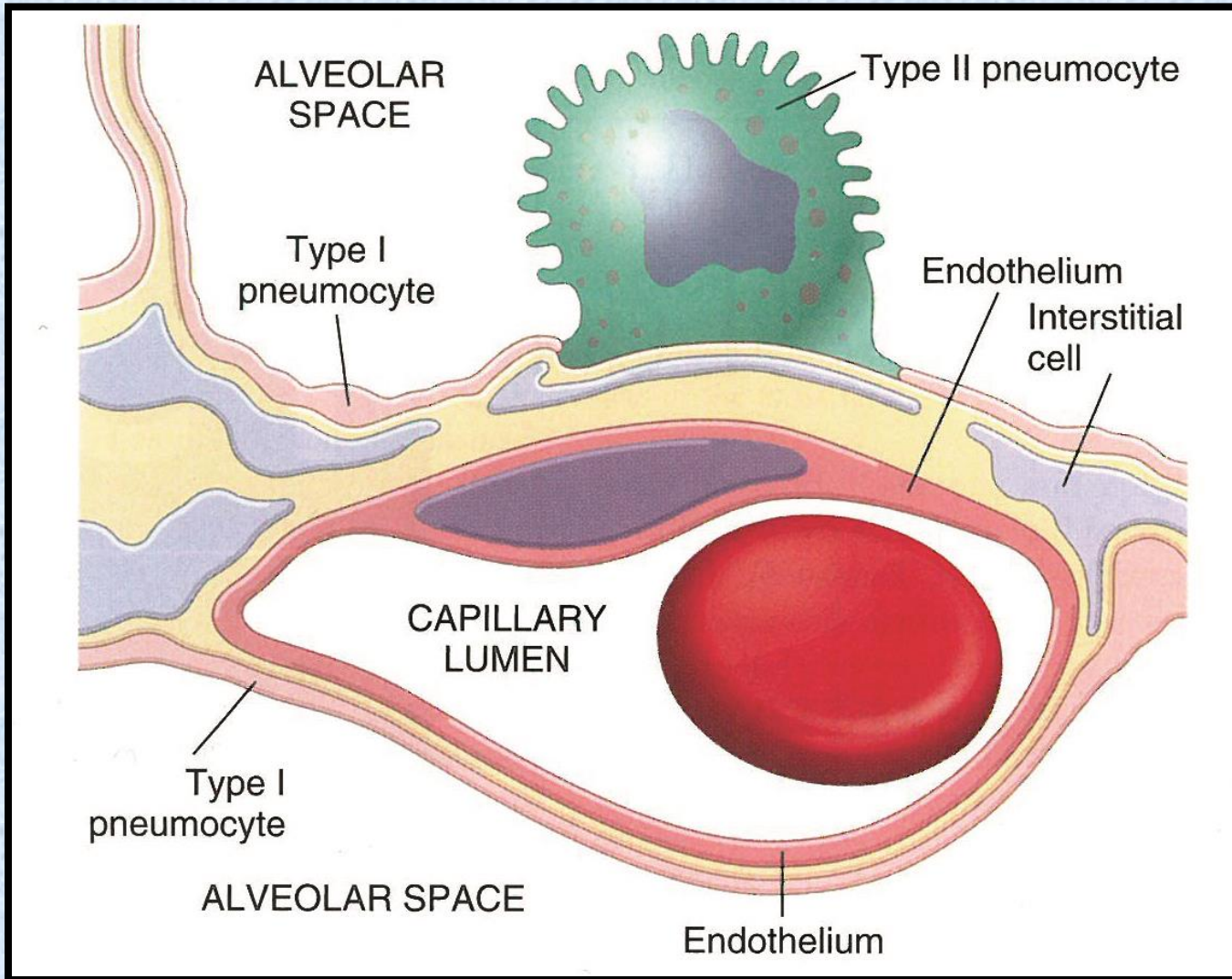


Normal lung, CT image

Diseases of Lung



The lower respiratory tract





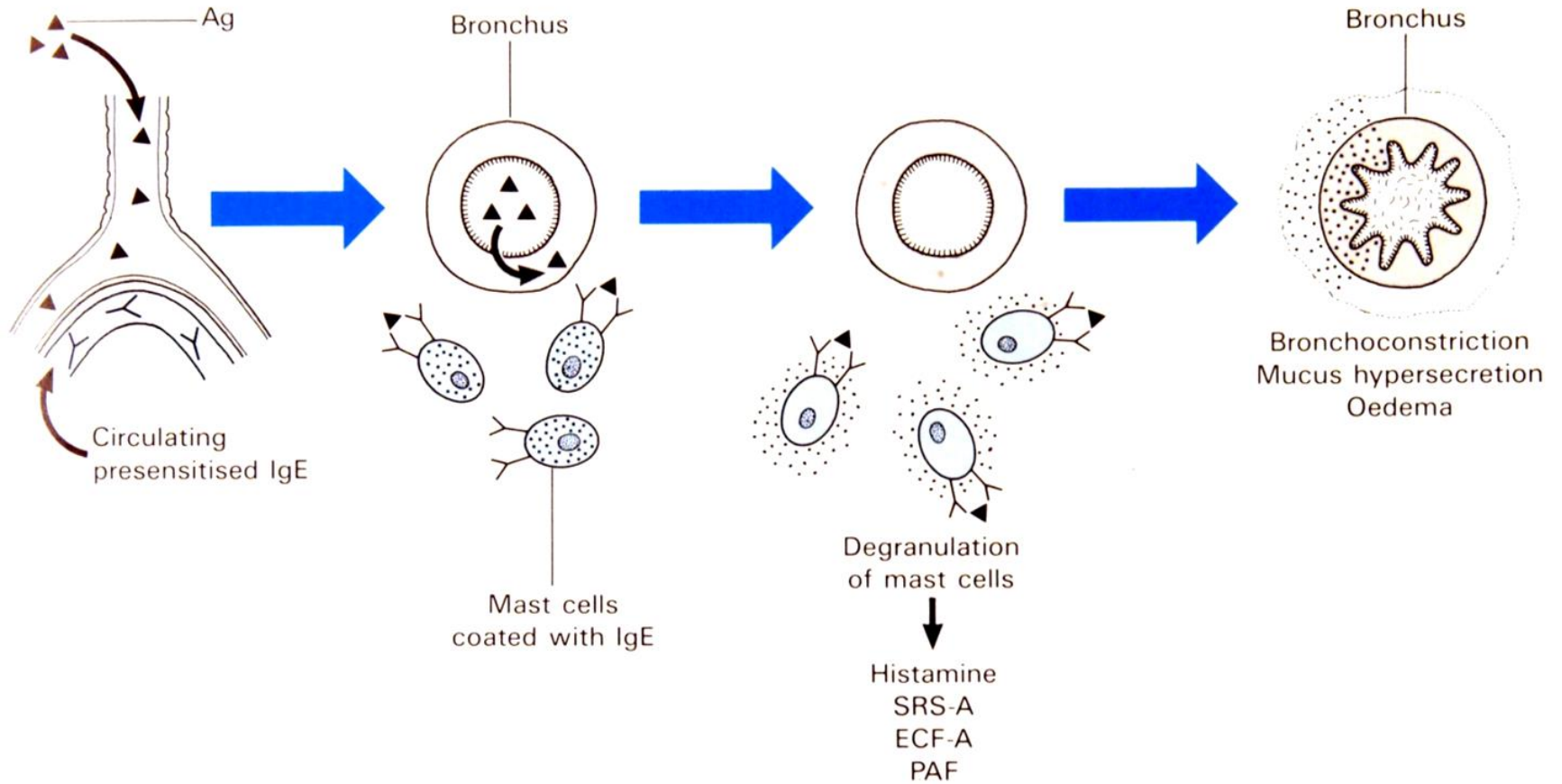
Normal adult lung



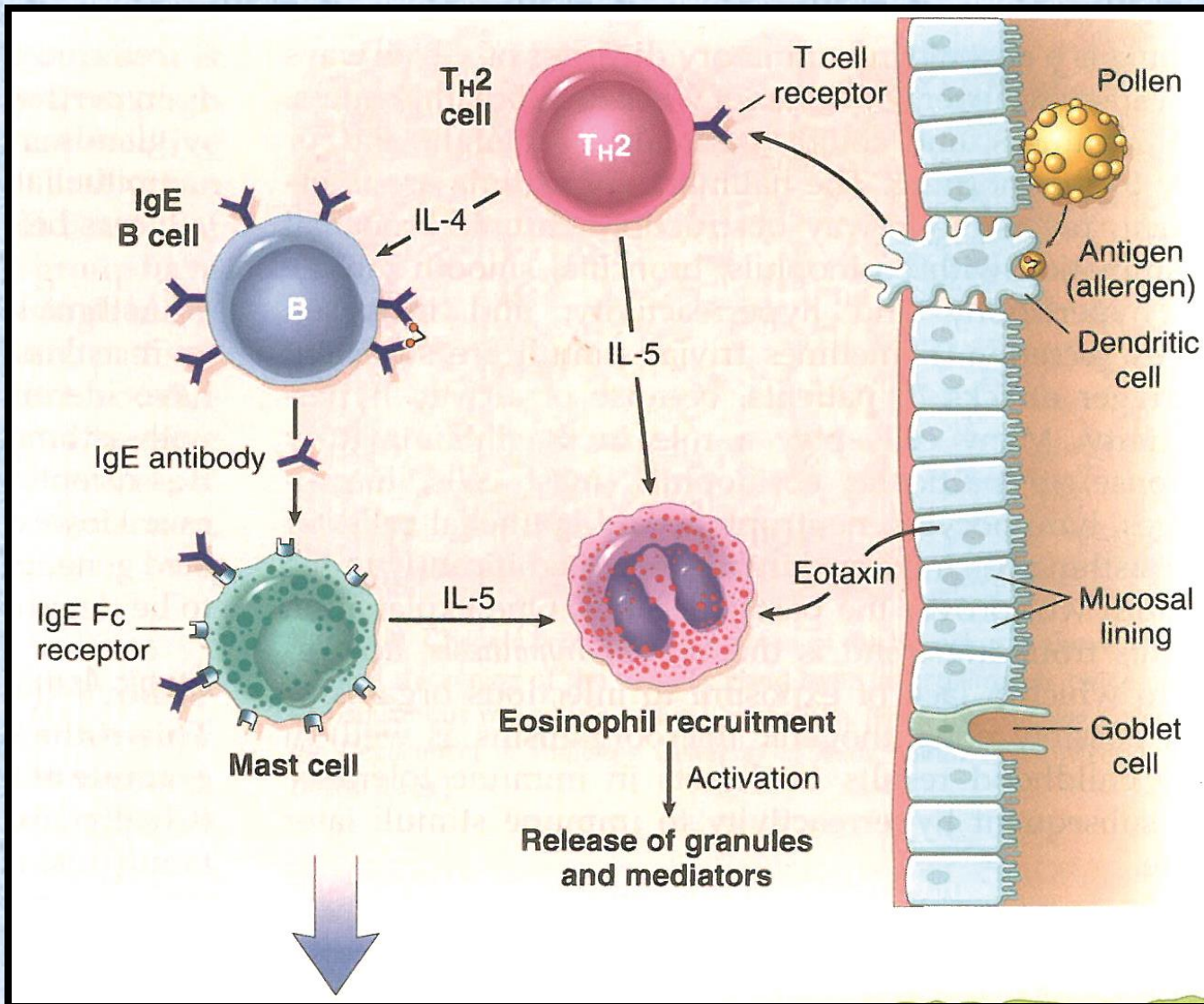
Diseases of the Respiratory System

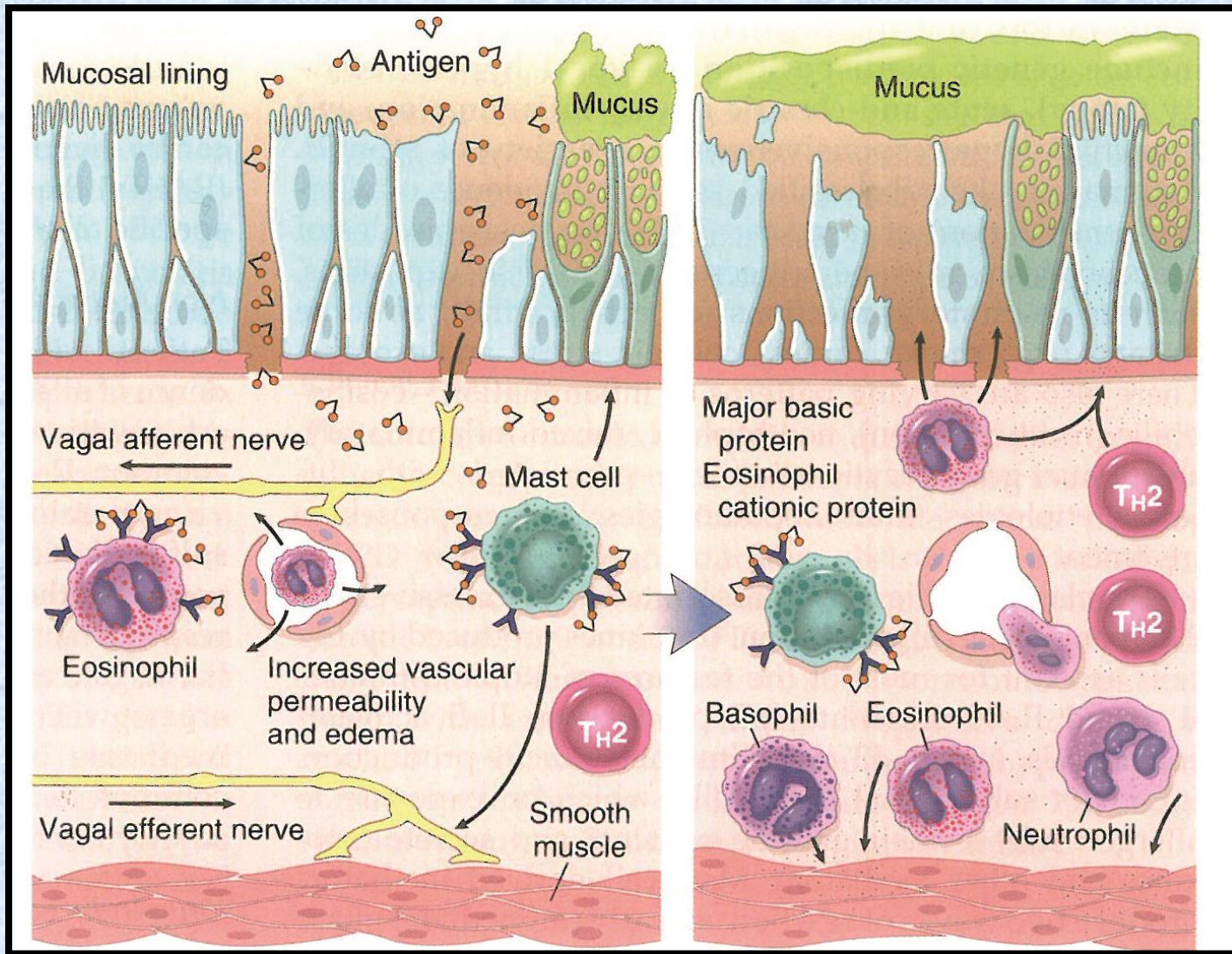
**Chronic Obstructive Pulmonary Diseases (COPD)
including Bronchial Asthma**

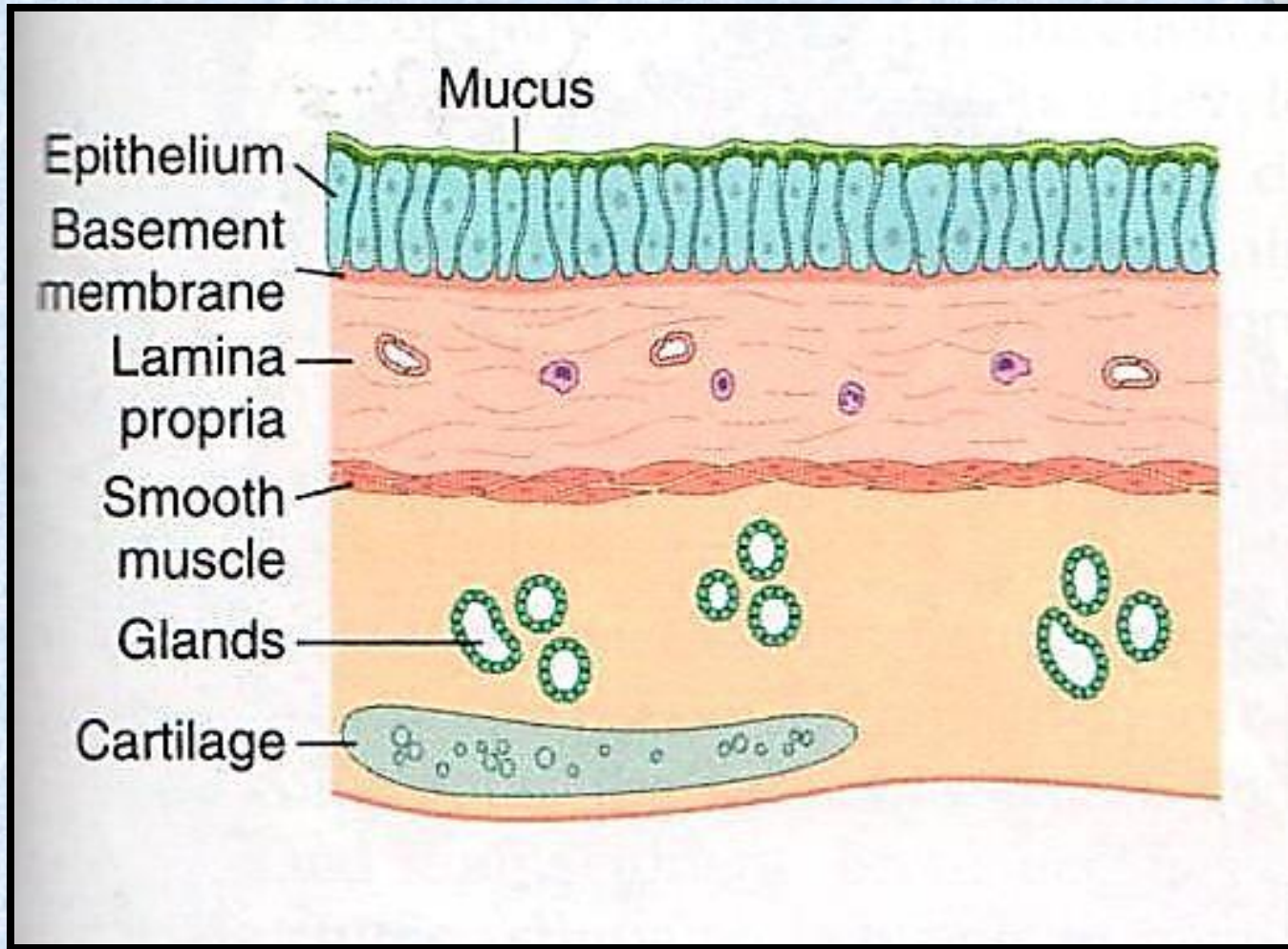
Diseases of Lung



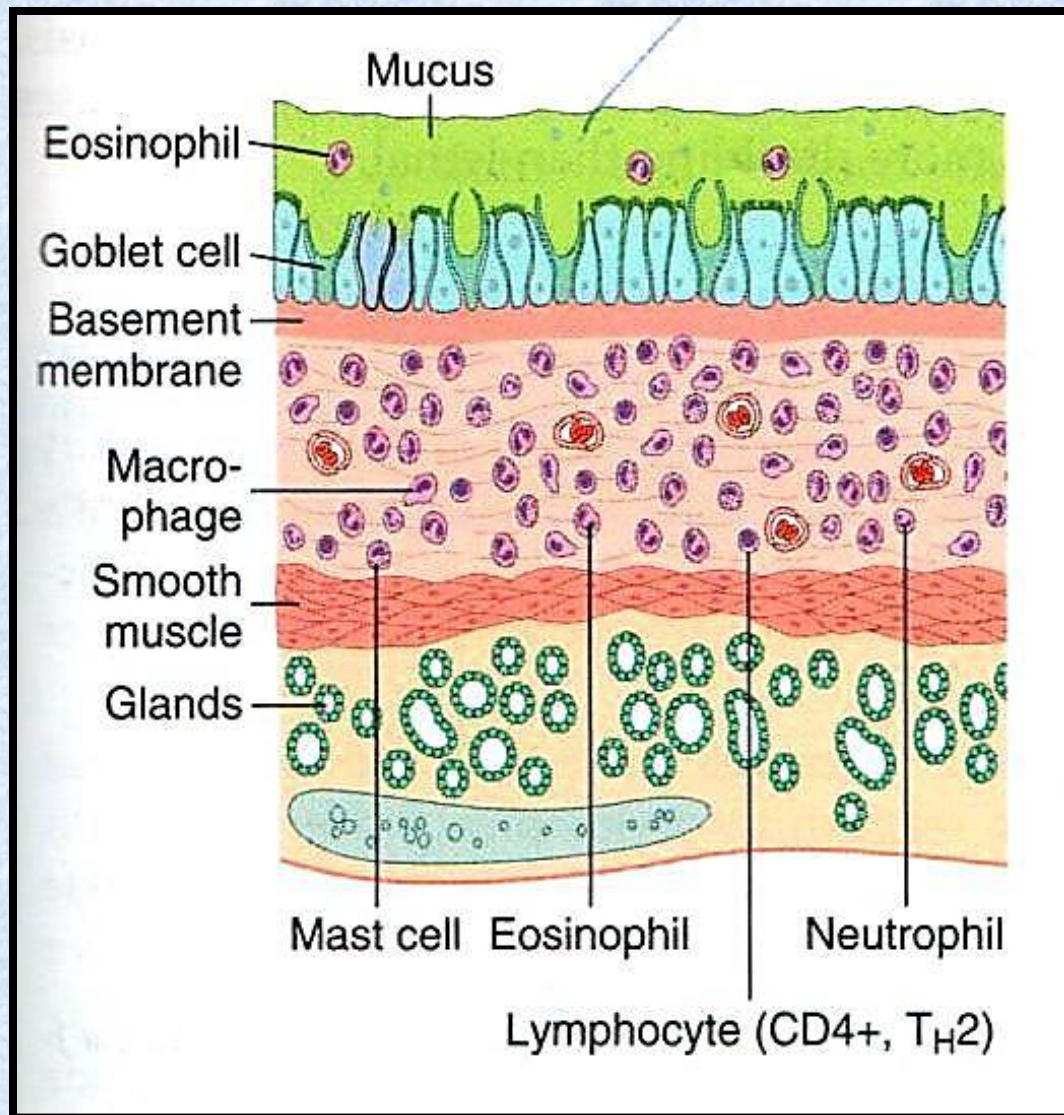
Pathogenesis of allergic asthma







Bronchial airway in normal lung

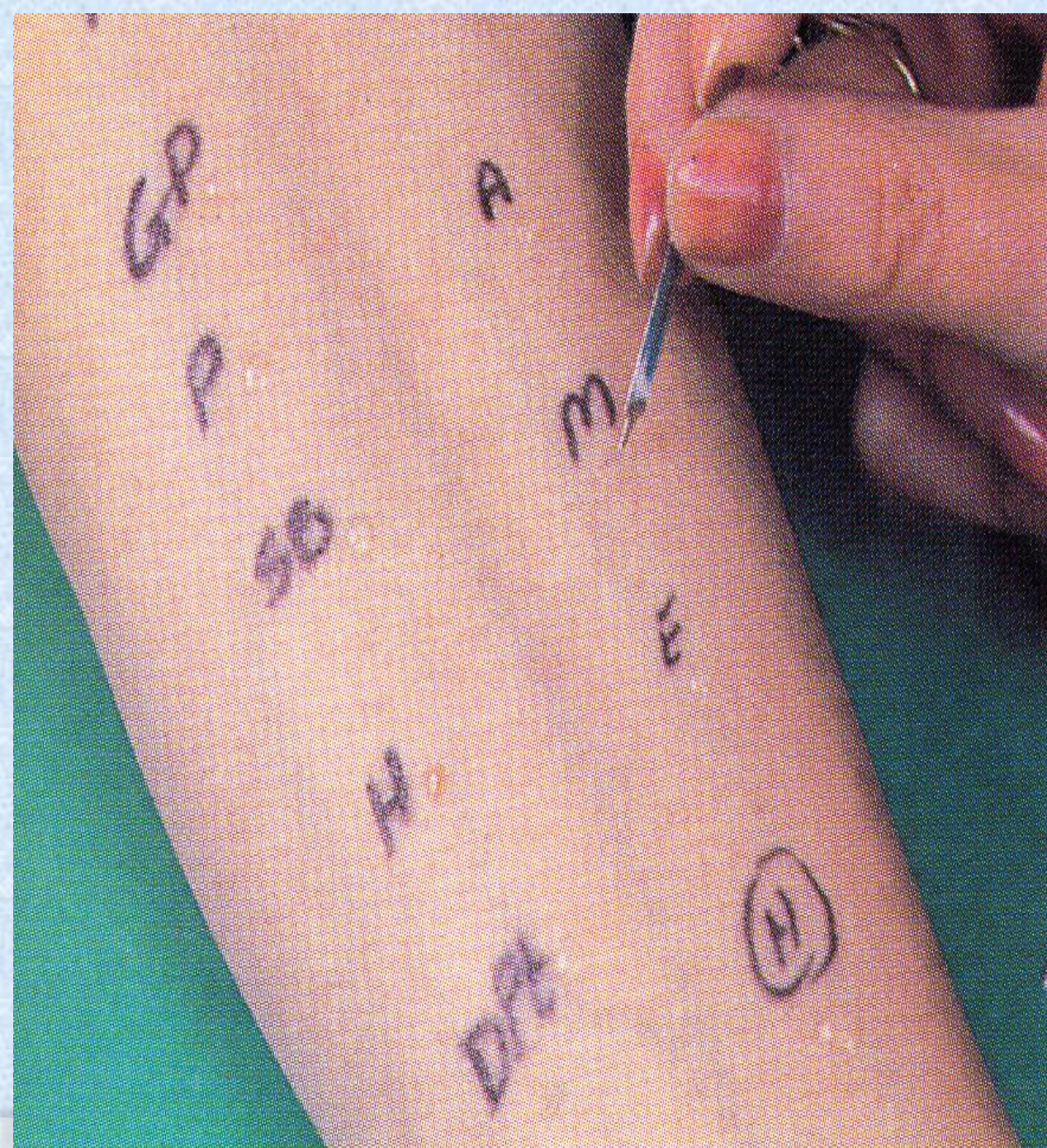


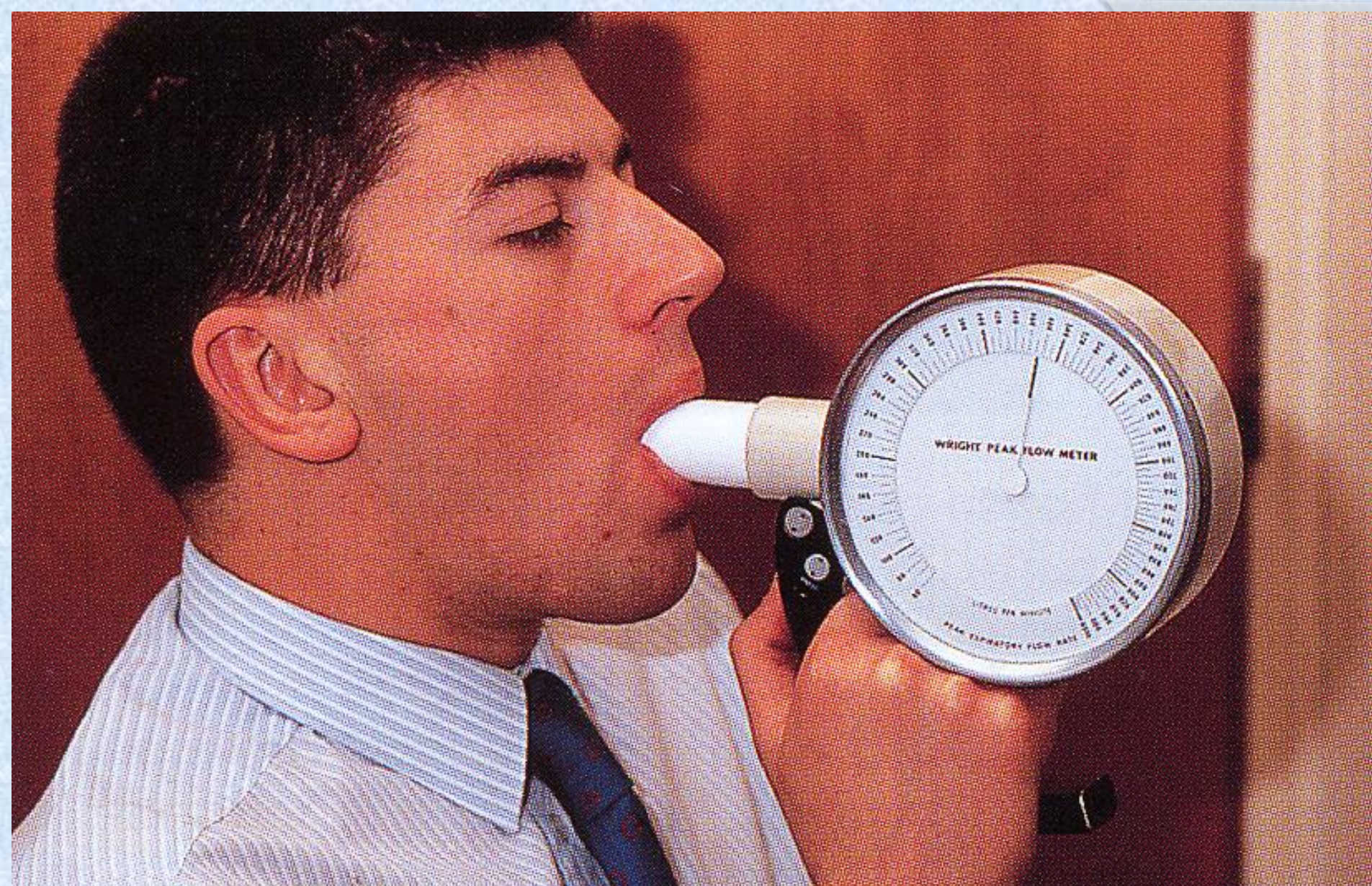
Bronchial airway in asthma patient



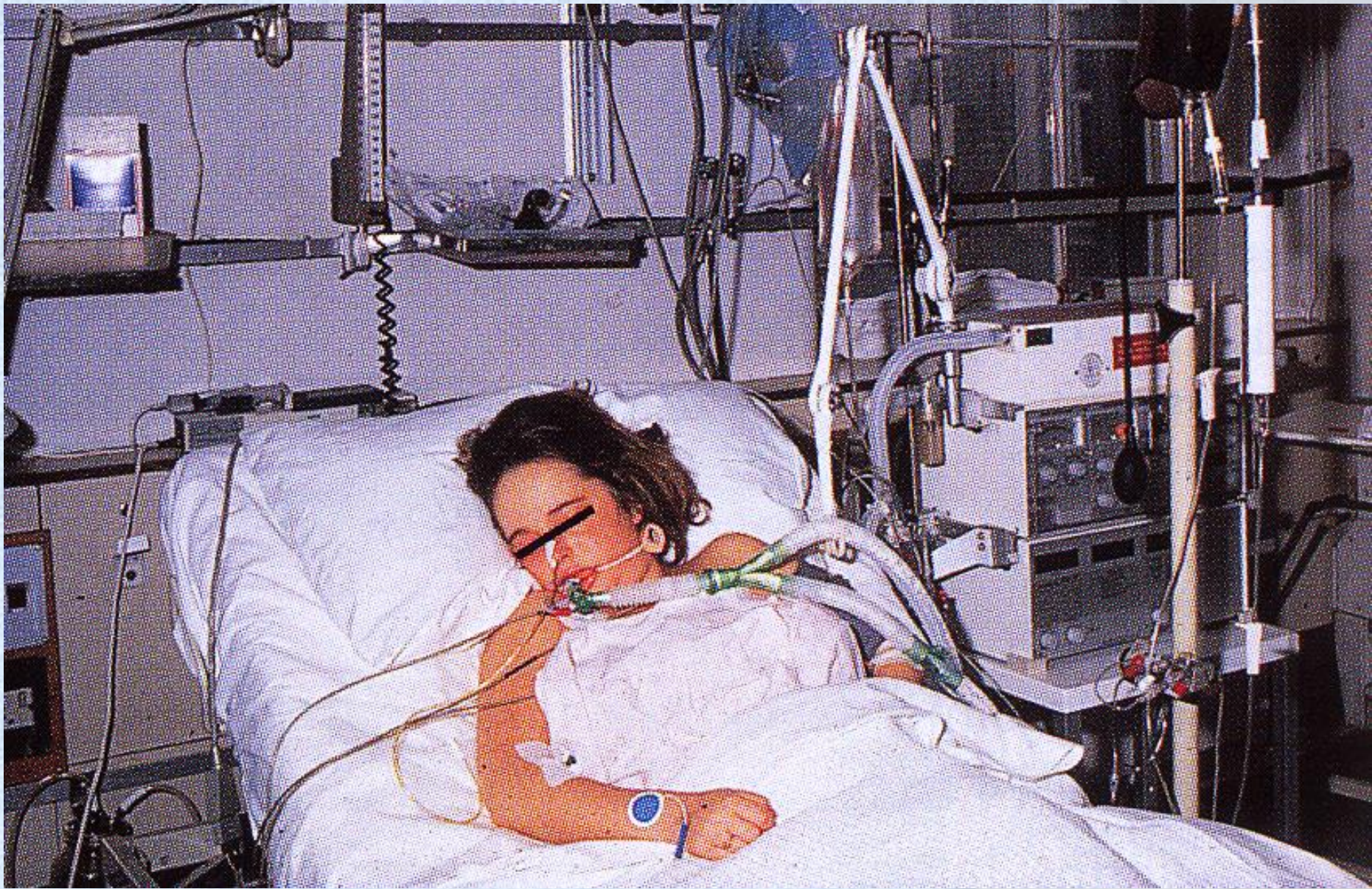
Bronchial biopsy specimen from an asthmatic patient showing sub-basement membrane fibrosis, eosinophilic inflammation and smooth muscle hyperplasia

Skin prick testing in a patient with asthma.





The range of presentation in asthma. This patient was found incidentally to have a degree of reversible airways obstruction during a routine medical examination.

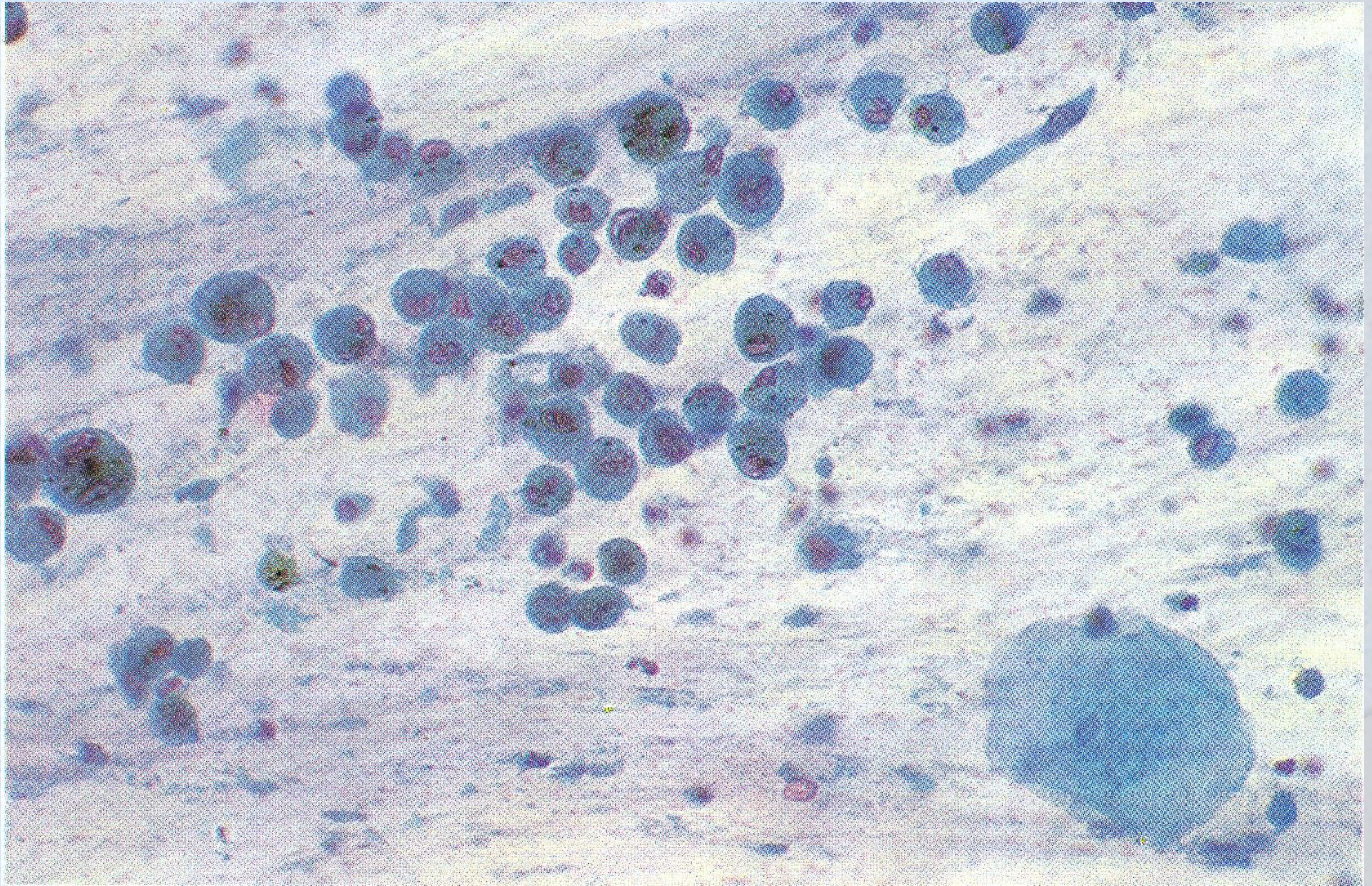


This patient presented as a medical emergency with acute severe breathlessness and diagnosed as a case of status asthmaticus which required immediate intensive care including intermittent positive-pressure ventilation.

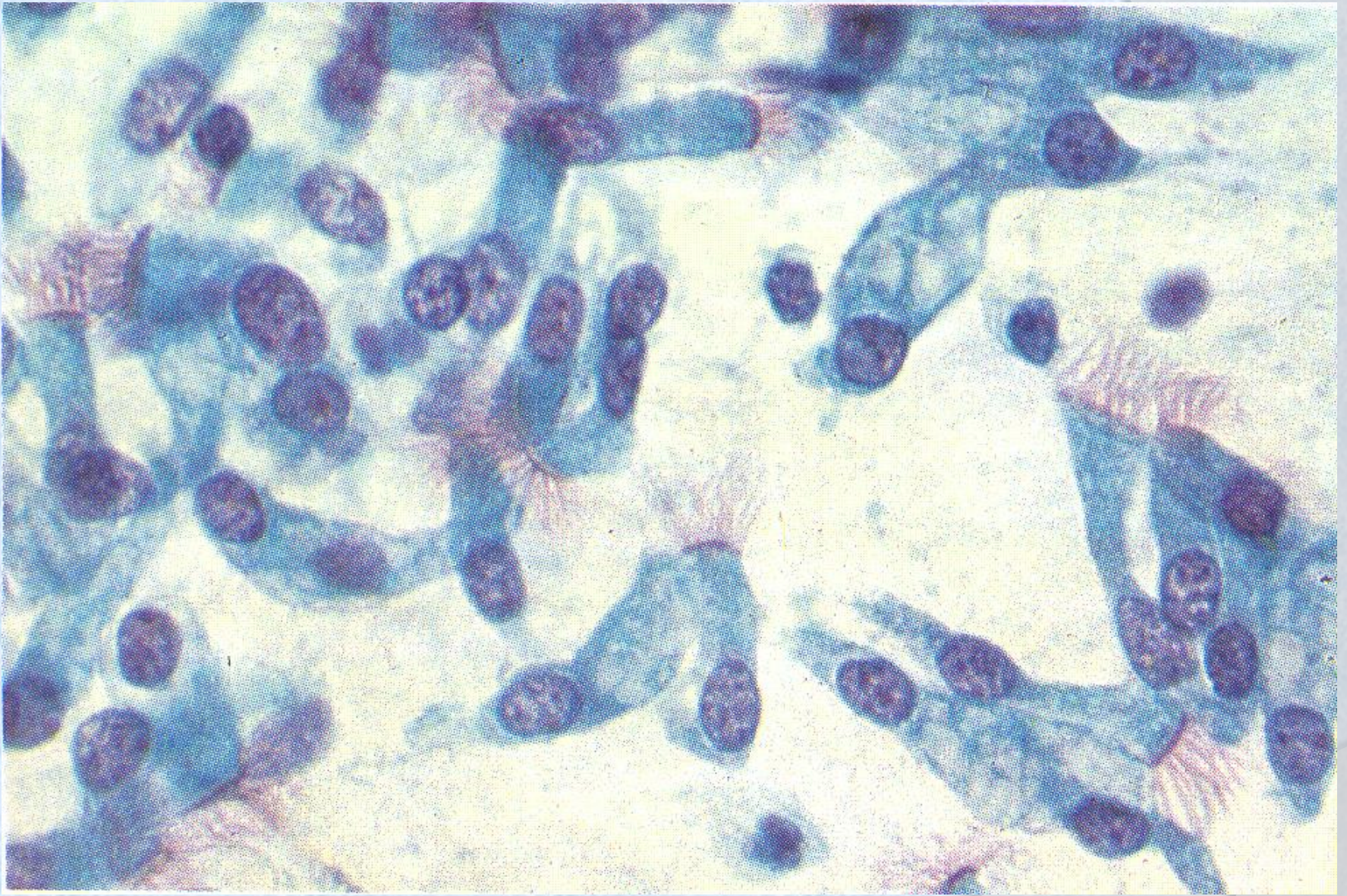
Diseases of Lung



Bronchitis in an asthmatic patient. Note the presence of congested mucosa and mucoid secretions.



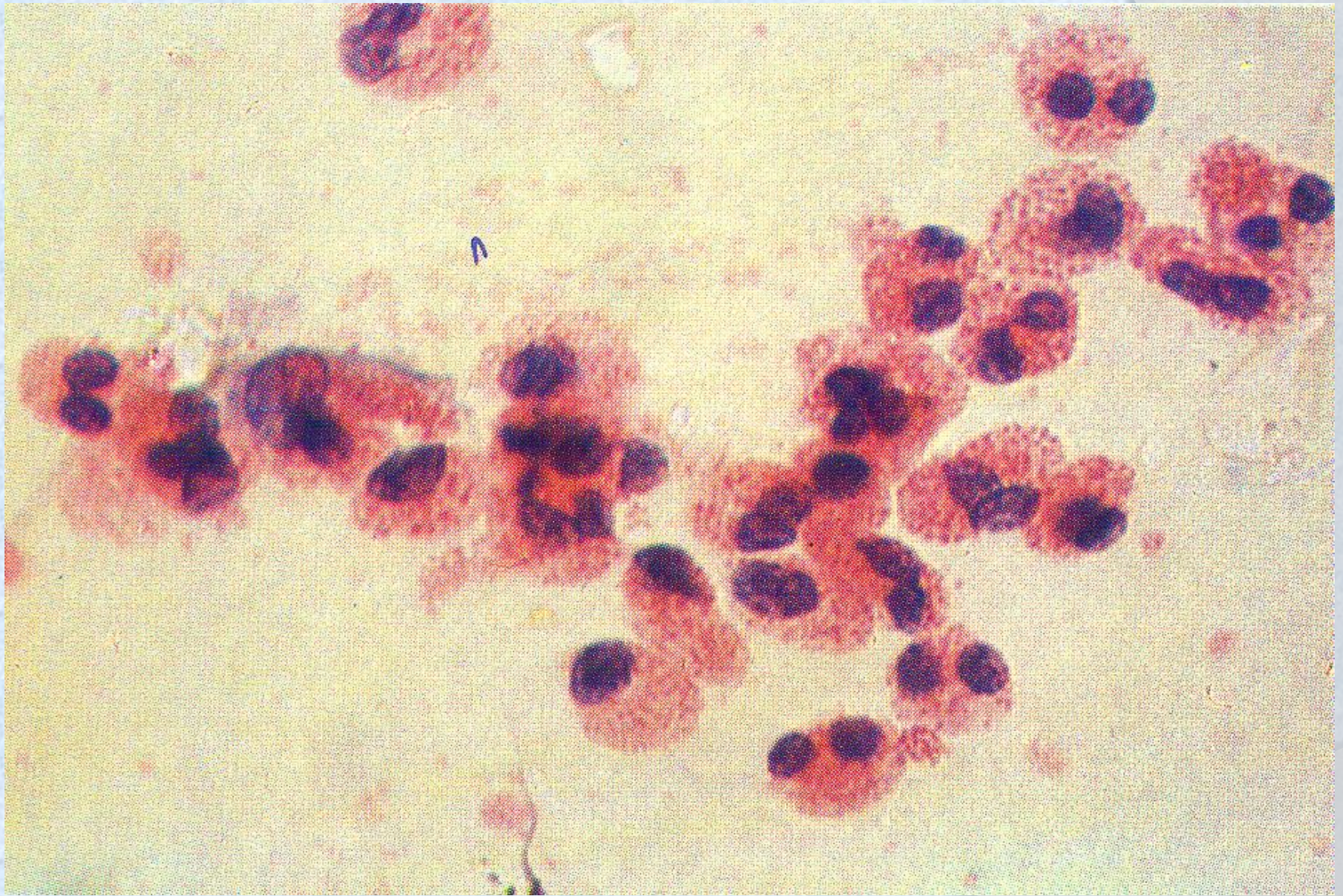
Composition of satisfactory specimen : Sputum



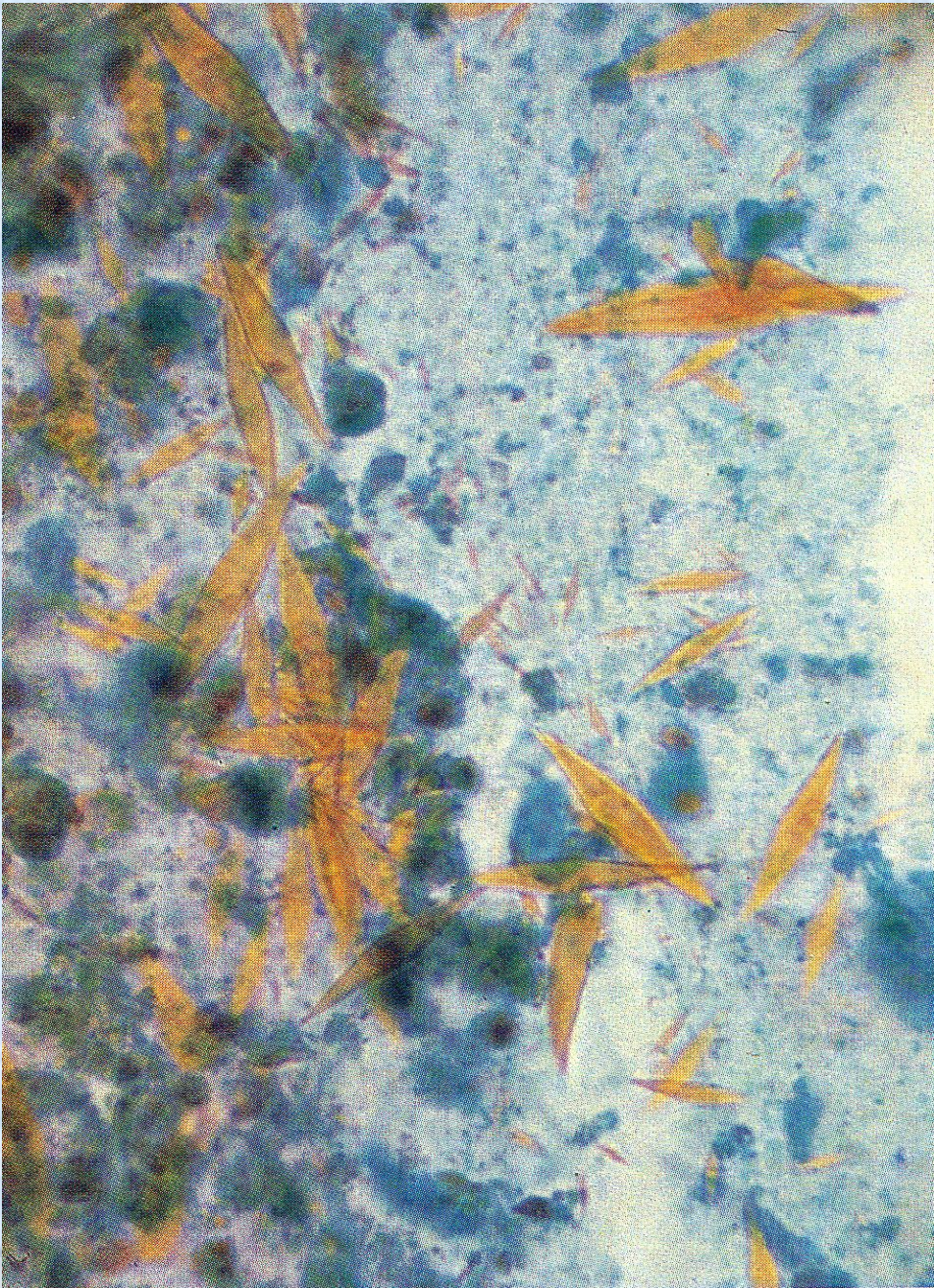
Ciliated columnar cells



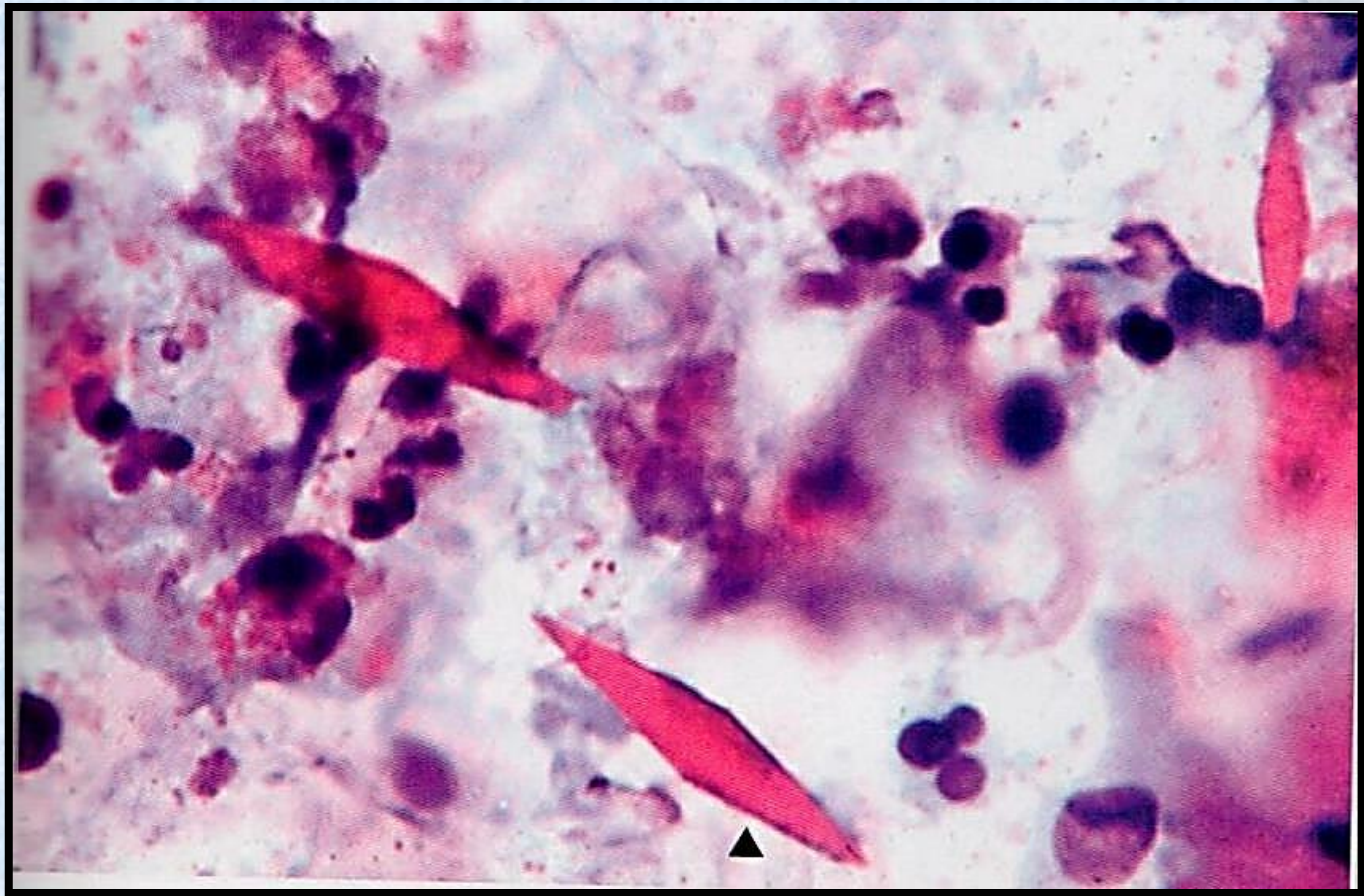
Curschmann's spiral : Sputum



Eosinophils from a case of Bronchial Asthma



Bronchial asthma :
Charcot – Leyden
Crystals

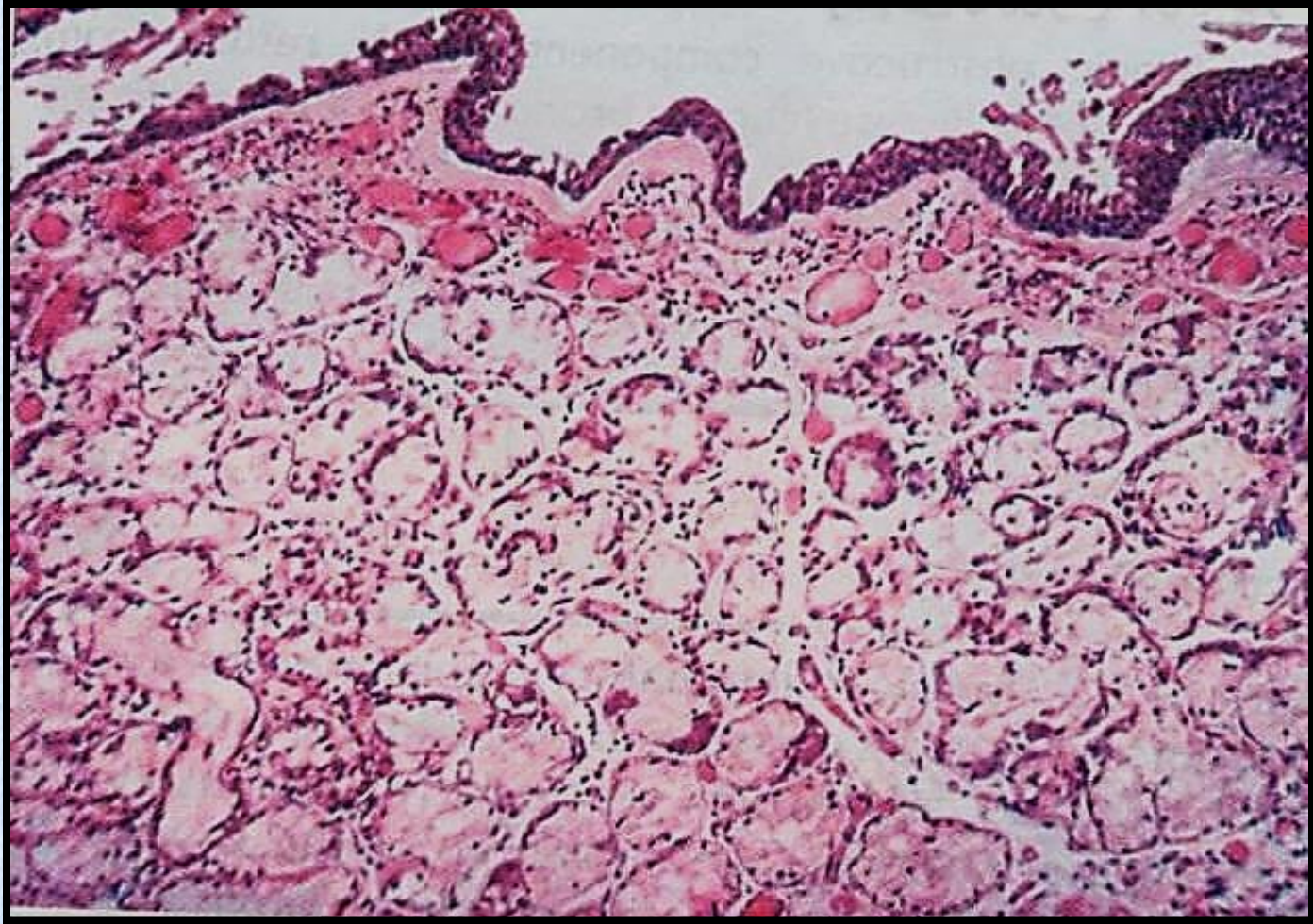


Bronchial Asthma, microscopic

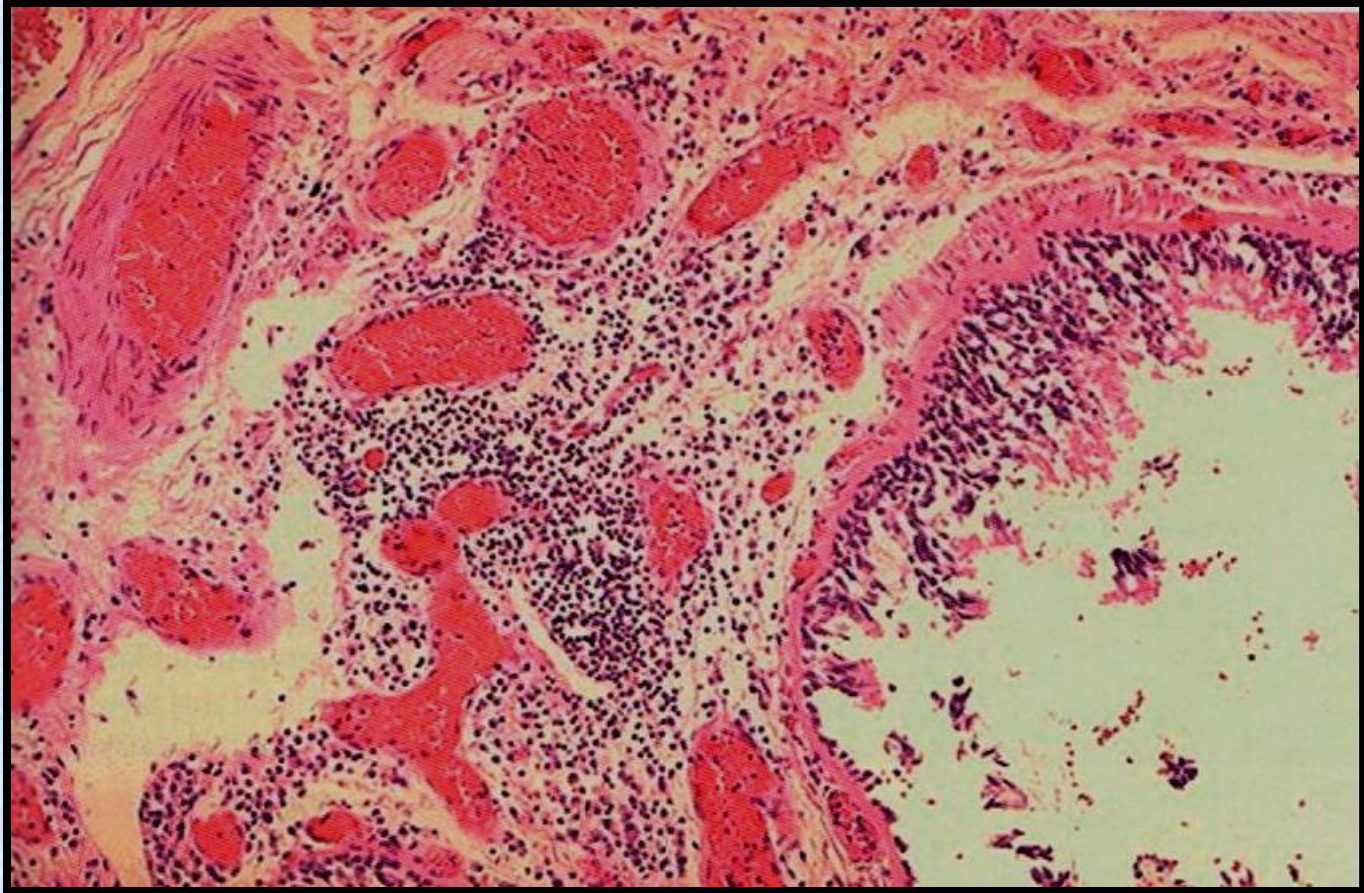


Diseases of the Respiratory System

Chronic Bronchitis

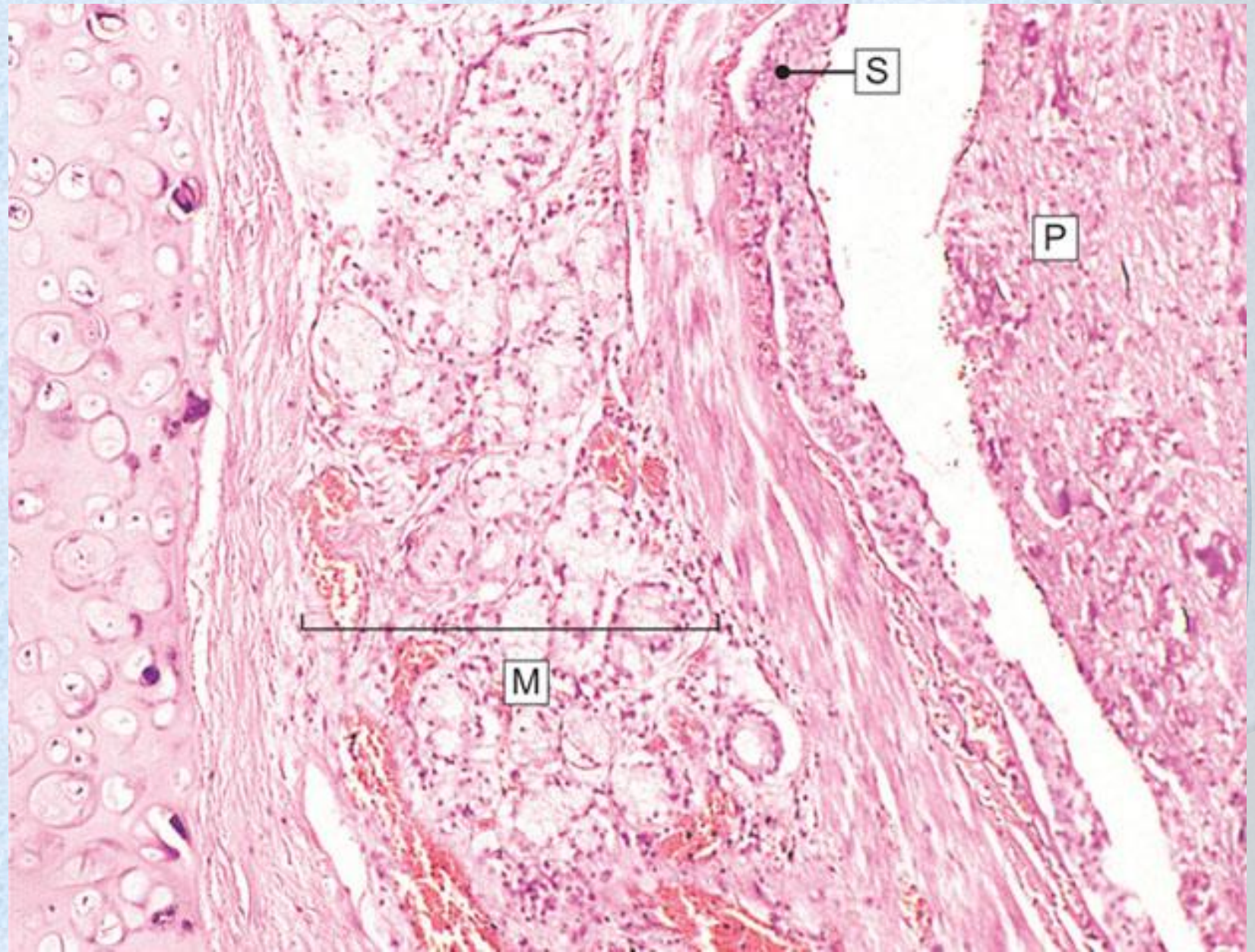


Chronic bronchitis

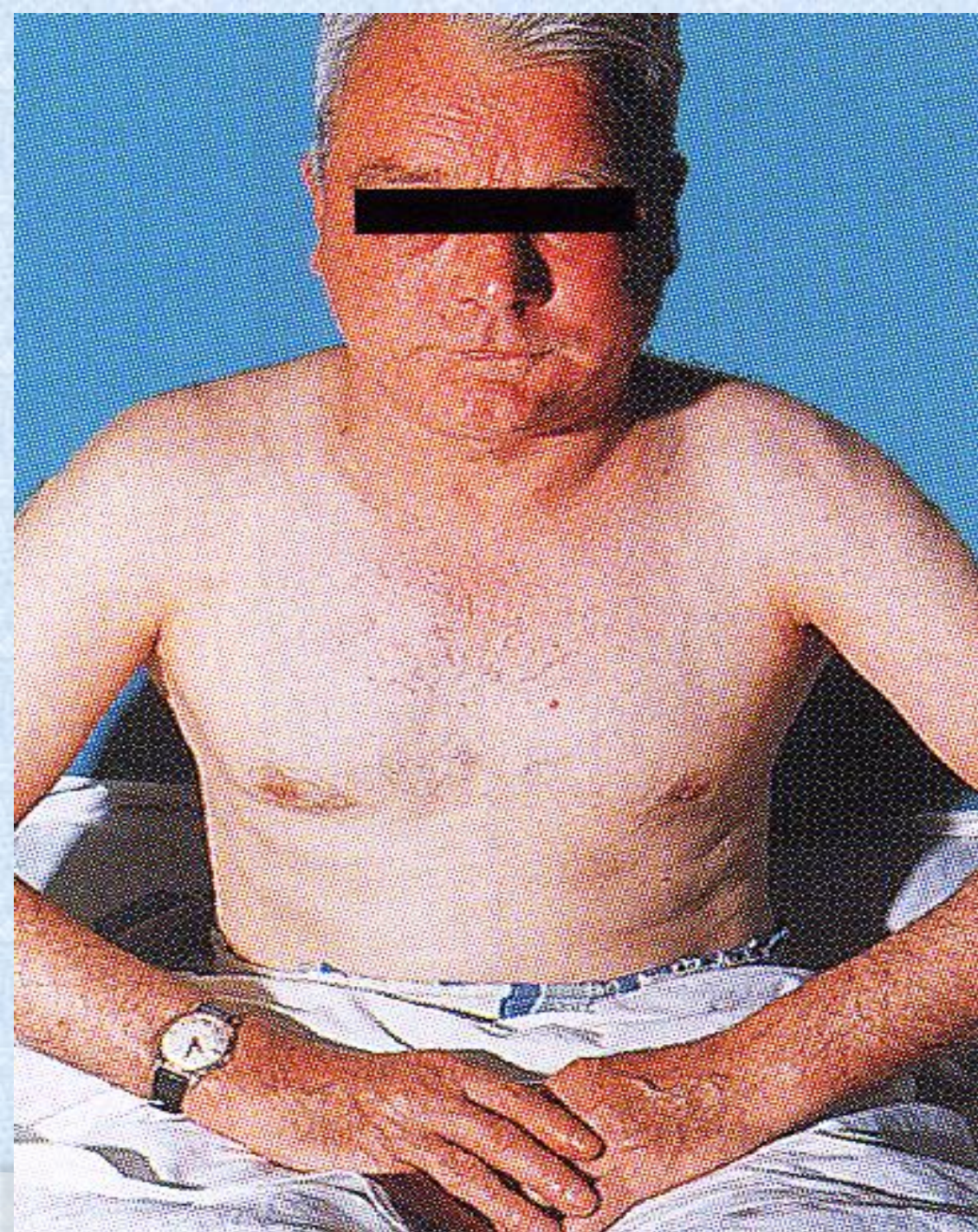


Chronic bronchitis

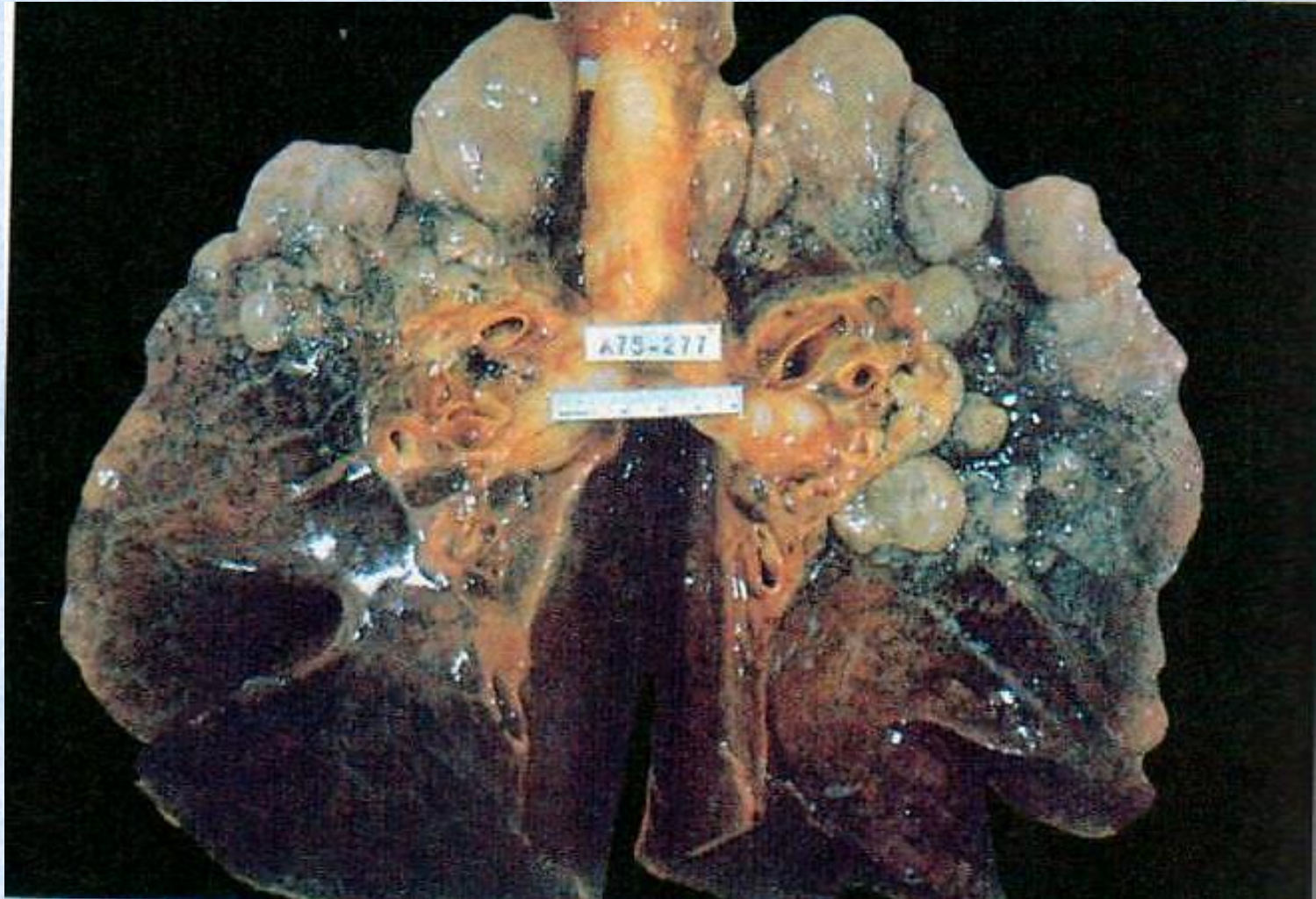
Diseases of Lung



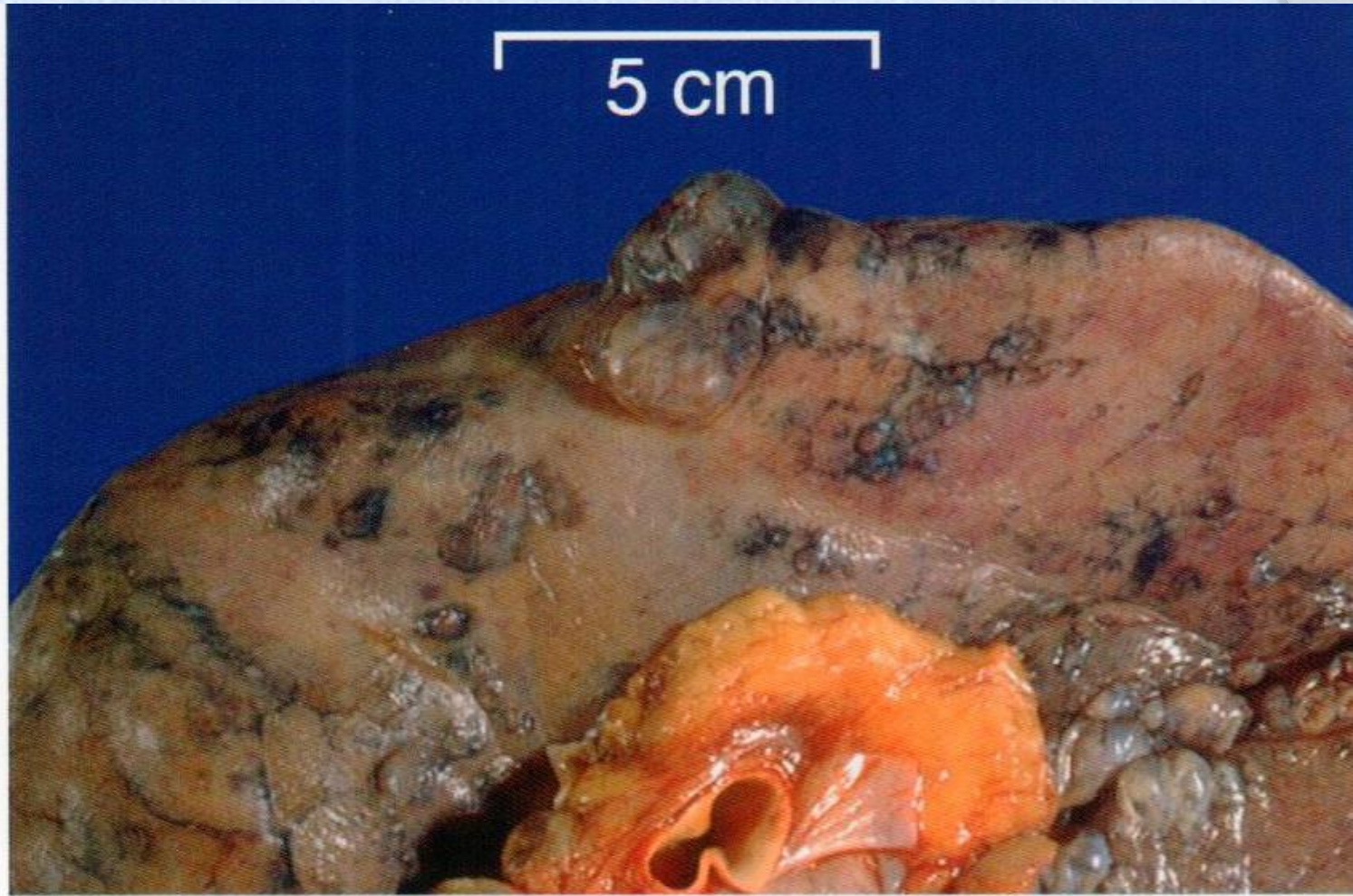
Chronic bronchitis. In chronic bronchitis the main abnormality is secretion of abnormal amounts of mucus, causing plugging of the airway lumen (P).



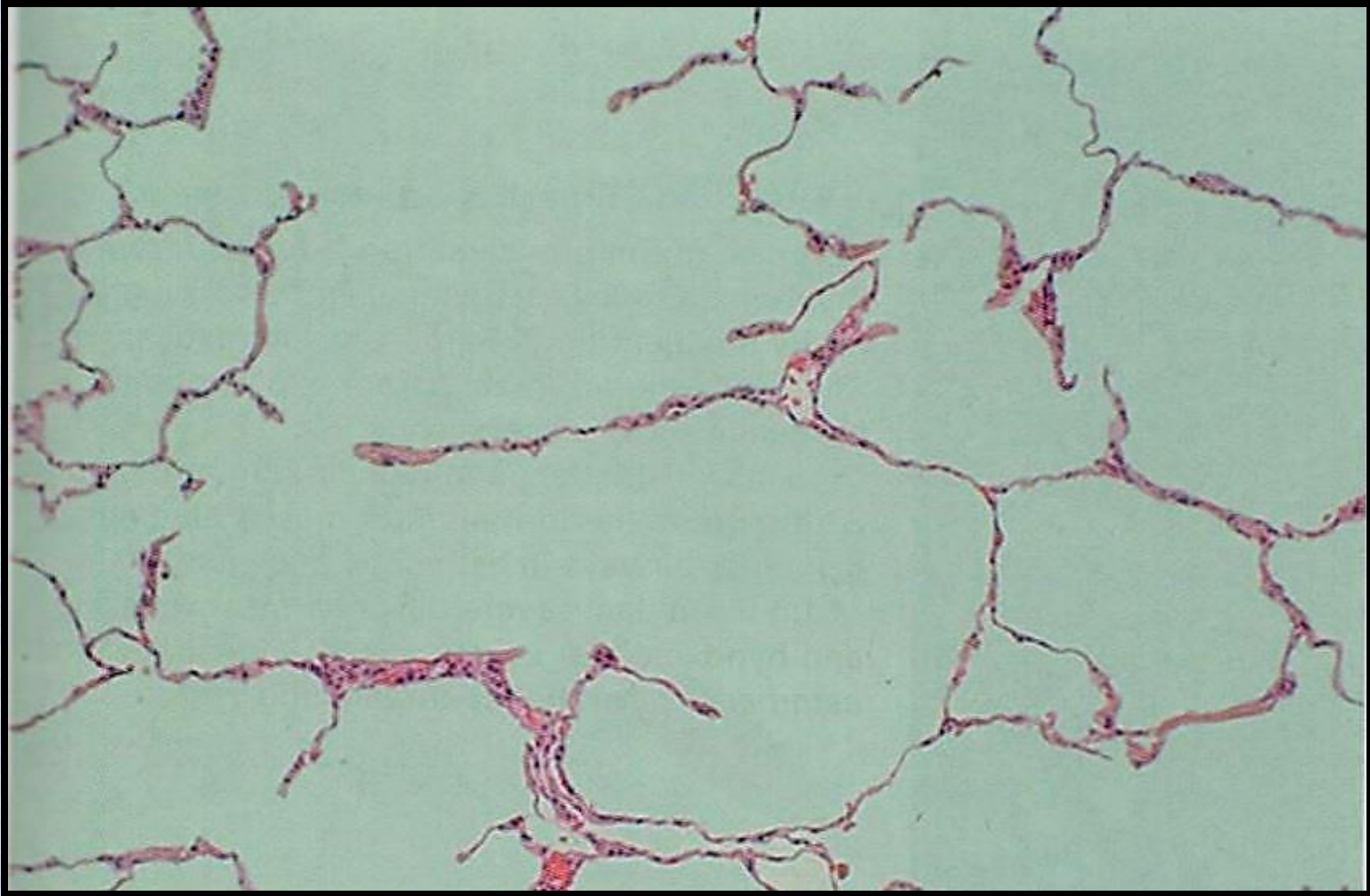
Pursed lip expiration is a common maneuver adopted by patients with severe chronic obstructive pulmonary disease including emphysema. The patient starts to breathe out closed or nearly closed lips to keep the intrabronchial pressure high and prevent collapse of the bronchial wall and expiratory obstruction. Later in expiration the lips are blown forwards and open, often with a grunt ("fish-mouth breathing").



Bullous emphysema with large apical and subpleural bullae

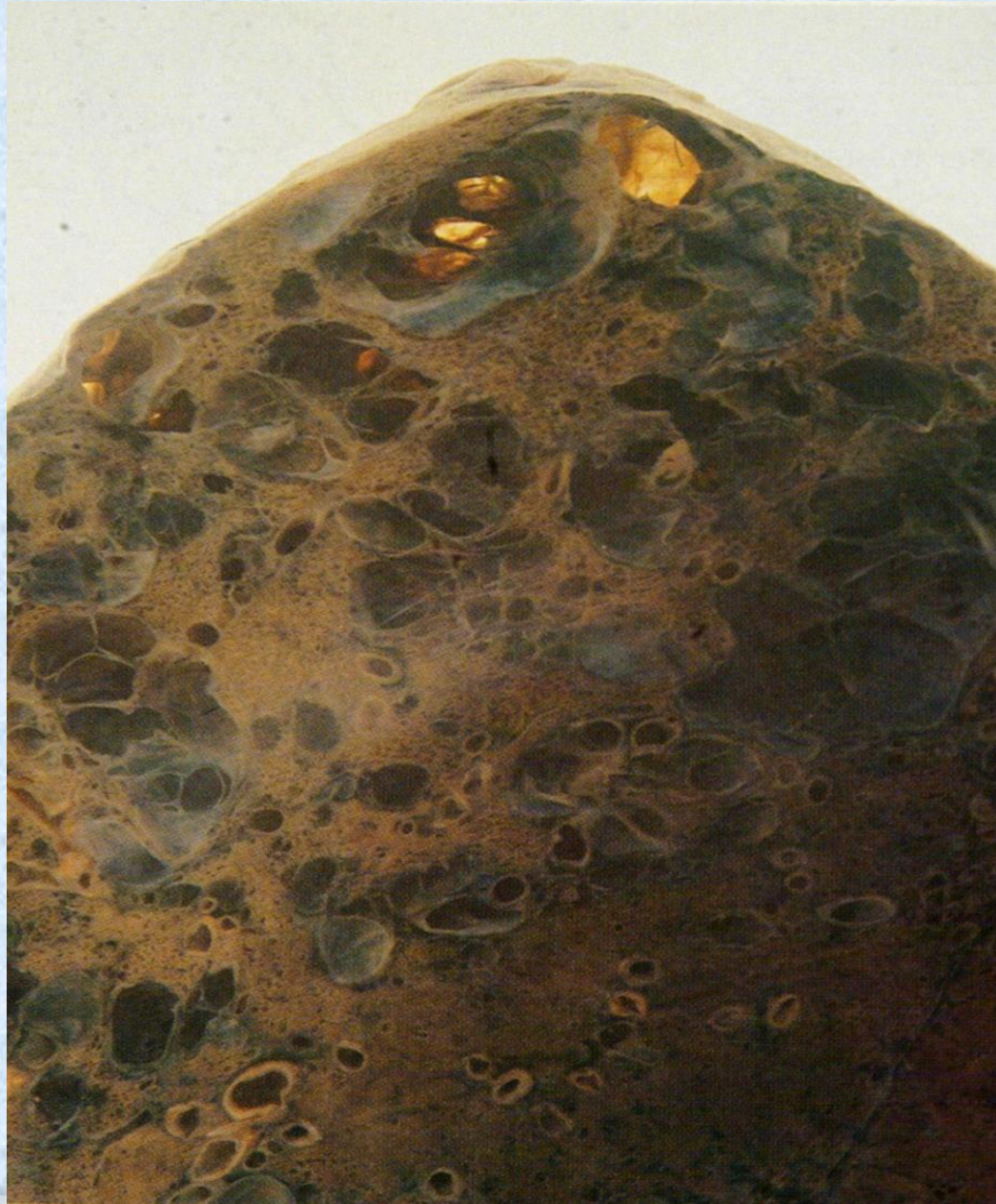


Paraseptal emphysema

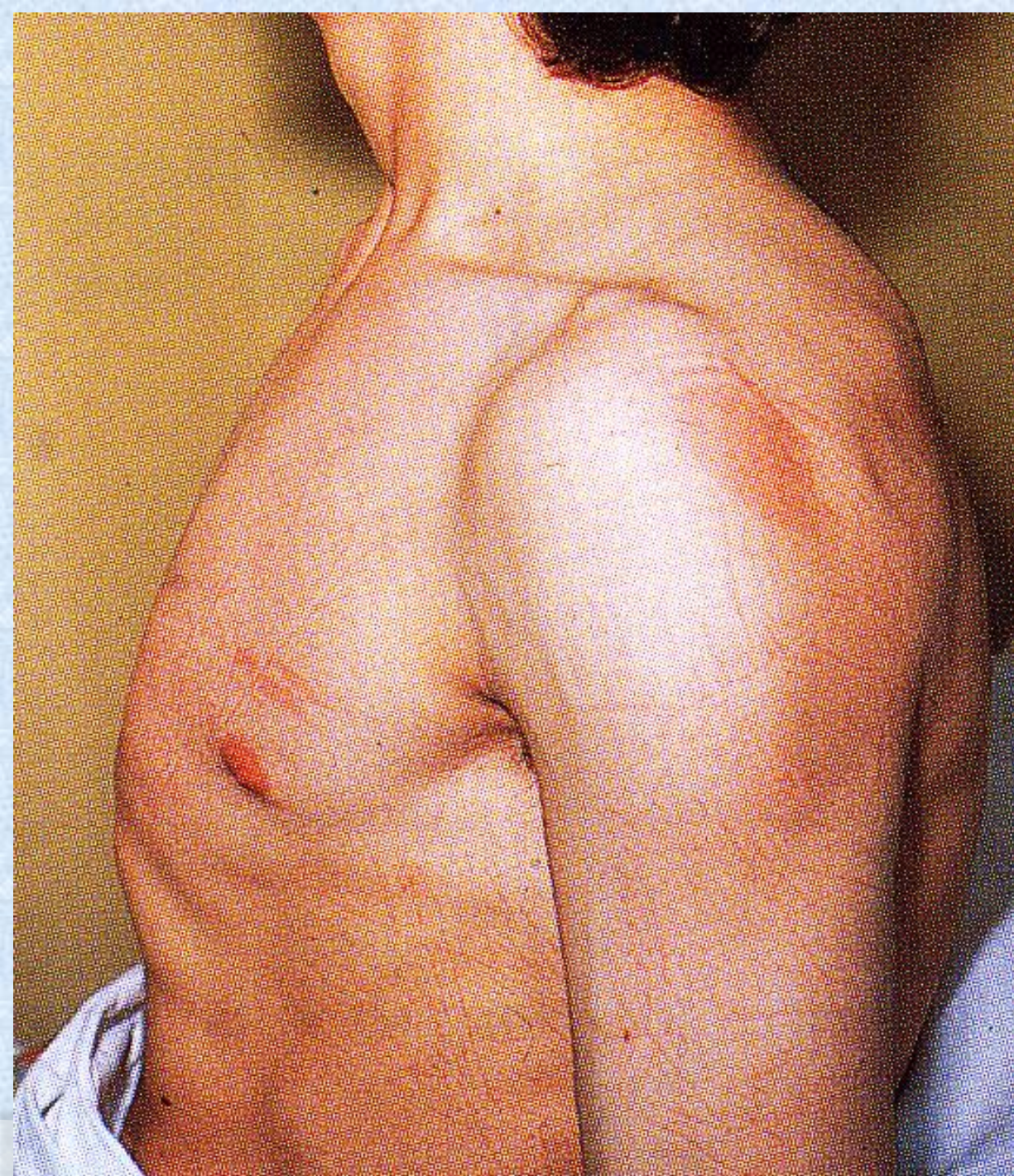


Paraseptal emphysema, microscopic

Diseases of Lung

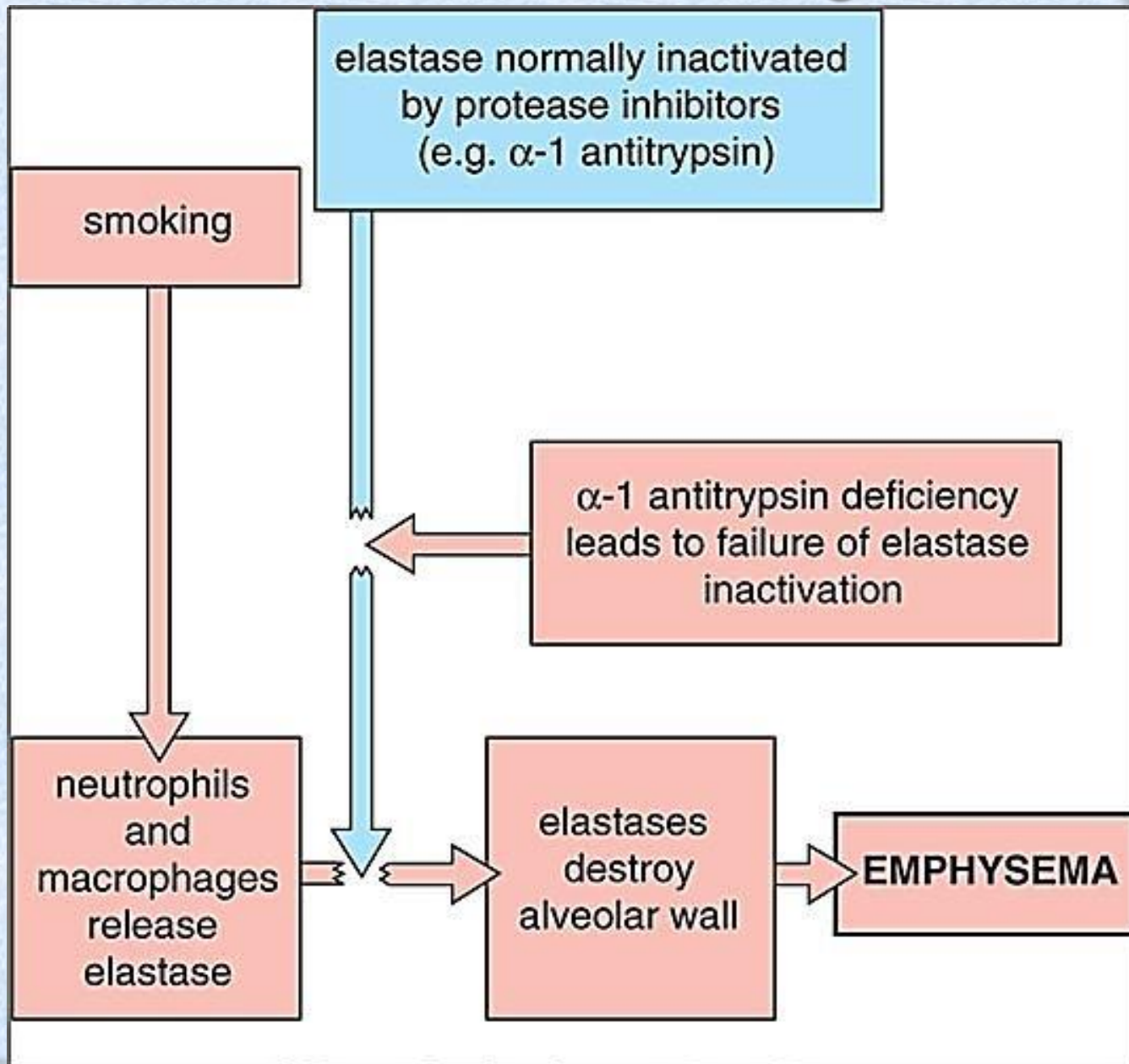


Emphysema



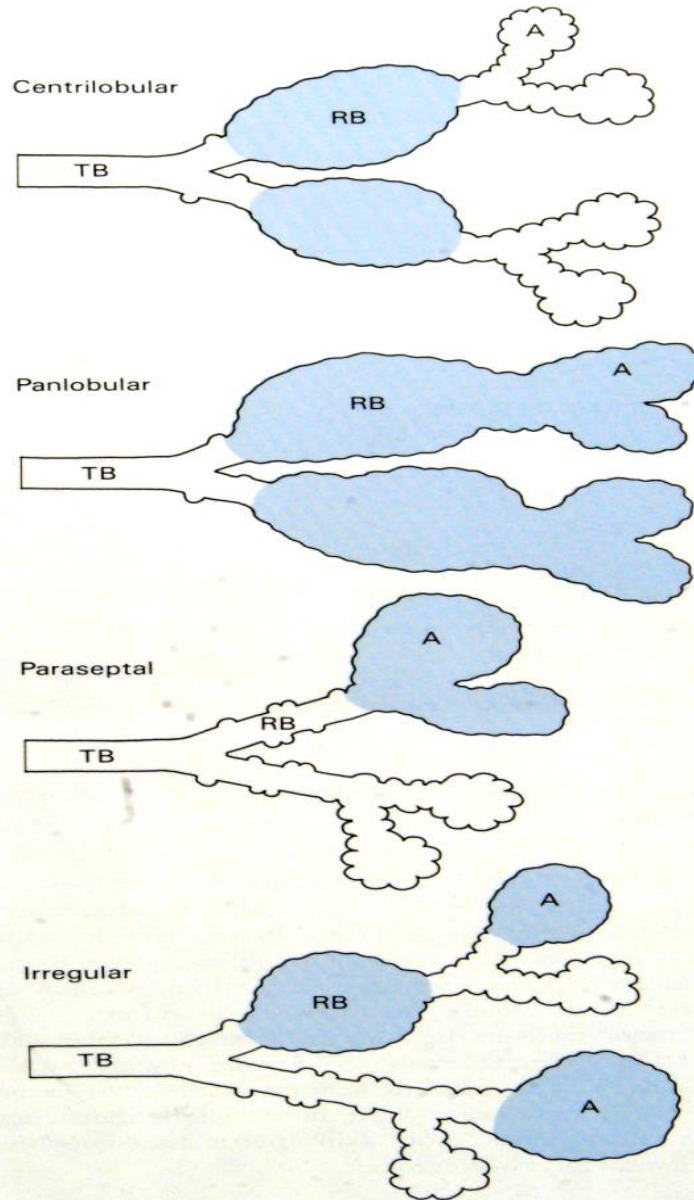
Barrel-shaped chest in a patient with emphysema. The hyperinflation results from air-trapping associated with inflammatory changes, hypersecretion of viscous mucus, and hypercontraction of the small airways. Note the associated indrawing of the intercostal muscles. Similar changes are seen in patients with chronic bronchitis and asthma.

Diseases of Lung



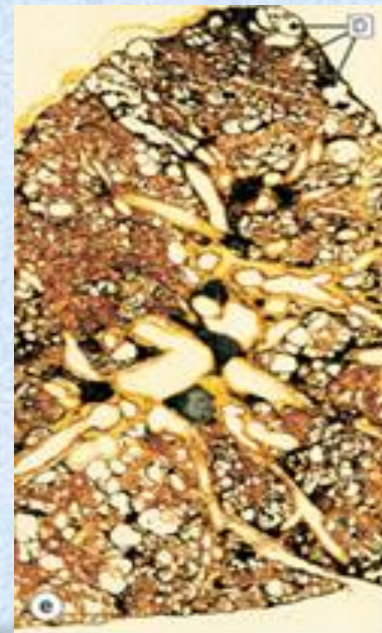
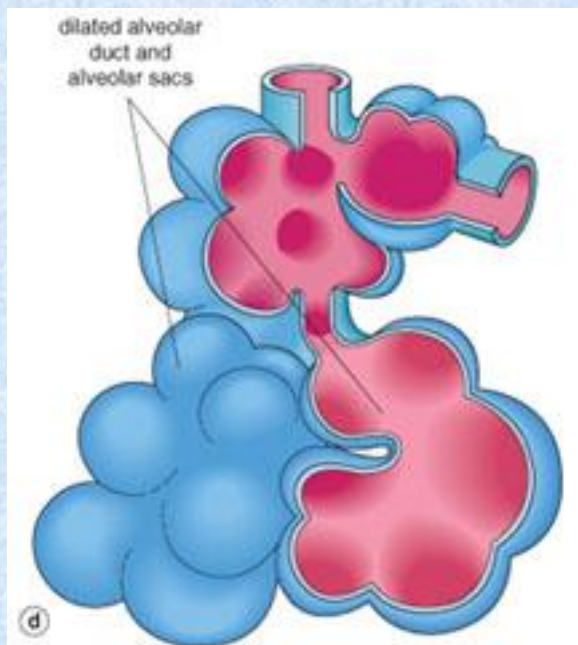
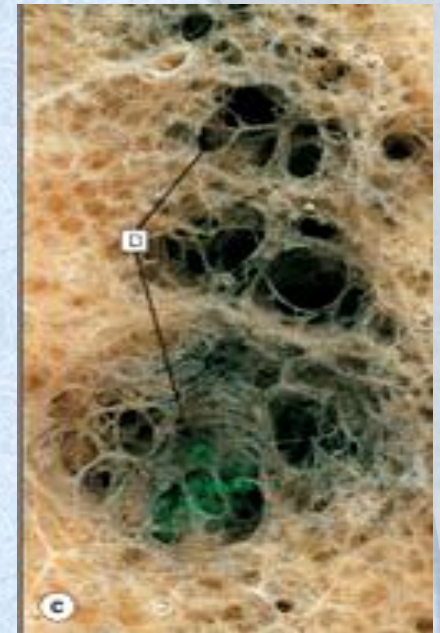
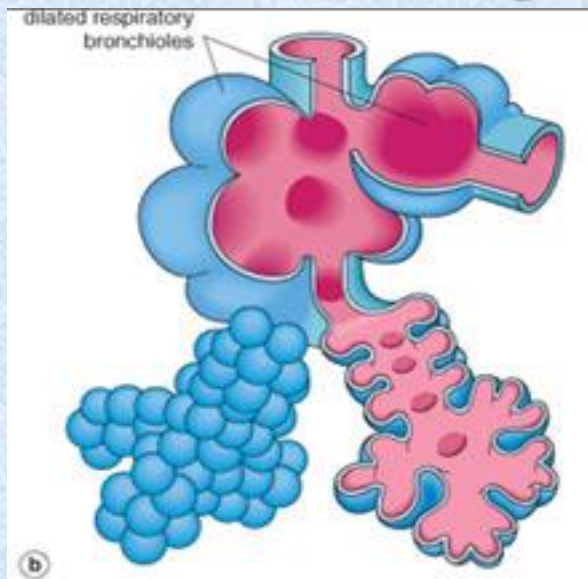
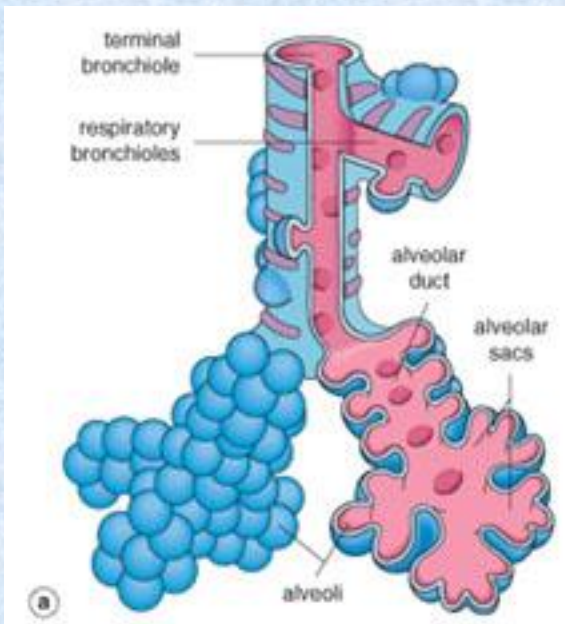
Pathogenesis of emphysema.

Diseases of Lung

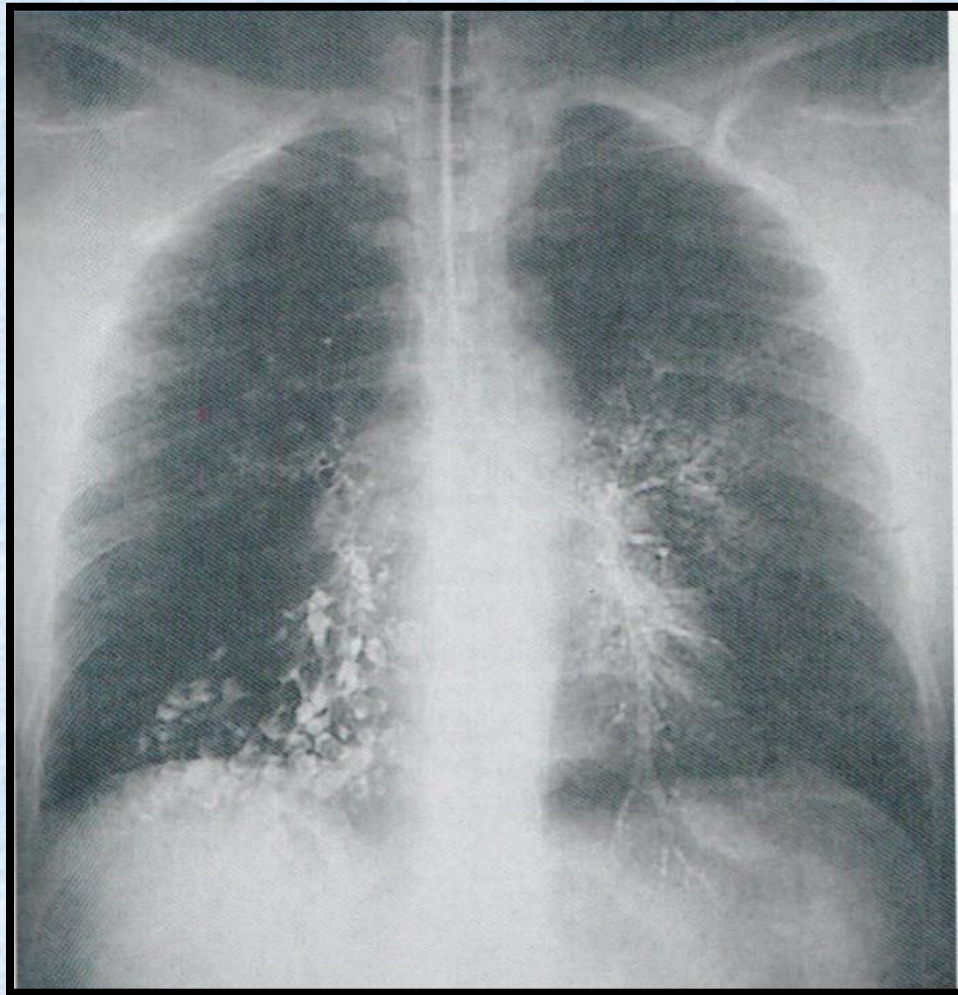


Classification of emphysema

Diseases of Lung



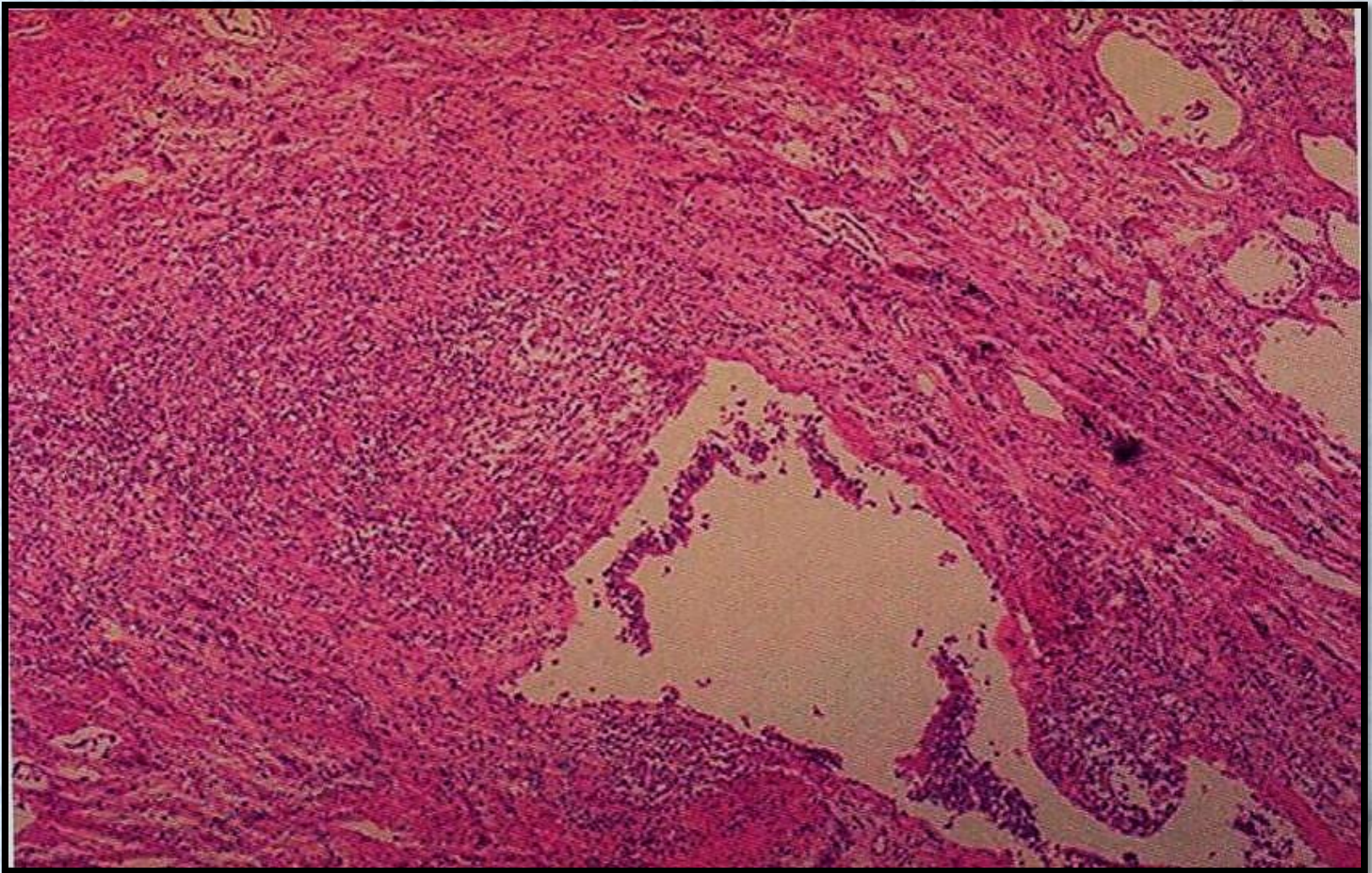
Generalized emphysema. (a) Normal distal lung acinus. (b) Centriacinar emphysema. (c) Centriacinar emphysema. (d) Panacinar emphysema. (e) Panacinar emphysema (Gough-Wentworth section).



Bronchiectasis, chest radiograph

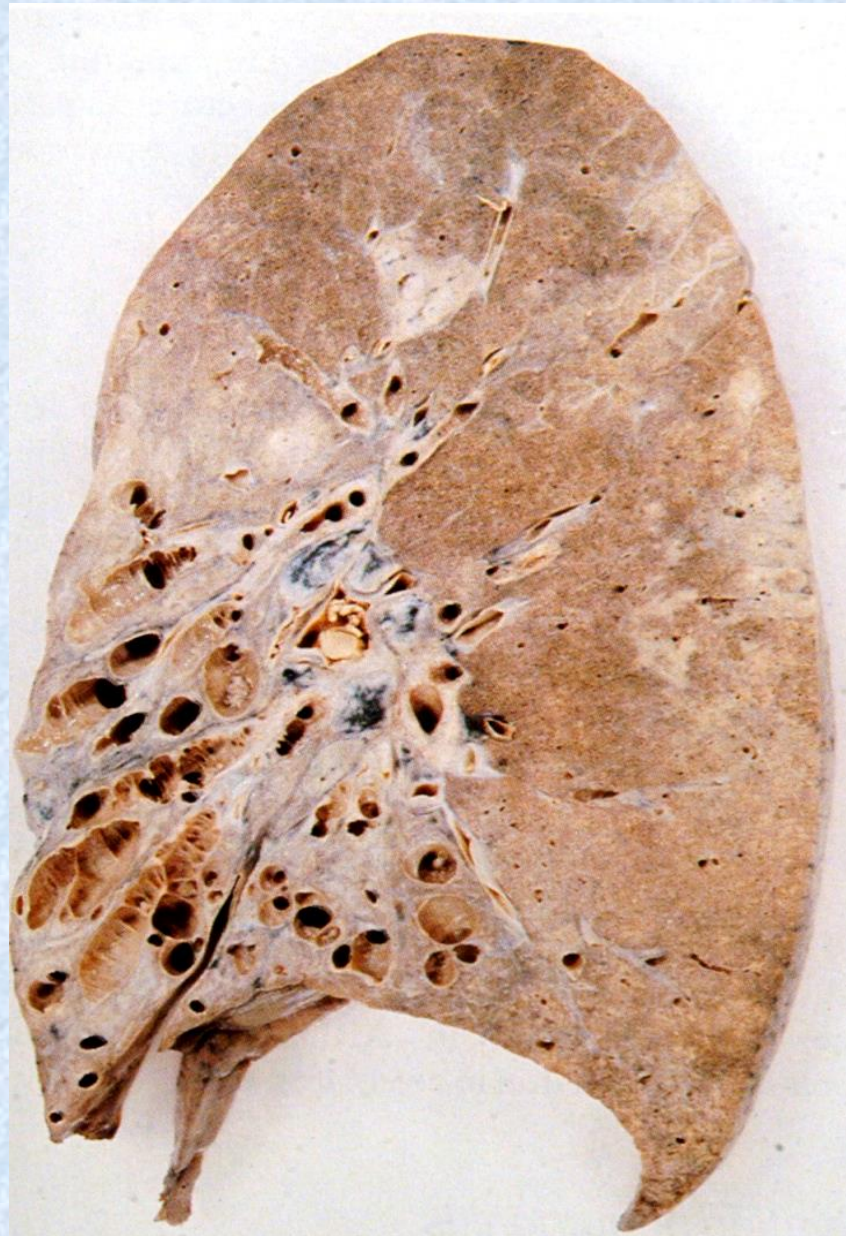


Bronchiectasis, gross



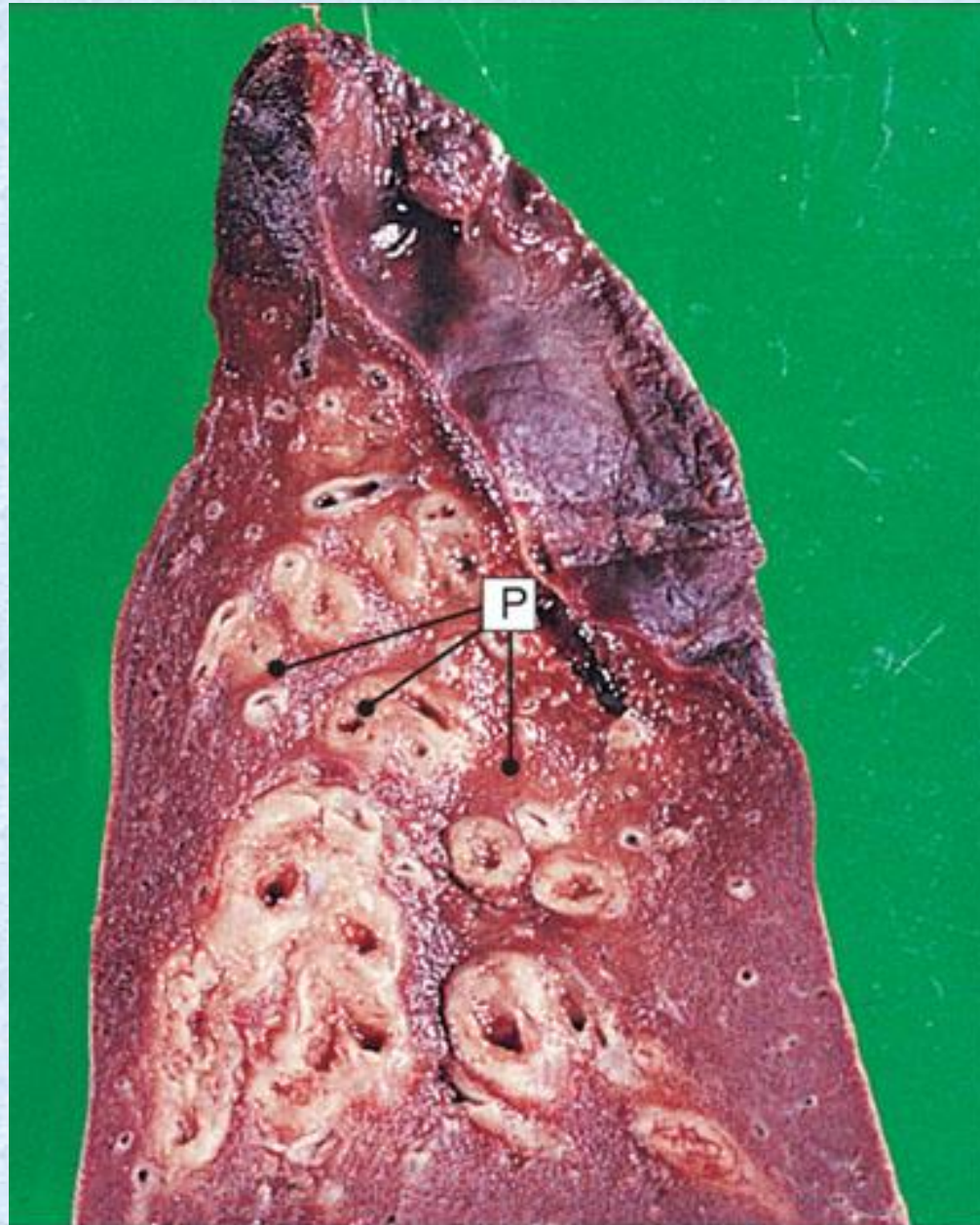
Bronchiectasis, microscopic

Diseases of Lung



Bronchiectasis

Diseases of Lung



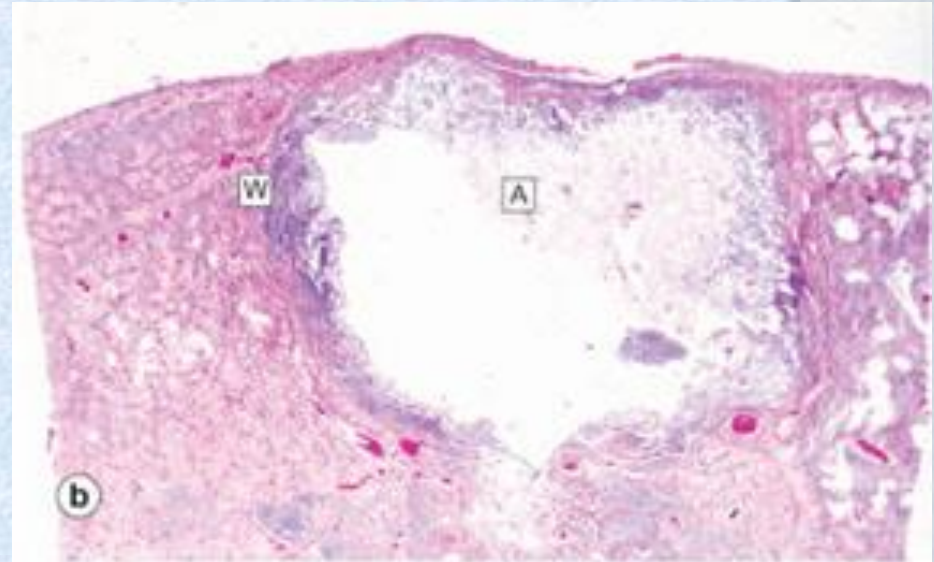
Bronchiectasis. This is a lower lobe of lung surgically resected for bronchiectasis.

Diseases of Lung



Ciliary dysmotility syndrome. Electron micrograph of cilia from a person with recurrent chest infections since childhood. The outer dynein arms are absent and there are abnormal single microtubules (M), which prevent normal motility.

Diseases of Lung



Lung abscess.

Diseases of Lung



Key Facts Chronic obstructive pulmonary

disease

- . Definition: a disease state characterized by airflow limitations that are not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.
- . Cigarette smoking remains the most important cause of COPD. Other risks are recurrent chest infections in childhood, atopy, asthma, and occupational exposure to dusts (especially mining).
- . Respiratory bronchiolitis is one of the earliest lesions seen in smokers.
- . Chronic bronchitic airways show mucous hypersecretion with mucous gland hyperplasia.
- . Chronic bronchitis and bronchiolitis cause airway narrowing.
- . Emphysema causes loss of elastic recoil in lungs and contributes to functional airways obstruction.
- . Generalized emphysema is defined as permanent dilatation of any part of the respiratory acinus, with destruction of tissue in the absence of scarring.
- . There are two patterns of generalized emphysema: centrilobular and panacinar.
- . Many patients with COPD have a reversible component to functional airways obstruction.
- . Pulmonary hypertension and right-sided heart failure are common in long-standing chronic obstructive pulmonary disease.
- . Acute deterioration in COPD is usually caused by viral or bacterial infection.



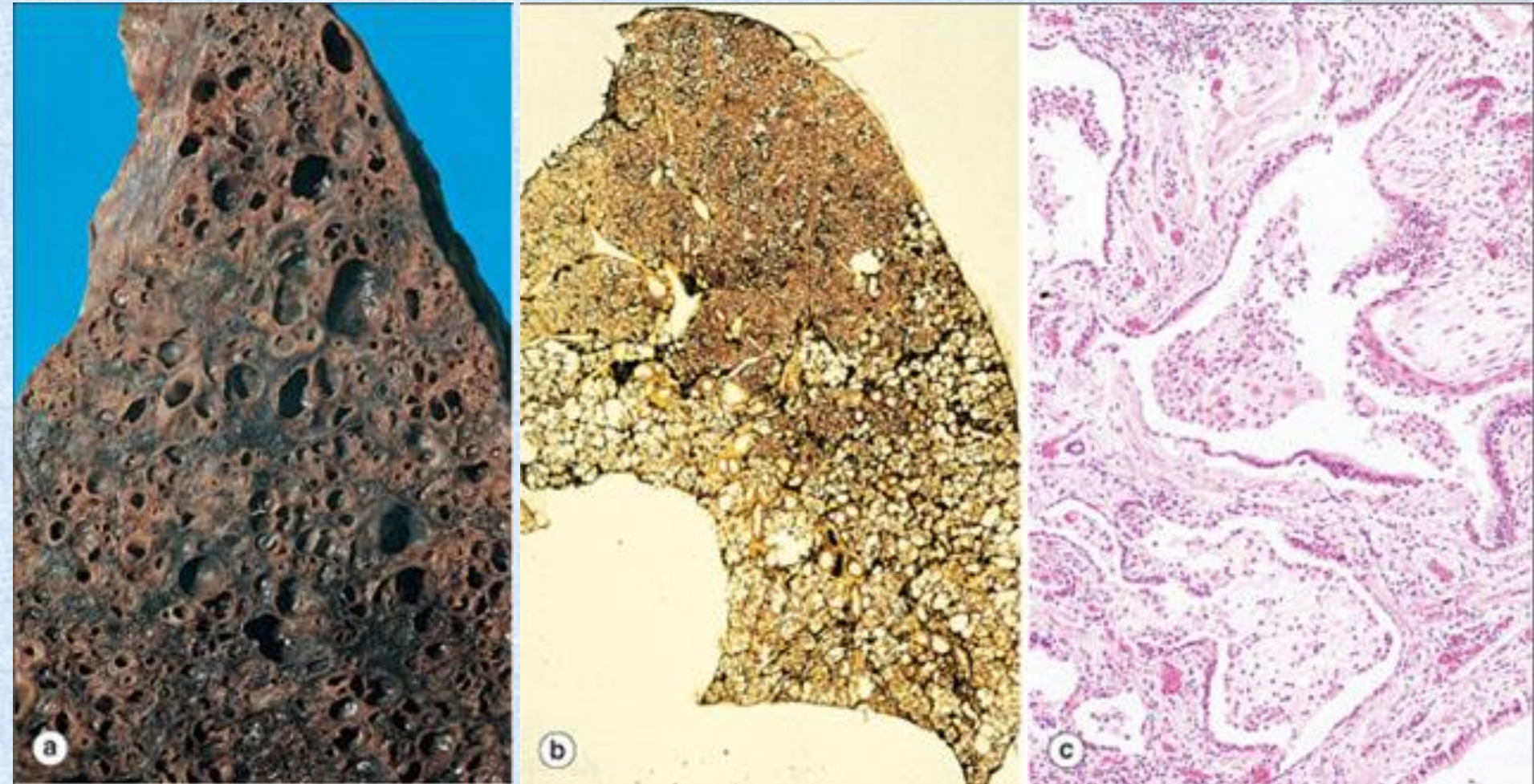
Diseases of the Respiratory System

Restrictive Pulmonary Diseases



Severe kyphoscoliosis of unknown etiology. Flexion (kyphosis) and lateral deviation (scoliosis) of the spine have the combined effect of reducing chest volume. This compromises respiratory function and may cause restrictive lung disease.

Diseases of Lung



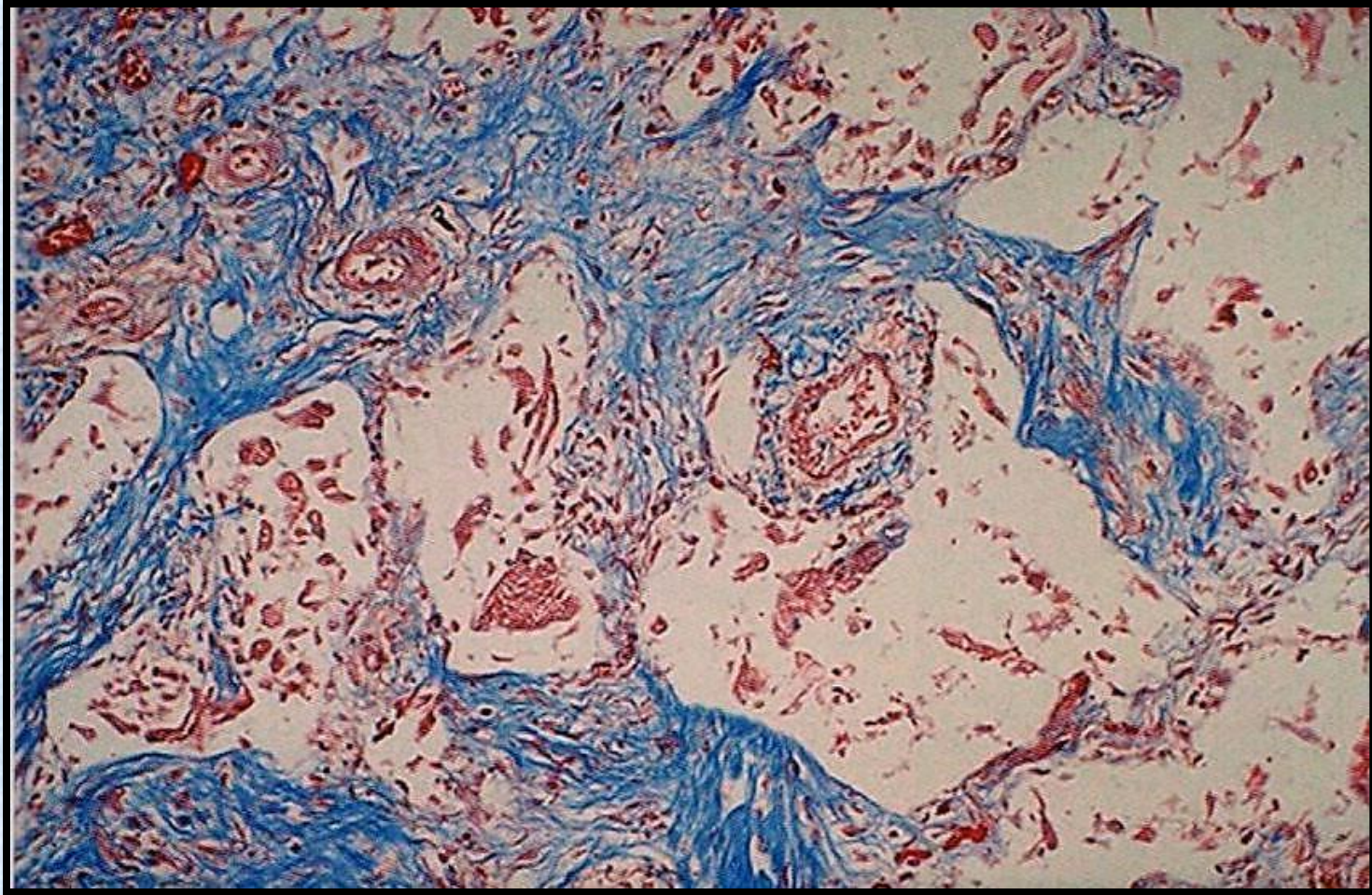
Honeycomb lung. Macroscopically (a) honeycomb lung appears as large (b) the extent of abnormality and interstitial fibrosis can be better appreciated. (c) shows coalescence of air spaces, both alveoli and bronchioles, to form cysts lined with cuboidal epithelium.



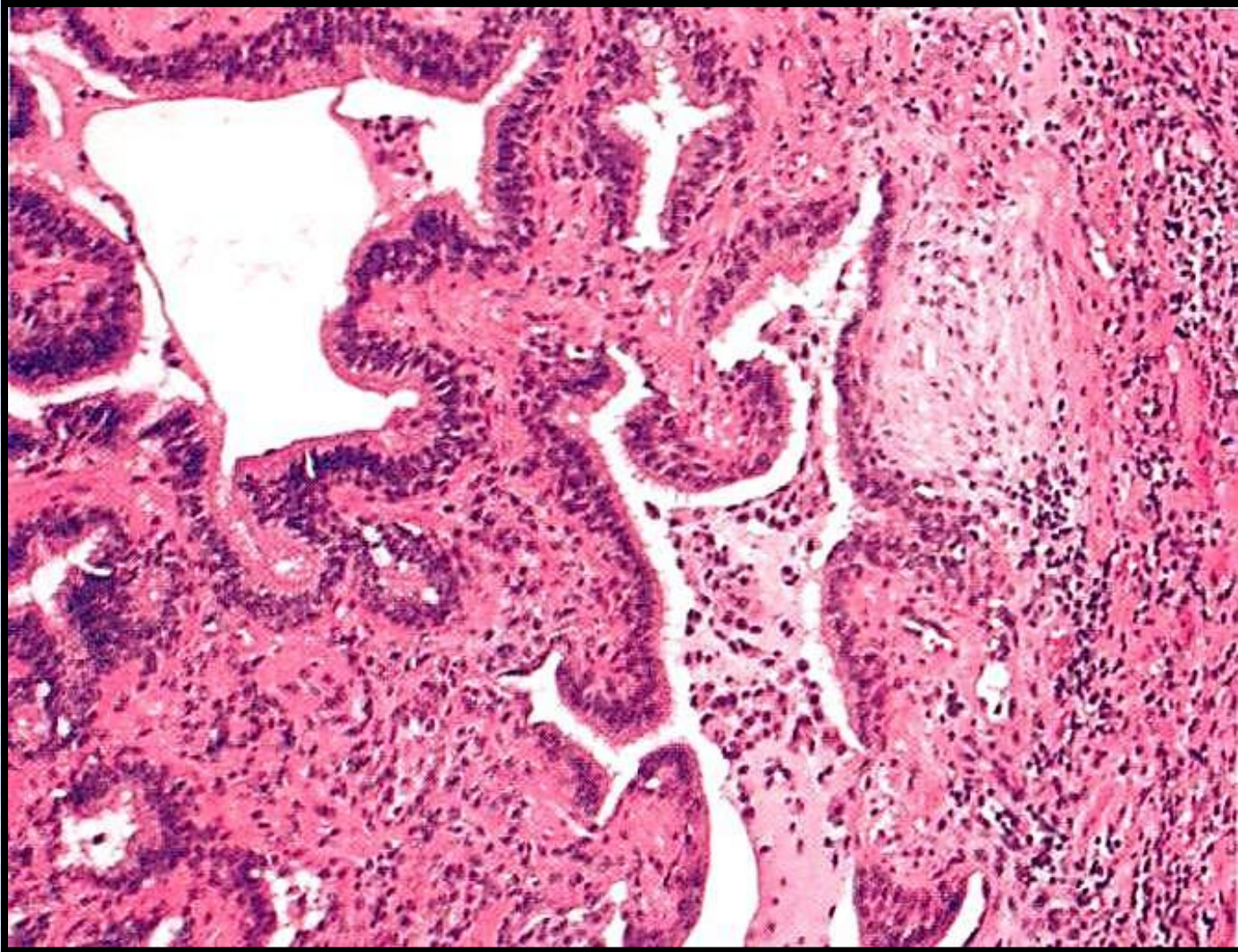
Idiopathic pulmonary fibrosis



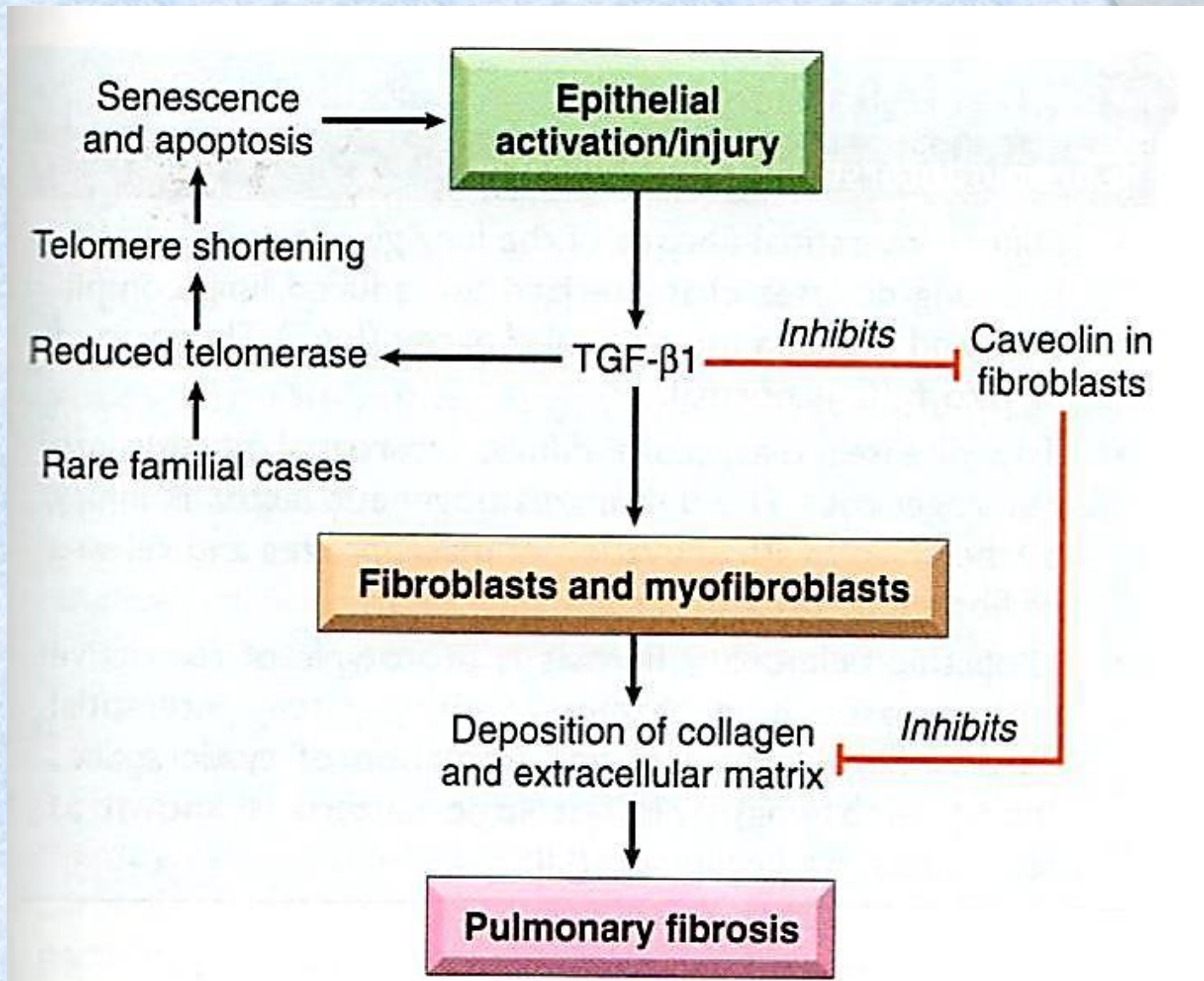
Honeycomb change, gross



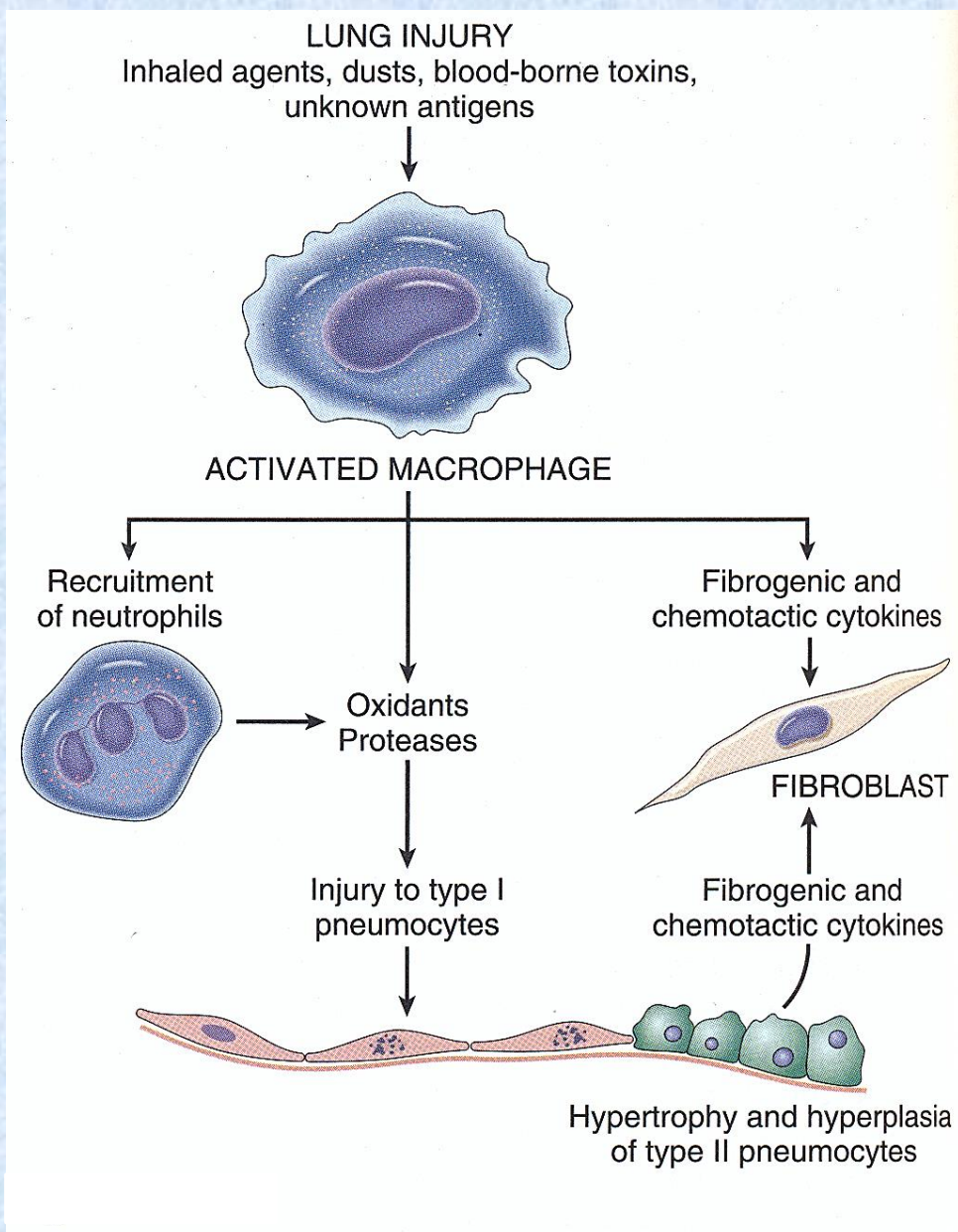
Interstitial fibrosis, microscopic



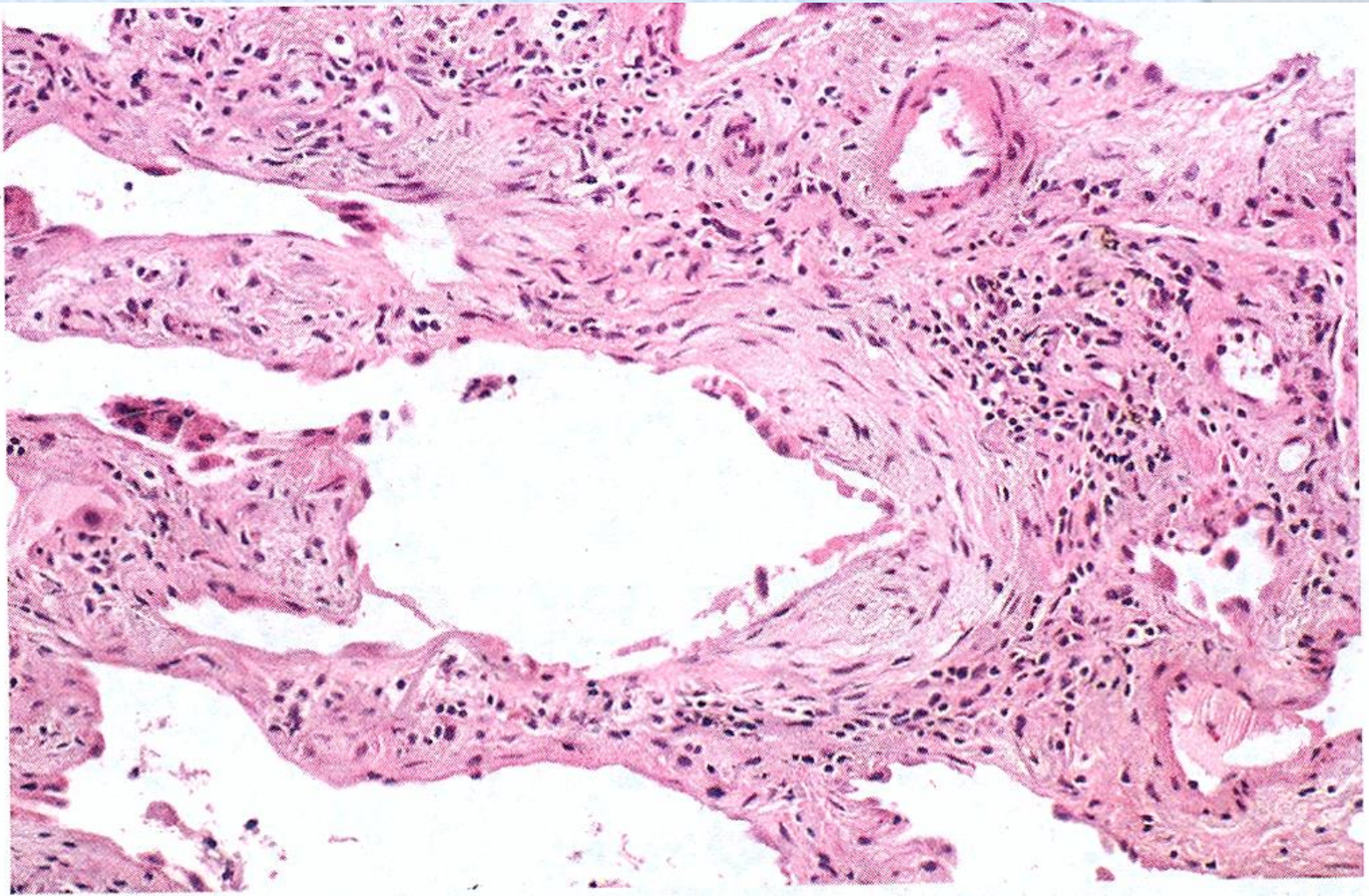
Usual interstitial pneumonia



Schematic representation of current understanding of the pathogenesis of idiopathic pulmonary fibrosis

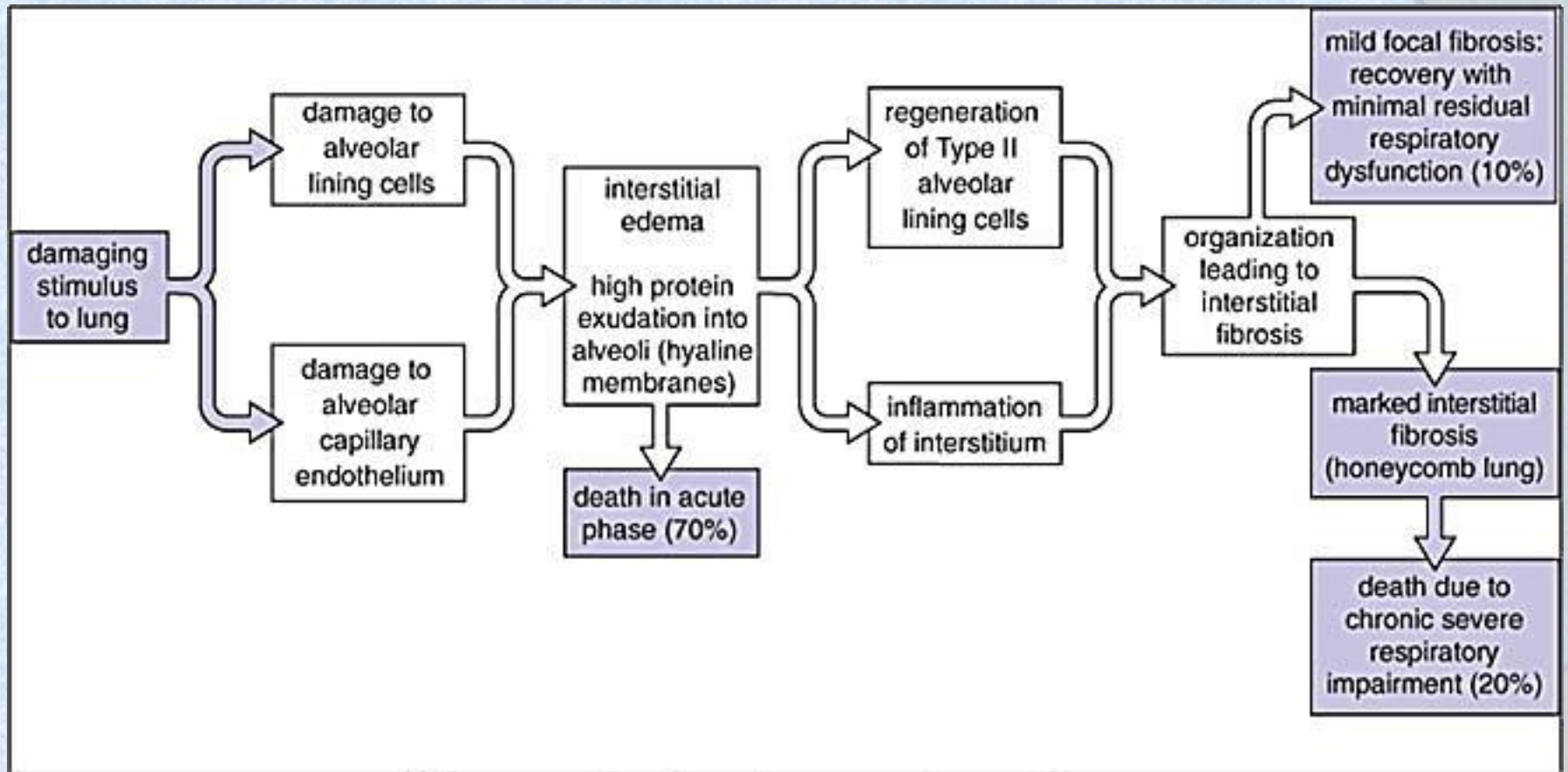


General scheme for the pathogenesis of chronic restrictive lung disease. See text for details.



Usual interstitial pneumonia. Fibroblastic focus with fibers running parallel to surface and bluish myxoid extracellular matrix.

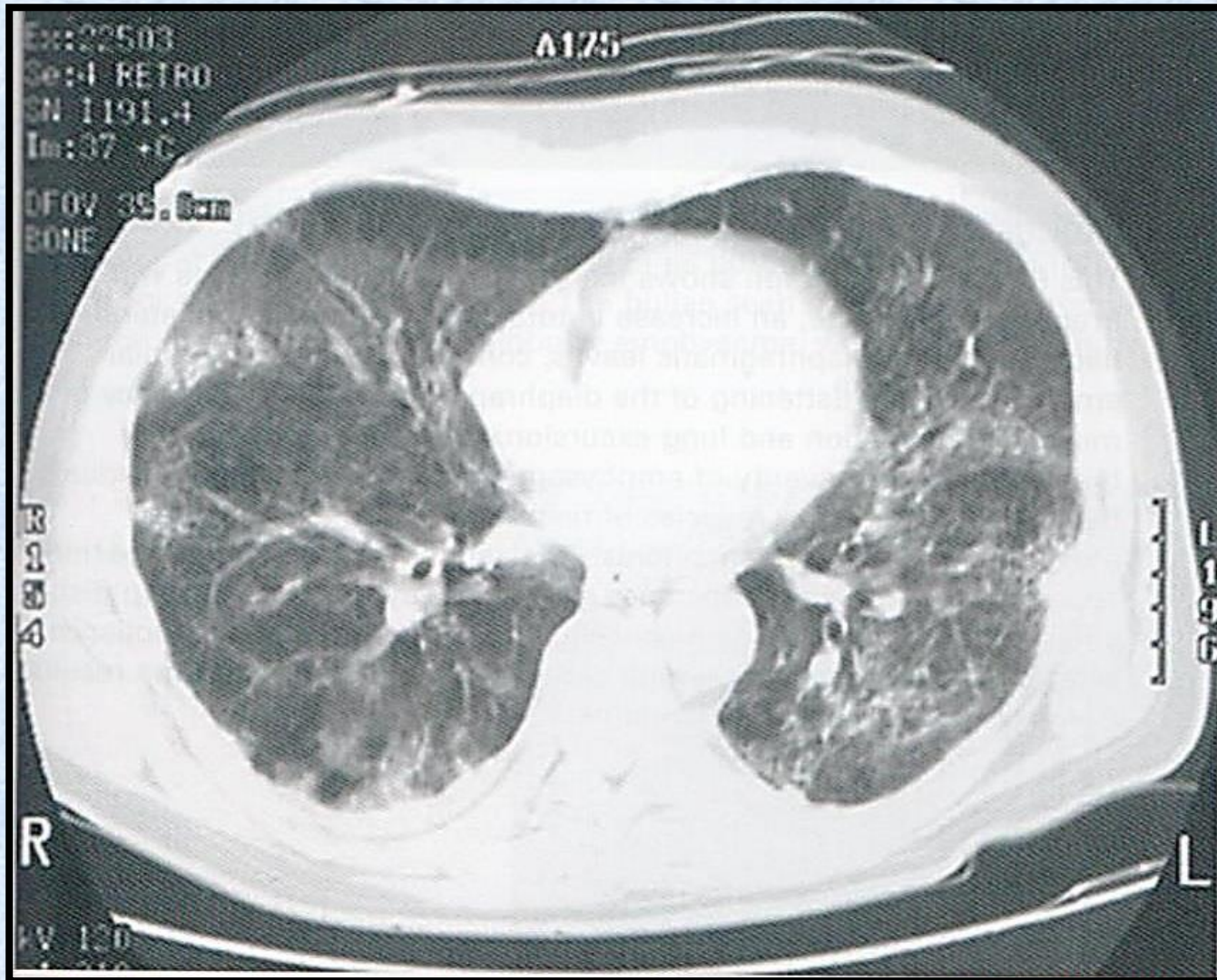
Diseases of Lung



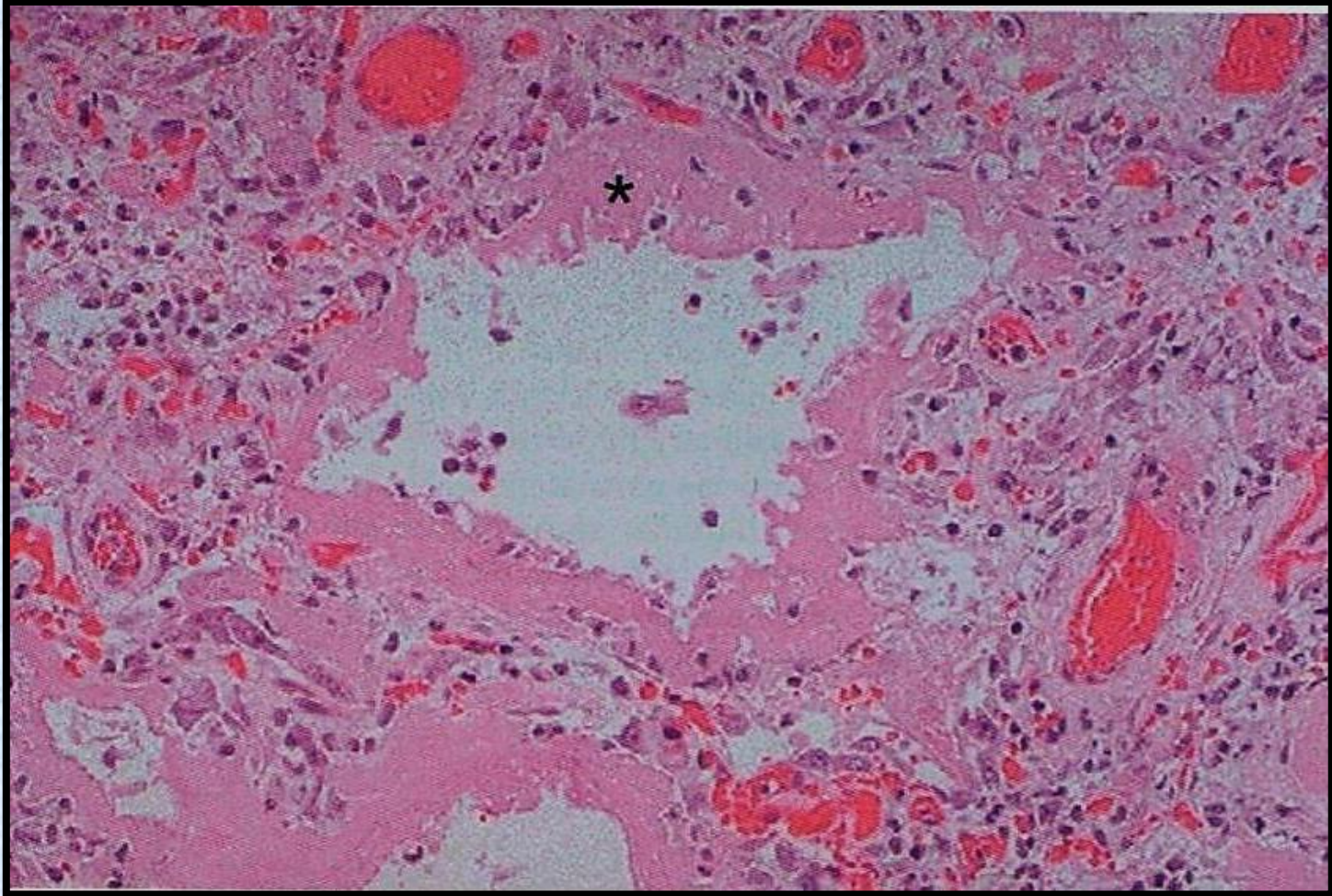
The main events and outcomes of ARDS.



Diffuse alveolar damage, gross

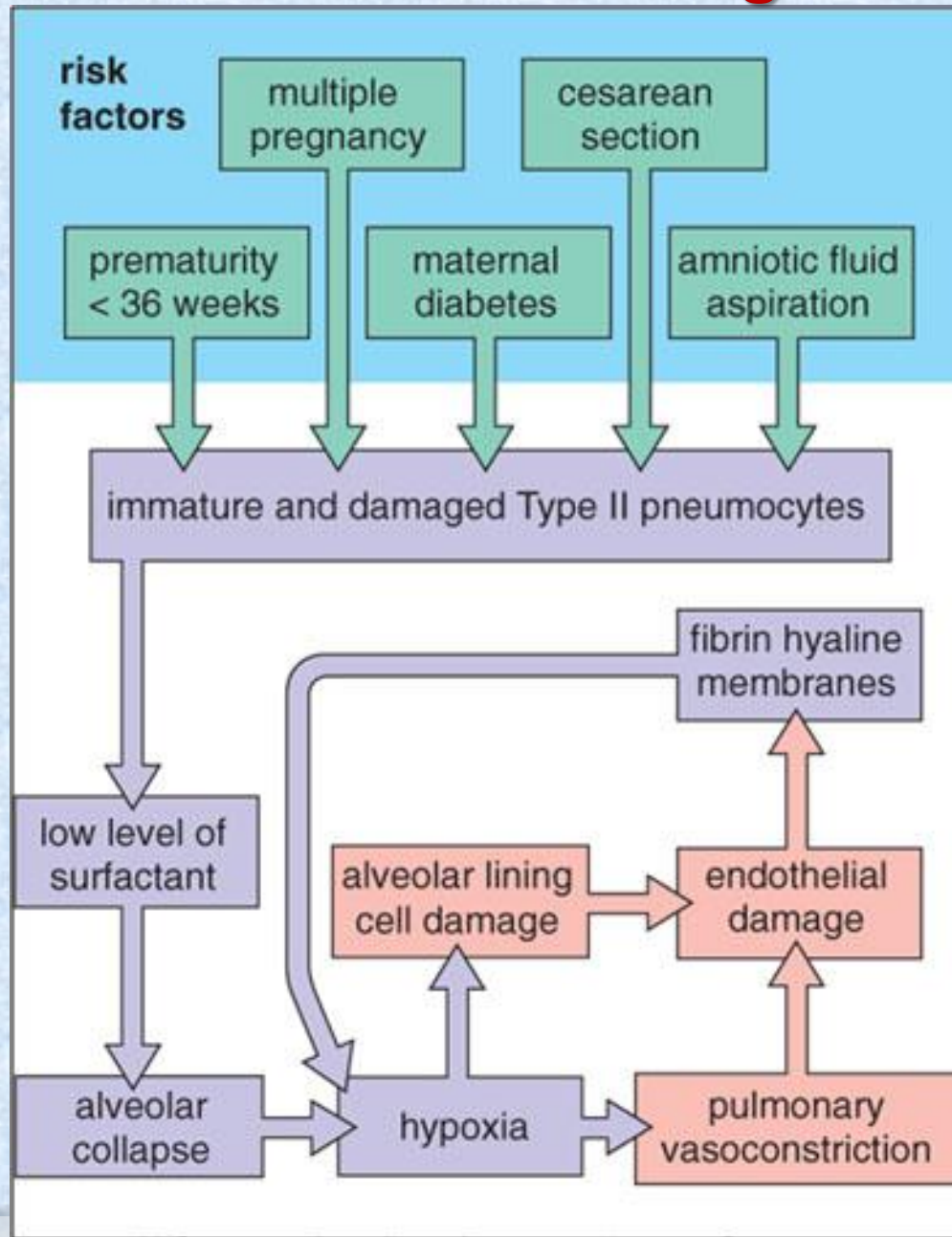


Diffuse alveolar damage, CT image

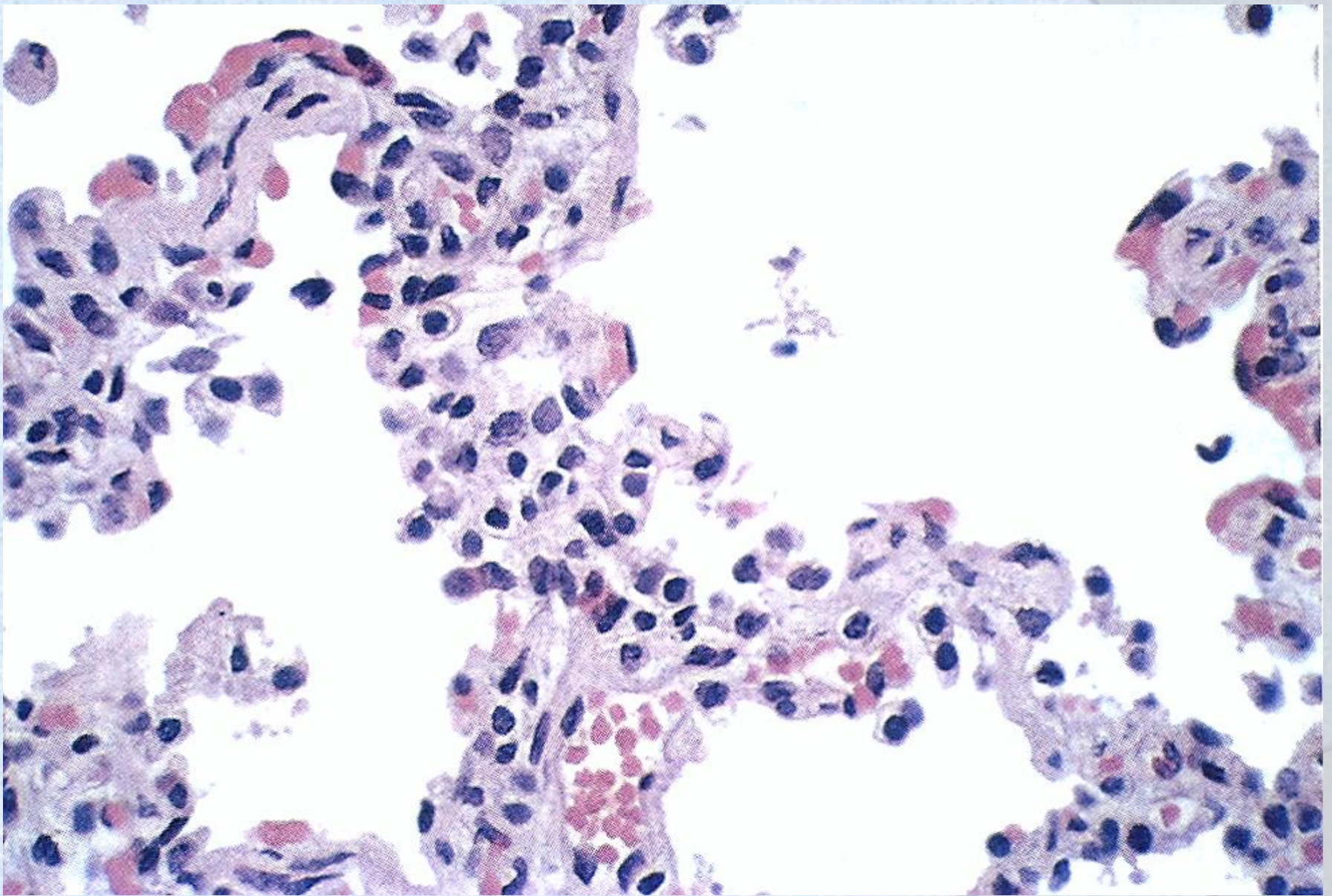


Diffuse alveolar damage, microscopic

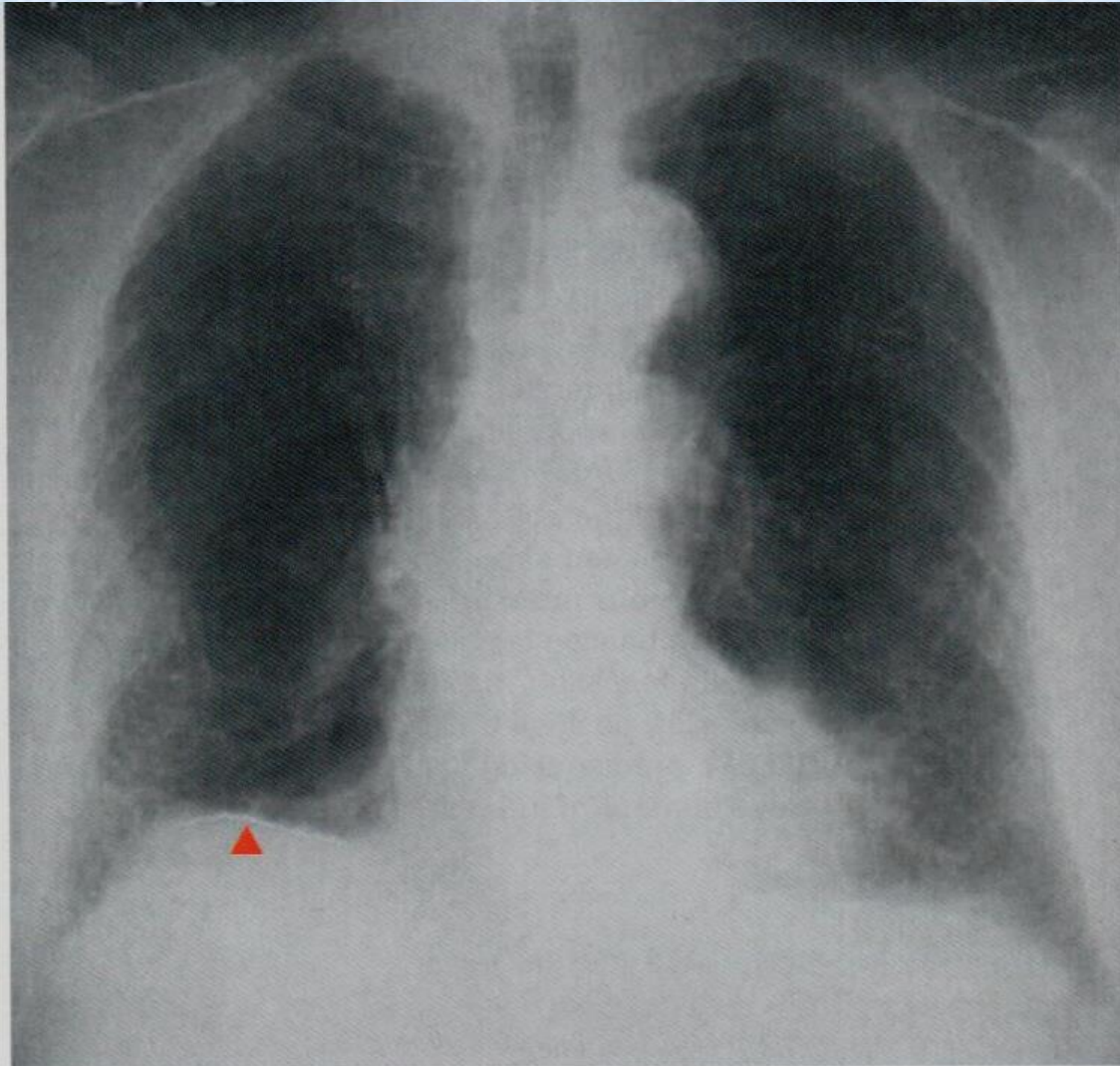
Diseases of Lung



Pathogenesis of NRDS.

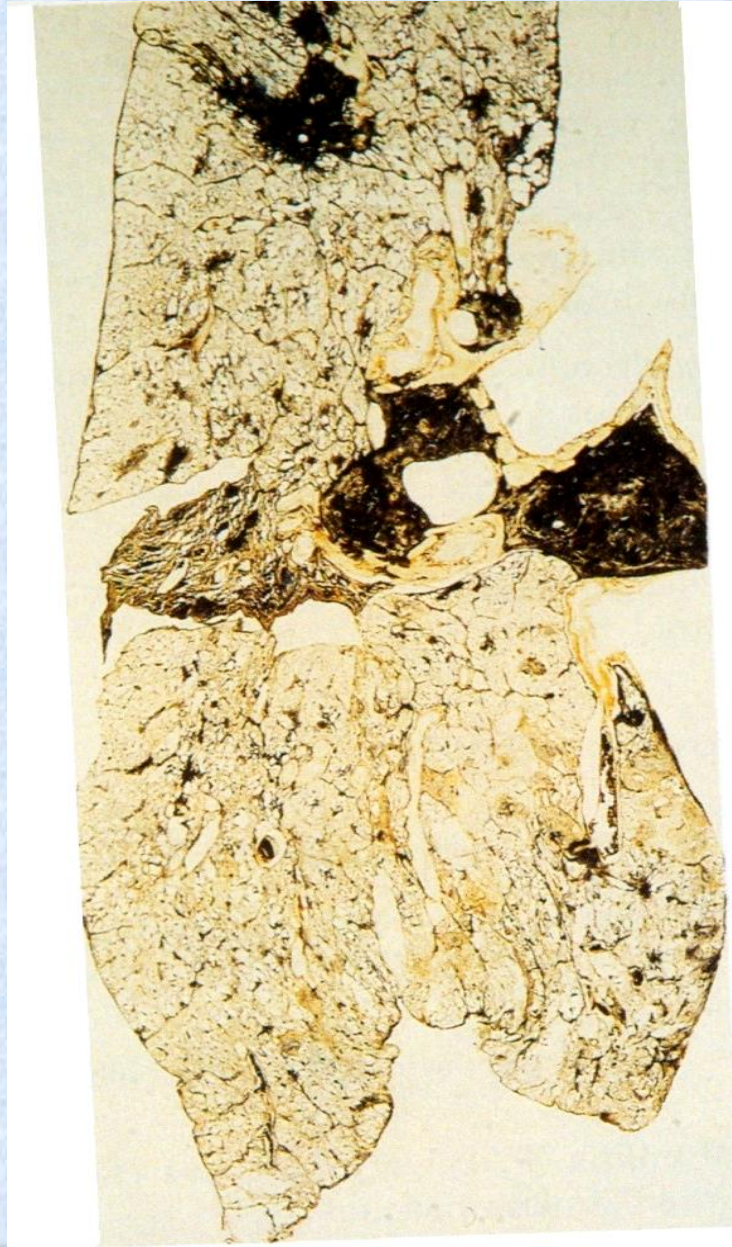


Atypical pneumonia



Pneumoconiosis, radiograph

Diseases of Lung

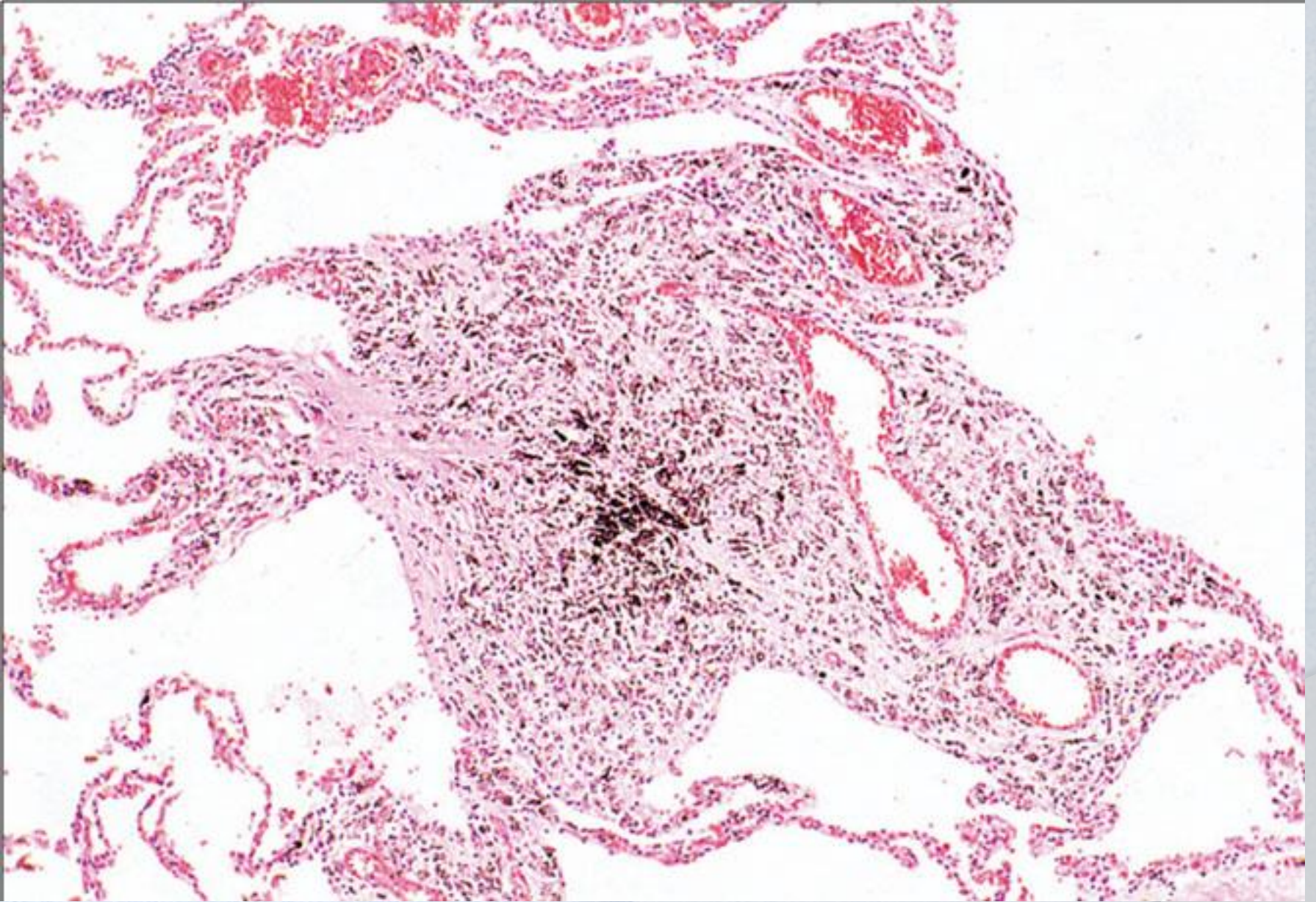


Coal workers pneumoconiosis



Coal worker's pneumoconiosis, microscopic

Diseases of Lung

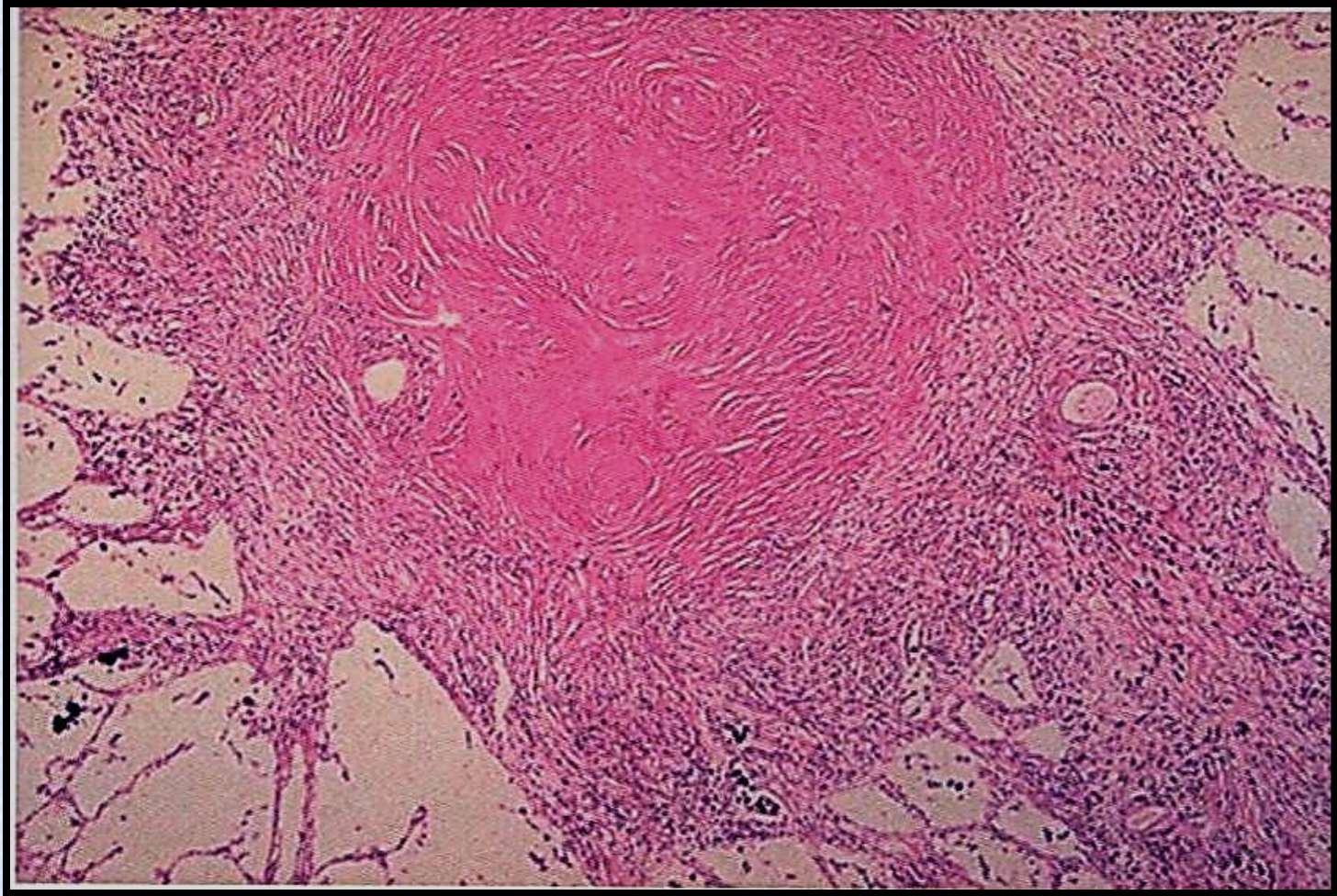


Simple coalworker's pneumoconiosis.

Diseases of Lung

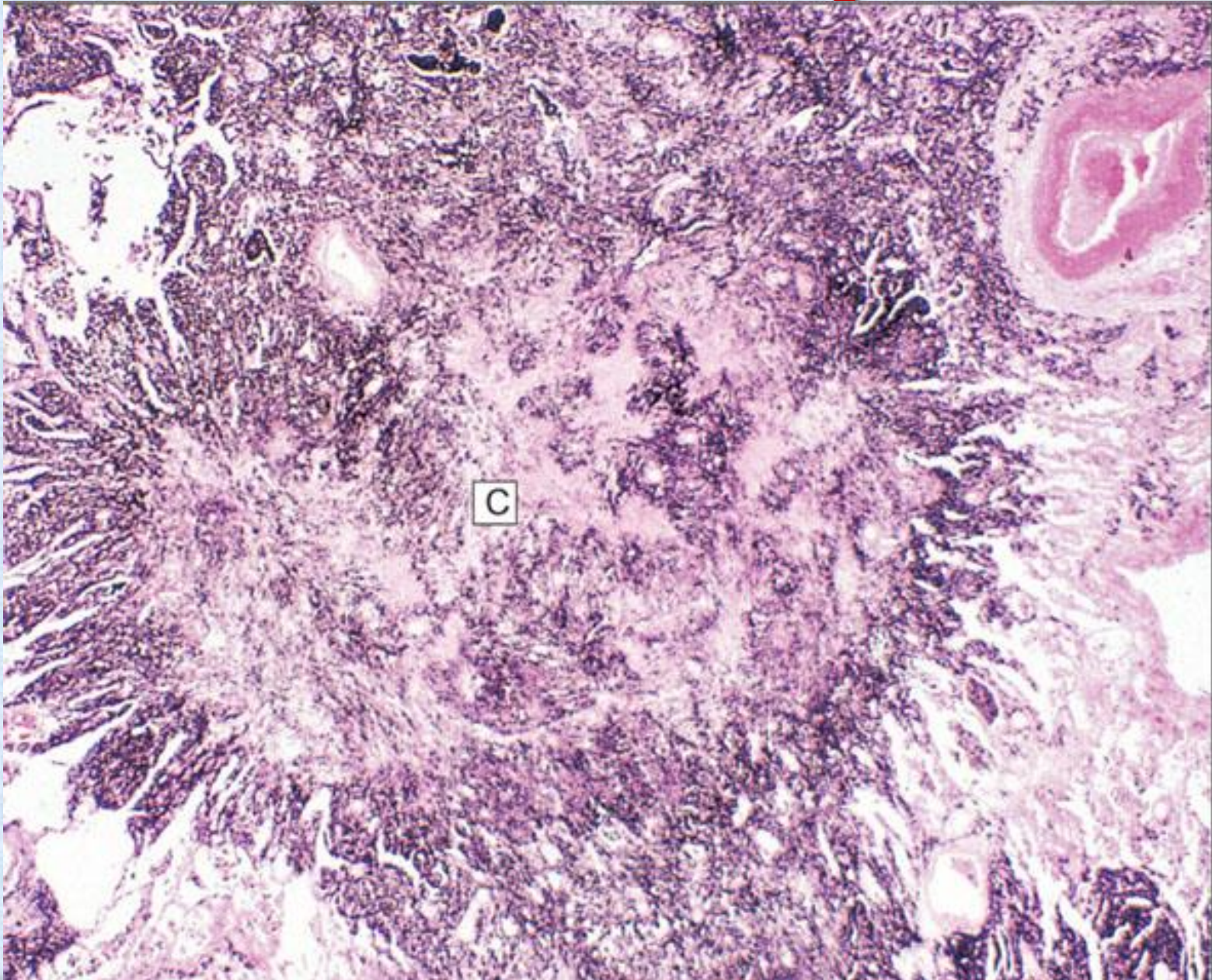


Coalworker's pneumoconiosis: progressive massive fibrosis. (a) Cut surface (b) thin section of whole lung.



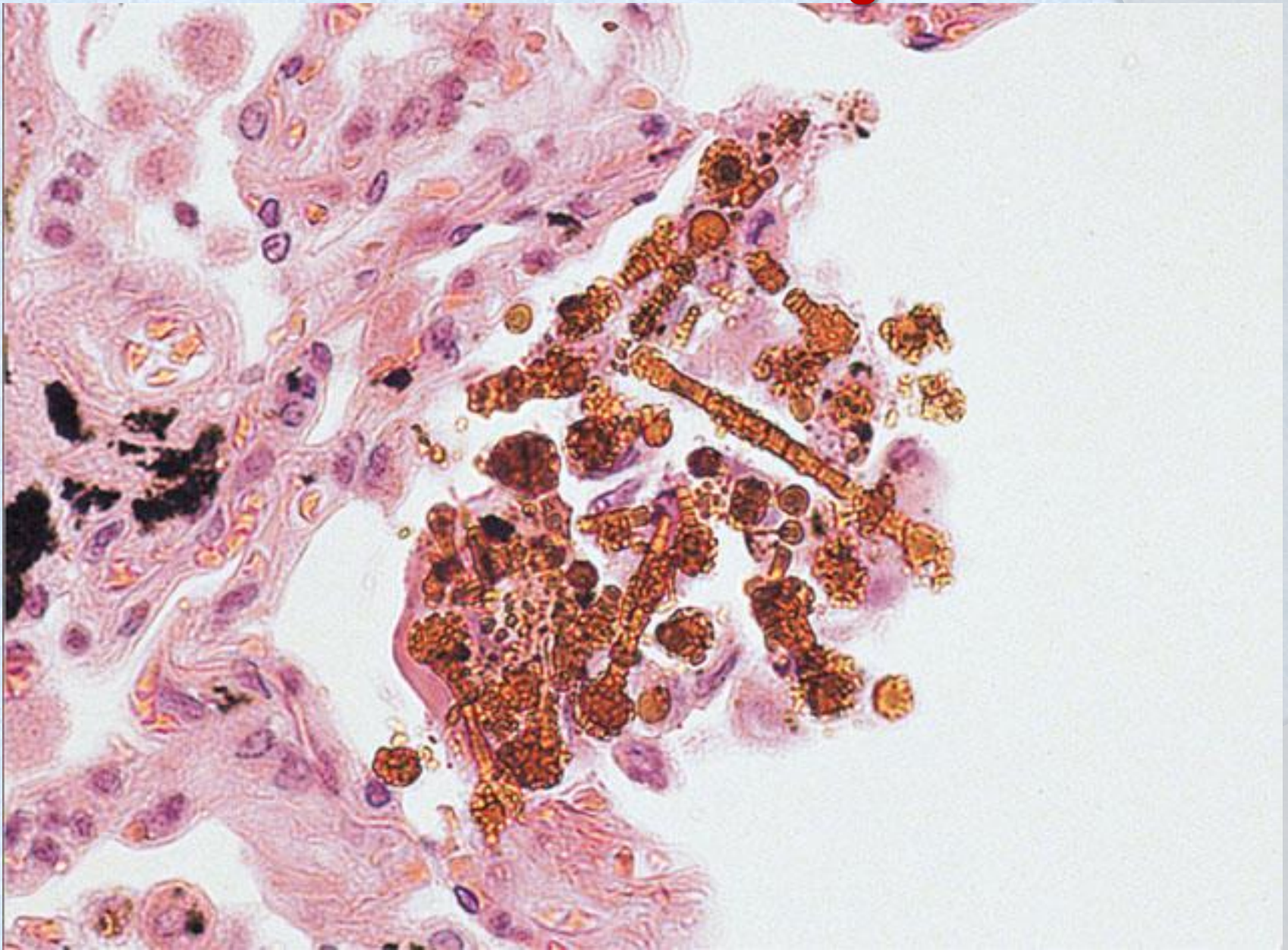
Silicosis, microscopic

Diseases of Lung

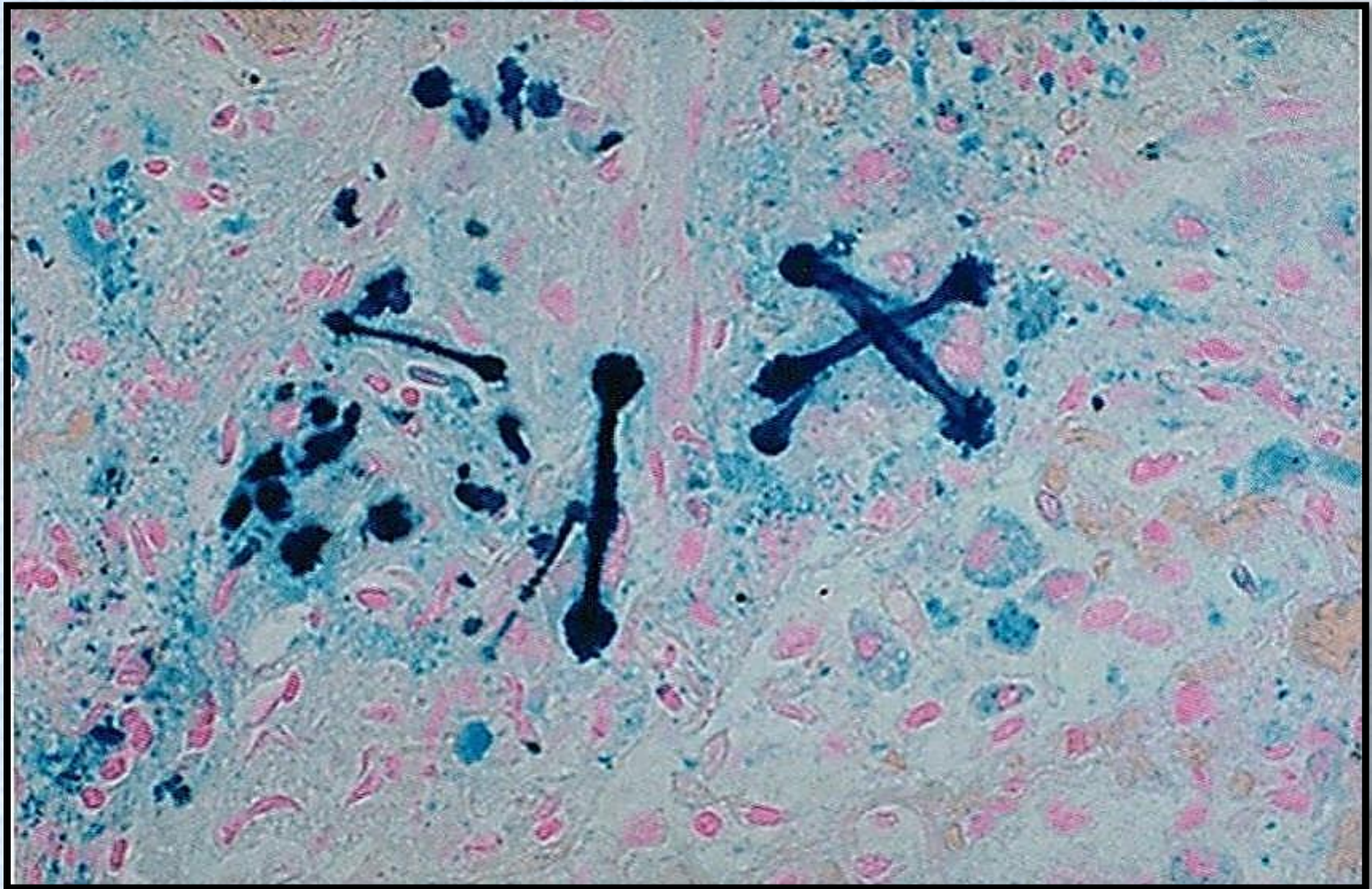


Silicosis of lung. In silicosis, nodules of collagen (C) contain silica particles.

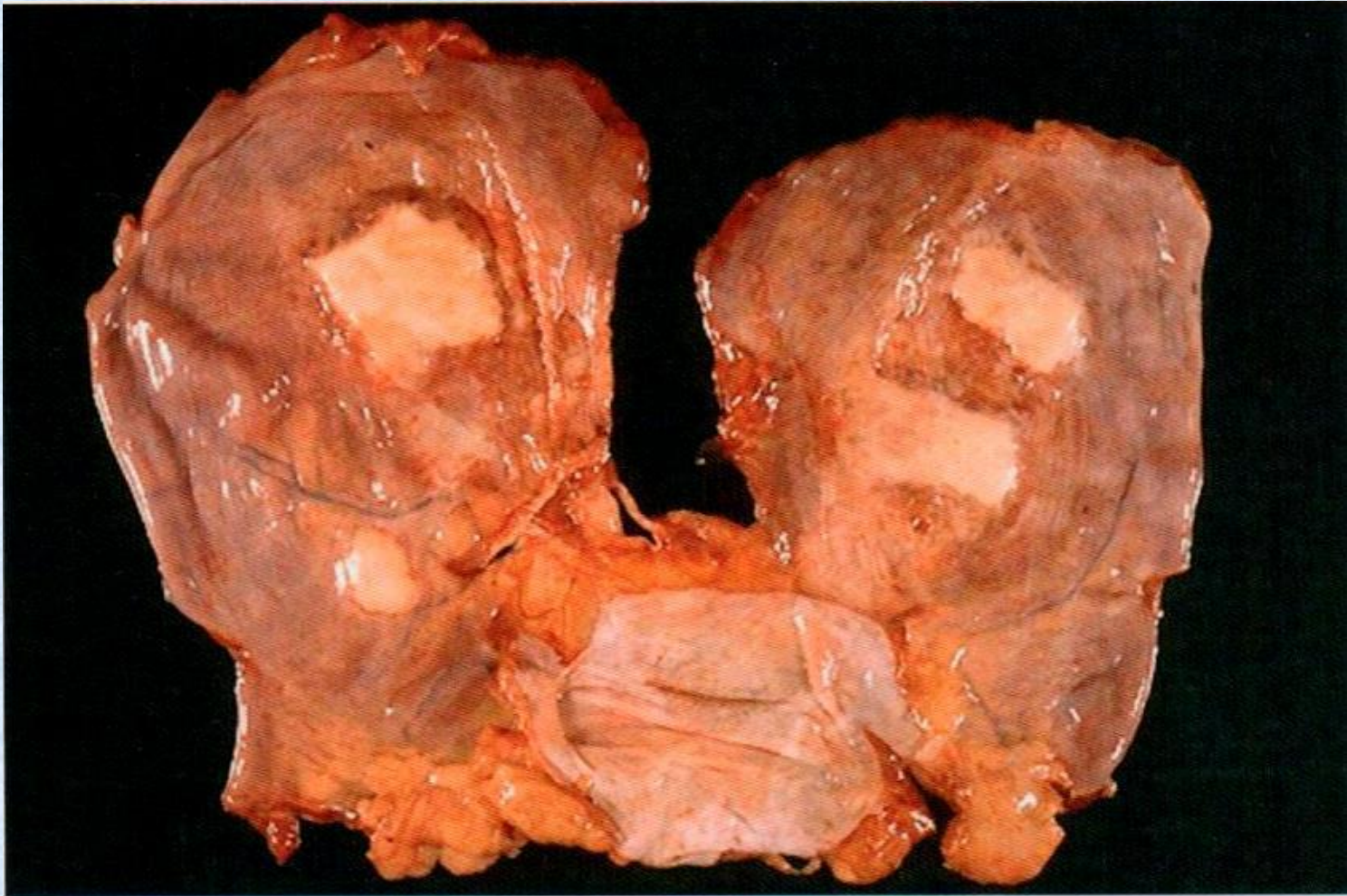
Diseases of Lung



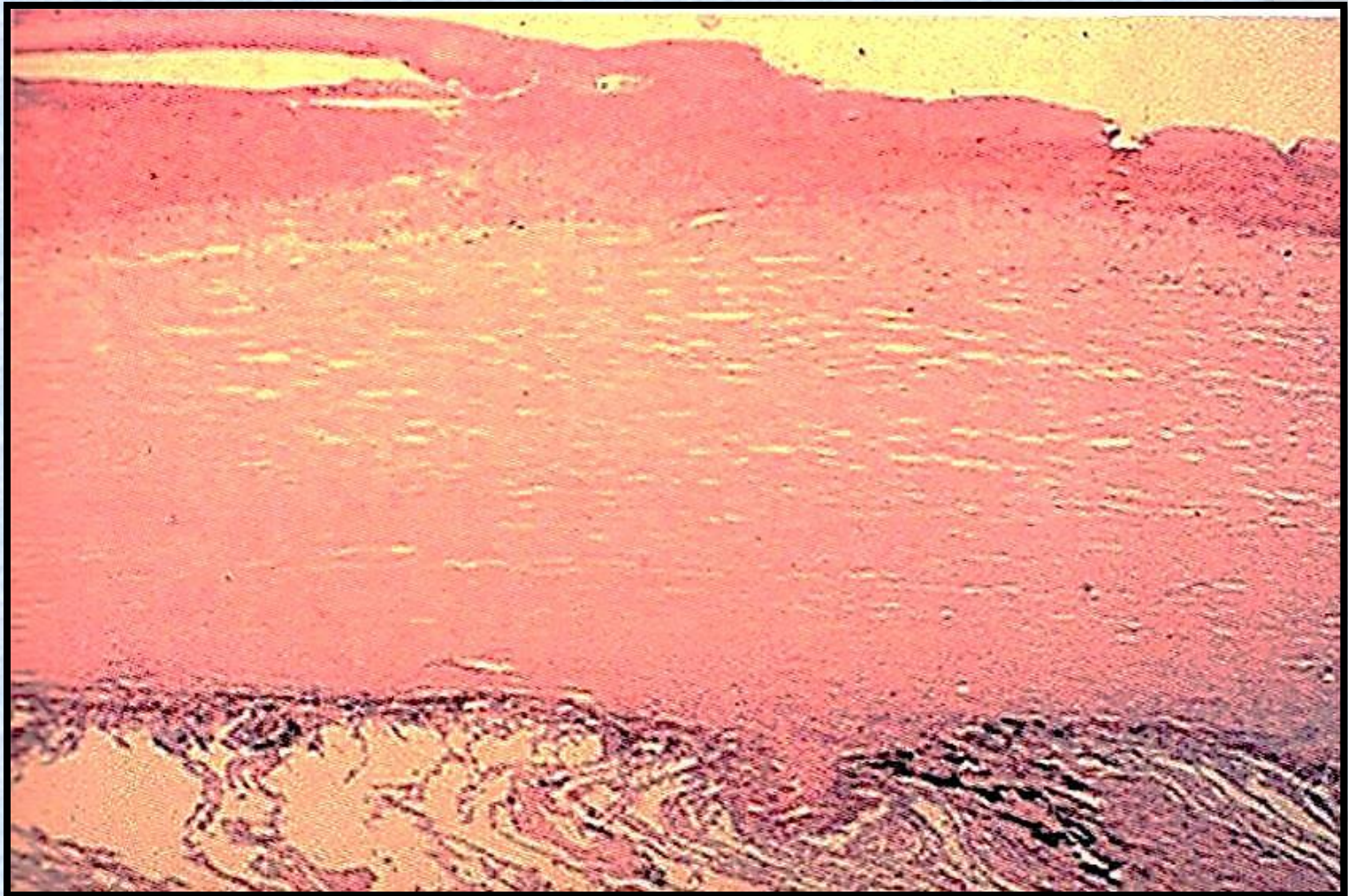
Asbestos bodies. Asbestos bodies are long, thin asbestos fibers coated with hemosiderin and protein to form brown filaments with a beaded or drumstick pattern.



Ferruginous bodies, microscopic

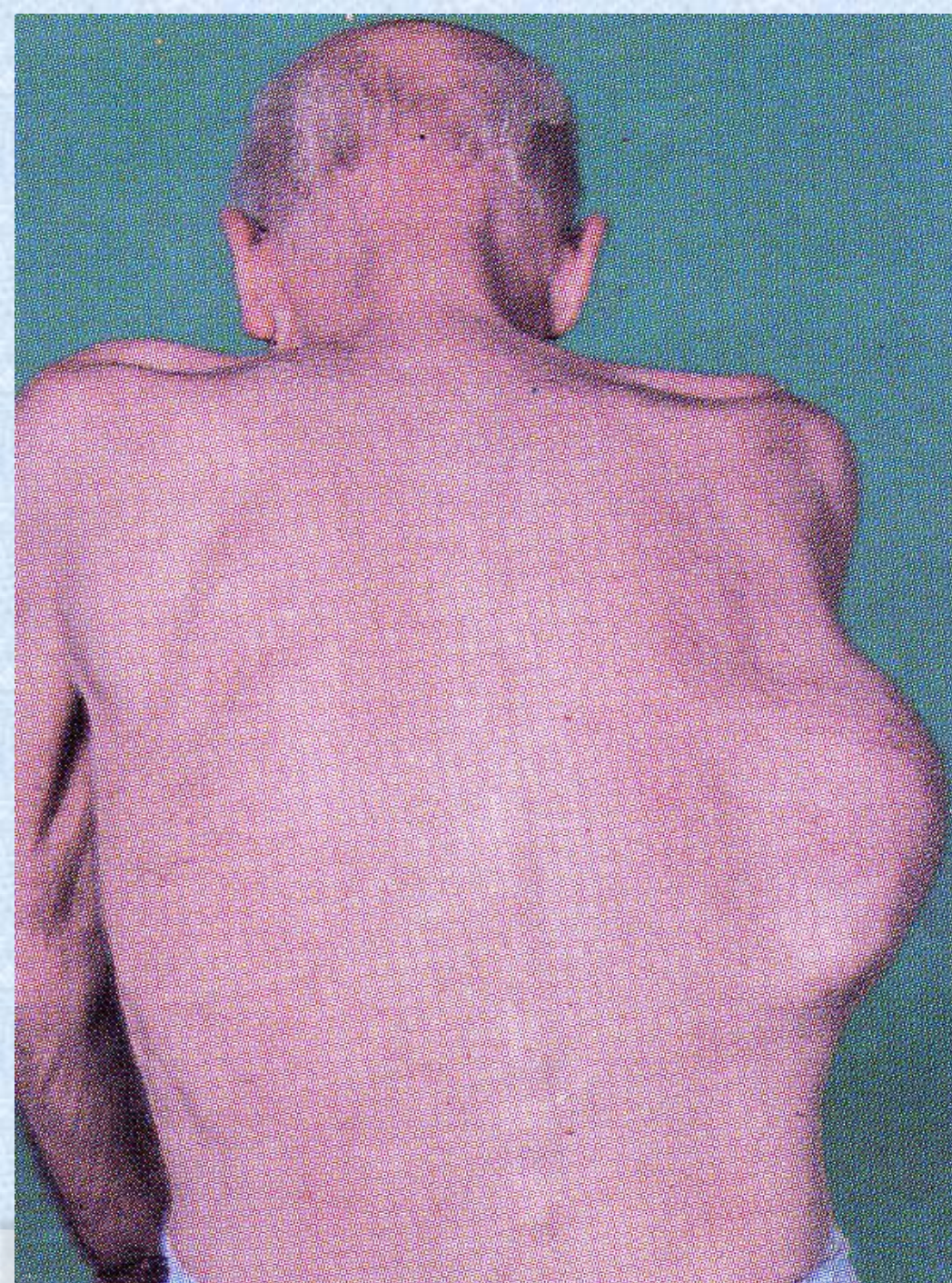


Pleural fibrous plaques, gross



Pleural fibrous plaques, microscopic

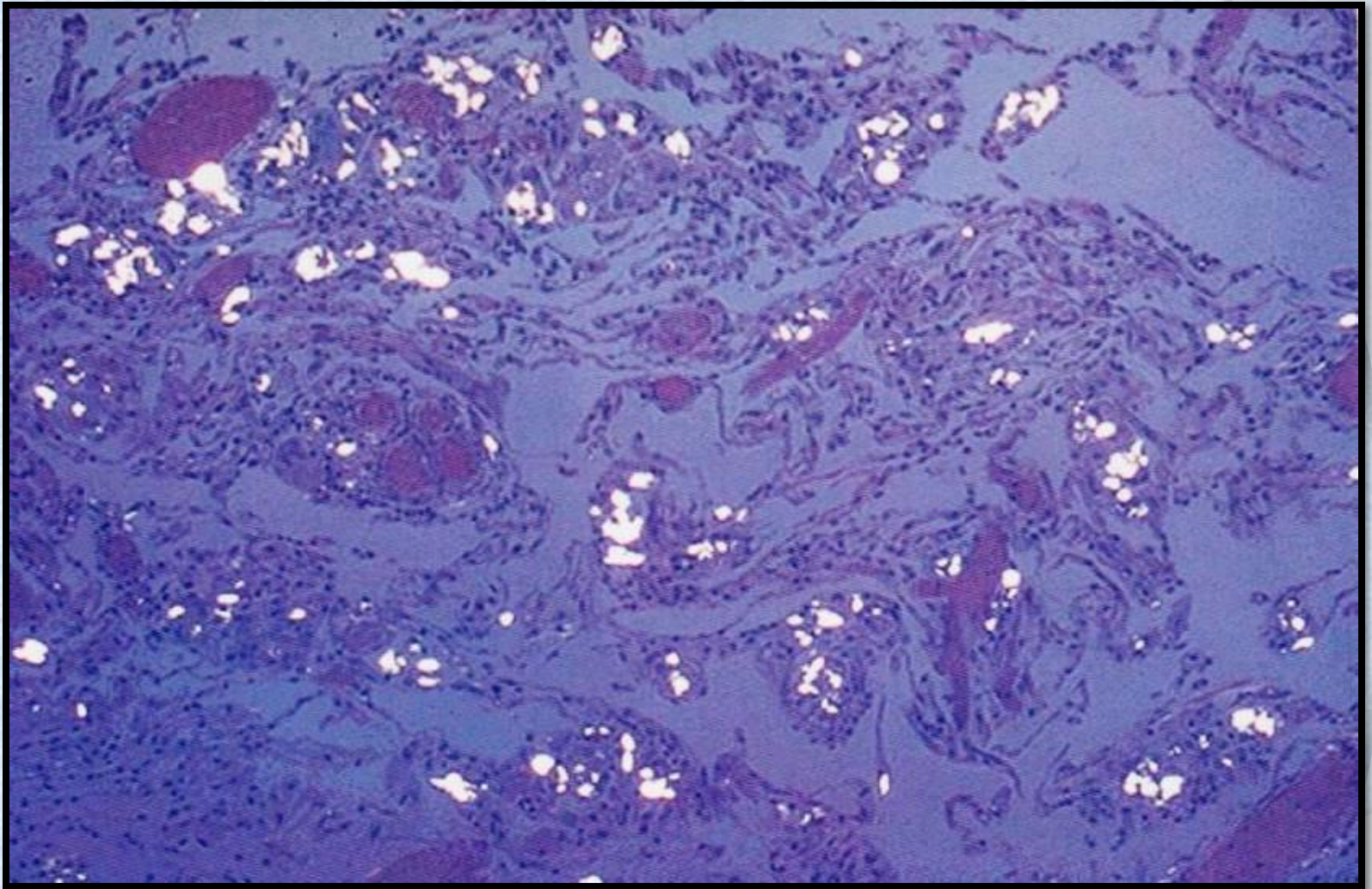
Mesothelioma. This patient presented with an asbestos link pleural plaque.



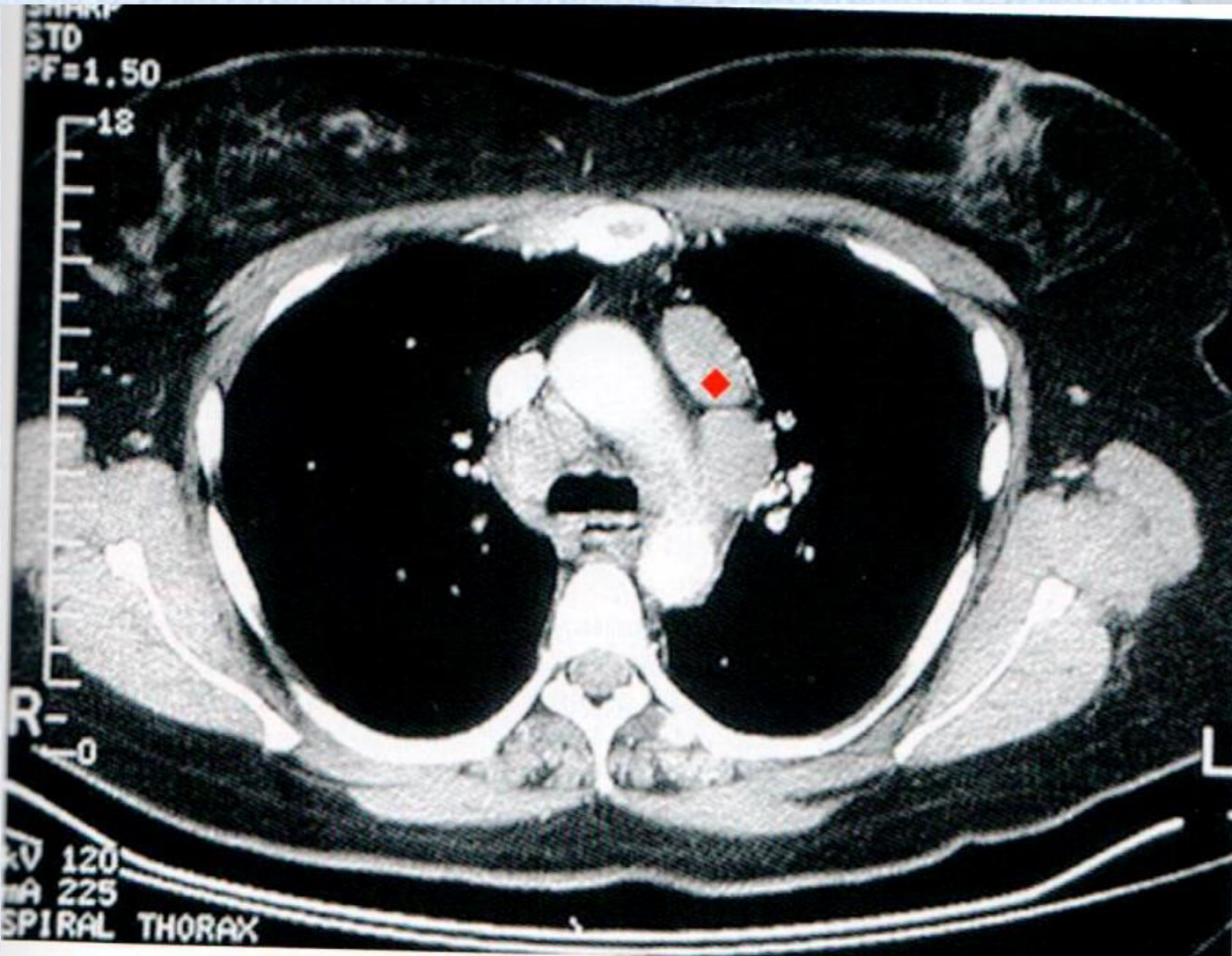
Diseases of Lung



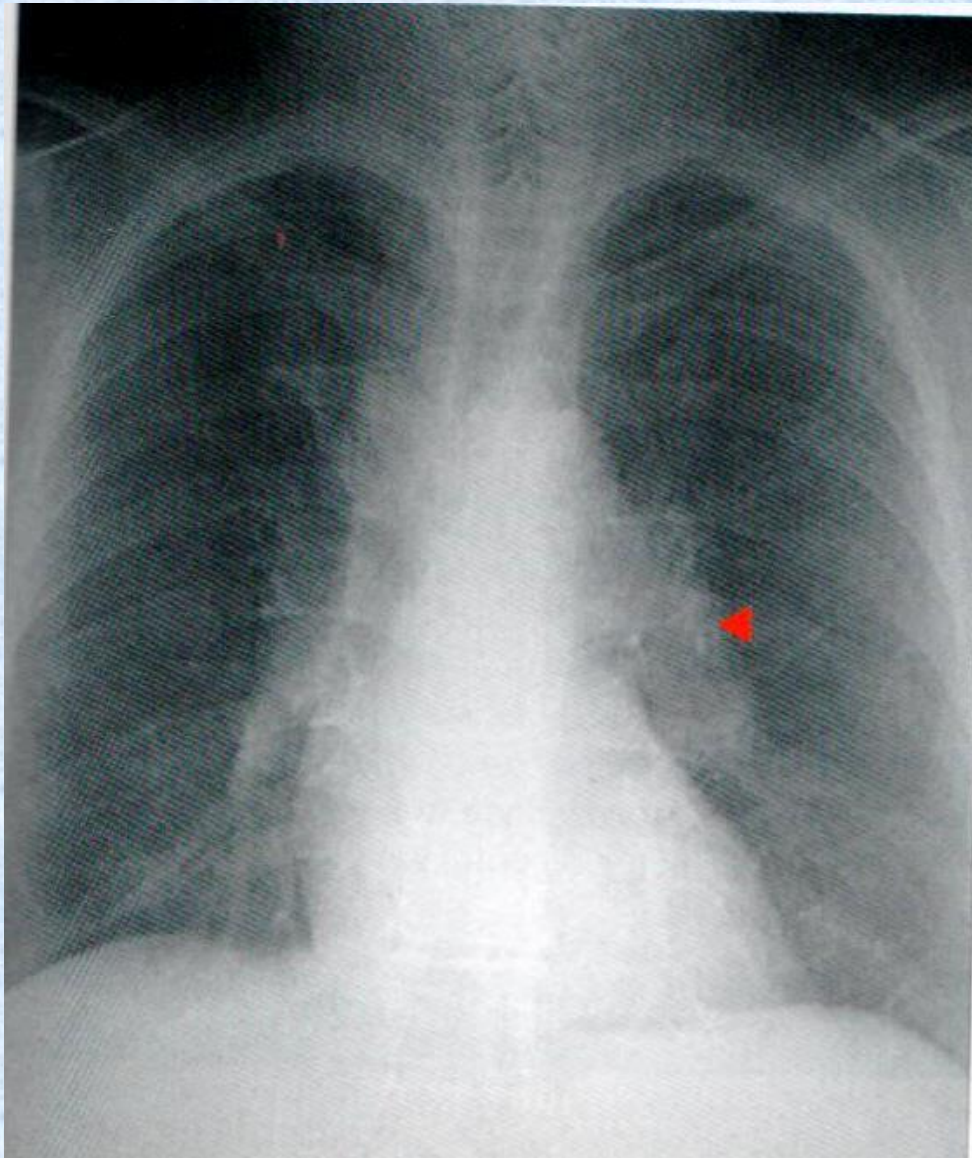
Pleural mesothelioma



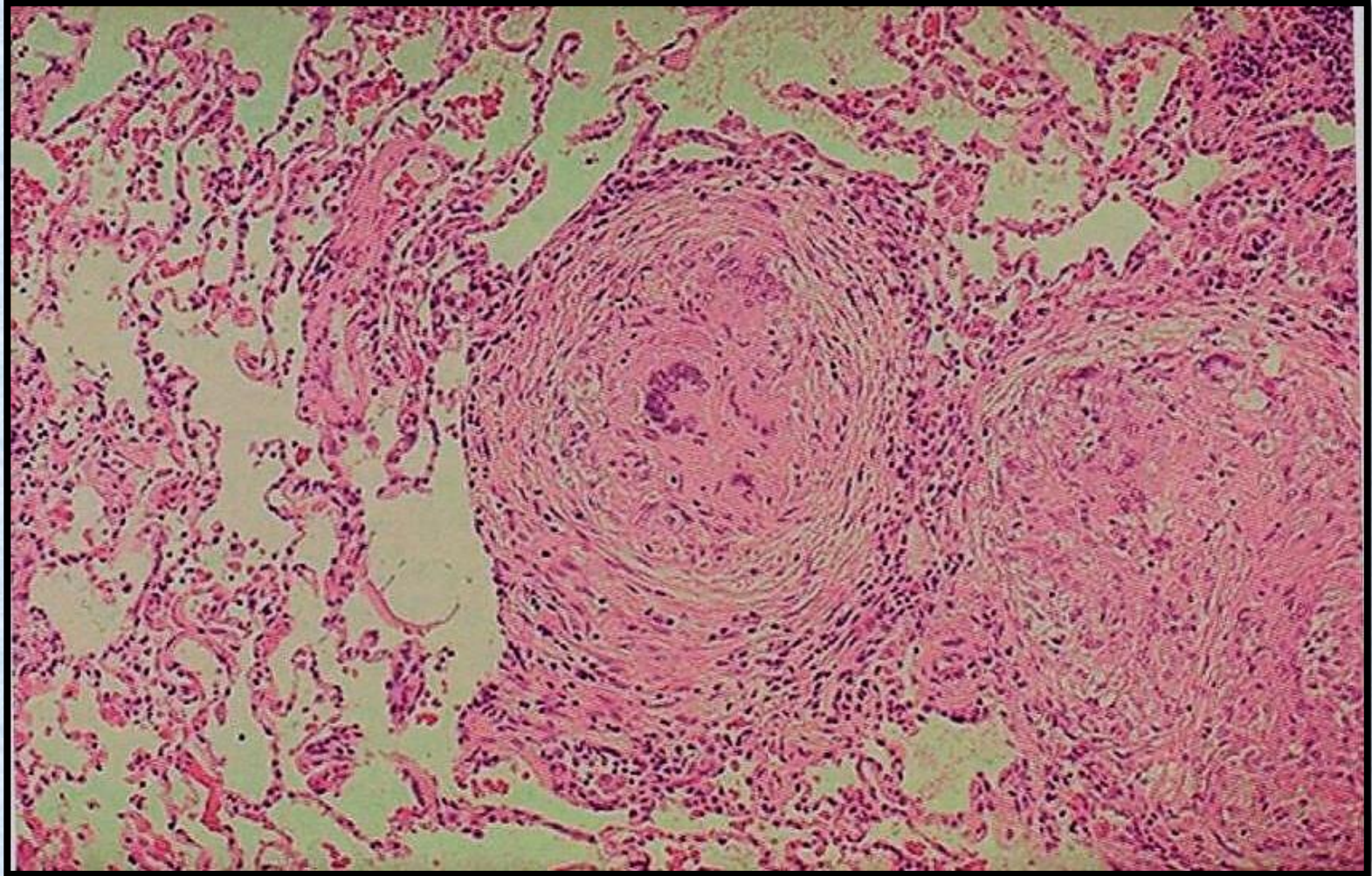
Injection drug use, microscopic



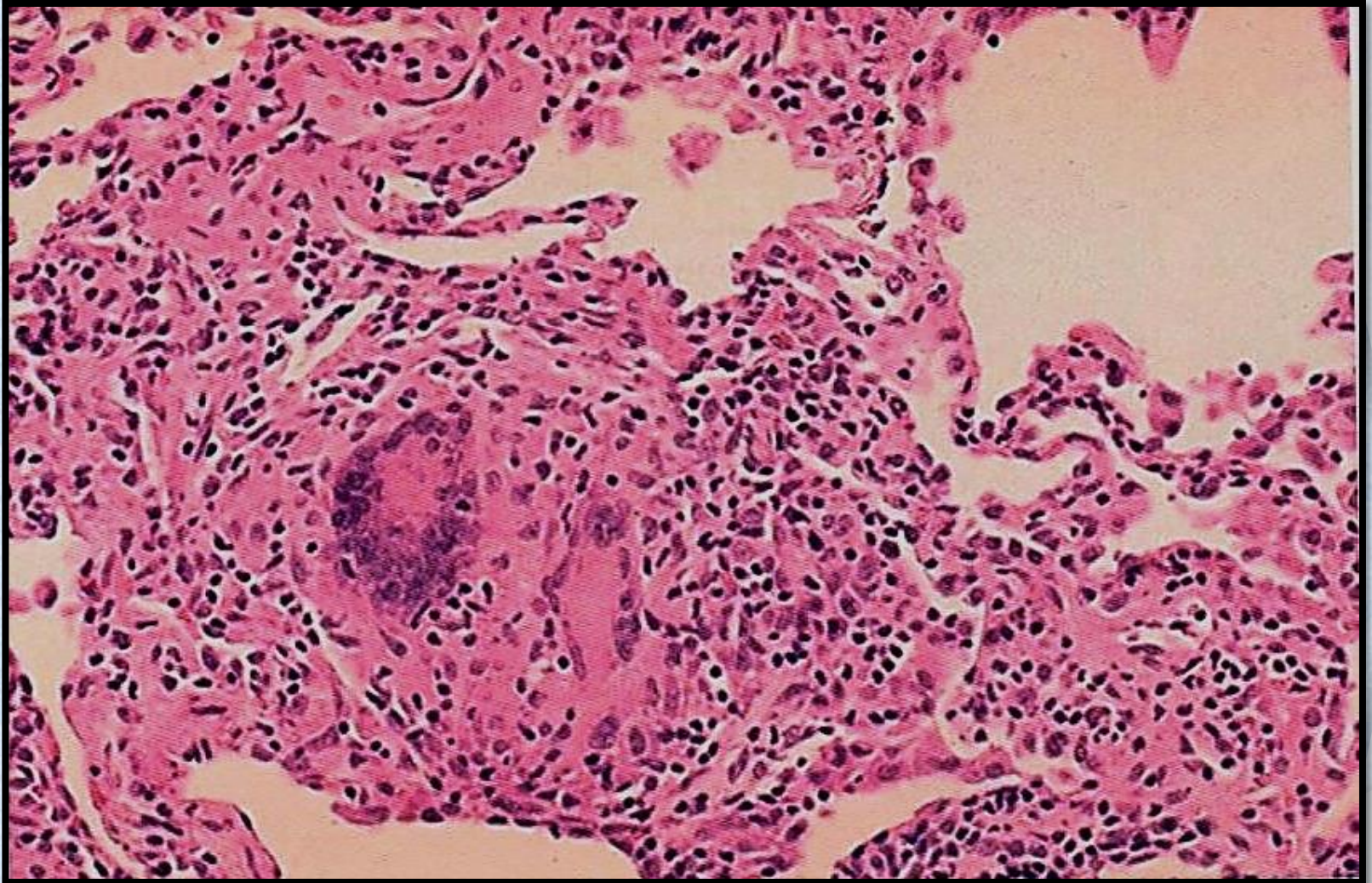
Sarcoidosis, CT image



Sarcoidosis, radiograph



Sarcoidosis, microscopic

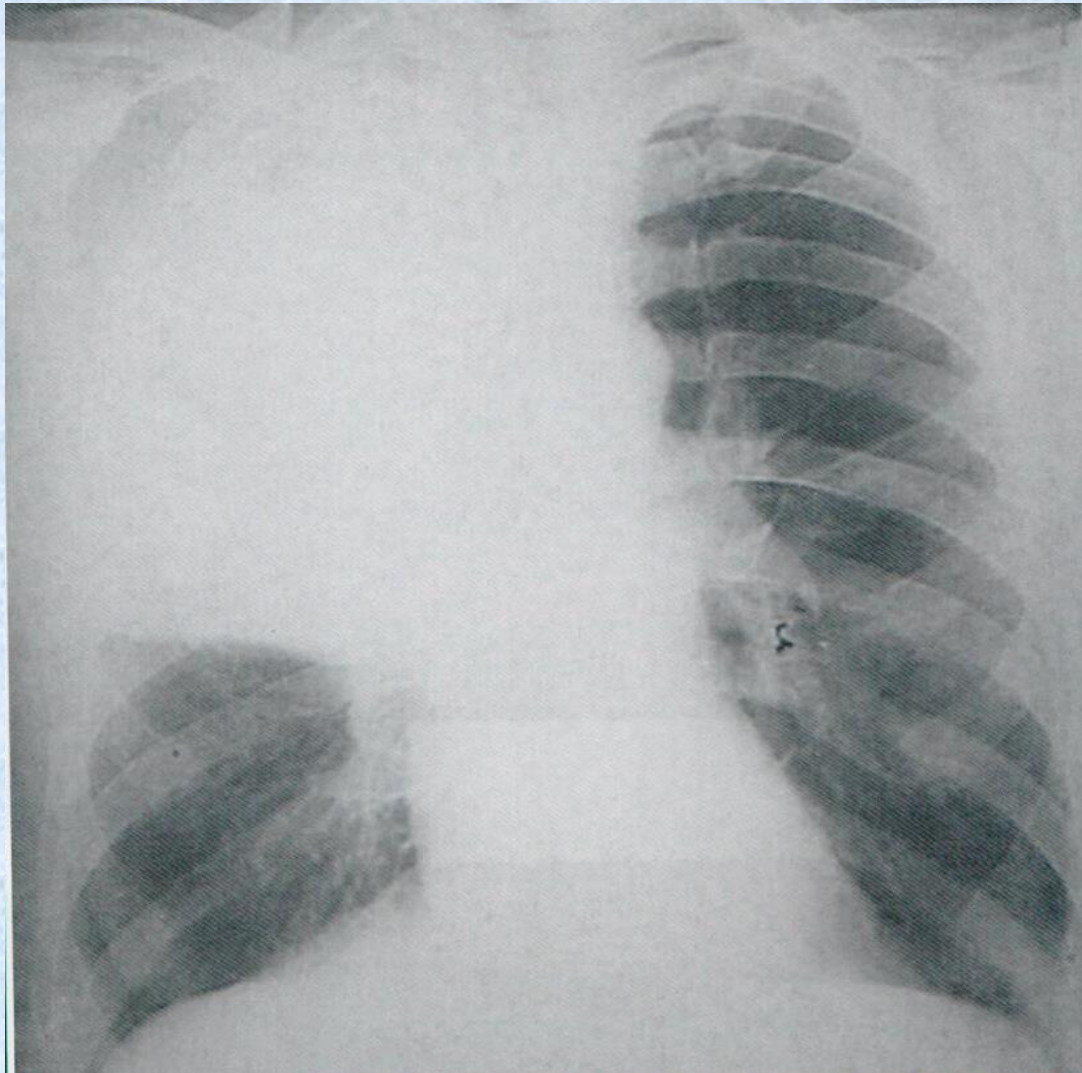


Hypersensitivity pneumonitis, microscopic



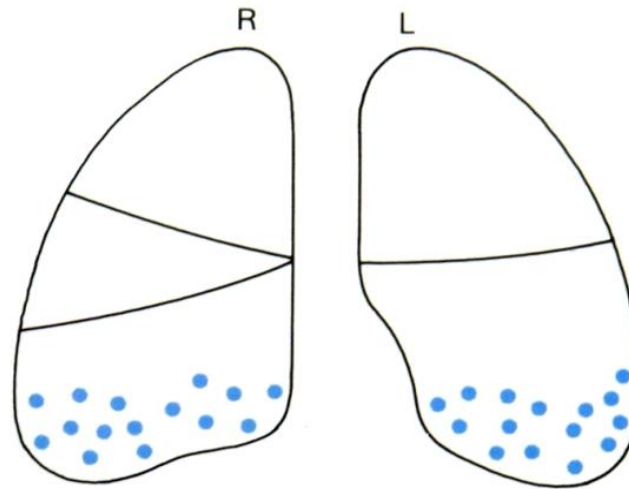
Diseases of the Respiratory System

Pulmonary Infections and Pneumonias

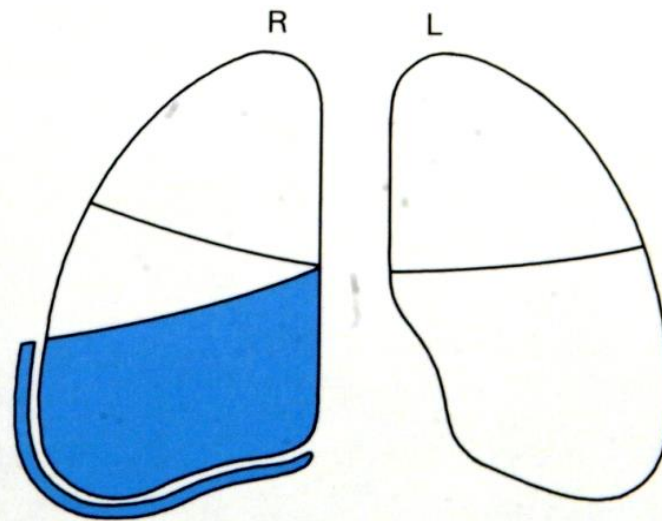


Bacterial pneumonia, radiograph

Diseases of Lung



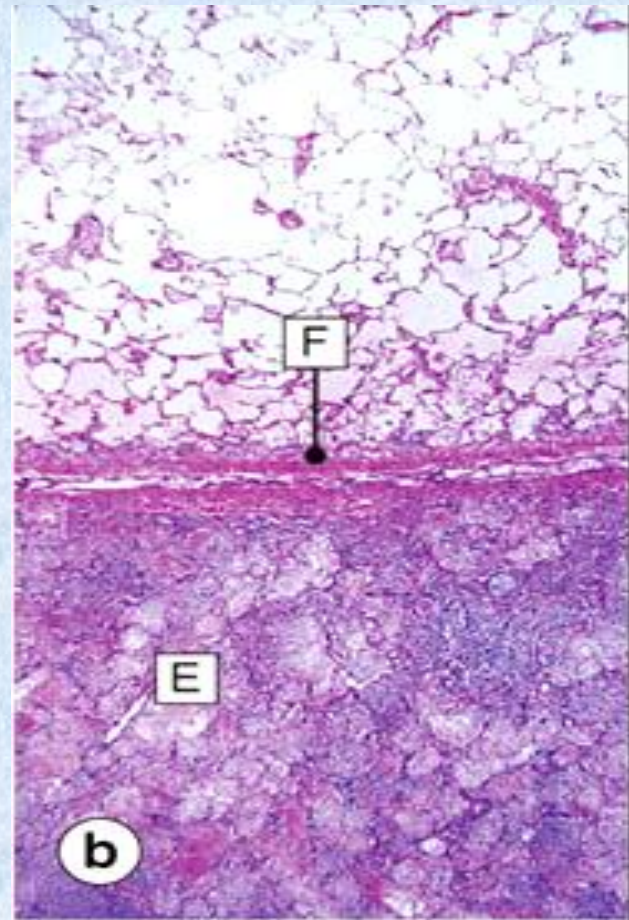
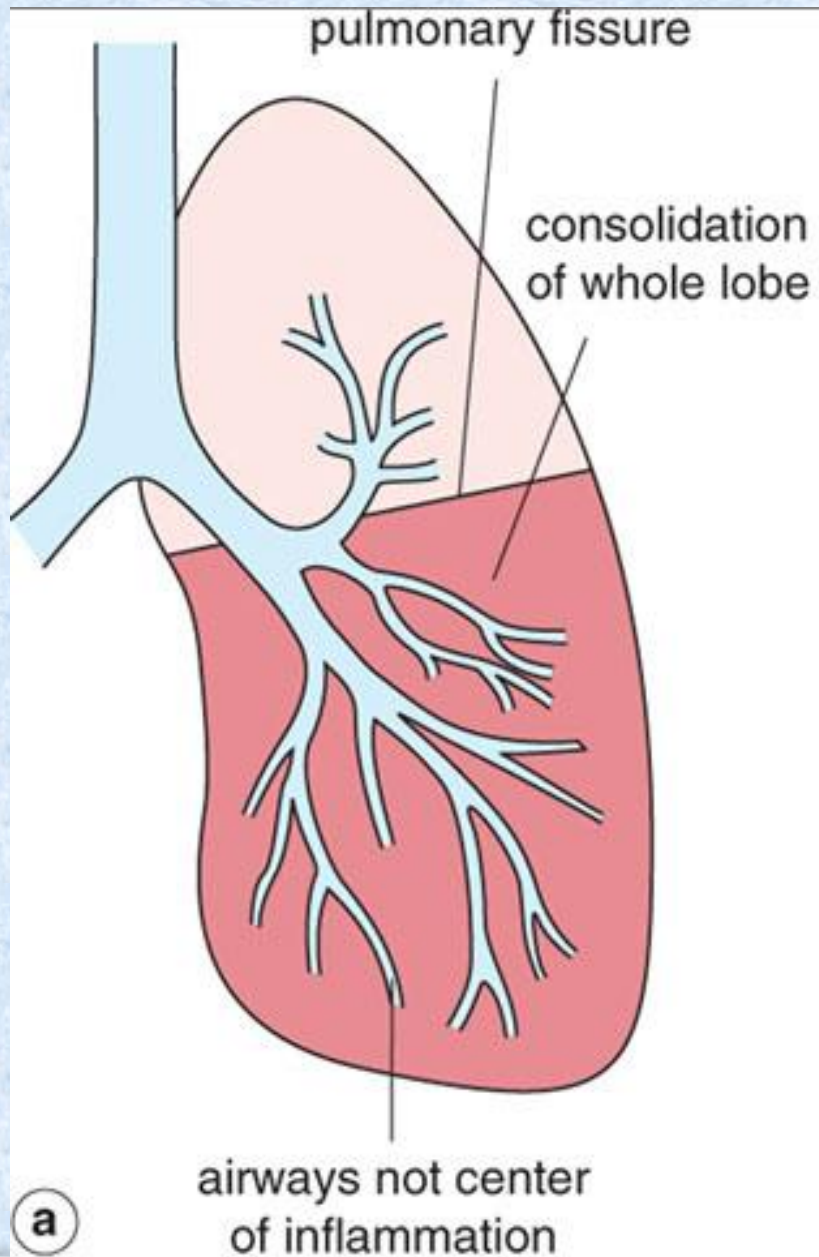
A. Bronchopneumonia



B. Lobar pneumonia

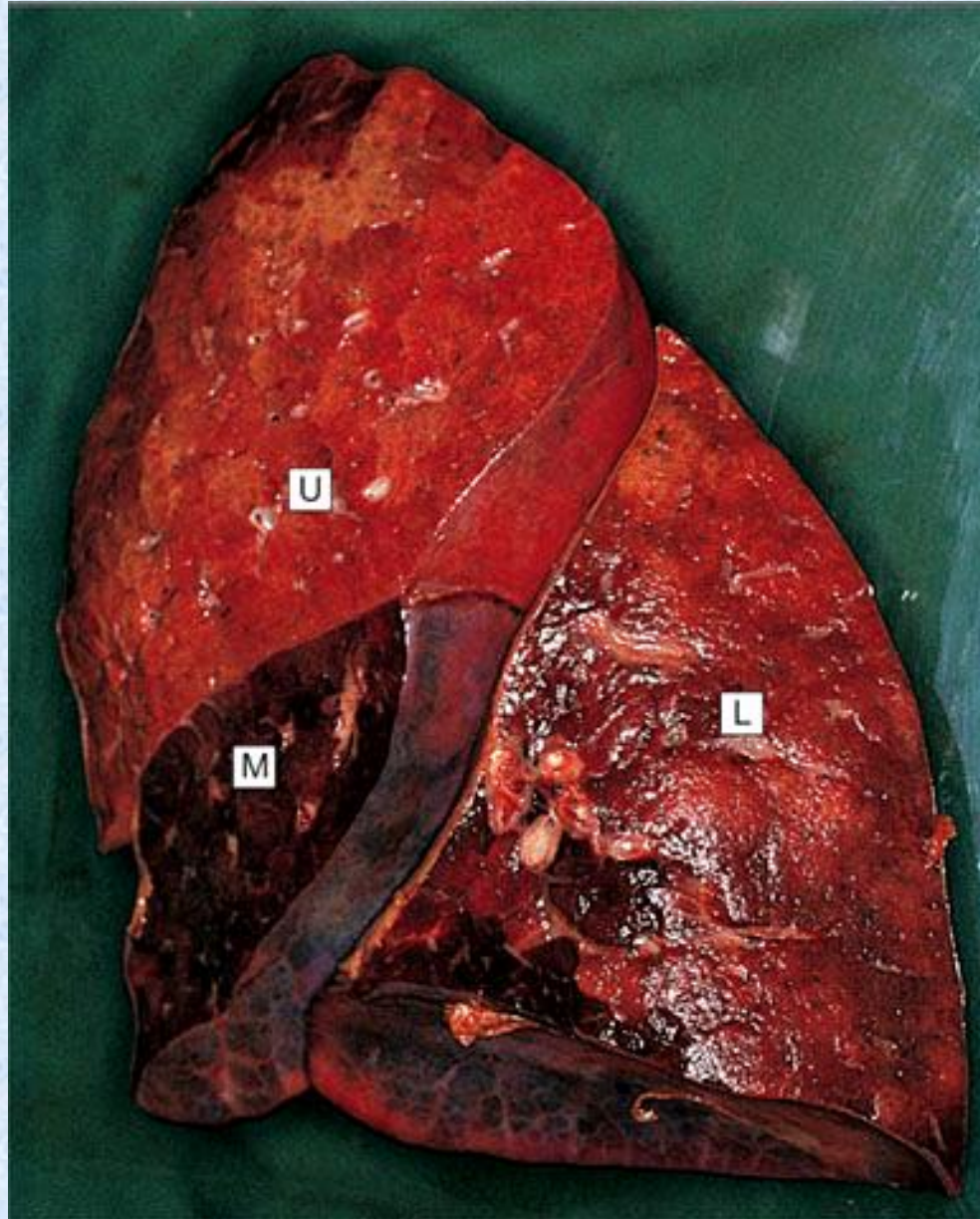
The distribution of lesions in lobar - and bronchopneumonia

Diseases of Lung



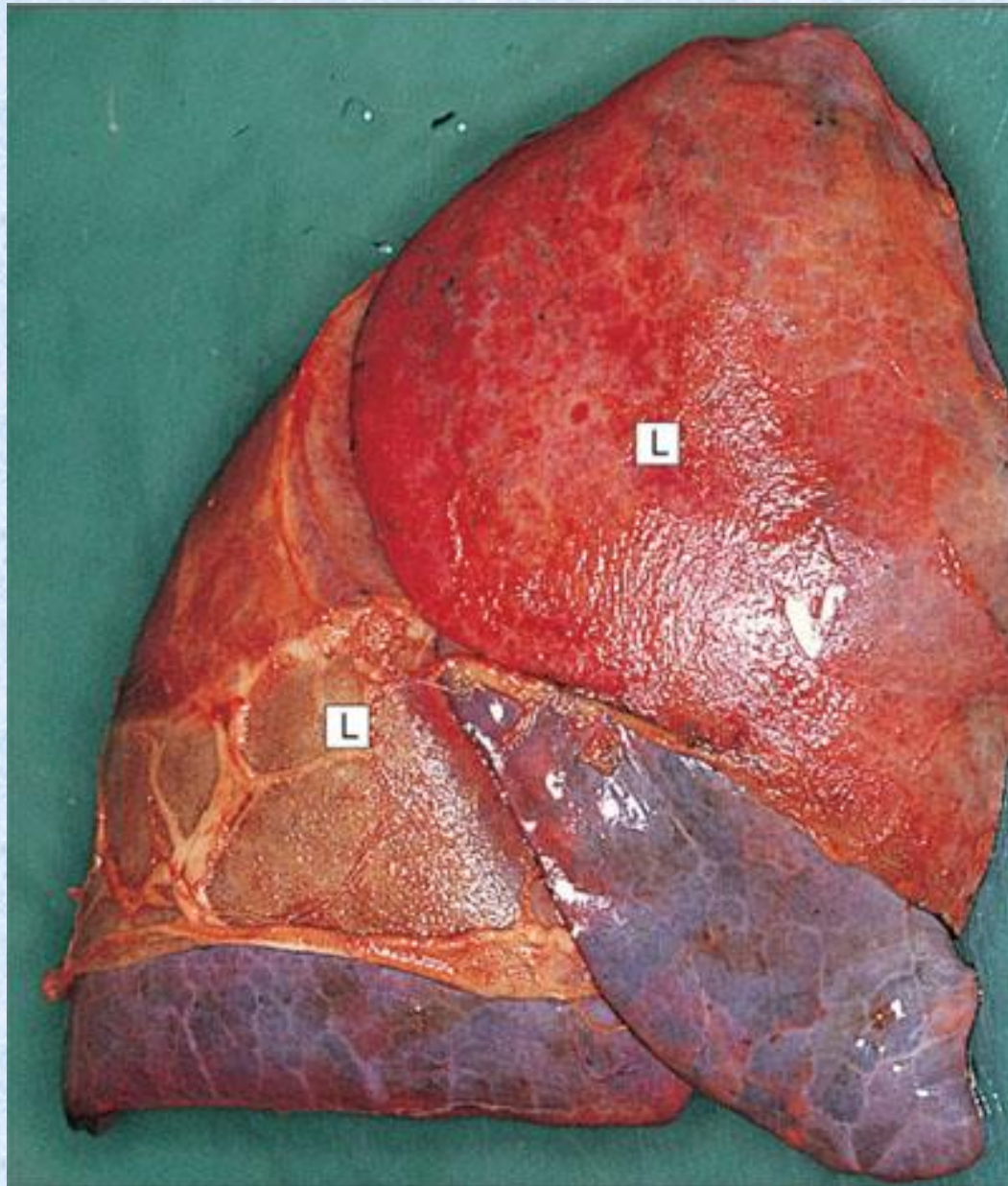
Lobar pneumonia.

Diseases of Lung

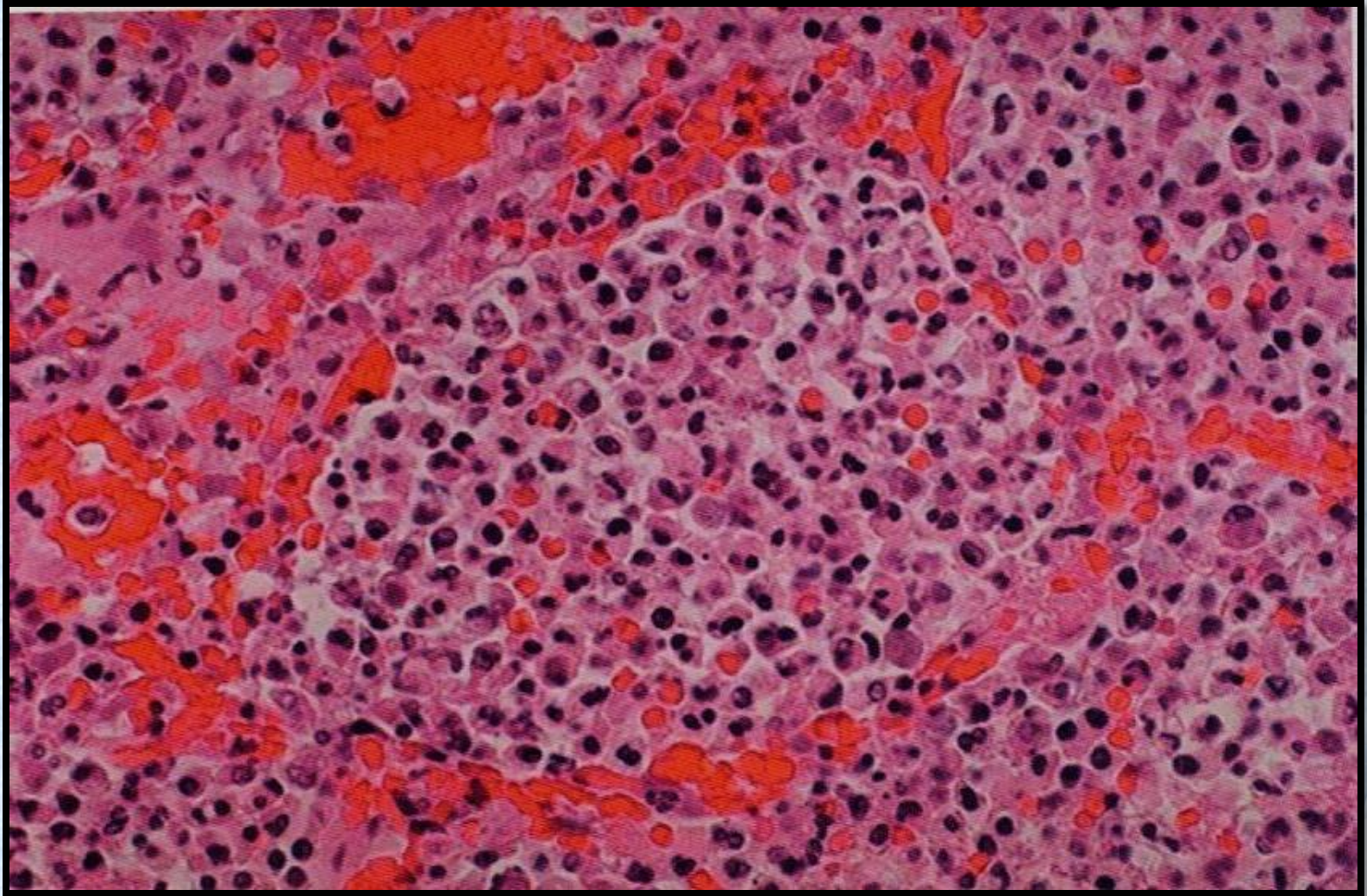


Lobar pneumonia. The upper (U) and lower (L) lobes are consolidated compared to the congested but uninvolved middle lobe (M).

Diseases of Lung



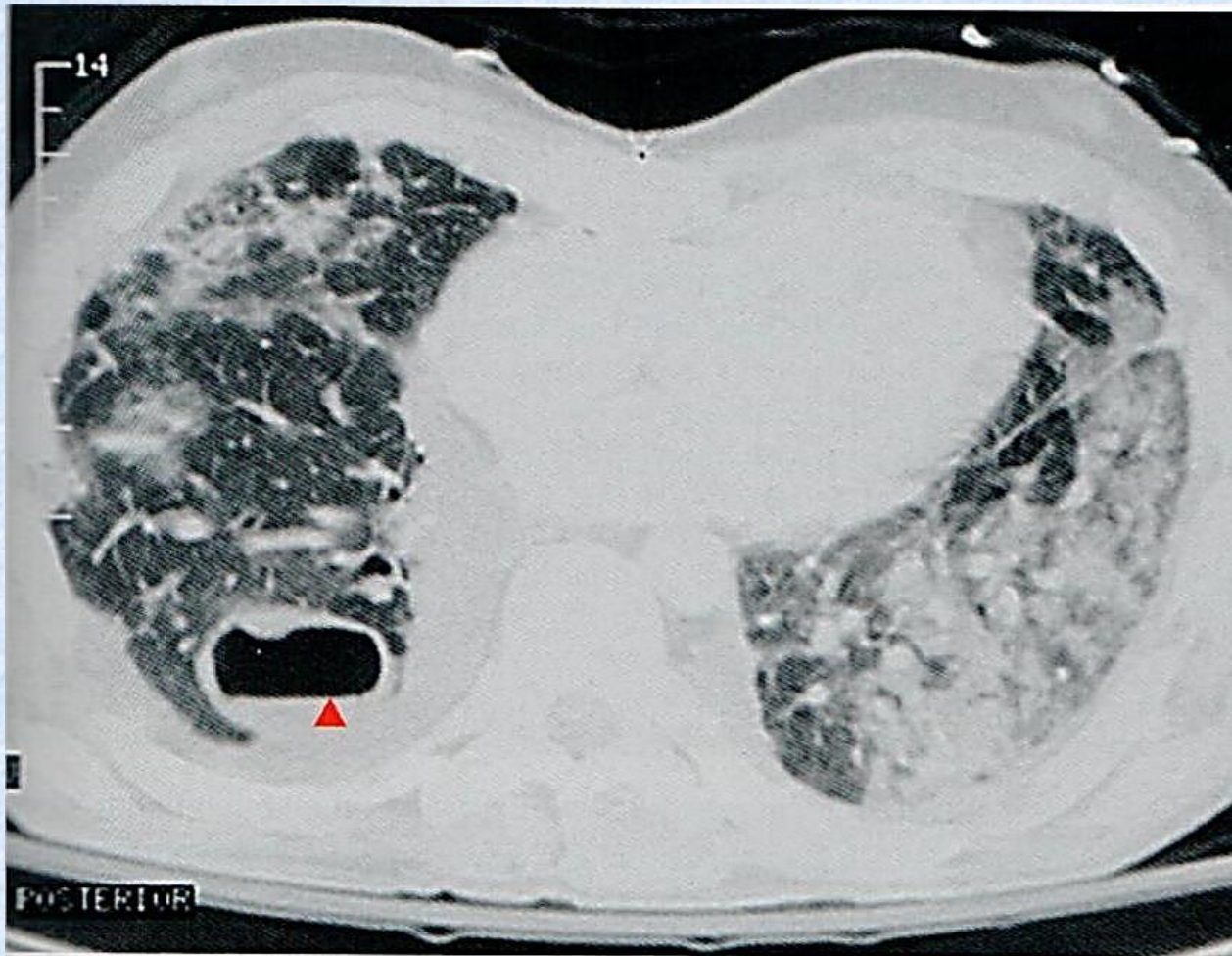
Acute pleurisy in lobar pneumonia. The pleural surfaces over consolidated lobes (L) are covered by a patchy, white, fibrinous exudate, causing acute pleurisy.



Bacterial pneumonia, microscopic



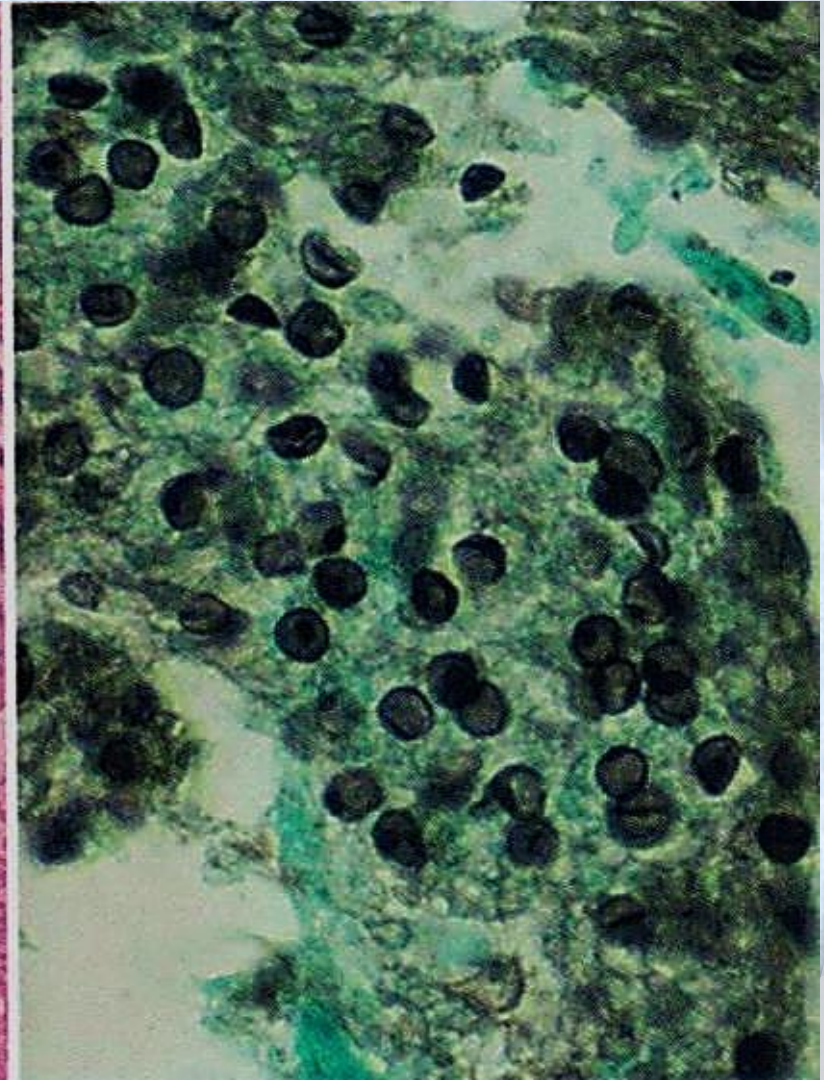
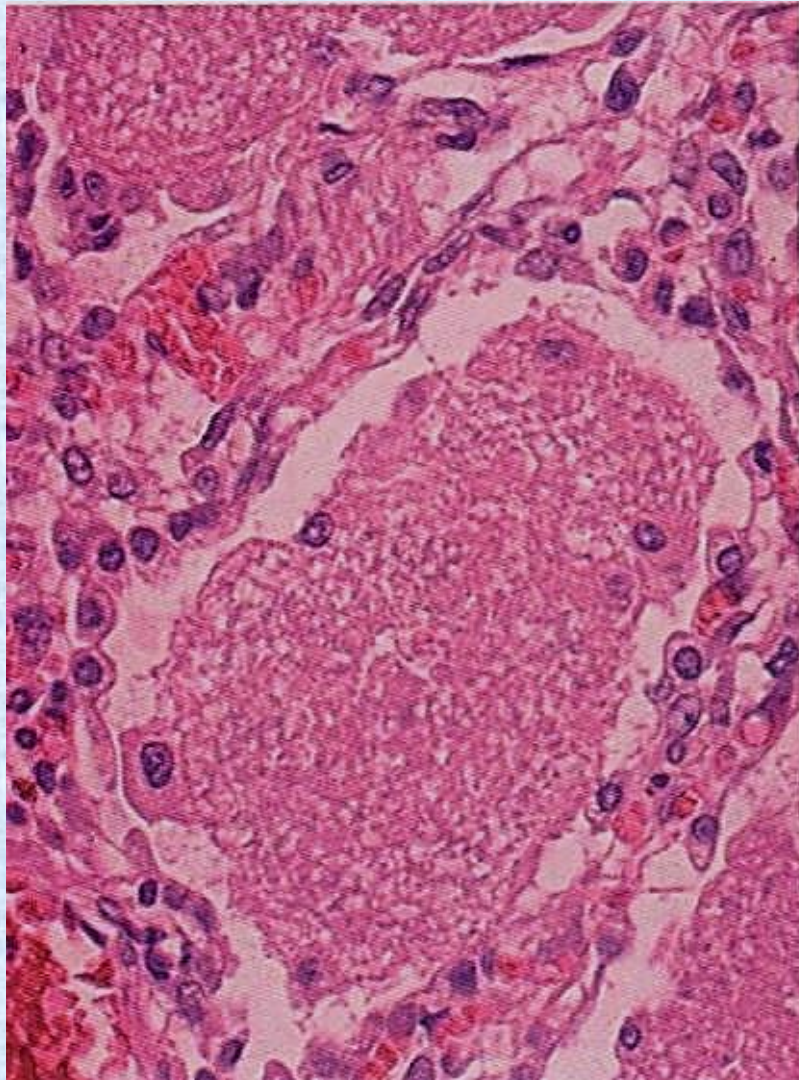
Lung abscesses, gross



Lung abscess, CT image

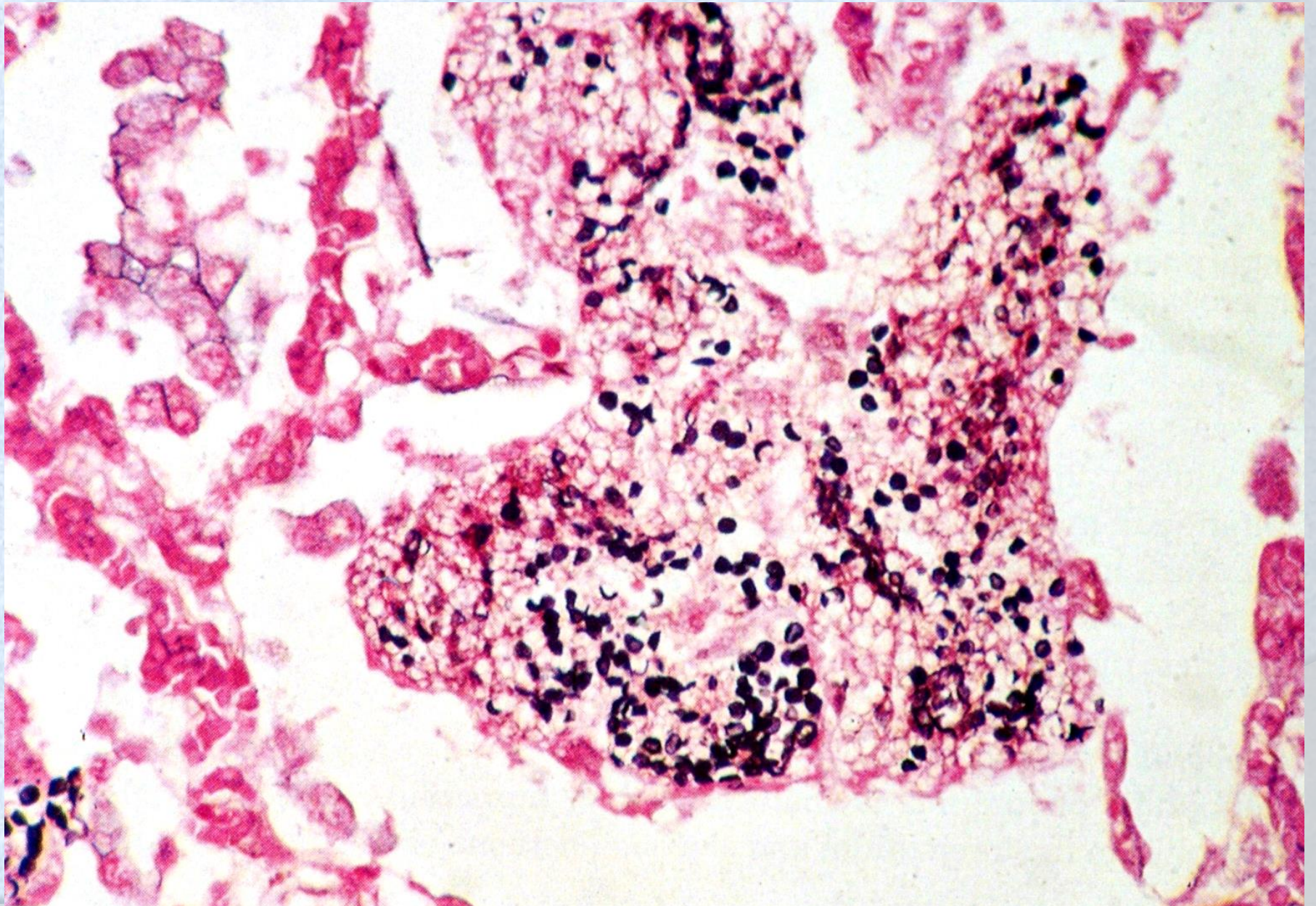


Empyema, gross

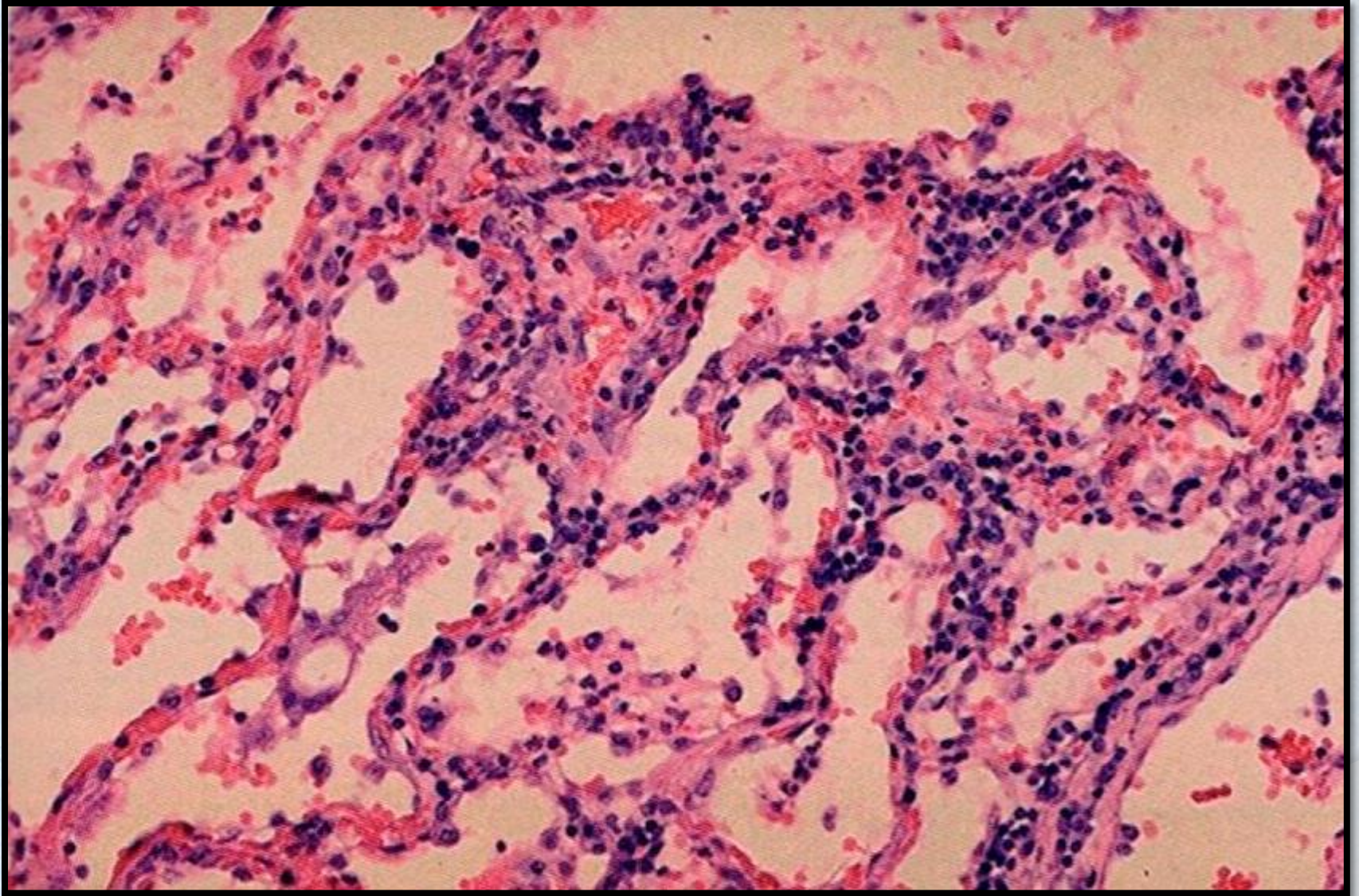


Pneumocystic pneumonia, microscopic

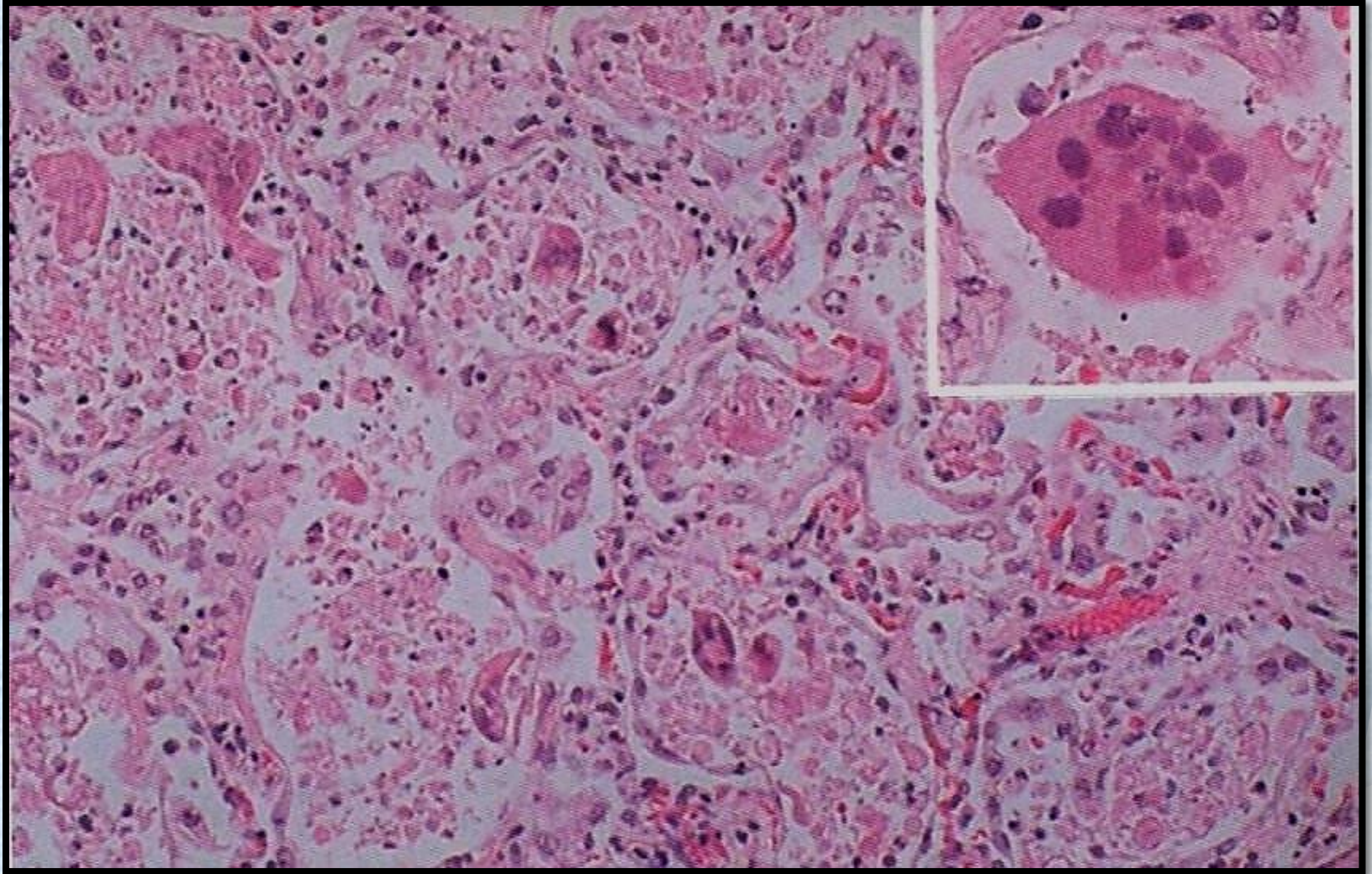
Diseases of Lung



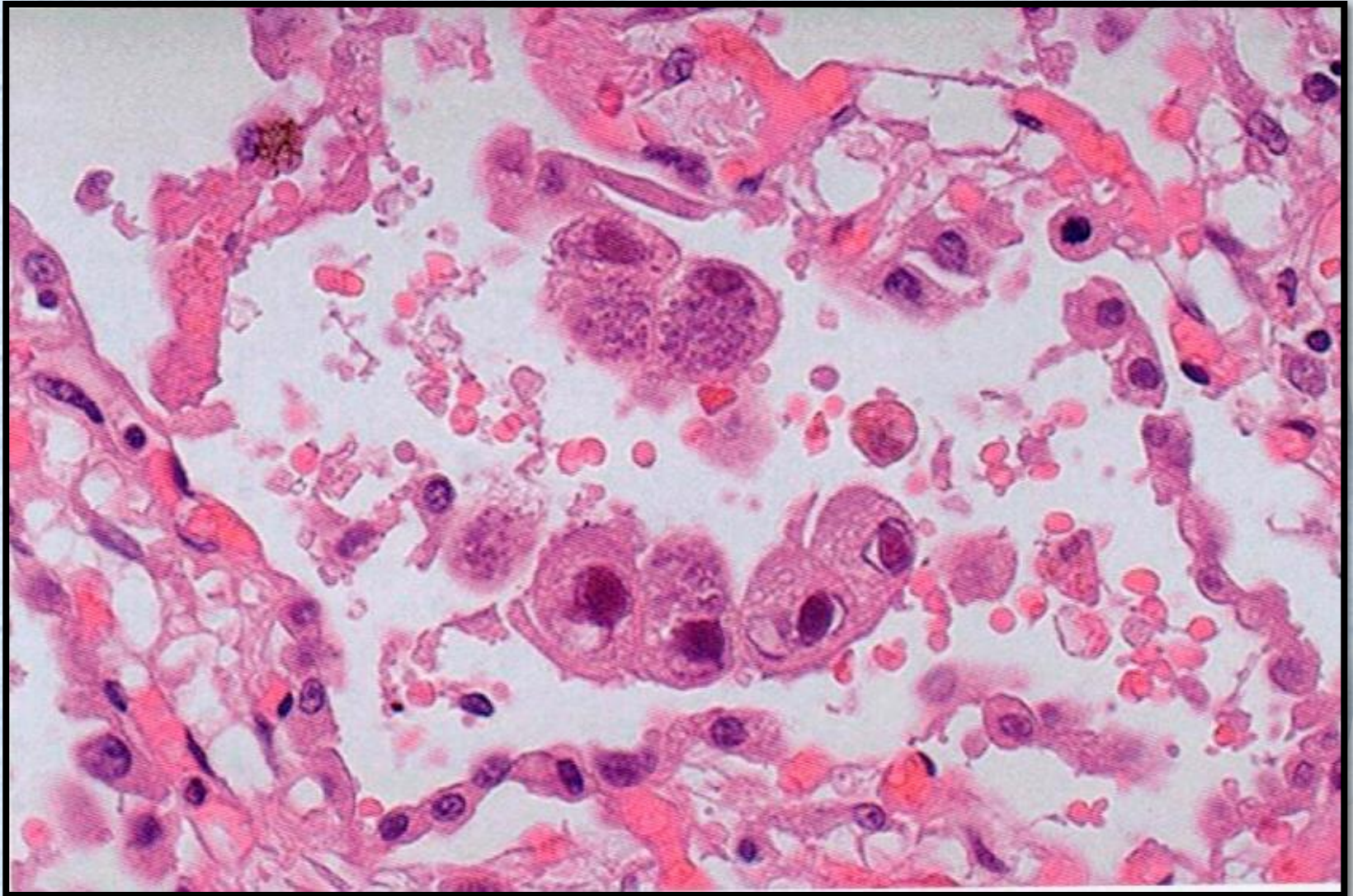
Pneumocystis carinii



Viral pneumonia, microscopic

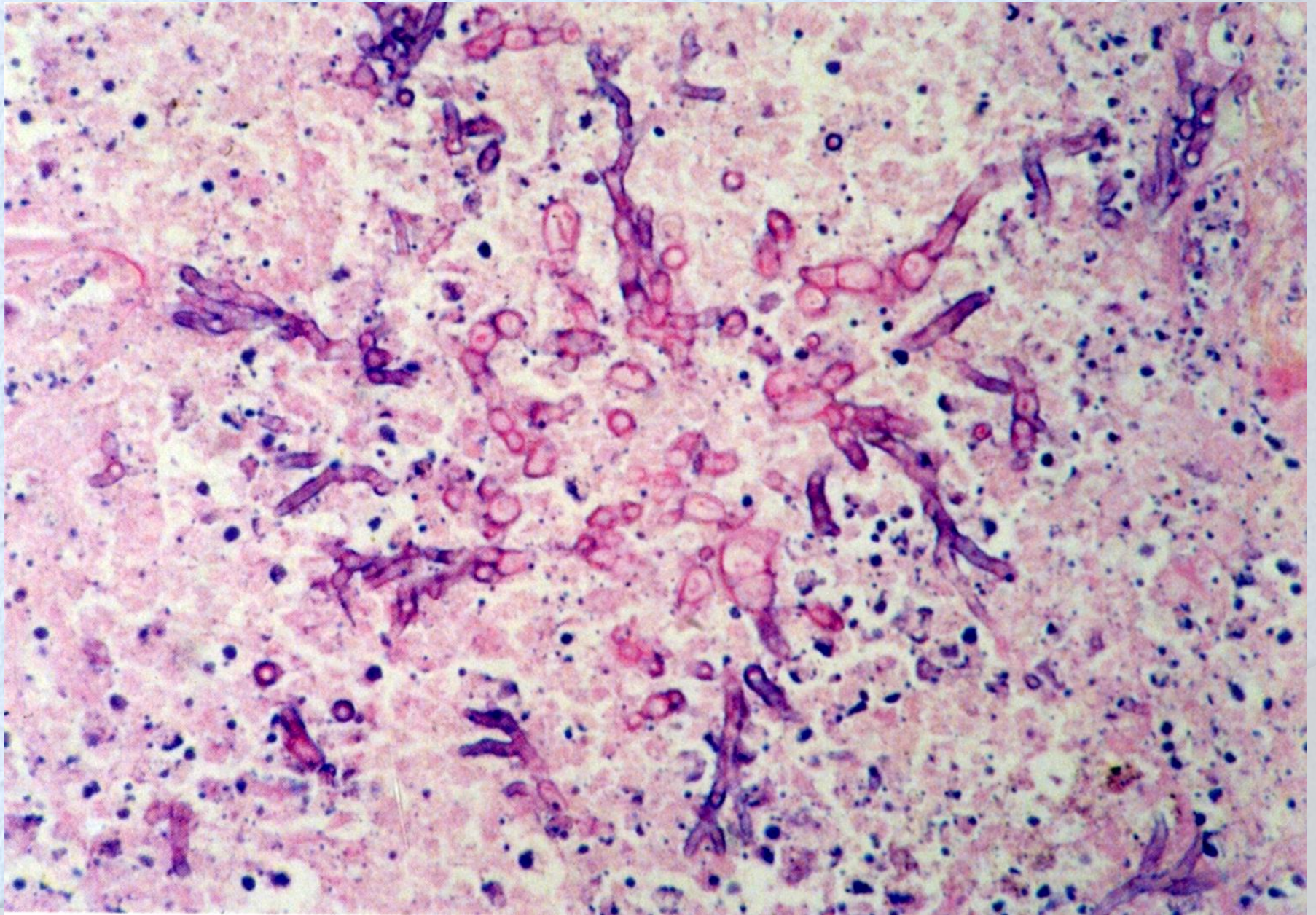


Respiratory syncytial virus pneumonia, microscopic



Cytomegalovirus pneumonia, microscopic

Diseases of Lung

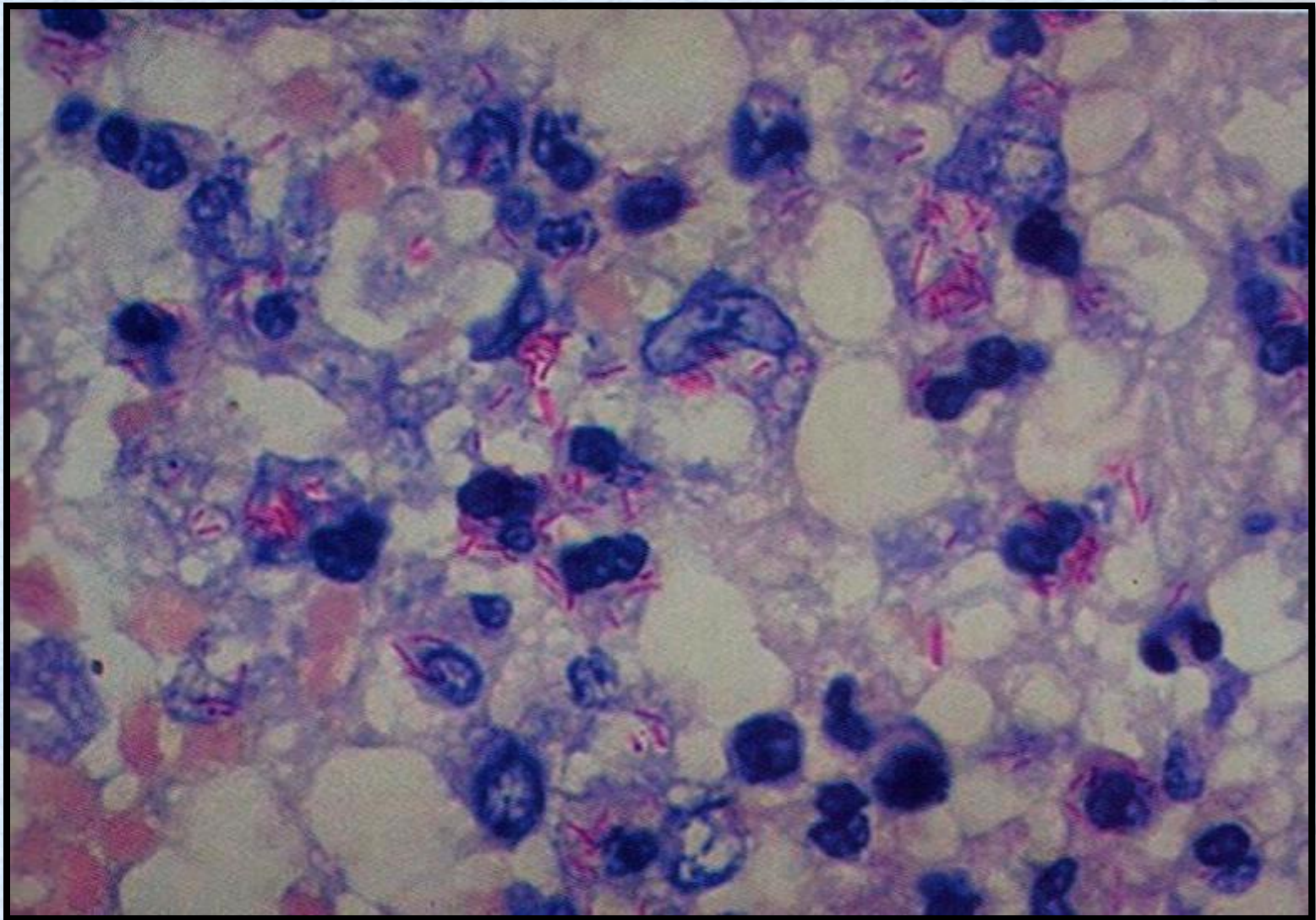


Fungal pneumonia



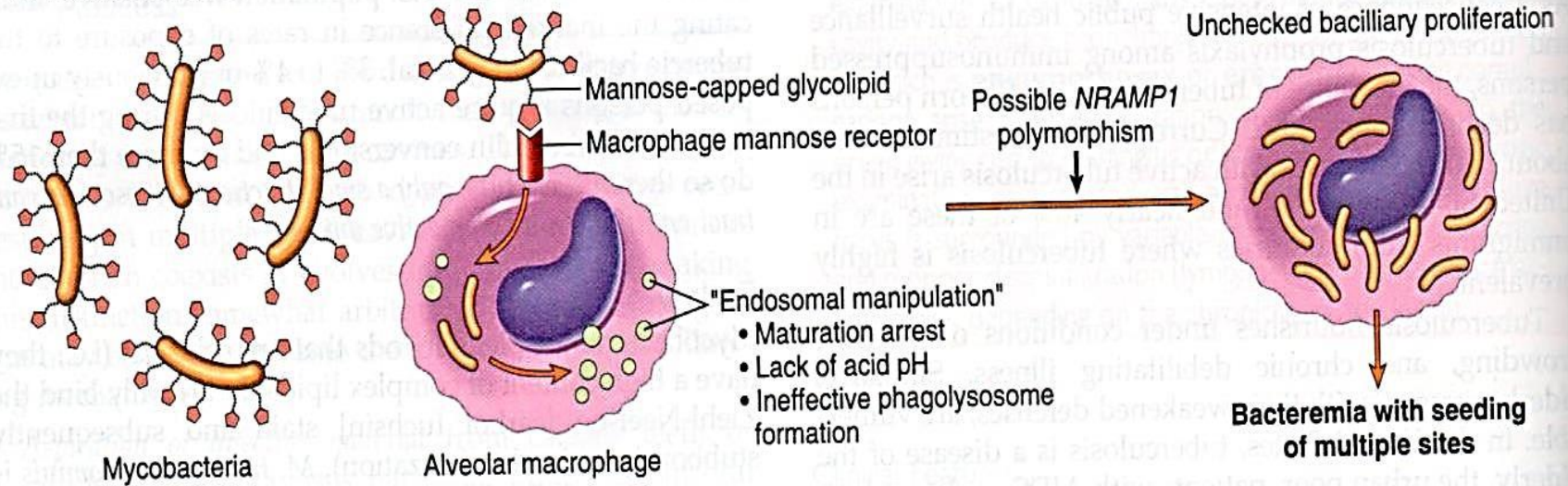
Diseases of the Respiratory System

Pathology of tuberculosis



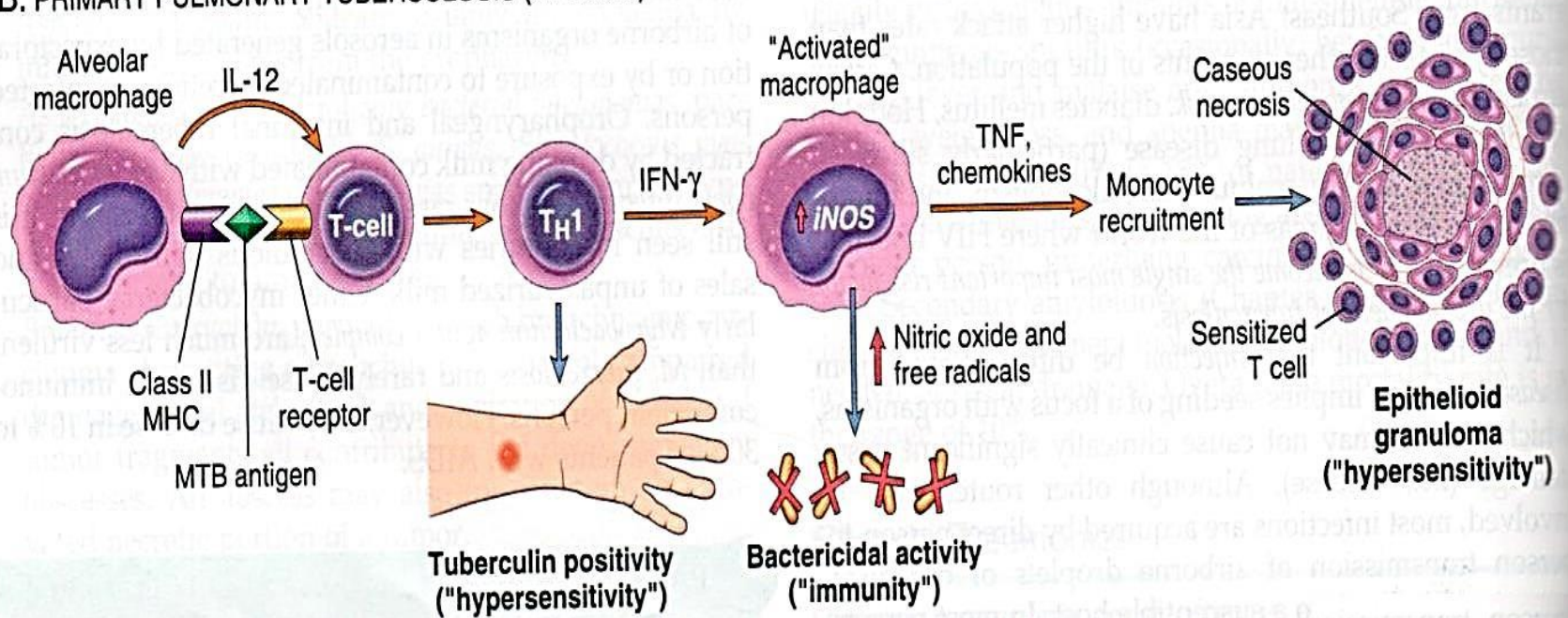
Acid-fast bacilli, microscopic

A. PRIMARY PULMONARY TUBERCULOSIS (0-3 weeks)

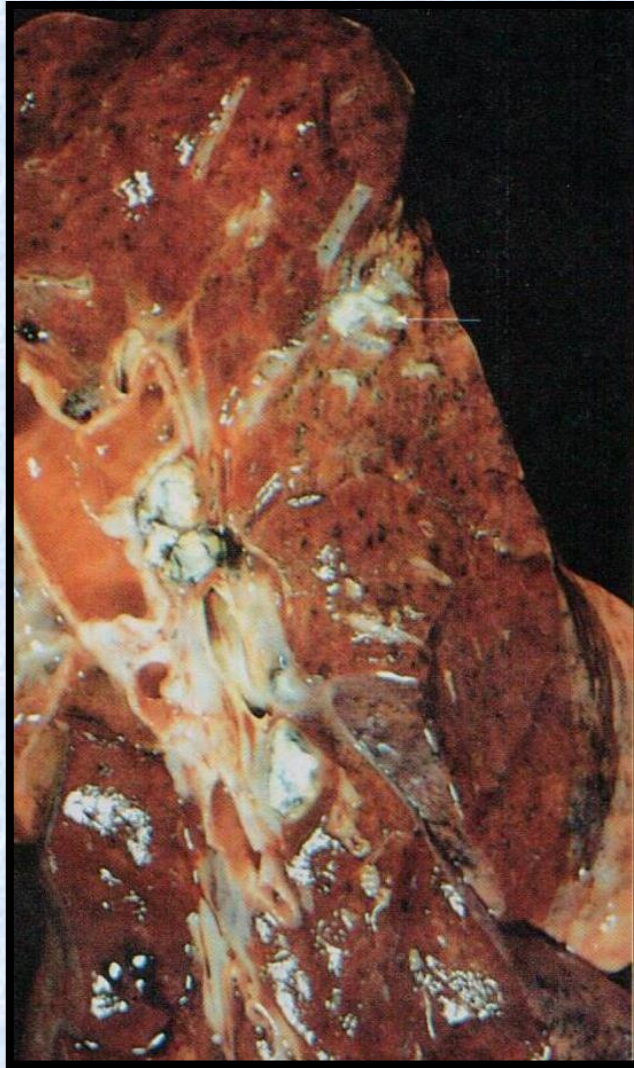


Sequence of events in the natural history of primary pulmonary tuberculosis

B. PRIMARY PULMONARY TUBERCULOSIS (>3 weeks)



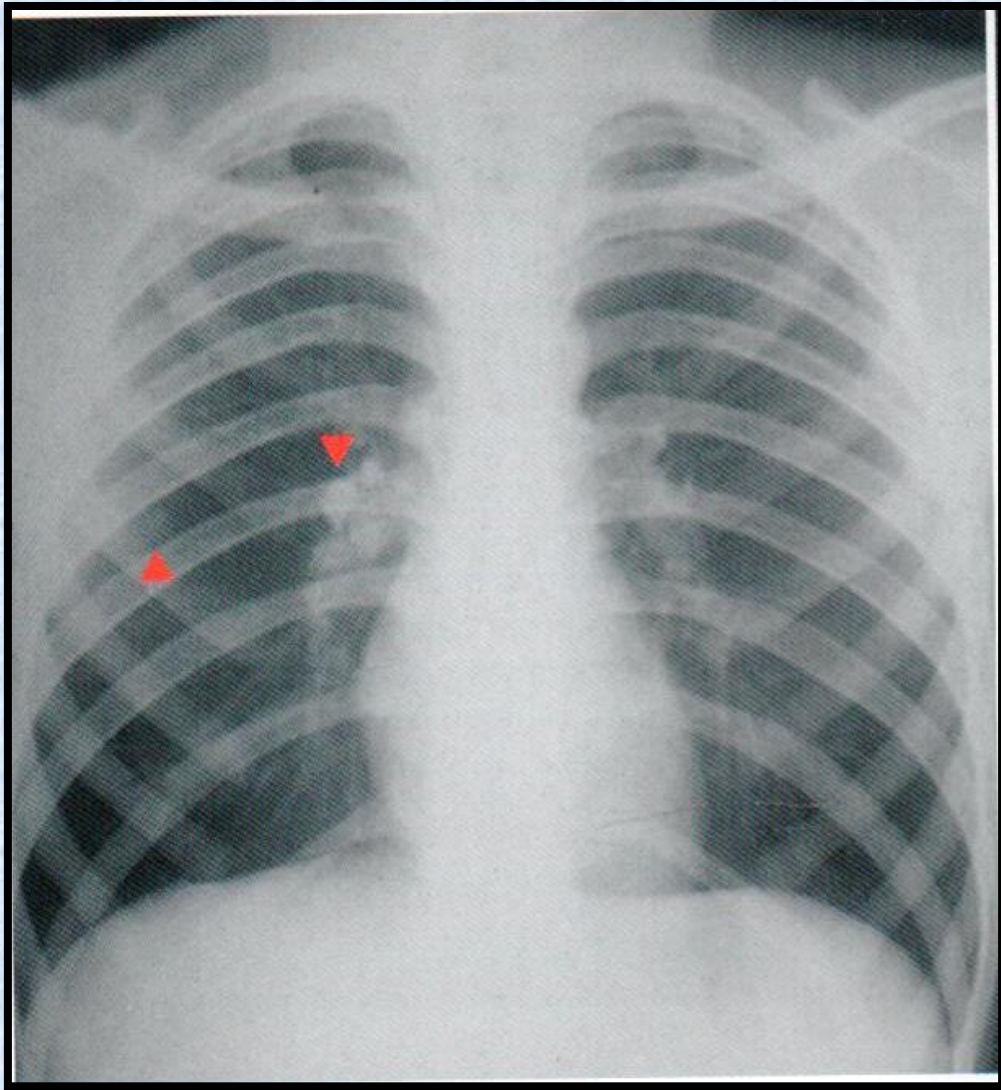
Sequence of events in the natural history of primary pulmonary tuberculosis



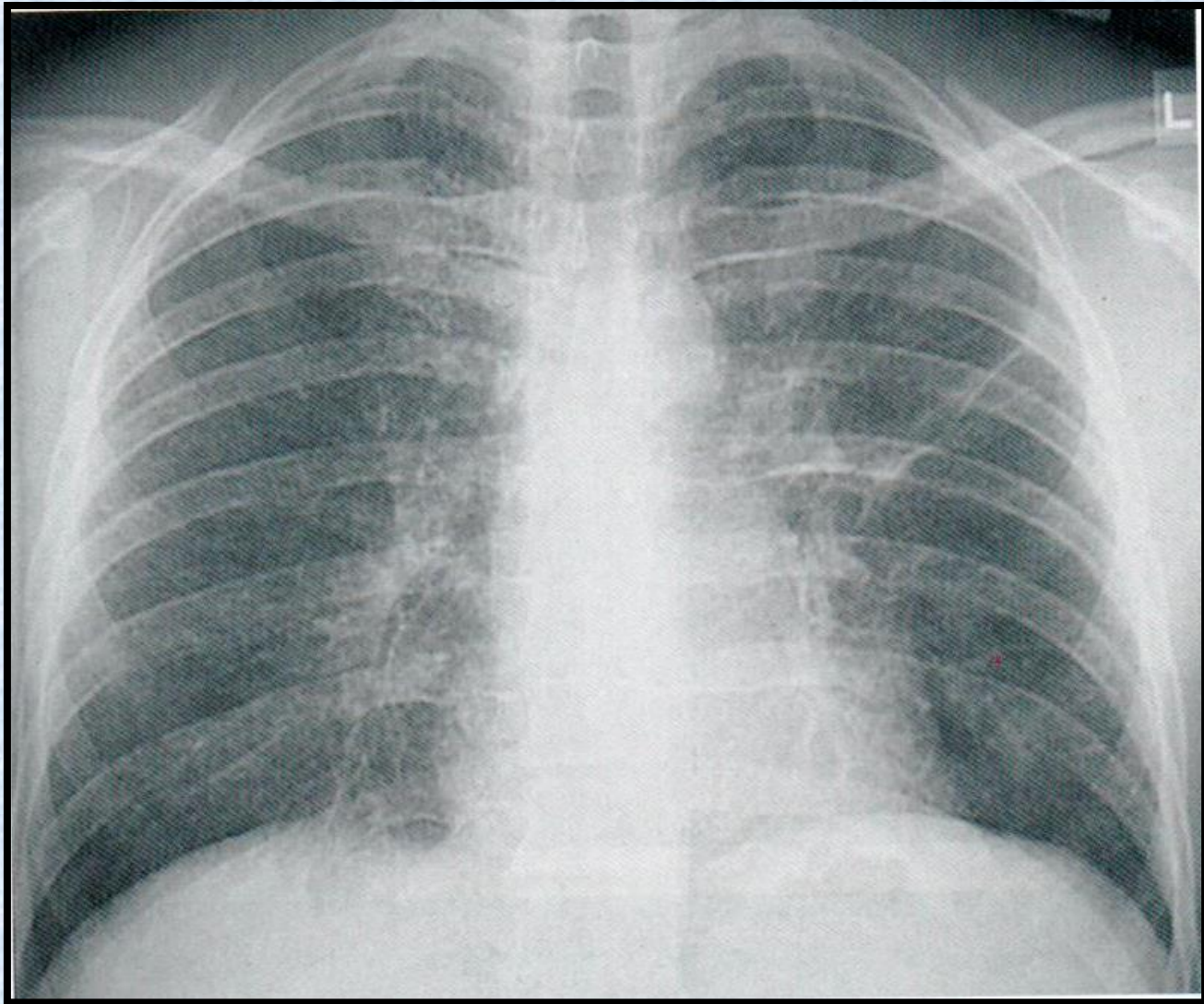
Primary pulmonary tuberculosis, Ghon complex



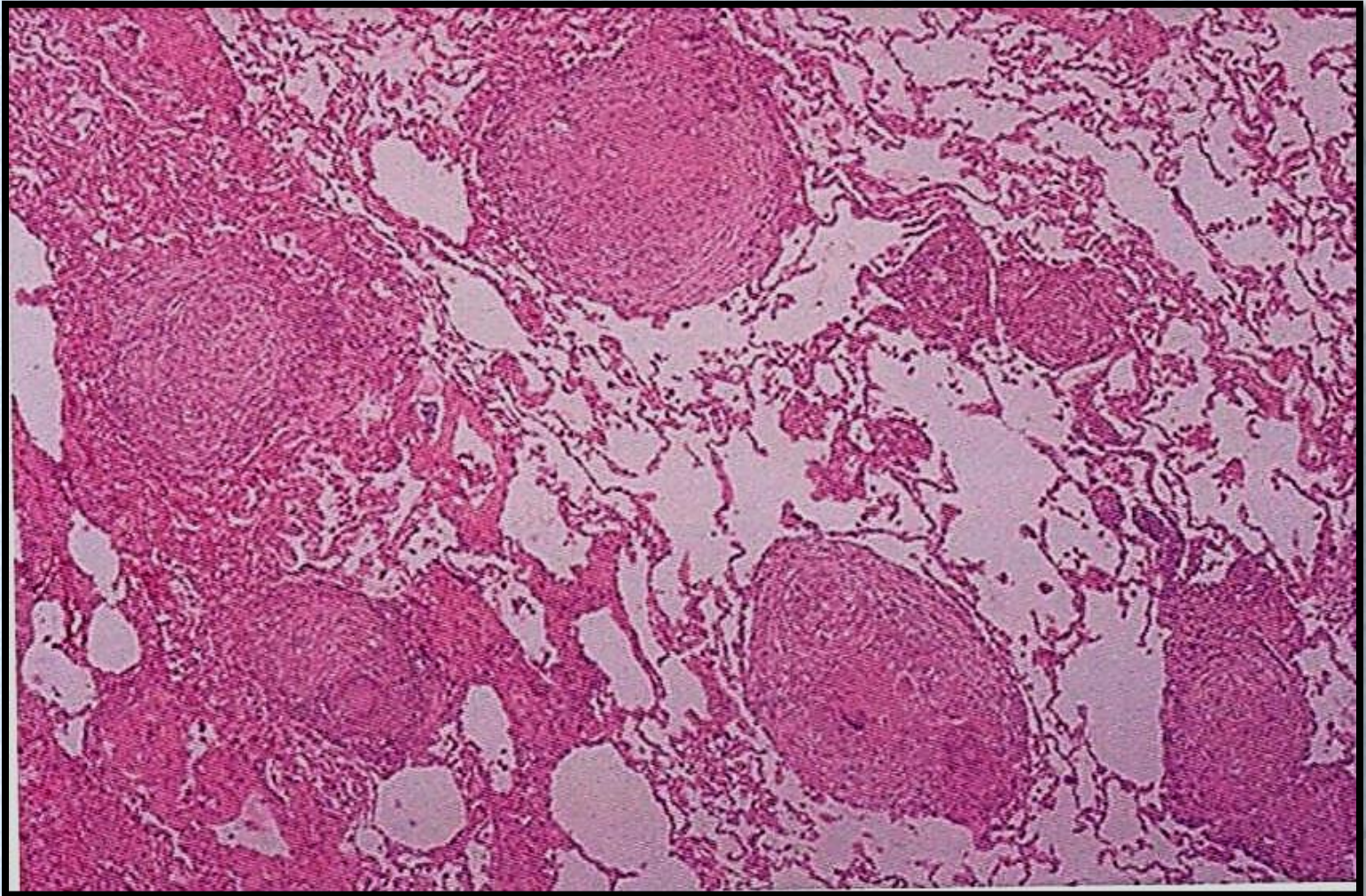
Primary tuberculosis, microscopic



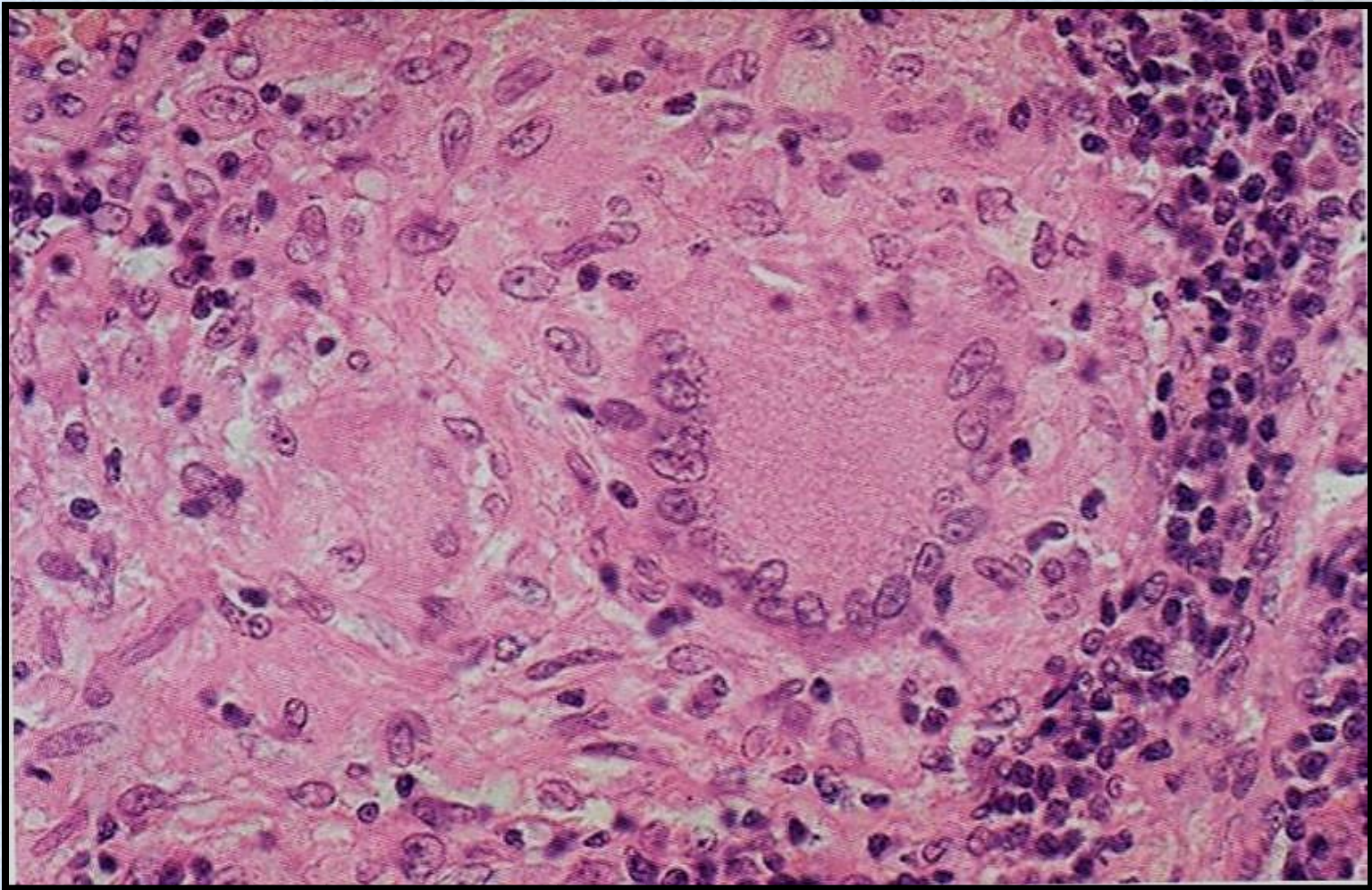
Primary tuberculosis, radiograph



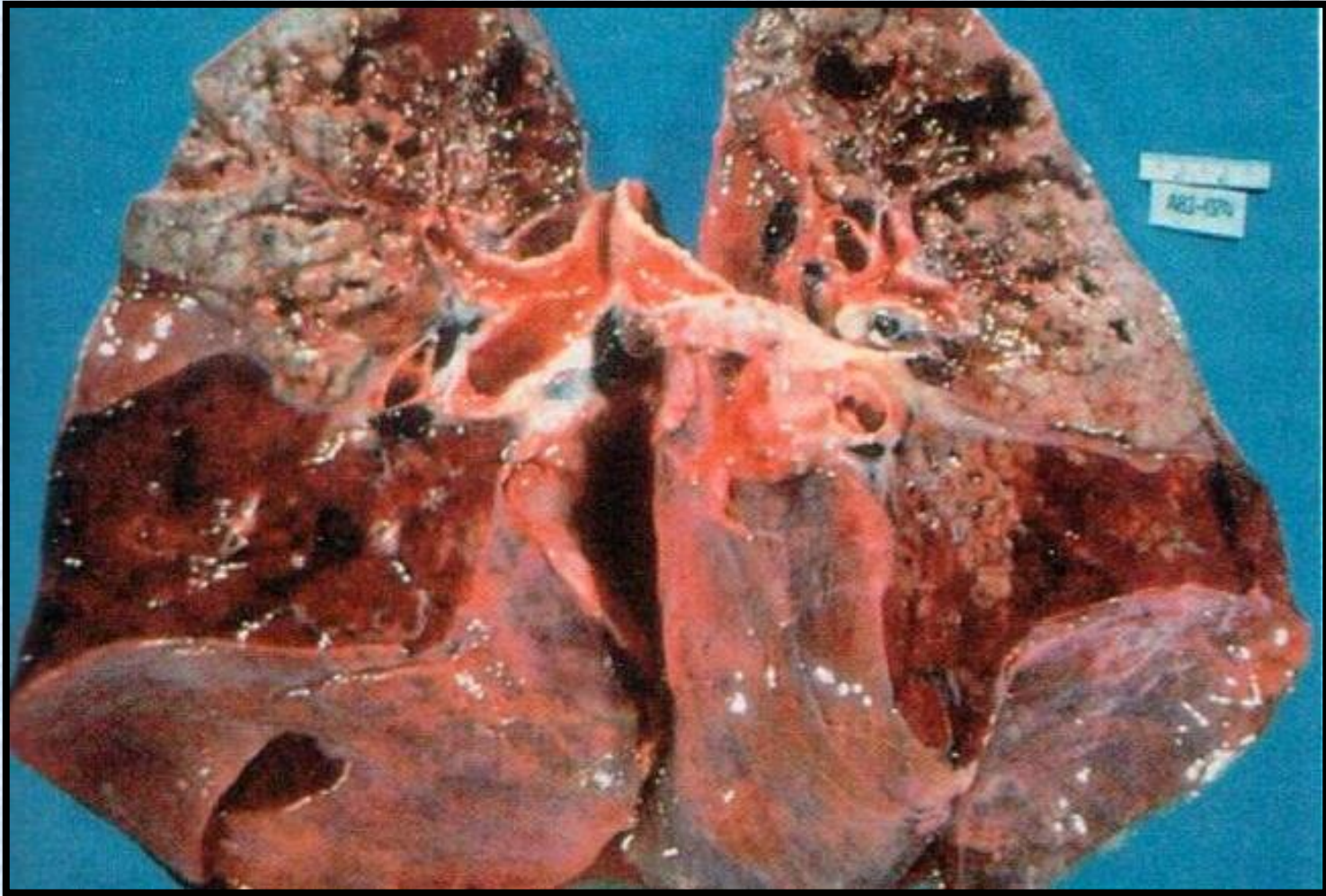
Miliary tuberculosis, radiograph



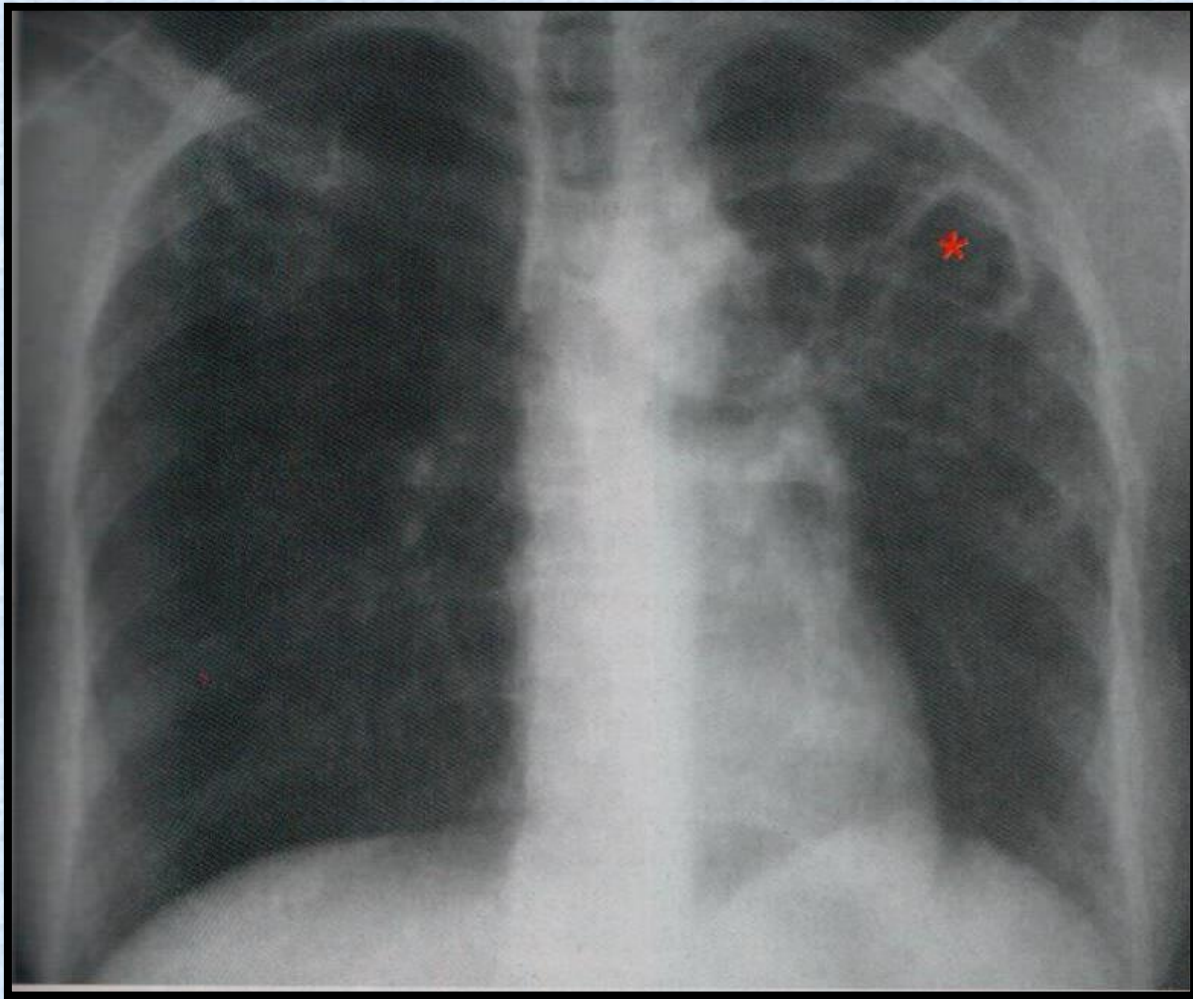
Tuberculosis, microscopic



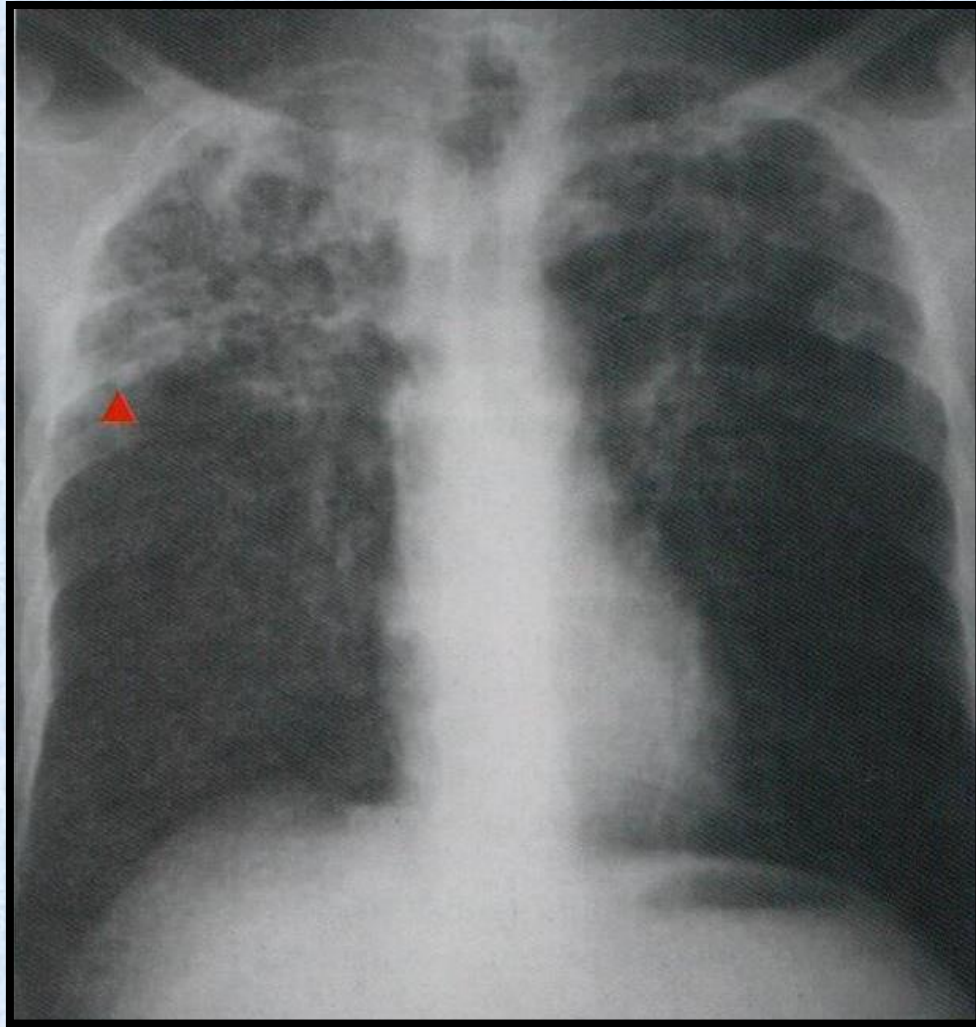
Tuberculosis, microscopic



Secondary pulmonary tuberculosis



Secondary tuberculosis, radiograph

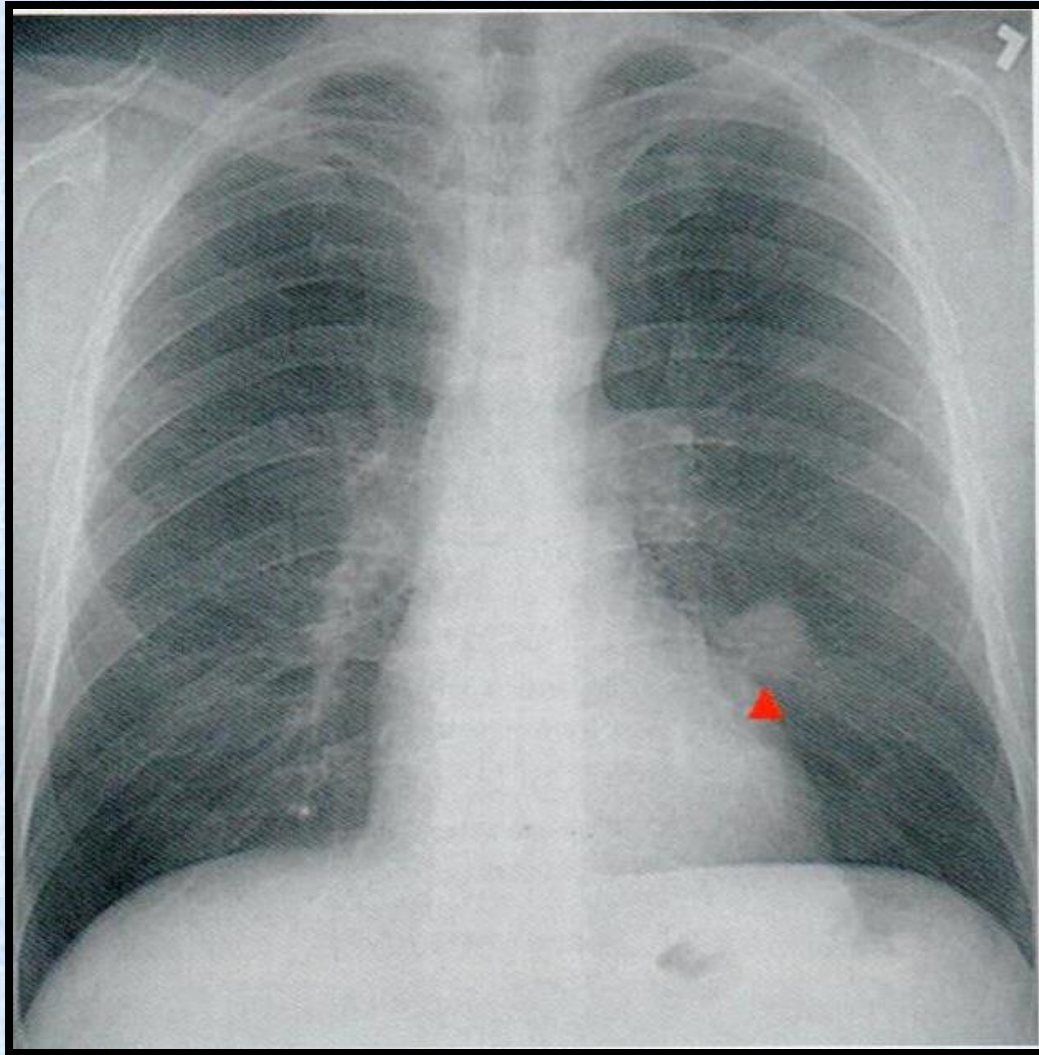


Secondary tuberculosis, radiograph



Diseases of the Respiratory System

Tumours of the Lung



Hamartoma, radiograph



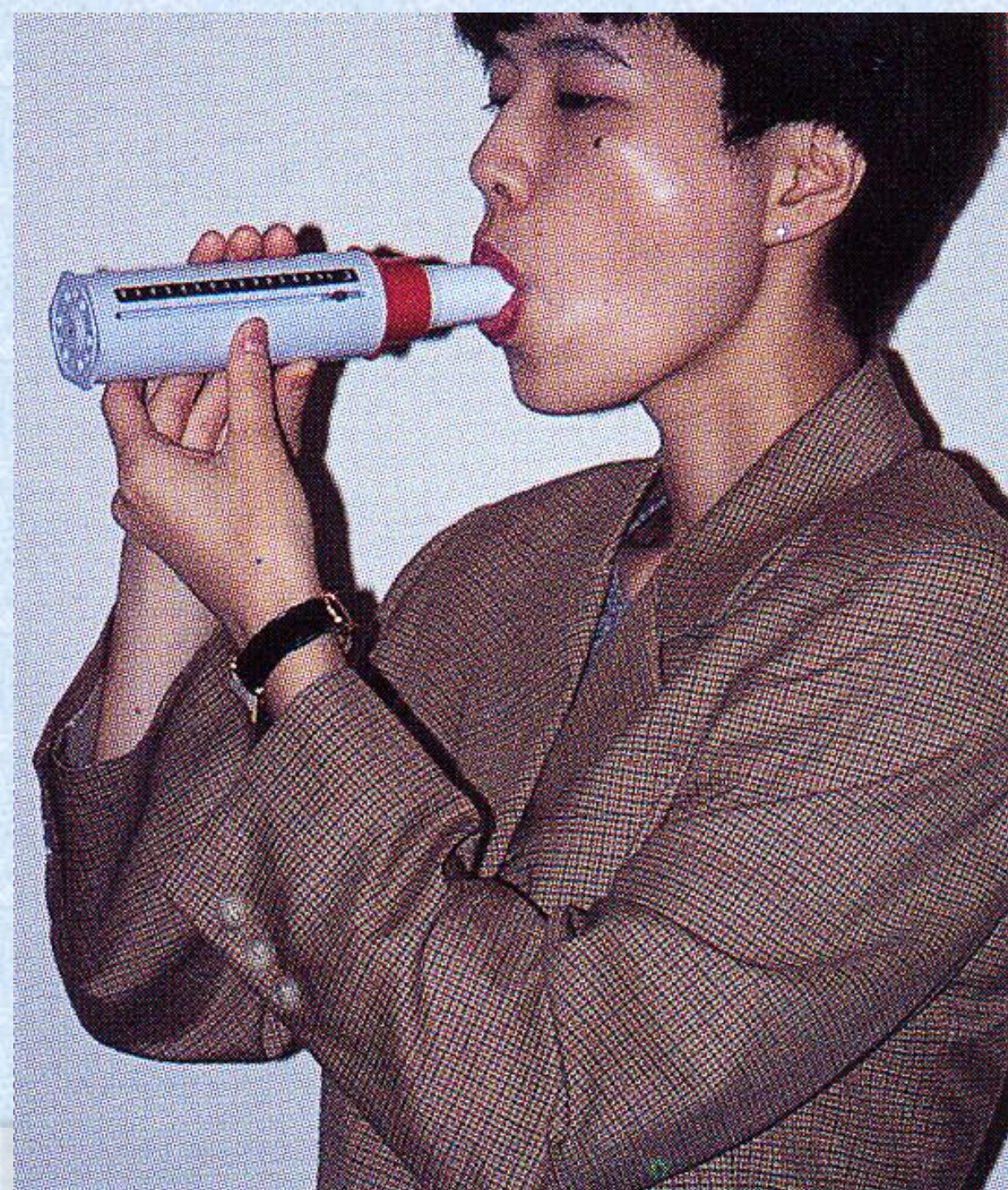
Hamartoma, gross



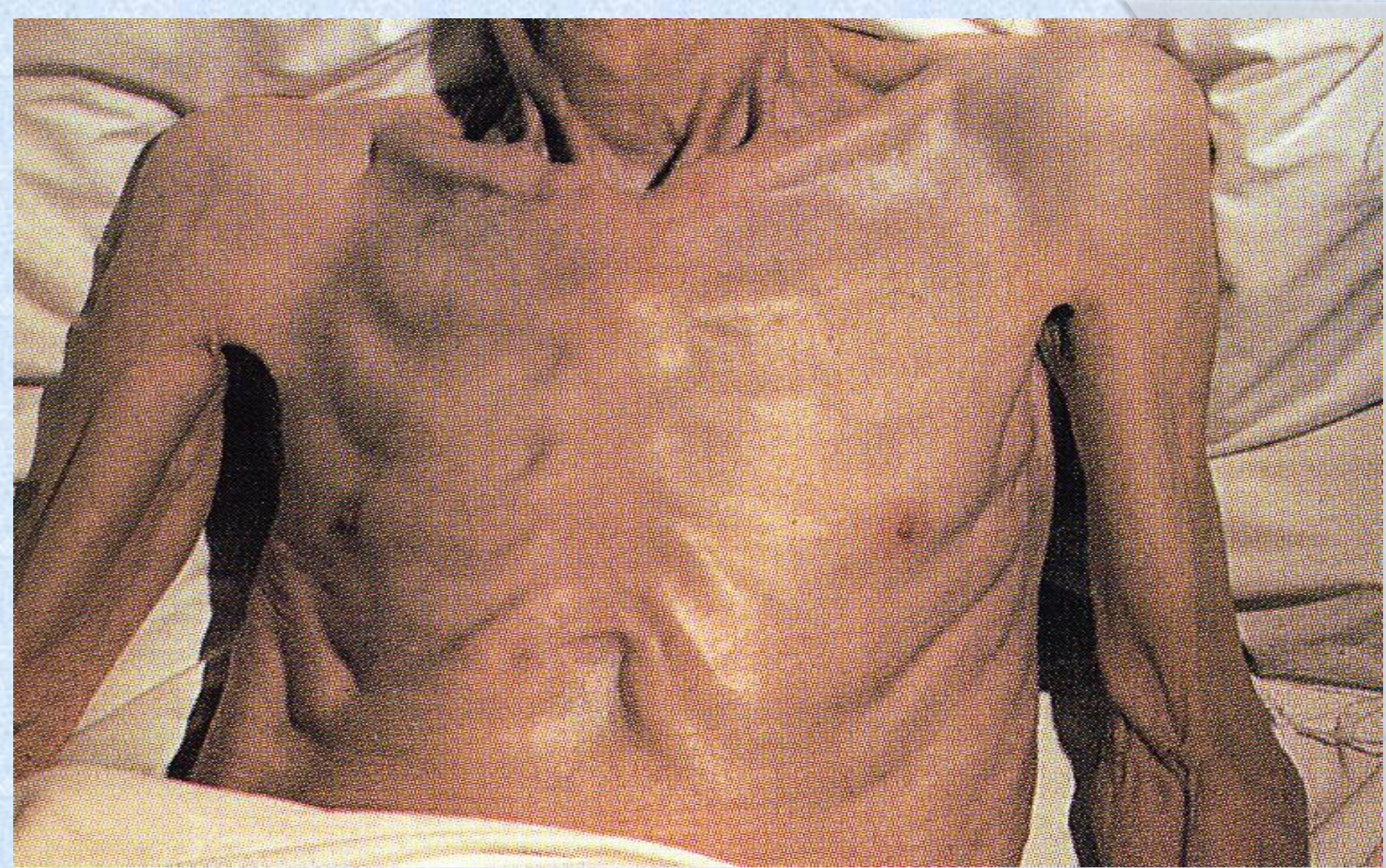
Hamartoma, microscopic



Tar-stained fingers. This patient smoked 40 cigarettes a day, but staining is more dependent on the action of smoking cigarettes right to the stub than on the total number smoked. This patient also has acute, recent onset clubbing (note the reddening and swelling of the nailfolds). He had bronchial carcinoma.



This patient has smoking-induced chronic obstructive airway disease.



Cachexia may occur in a number of severe disorders, including chronic lung diseases such as pulmonary fibrosis, tuberculosis and emphysema, malignant disease, including bronchial carcinoma.

Diseases of Lung

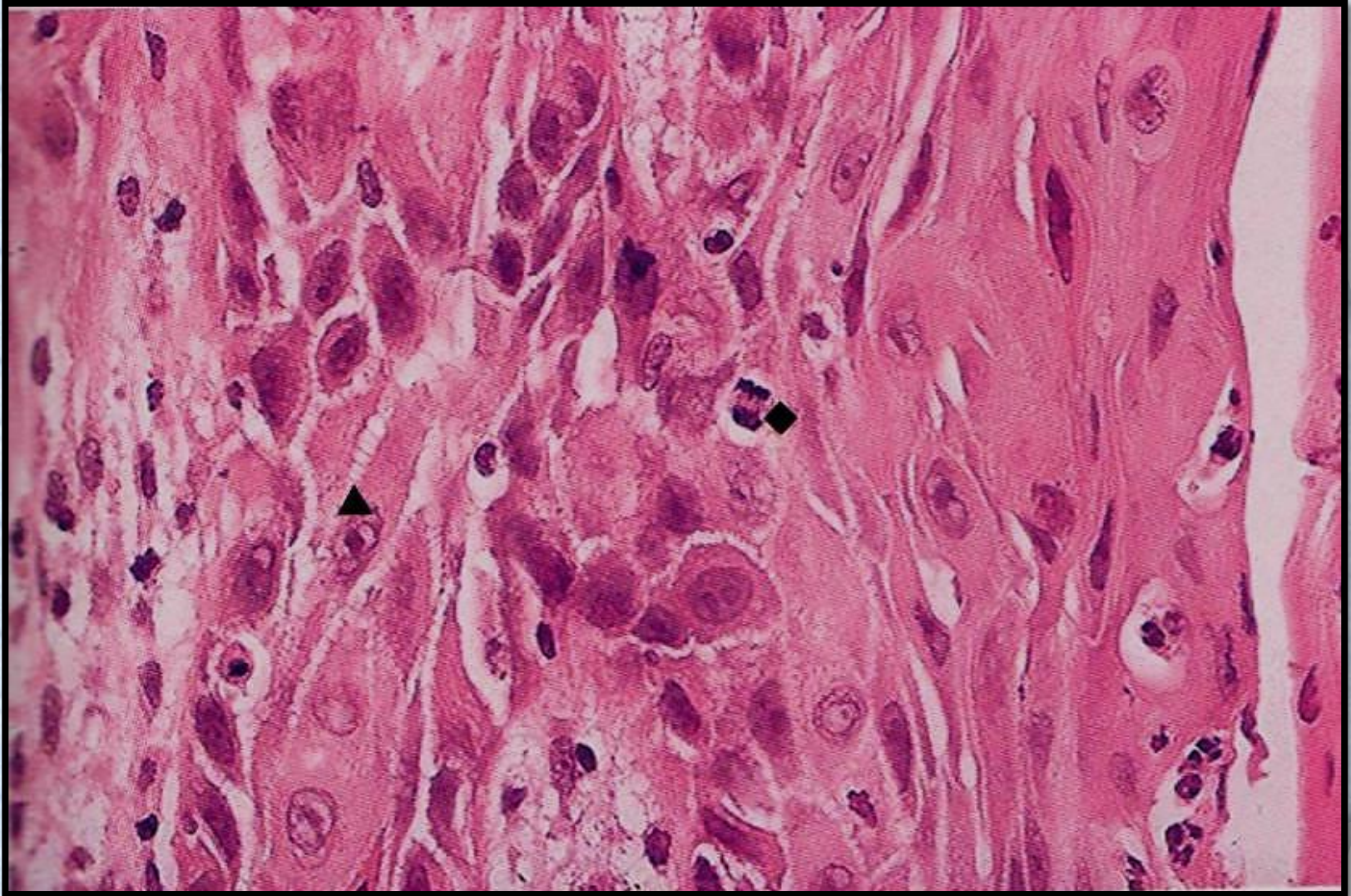


Carcinoma of the lung

Diseases of Lung

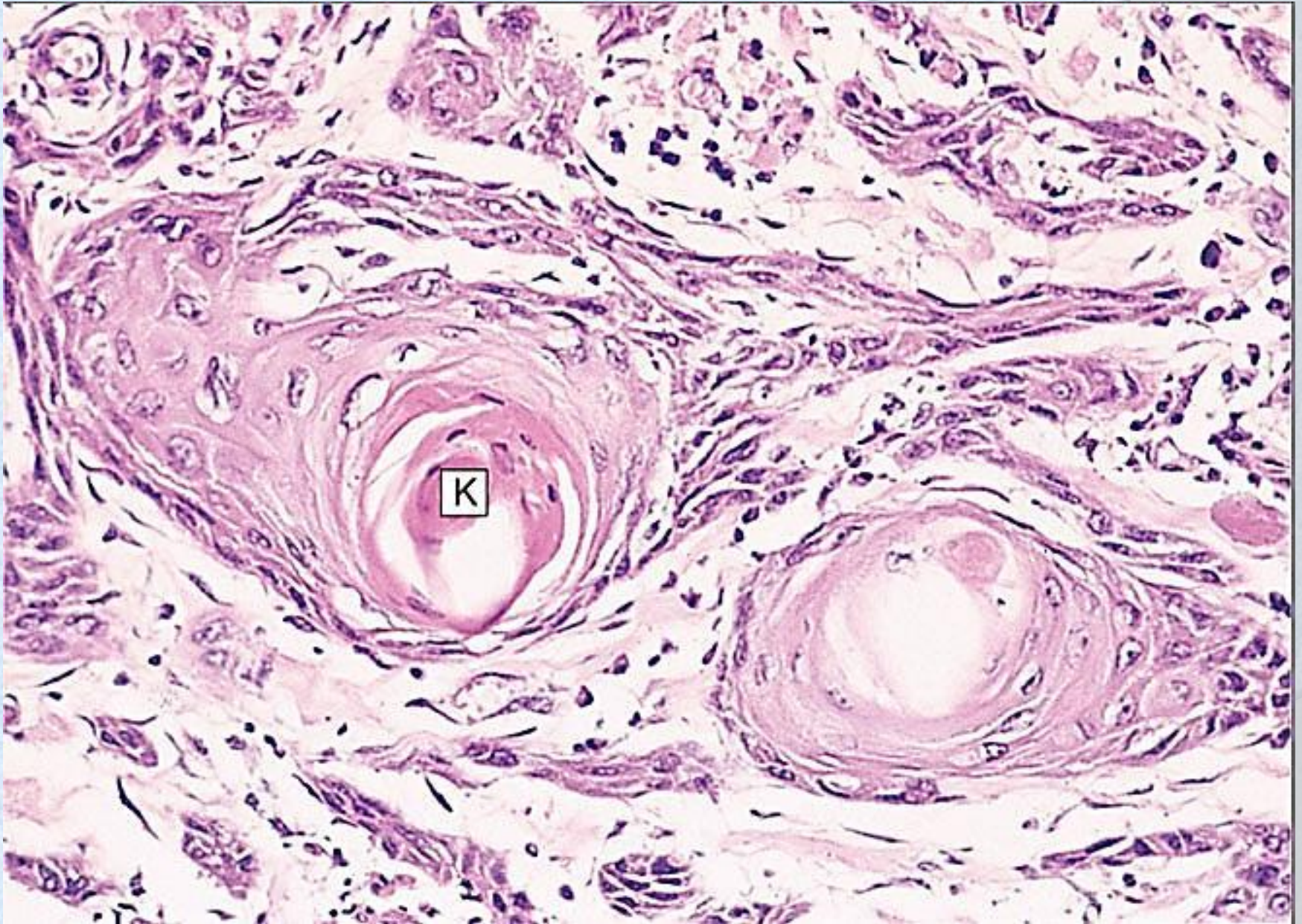


Central carcinoma of the bronchus. Central carcinomas of the lung (L) appear as friable white masses of tissue that extend into the lumen of bronchi and invade into the adjacent lung.



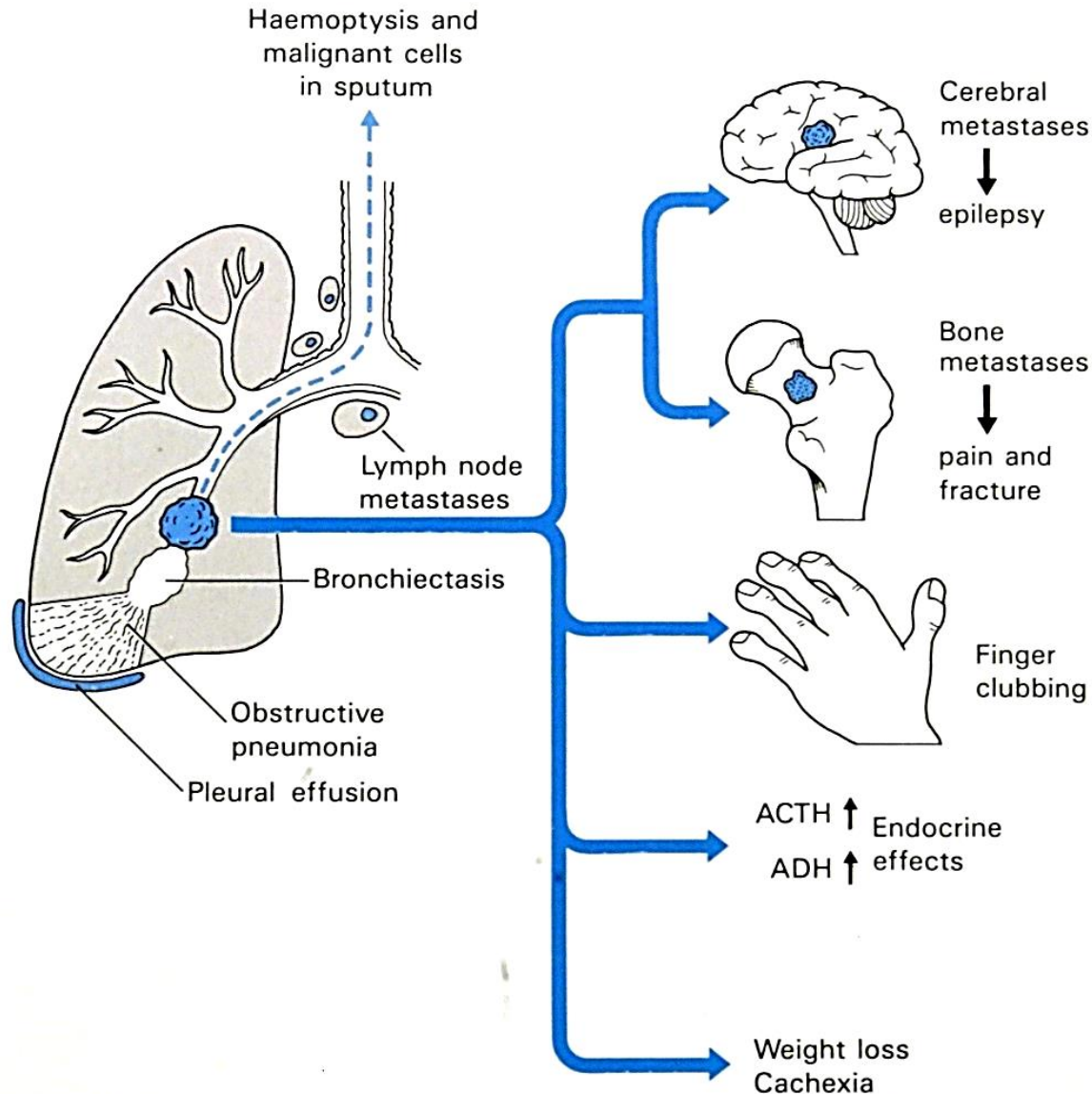
Squamous cell carcinoma, microscopic

Diseases of Lung



Squamous cell carcinoma of the lung

Diseases of Lung

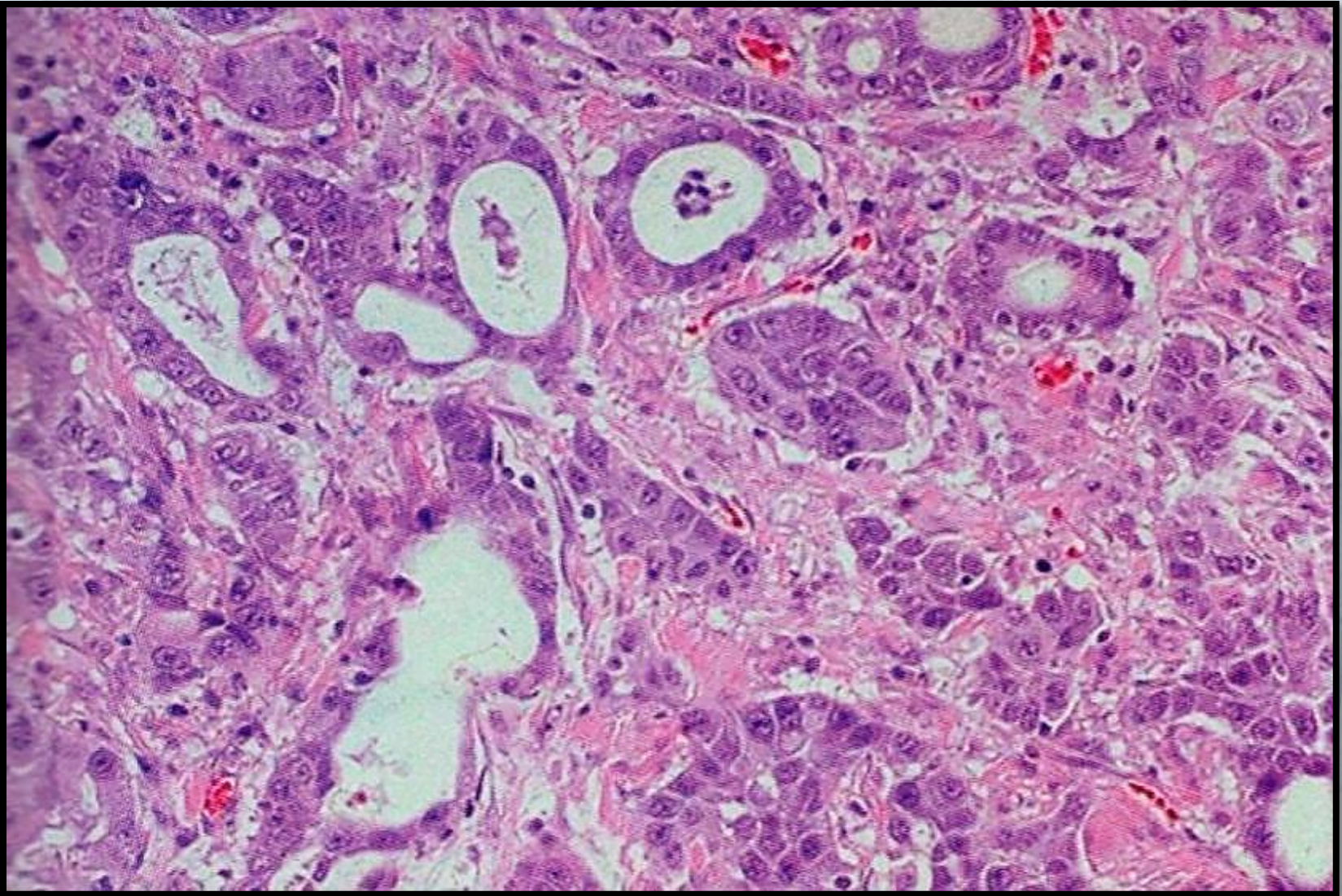


Clinical features and complication of bronchogenic carcinoma

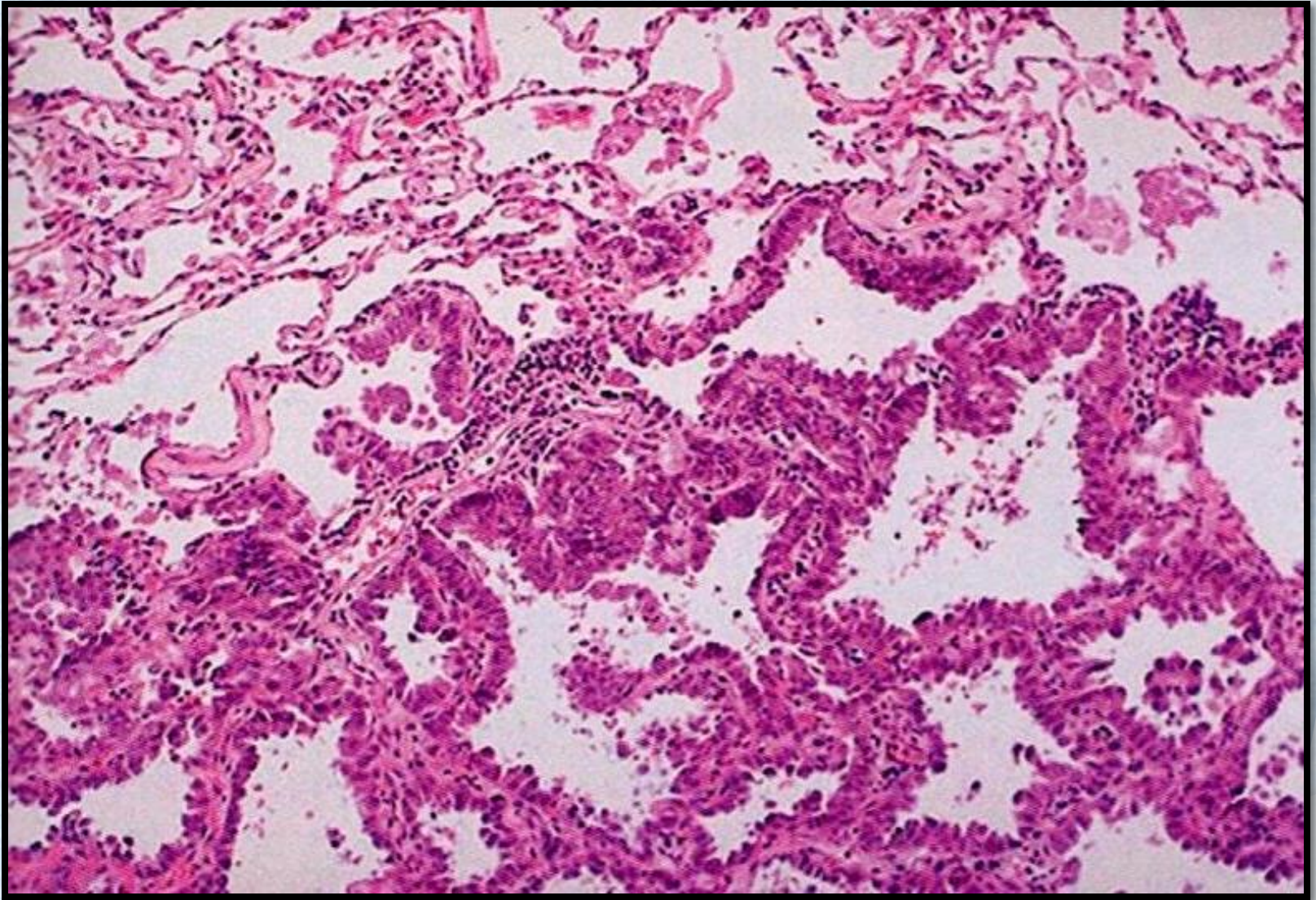
Diseases of Lung



Peripheral carcinoma of the lung. Peripheral carcinomas of the lung (C) appear as ill-defined masses, often occurring in relation to scars, and frequently extend to the pleural surface.

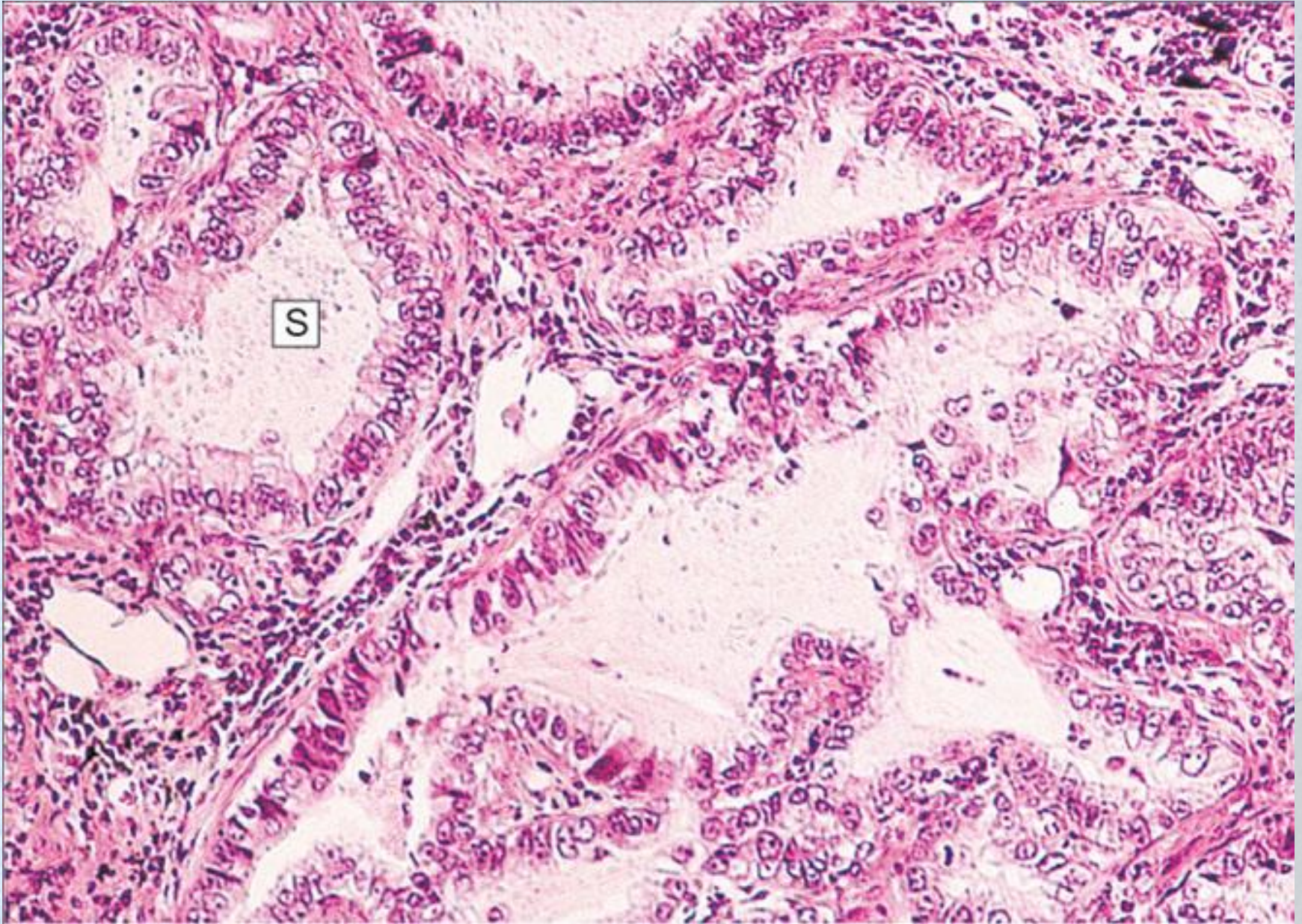


Adenocarcinoma, microscopic

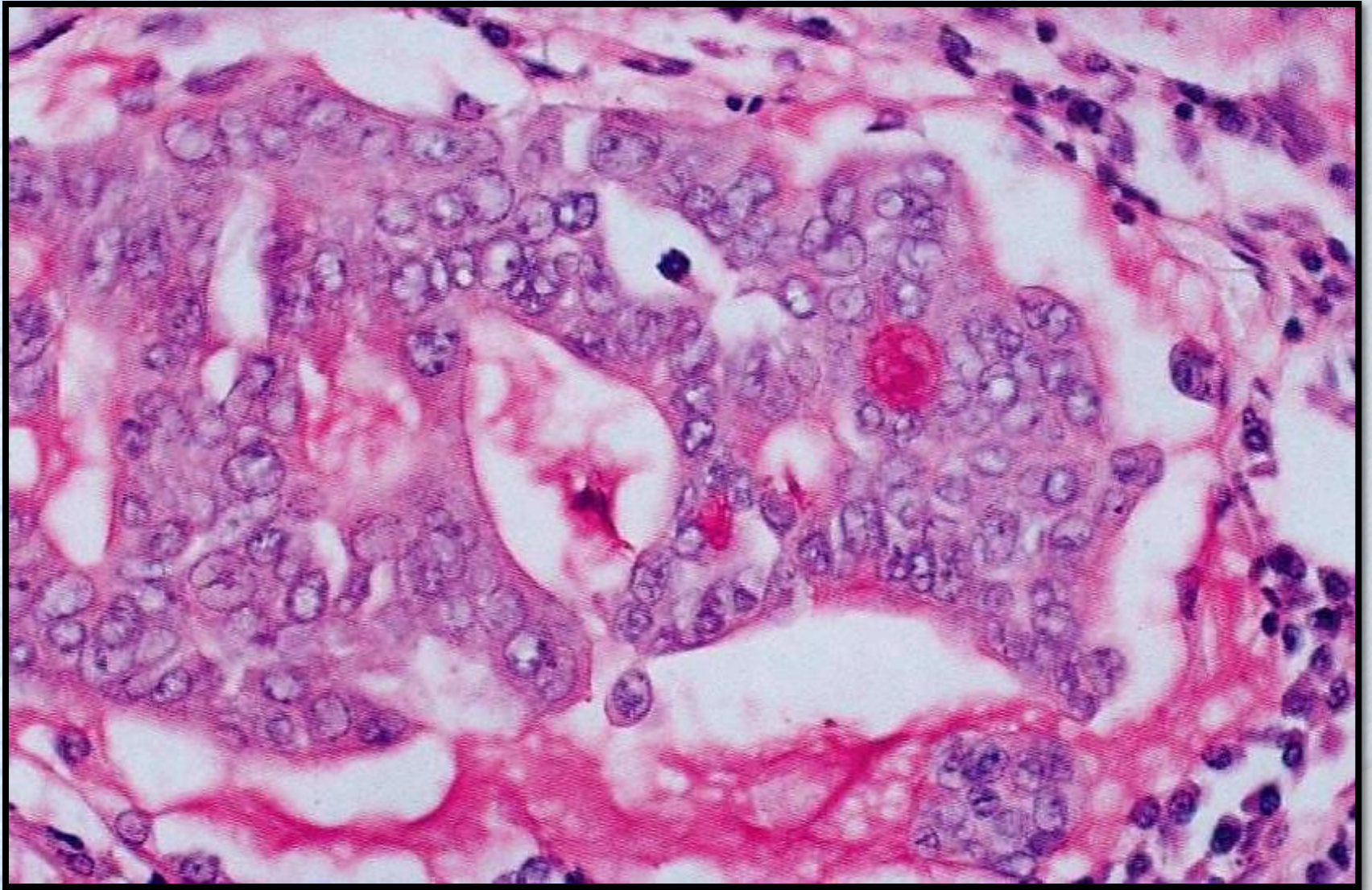


Bronchioloalveolar carcinoma, microscopic

Diseases of Lung



Adenocarcinoma of the lung. This micrograph shows an acinar pattern of adenocarcinoma of the lung, with prominent gland-like spaces (S) lined by a columnar epithelium.



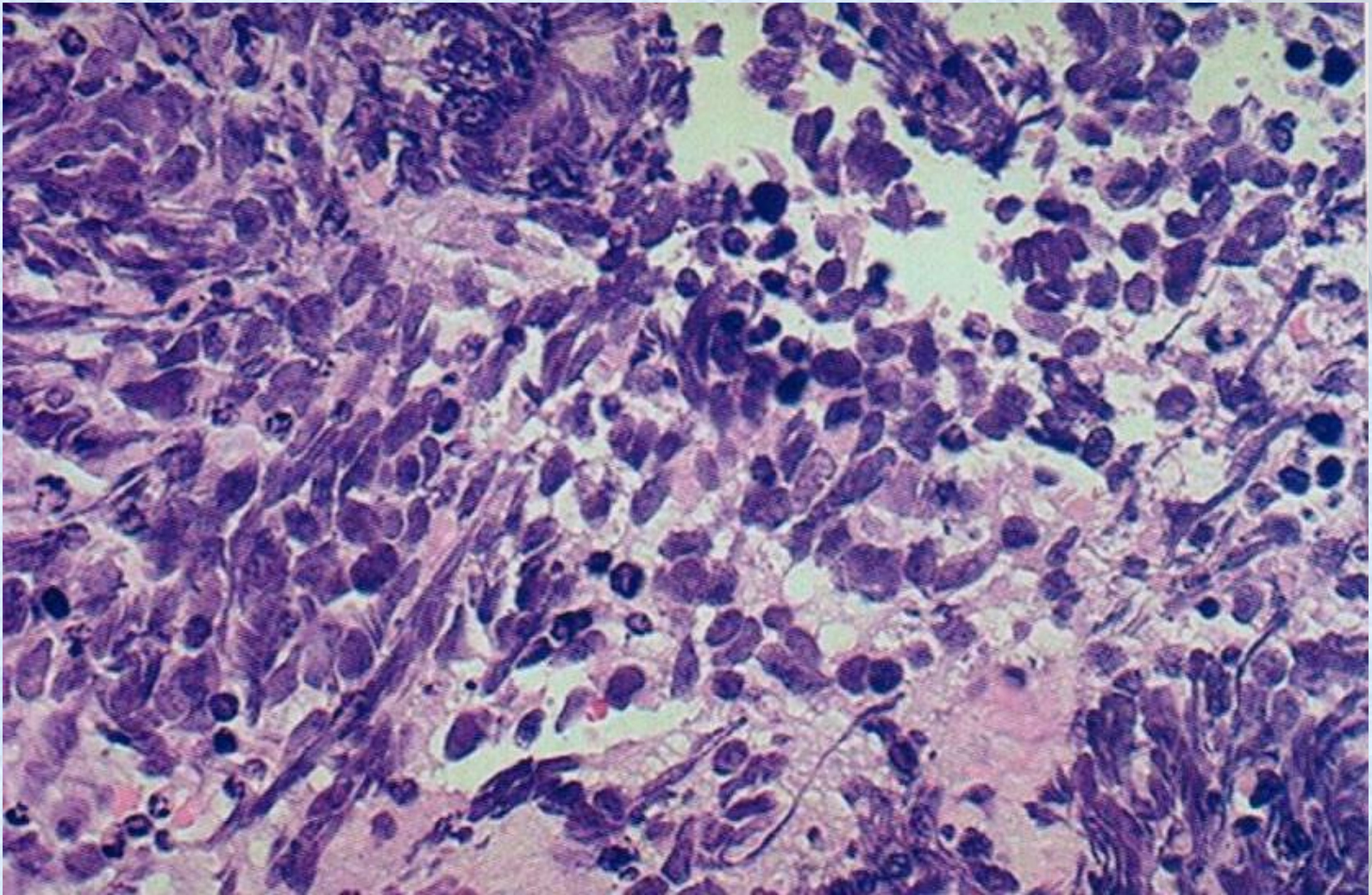
Poorly differentiated carcinoma, microscopic



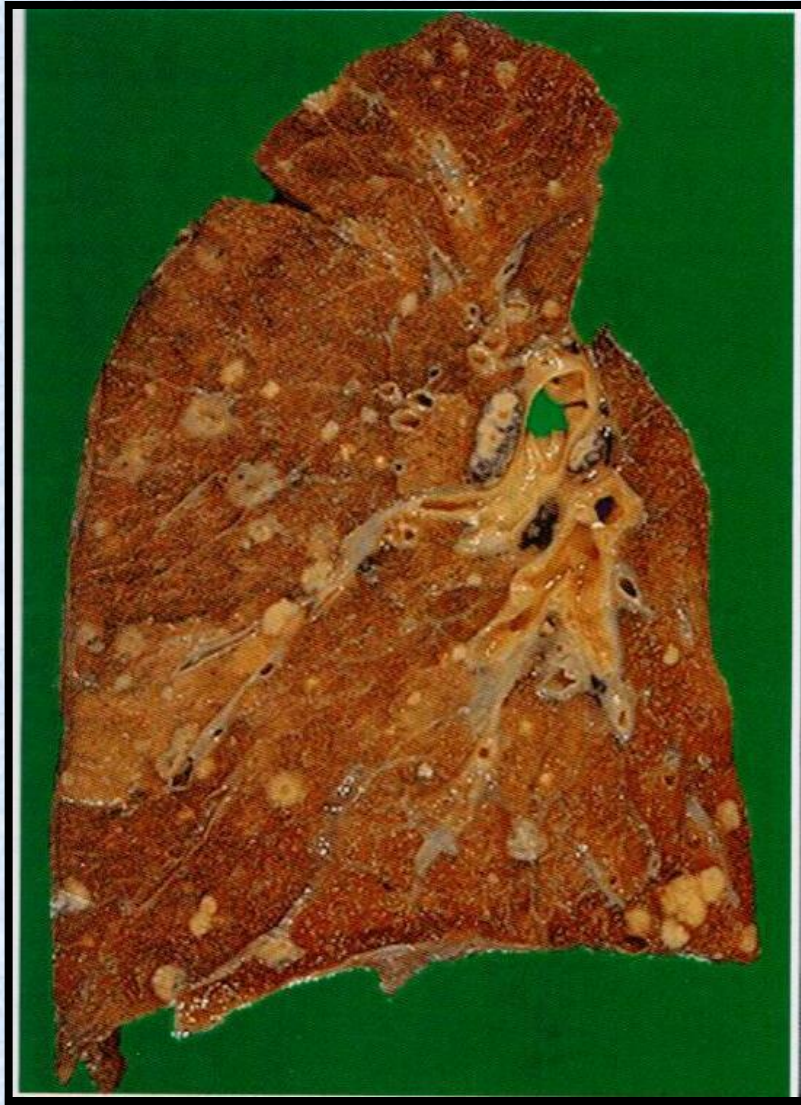
Horner's syndrome resulting from a right Pancoast tumour. The patient had a right ptosis and a constricted right pupil, caused by tumour infiltration of the inferior cervical sympathetic ganglia.



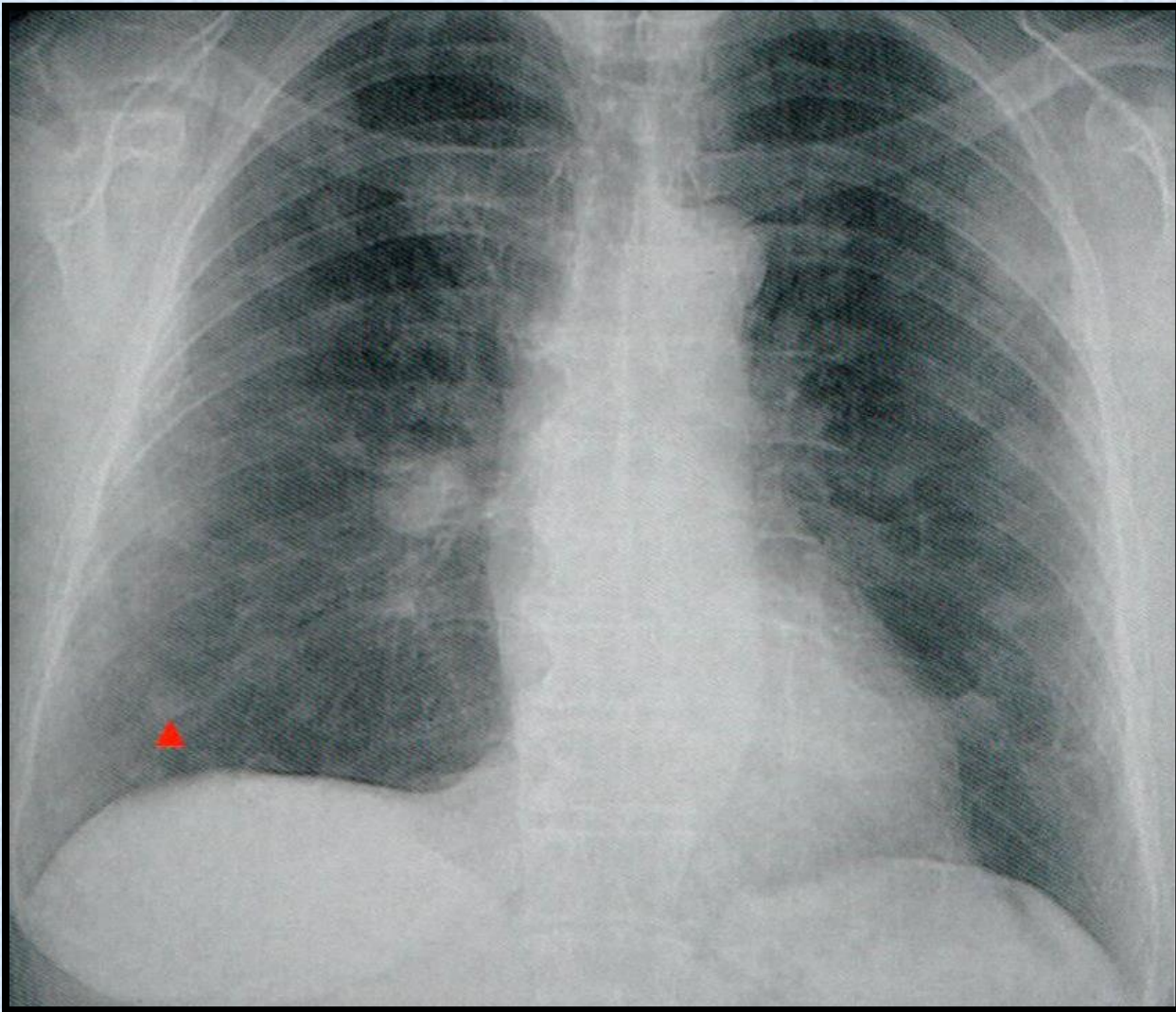
Cushing's syndrome resulting from ectopic adrenocorticotropic hormone (ACTH) secretion by a small-cell bronchial carcinoma. The facial appearance is similar to that of Cushing's disease of other causes, but the disease often runs a very rapid course.



Small cell carcinoma of lung (oat cell carcinoma/poorly differentiated neuroendocrine carcinoma)

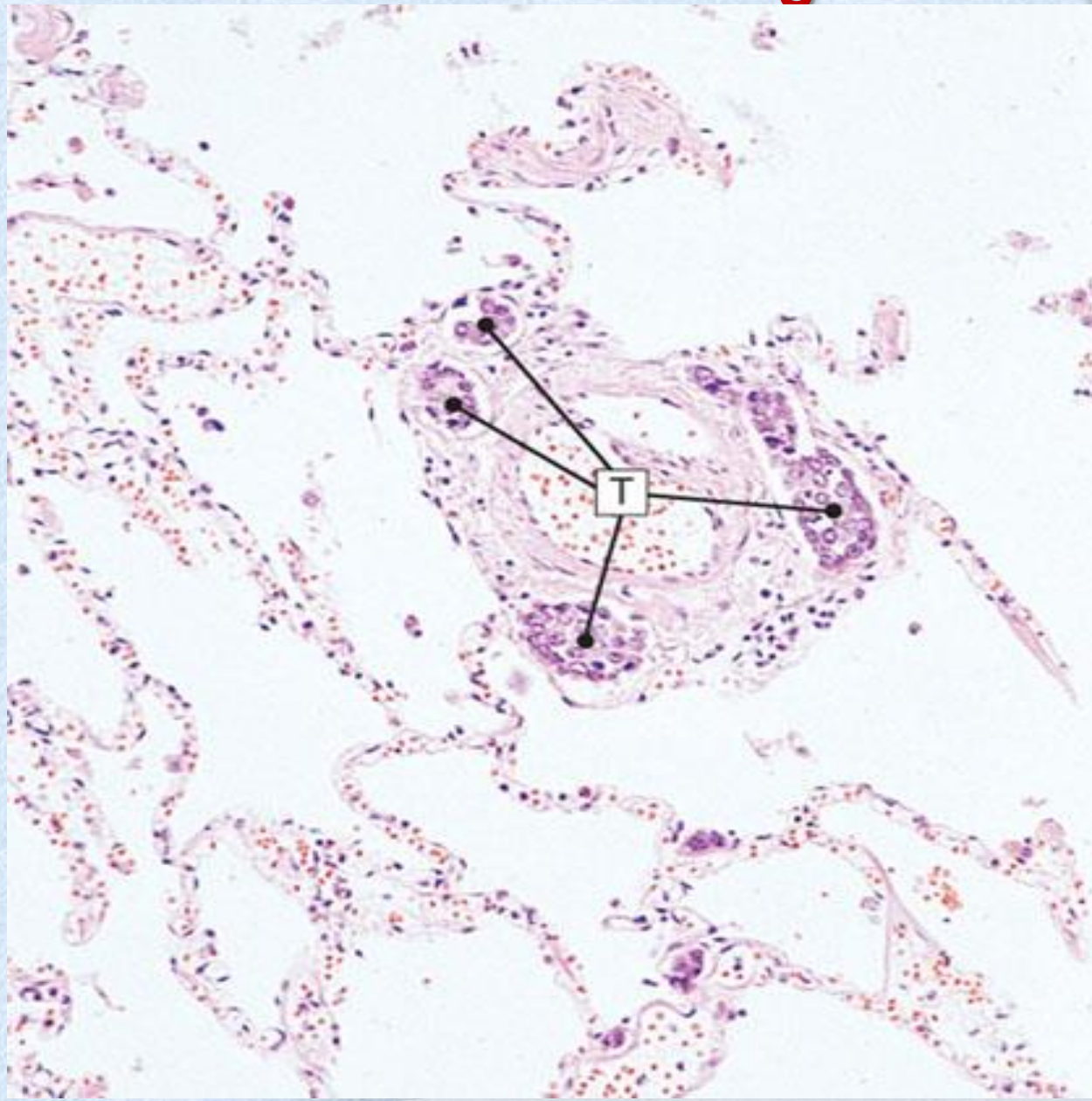


Metastases, gross



Metastases, microscopic

Diseases of Lung



Lymphangitis carcinomatosa

Diseases of Lung



Key Facts Lung cancer

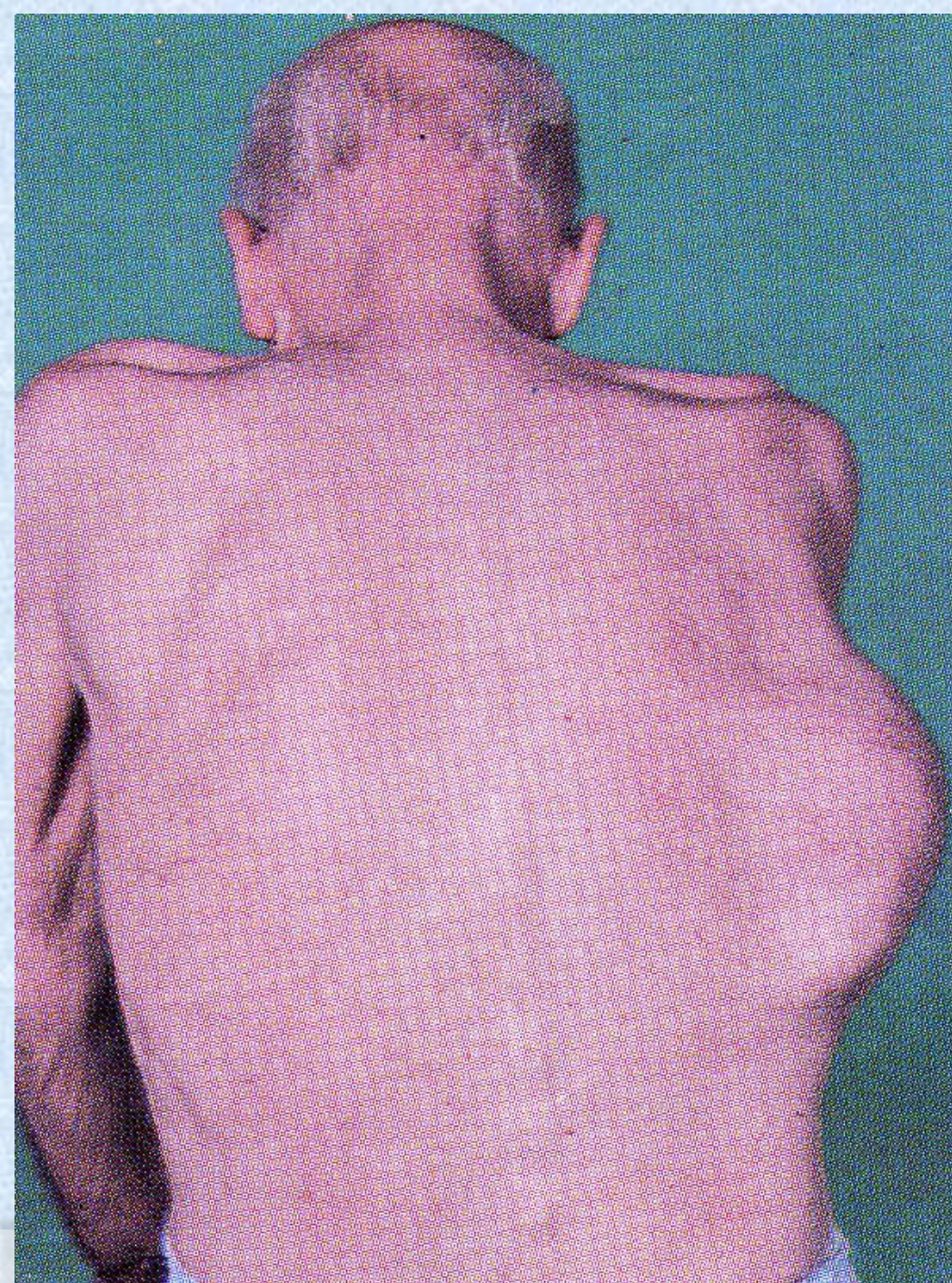
- . Caused by inhaled environmental agents, particularly smoking and radon.
- . Peak incidence 40-70 years, most common form of cancer.
- . Four main types: squamous cell, small-cell anaplastic, adenocarcinoma and large-cell anaplastic.
- . Bronchoalveolar carcinoma is a special form of adenocarcinoma with a better prognosis than other types.
- . Clinical division is into small-cell and non-small cell types (all others).
- . Tumors may be central (all types) or peripheral (mainly adenocarcinomas).
- . Small-cell carcinoma is neuroendocrine, highly malignant, and may be associated with ectopic endocrine syndromes.
- . TNM staging used for NSCLC.
- . Simple staging used for SCLC-Limited and Extensive.
- . Overall survival 5-30% at 5 years, highly dependent on type and stage of disease.

Diseases of Lung

Type of effusion	Pathogenesis	Causes
Transudate Less than 30 g protein/L	Increased hydrostatic pressure	Cardiac failure
	Decreased oncotic pressure	Vena caval obstruction Hypoalbuminemia
Exudate More than 30 g protein/L	Infections	Bacterial, including TB Other organisms
	Neoplasm	Metastatic carcinoma Primary carcinoma of lung Mesothelioma of pleura
	Pulmonary infarction	Thromboembolic disease
	Autoimmune disease	Rheumatoid disease Systemic lupus erythematosus
	Abdominal disease	Pancreatitis Subphrenic abscess

Pleural effusion.

Mesothelioma. This patient presented with an asbestos link pleural plaque.



Diseases of Lung



Malignant mesothelioma. Mesothelioma is seen as a thick sheet of white tumor that encases the whole of the lung.

