

# RESPIRATORY SYSTEM BLOCK

## *Pathology Practical*

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# Objectives:

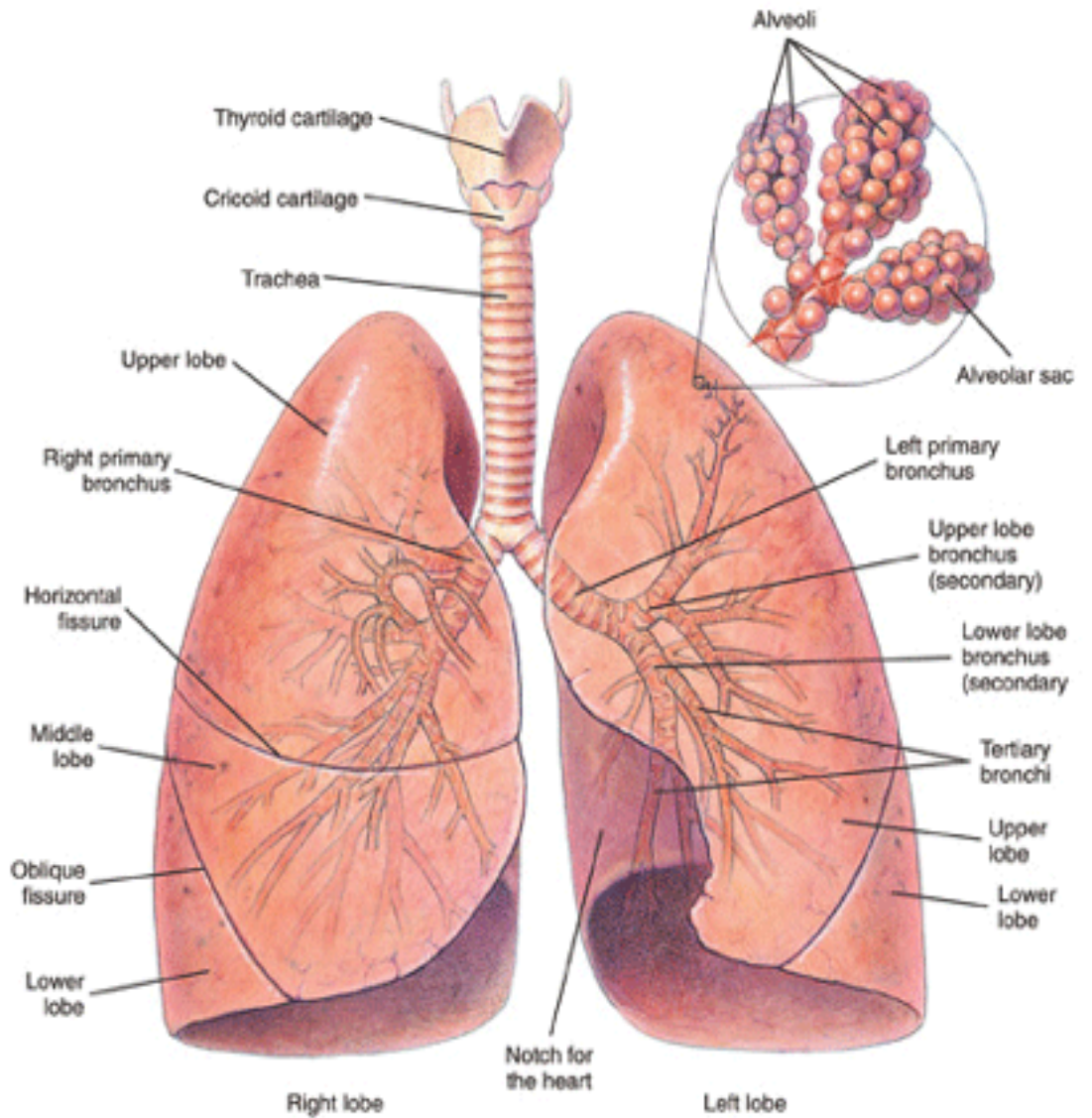
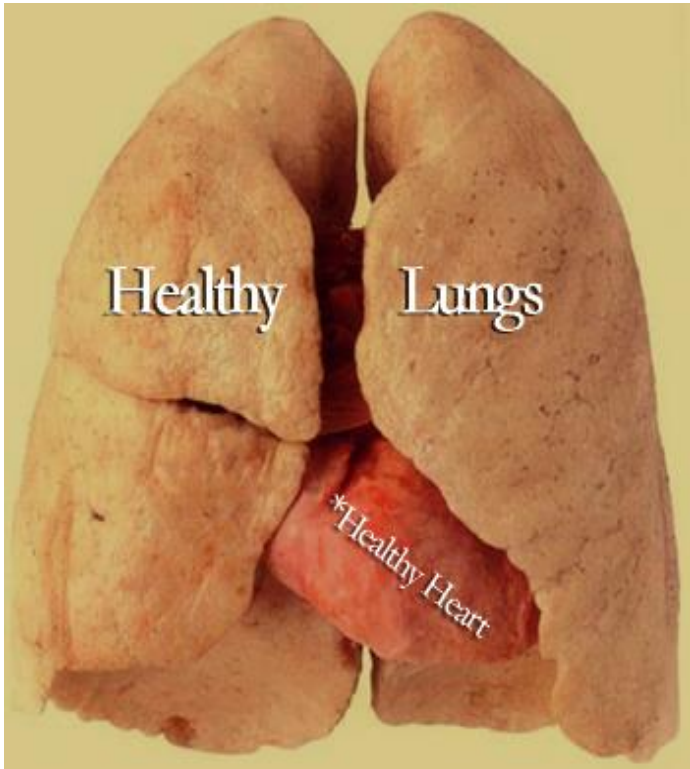
**By the end of the practical sessions of the respiratory block, the medical students will be able to:**

- Acquire the basic knowledge of the histopathological features of lobar pneumonia, bronchopneumonia, emphysema, pulmonary embolus and pulmonary infarction.
- Identify the gross appearance of bronchial asthma, bronchiectasis, bronchopneumonia, lobar pneumonia, bronchogenic carcinoma, squamous cell carcinoma and metastatic carcinoma of the lung, .

# ***First Practical Session***

- **Allergic Alveolitis**
- **Bronchial asthma**
- **Bronchiectasis**
- **Chronic Bronchitis**
- **Emphysema**
- **Lobar Pneumonia**
- **Bronchopneumonia**
- **Pulmonary Embolus & Infarction**

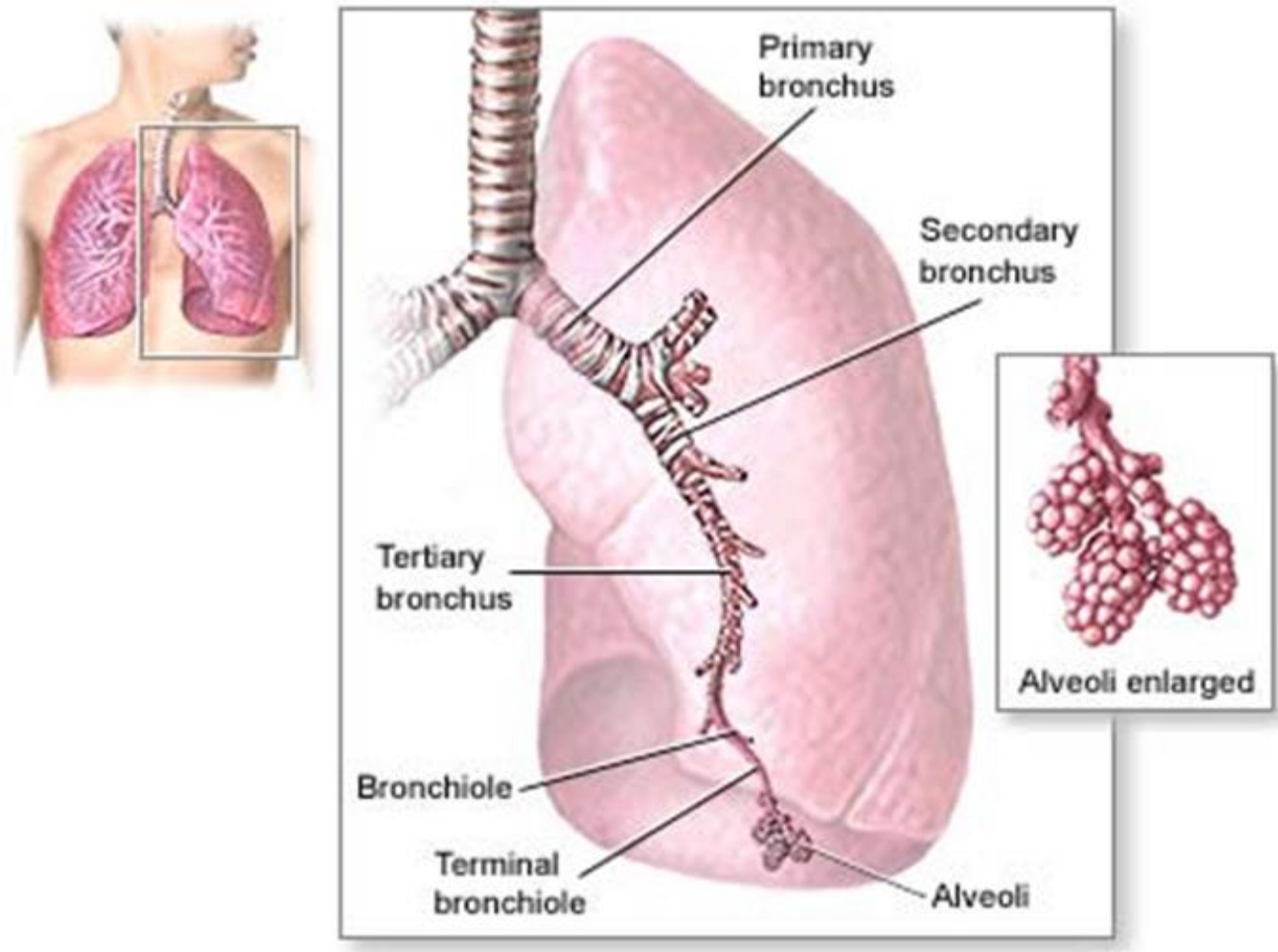
# Anatomy of the Respiratory System

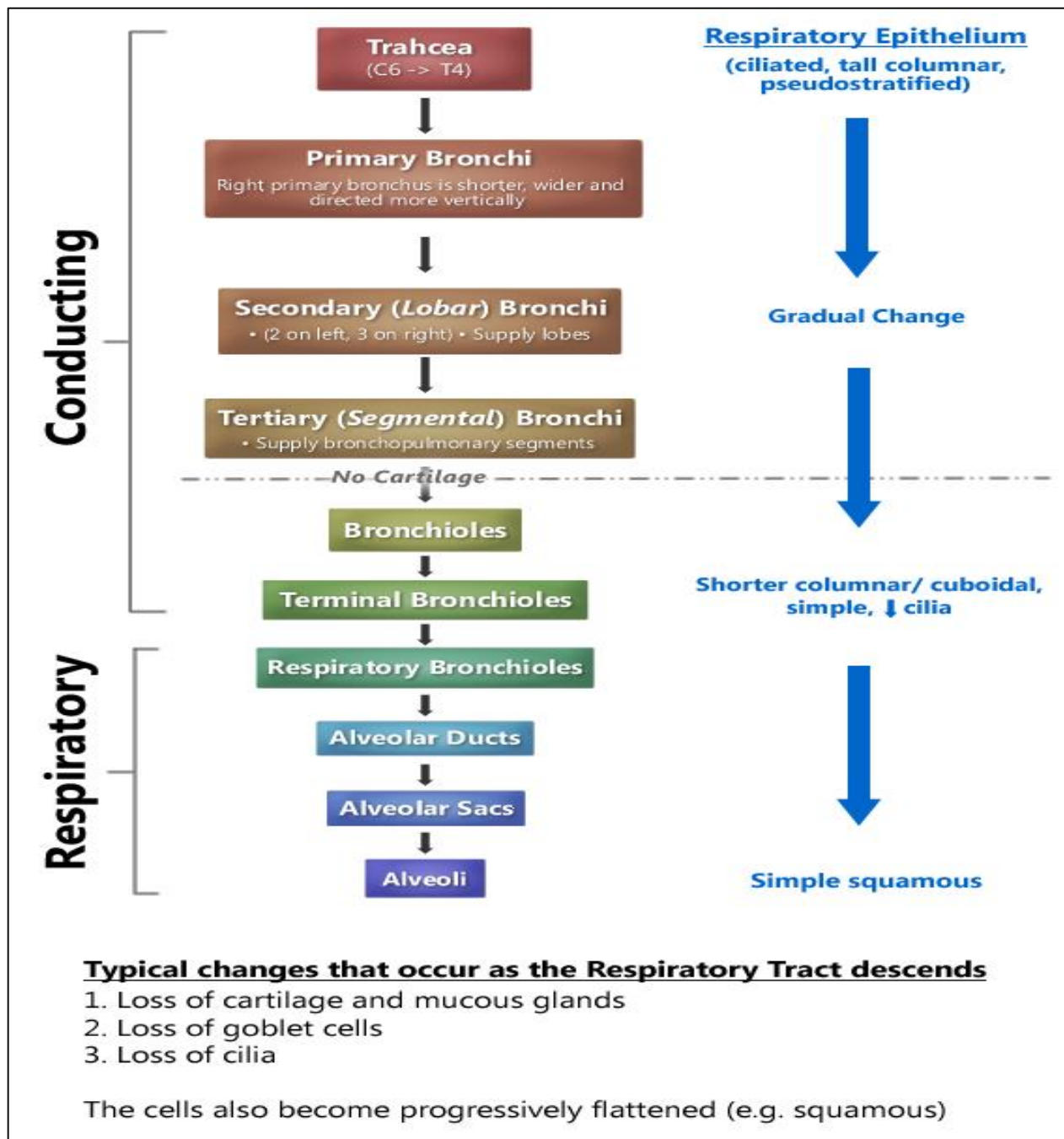




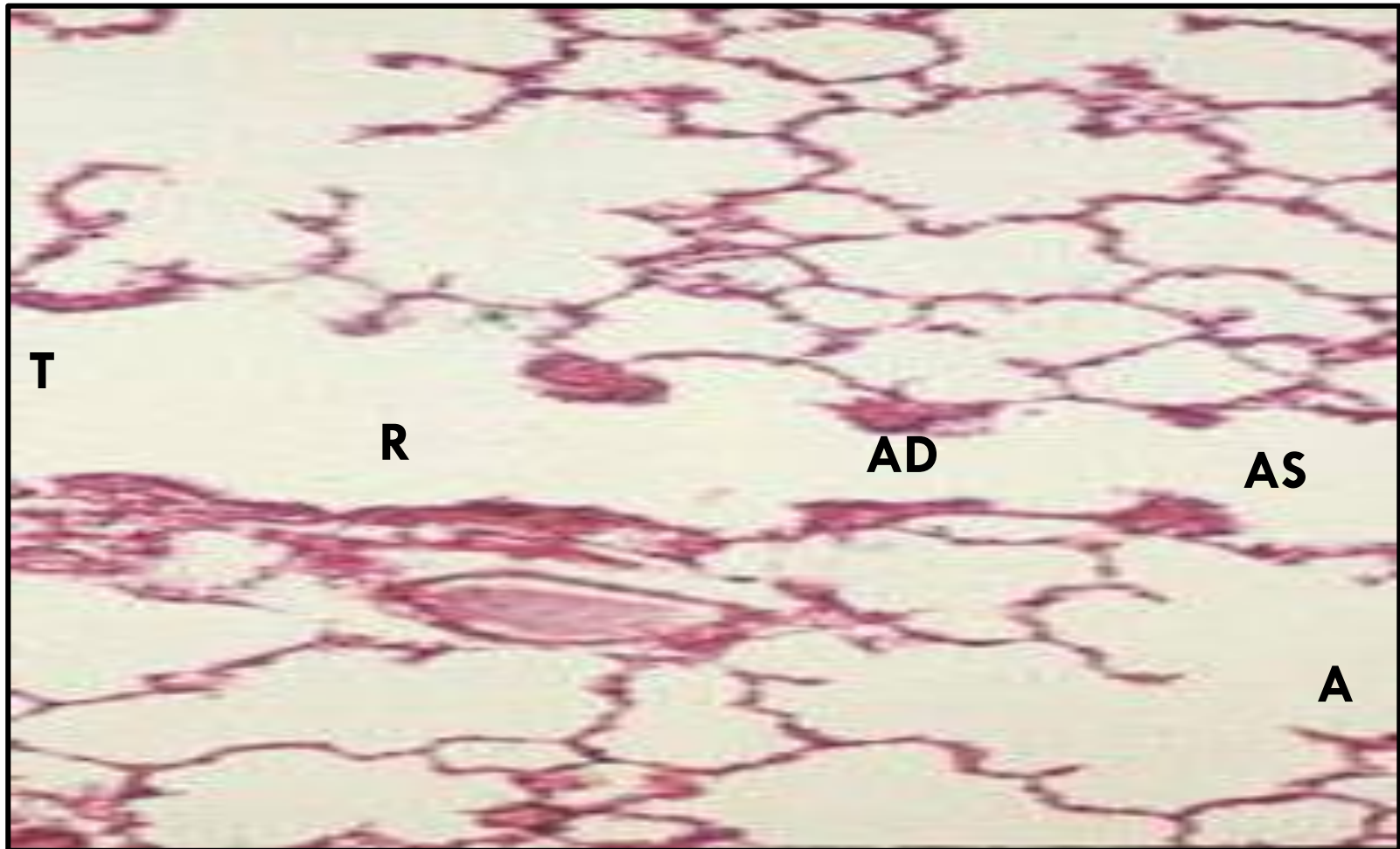
# Lung Anatomy

- **Cartilage is present to the level of proximal bronchioles.**
- **Beyond terminal bronchiole gas exchange occurs.**
- **The distal airspaces are kept open by elastic tension in alveolar walls.**





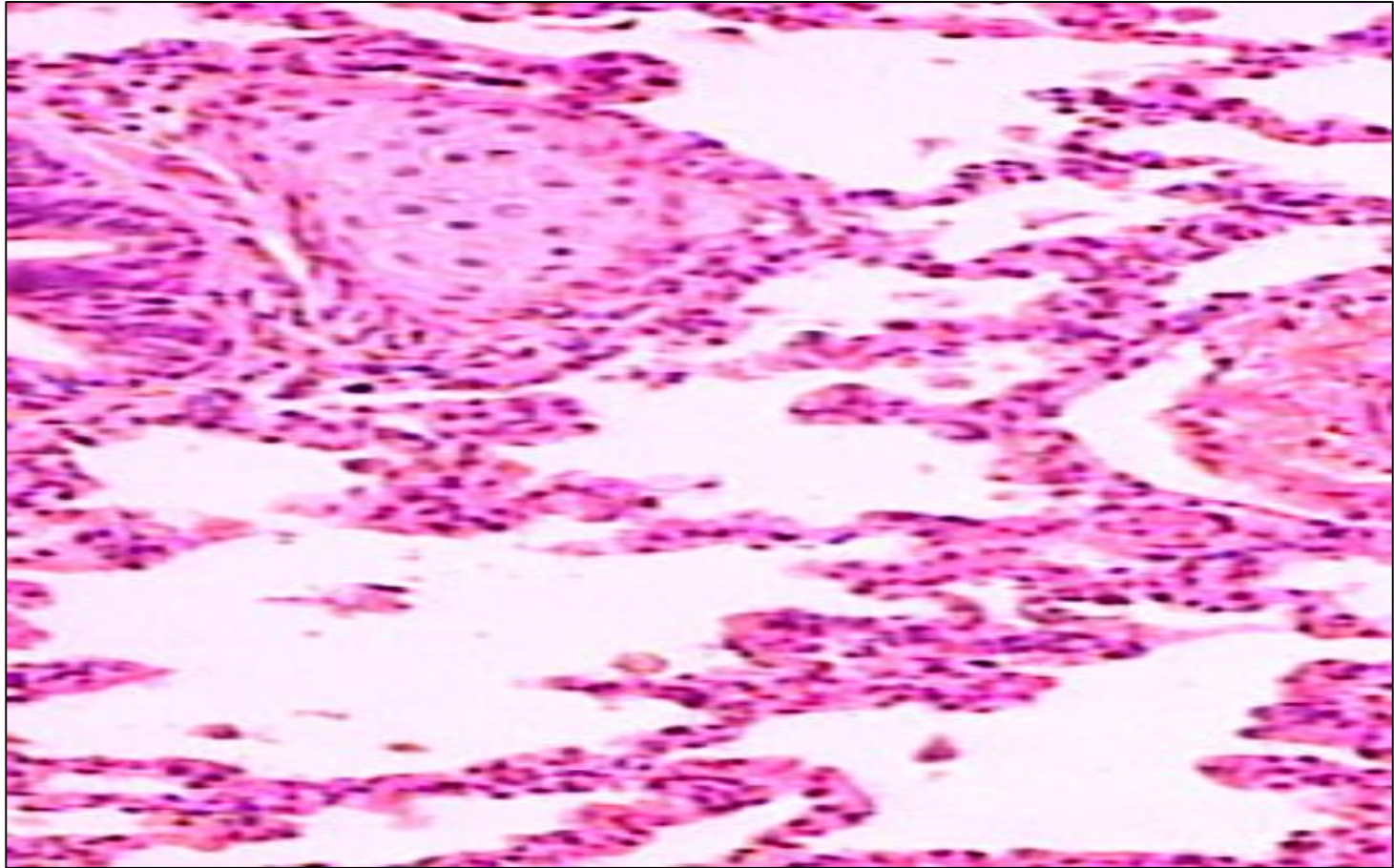
## Normal Histology of the Lungs



**Microscopic section of normal lung showing terminal bronchiole (T) , respiratory bronchiole (R), alveolar duct (AD), alveolar sac (AS), and alveoli (A).**



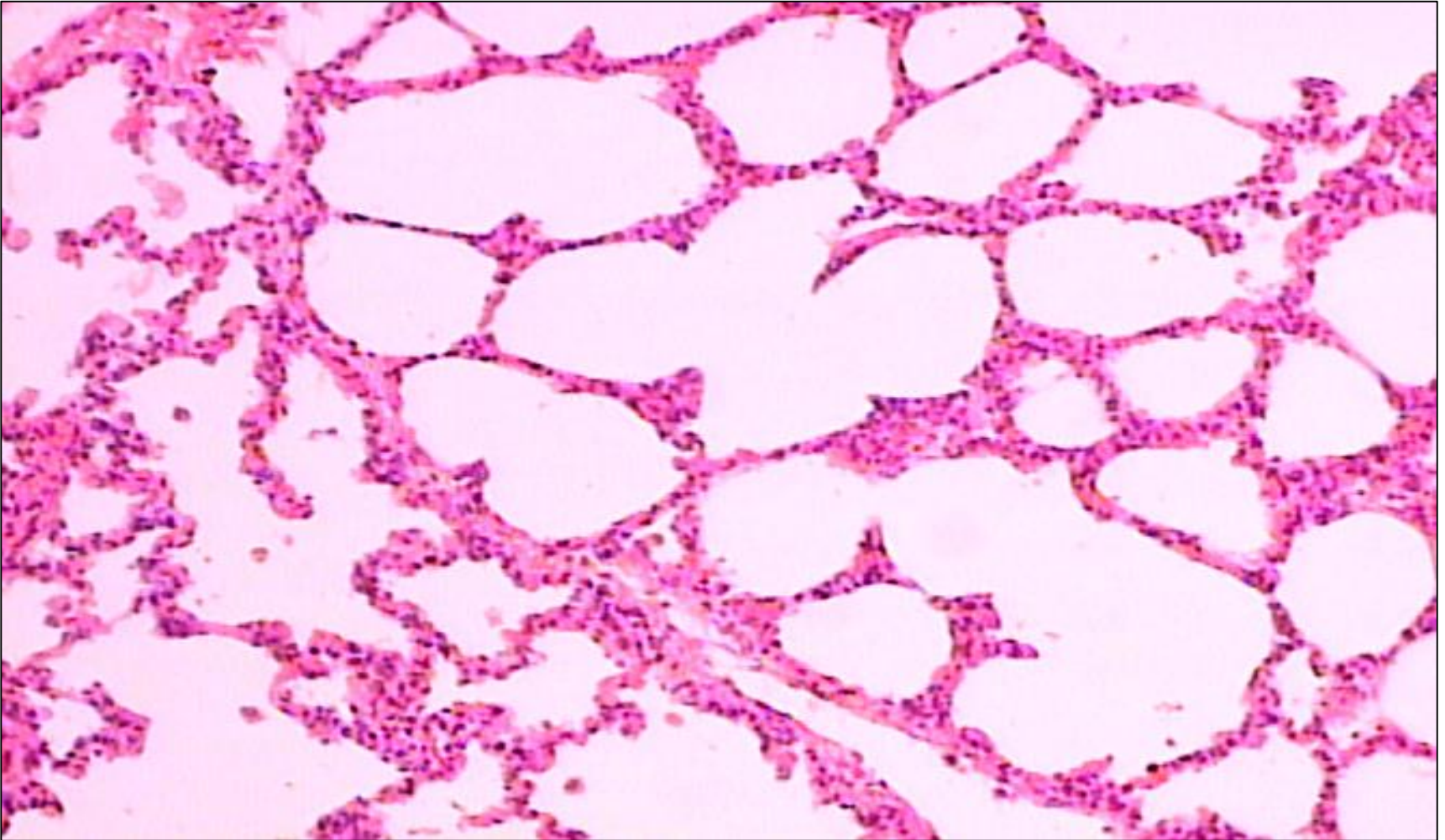
## Normal Histology of the Lungs - Bronchiole



This view shows a **BRONCHIOLE (left)** and **Blood Vessel (right)** in cross-section as well as numerous **ALVEOLI** in normal lung at 100X magnification.

The bronchiole inner membrane is composed of pseudostratified columnar epithelial tissue. Portions of hyaline cartilage rings can also be seen outside of the bronchiole.

## Normal Histology of the Lungs - Alveoli



**Normal Alveoli:** These oval-shaped alveoli expand with air during inspiration, have very thin epithelial walls and are surrounded by capillaries creating the respiratory membrane where gas exchange occurs between air and blood

# Classification of Respiratory Diseases

## 1. Inflammatory lung diseases:

(Asthma, cystic fibrosis, & COPD)

## 2. Restrictive lung diseases:

(Allergic Alveolitis)

## 3. Obstructive lung diseases :

(Bronchial Asthma, Bronchiectasis, & (COPD- Ch. Bronchitis & Emphysema ))

## 4. Respiratory tract infections:

-Upper resp. tract infection (sinusitis, tonsillitis, otitis media, pharyngitis & laryngitis )

-Lower resp. tract infection (Pneumonia & Bronchopneumonia , T.B.)

## 5. Malignant tumors (Squamous CC, adenocarcinoma, Large CC & Small CC)

## 6. Benign tumors (Pulmonary hamartoma, pulmonary sequestration)

## 7. Pleural cavity diseases ( eg. Mesothelioma, effusion )

## 8. Pulmonary vascular diseases (Embolism, edema & hypertension)

## 9. Neonatal diseases (pulmonary hyperplasia.)



# ***RESTRICTIVE LUNG DISEASES***

## ***ALLERGIC ALVEOLITIS***

# Restrictive Lung Disease

## Fibrosing

Usual interstitial pneumonia (idiopathic pulmonary fibrosis)  
Nonspecific interstitial pneumonia  
Cryptogenic organizing pneumonia  
Associated with collagen vascular disease  
Pneumoconiosis  
Associated with therapies (drugs, radiation)

## Granulomatous

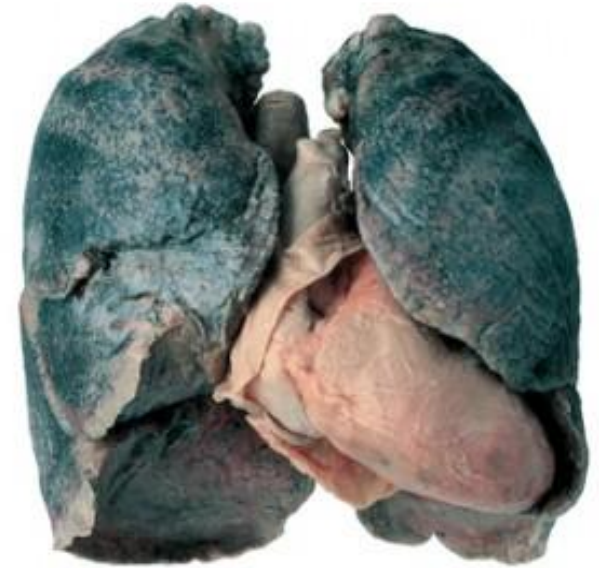
Sarcoidosis  
Hypersensitivity pneumonia

## Eosinophilic

Loeffler syndrome  
Drug allergy-related  
Idiopathic chronic eosinophilic pneumonia

## Smoking-Related

Desquamative interstitial pneumonia  
Respiratory bronchiolitis

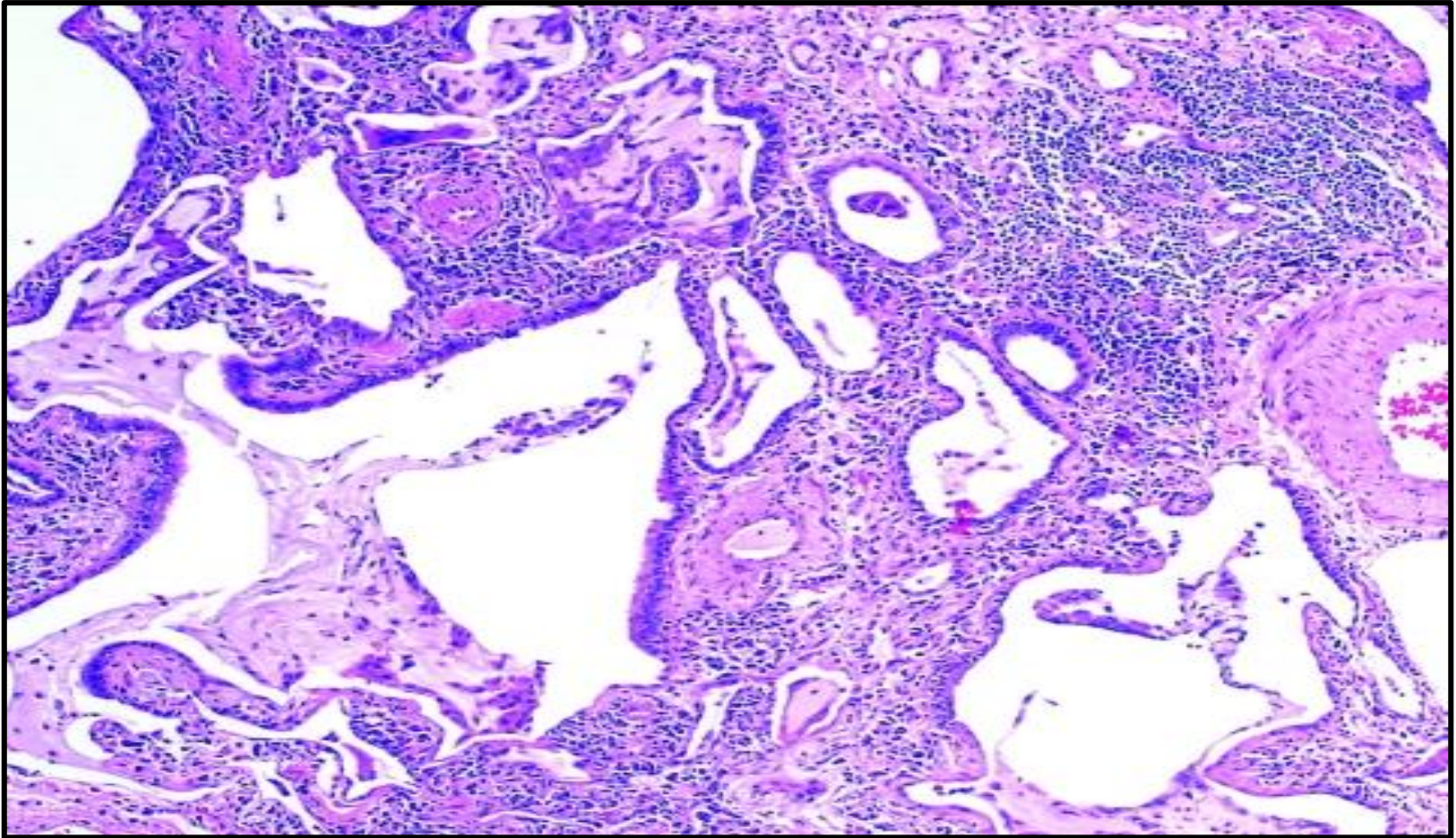


## ***Restrictive Lung Disease (Honeycomb lung) – Cut section***



***“Honeycomb” lung. (extensive fibrosis from restrictive lung disease.  
The gross appearance, as seen here in a patient with organizing diffuse alveolar damage***

## **Restrictive Lung Disease (Honeycomb lung) – LPF**

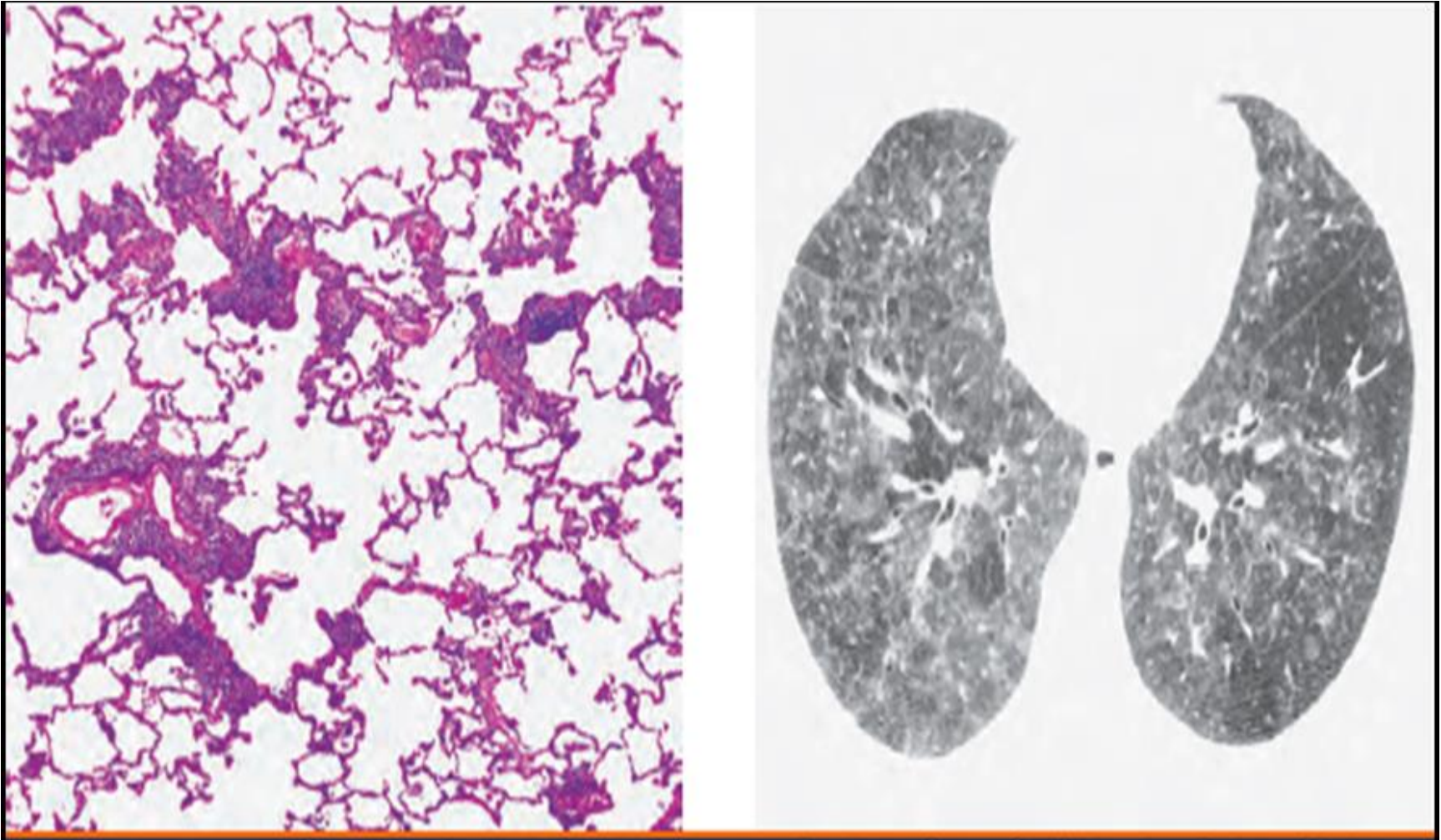


### **Restrictive Lung Disease**

***Pulmonary fibrosis with extensive interstitial collagen deposition, minimal lymphocytic infiltrates, and residual airspace dilation.***

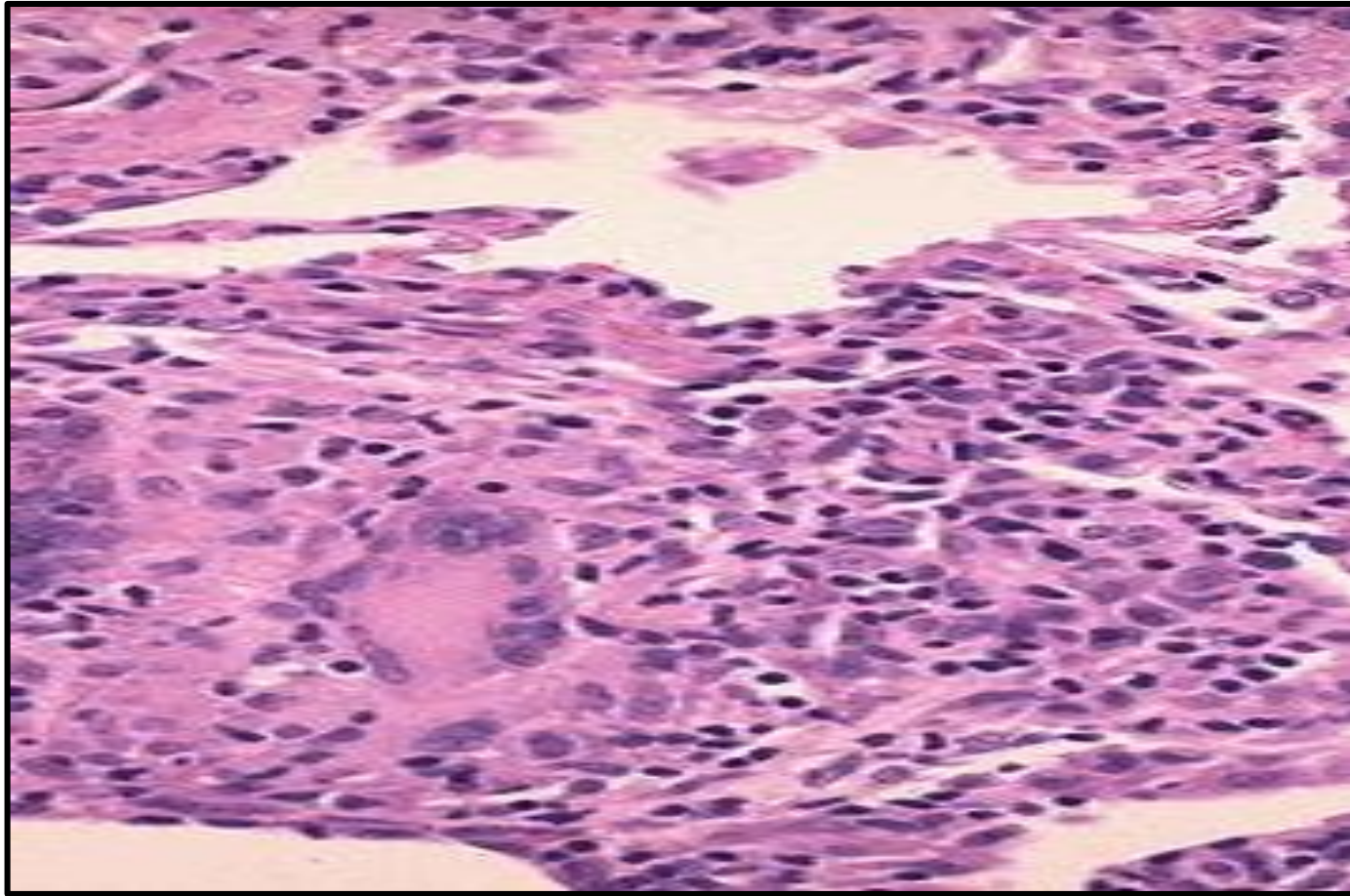


## Hypersensitivity Pneumonitis— Histopathology & Radiogram



This case of **extrinsic allergic alveolitis** shows **interstitial inflammation along alveolar ducts (bronchiolocentric distribution or peribronchiolar)**. The inflammation is **diffuse, lacks nodularity, and manifests radiologically as a ground-glass pattern**

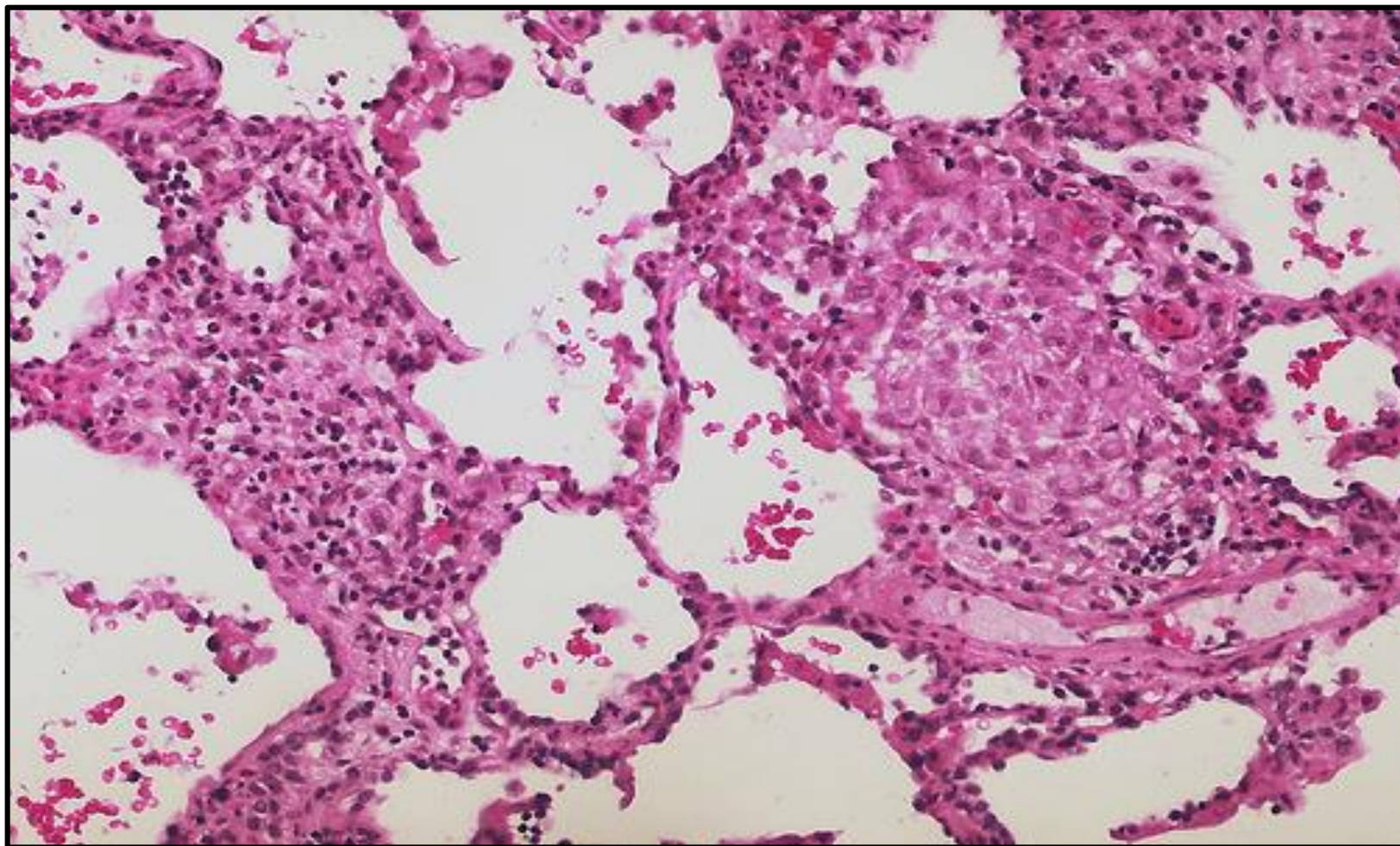
## **Hypersensitivity Pneumonitis ( HP)**



***Interstitial bronchiolocentric pneumonitis (Extrinsic allergic alveolitis) with lymphocytes, plasma cells and foamy macrophages in alveolar space and terminal airways . Interstitial fibrosis, obliterative bronchiolitis and intra-alveolar exudate . Nodules of organizing fibroblasts, histiocytes with Interstitial noncaseating granulomas and other inflammatory cells***



## **Hypersensitivity Pneumonitis (HP)**



***Interstitial fibrosis, lymphocyte infiltration in the alveolar wall, mainly collagen fibers hyperplasia, especially in the bronchioles due to their respective muscle fibers and endothelial cell proliferation and thickening***

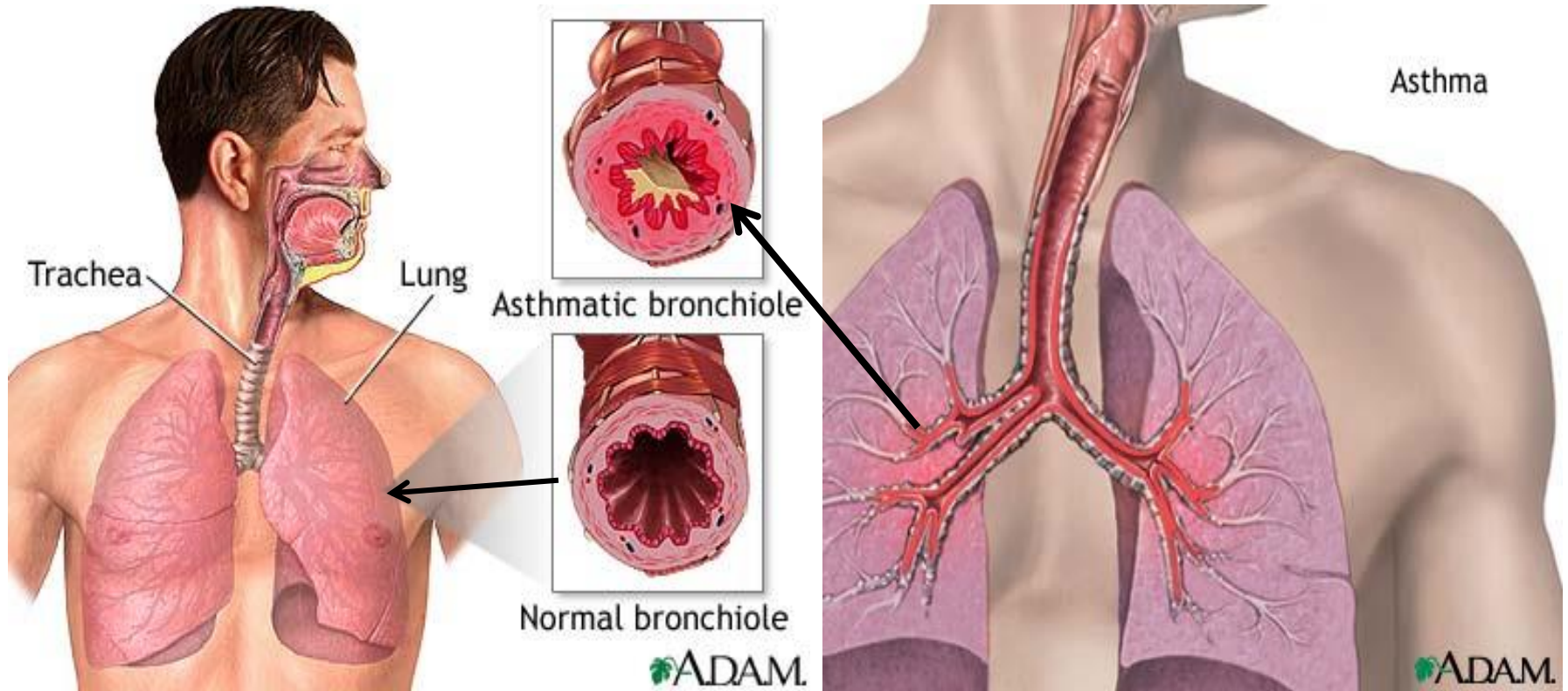
# ***OBSTRUCTIVE LUNG DISEASES***



- 1. Bronchial Asthma**
- 2. Bronchiectasis**
- 3. COPD :**  
***(Chronic Bronchitis & Emphysema)***

# 1. BRONCHIAL ASTHMA

# BRONCHIAL ASTHMA - Anatomy

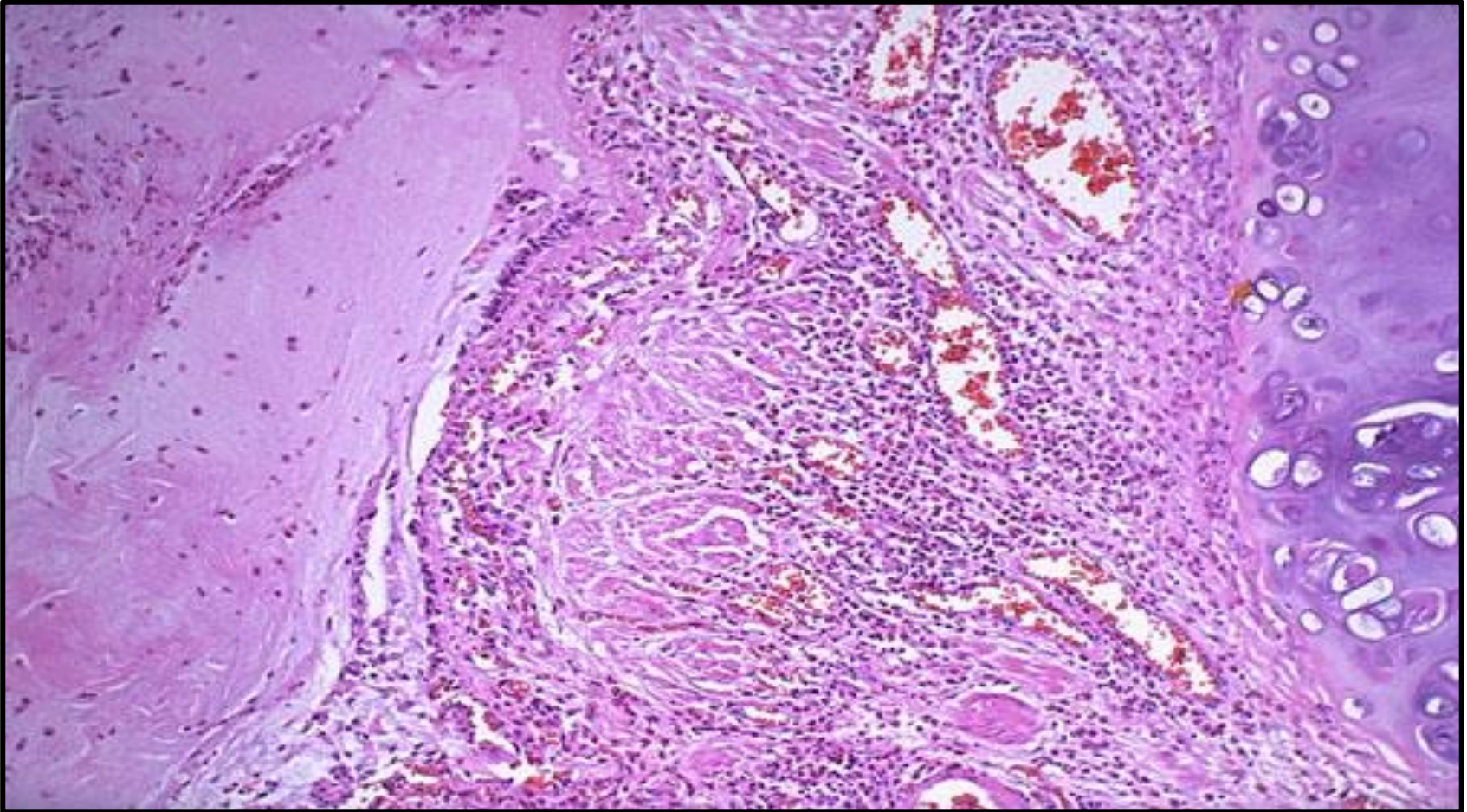


**Bronchial Asthma:** Inflammation of the airways causes airflow into and out of the lungs to be restricted. The muscles of the bronchial tree become tight and the lining of the air passages swells, reducing airflow and producing the characteristic wheezing sound



# BRONCHIAL ASTHMA - LPF

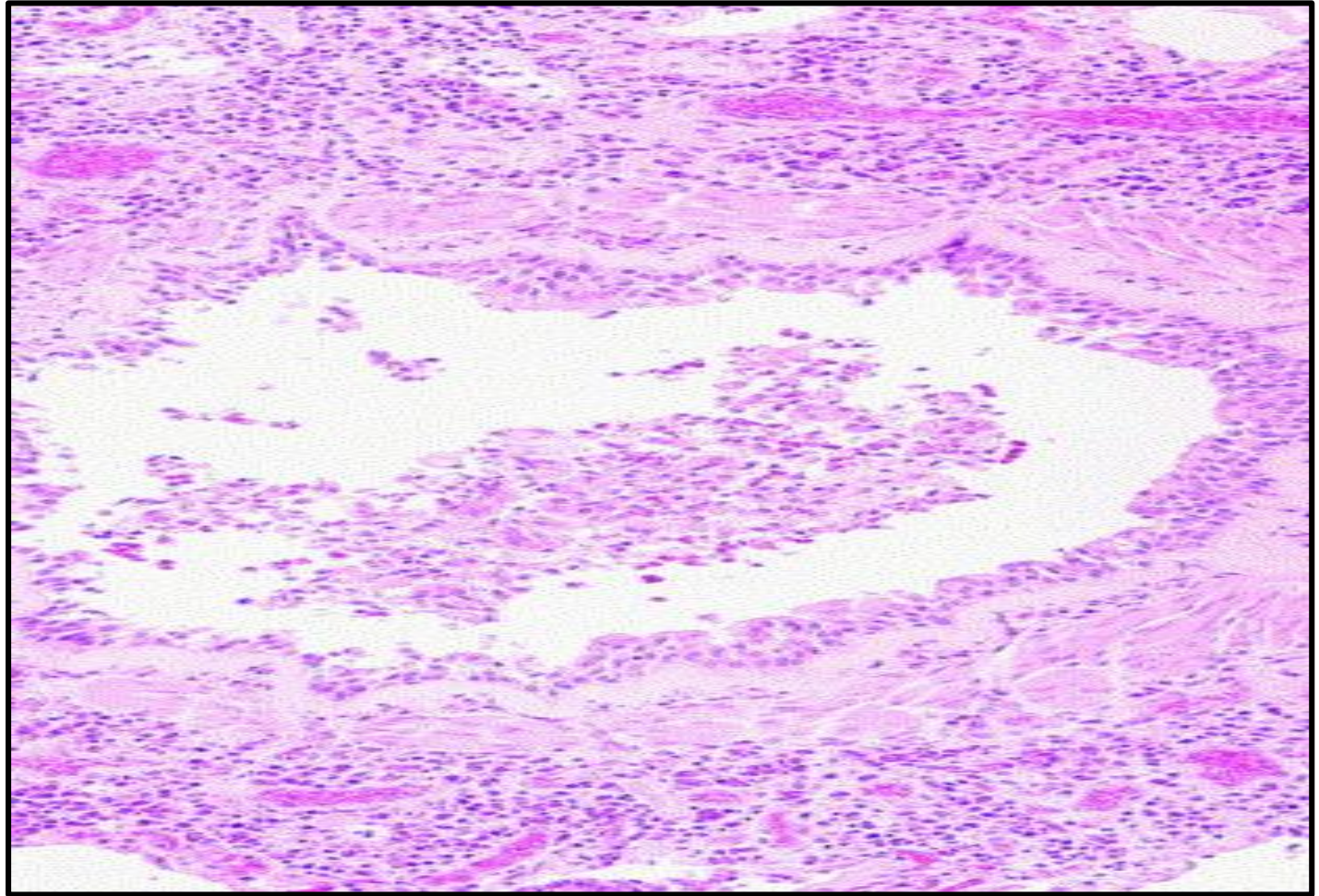
## Charcot Leyden Crystals



***Between the bronchial cartilage at the right and the bronchial lumen filled with mucus at the left is a submucosa widened by smooth muscle hypertrophy, edema, and inflammation (mainly eosinophils). These are changes of bronchial asthma. The peripheral eosinophil count or the sputum eosinophils can be increased during an asthmatic attack.***



# BRONCHIAL ASTHMA - LPF



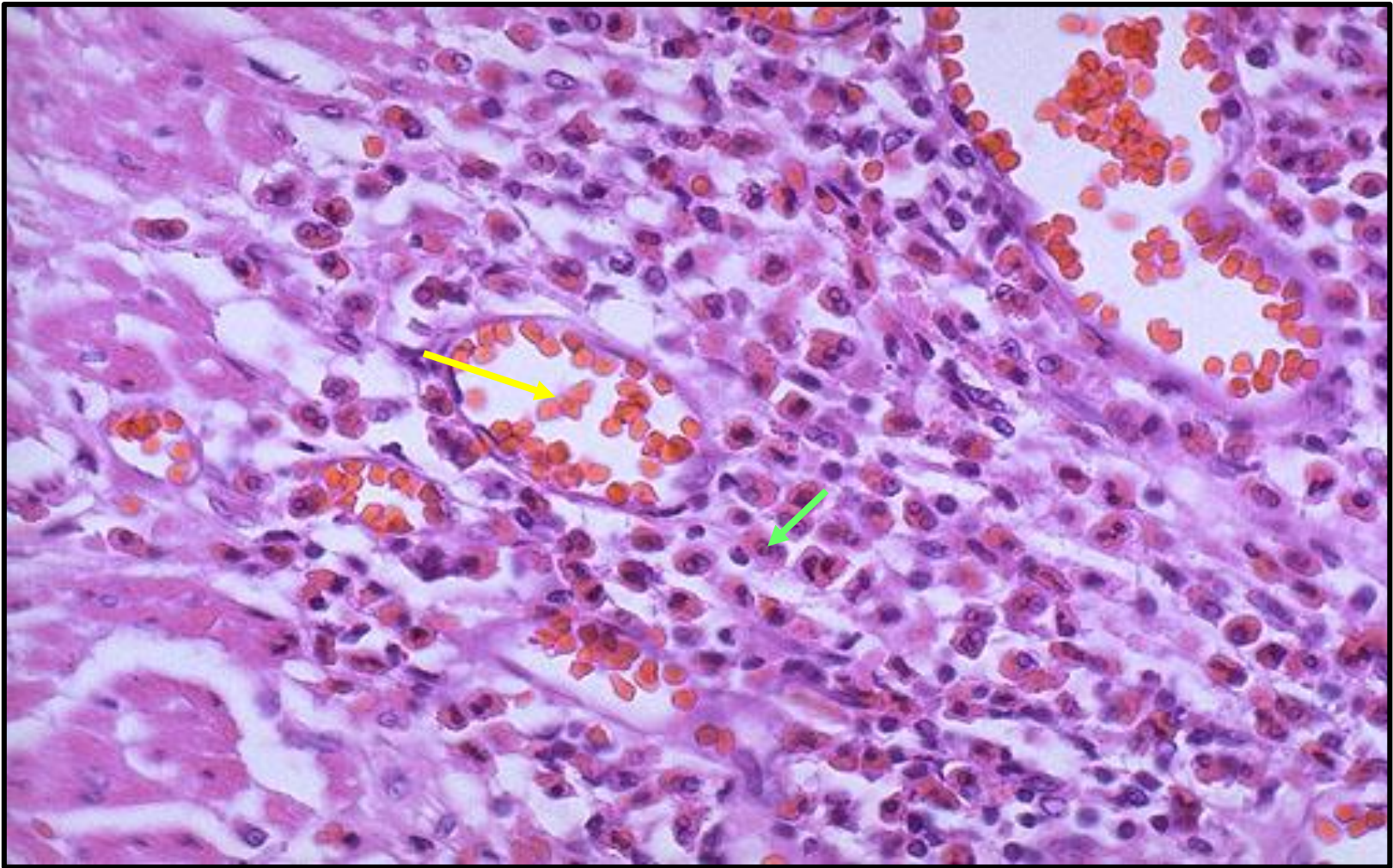
## Complications:

- Status asthmaticus
- Emphysema
- Chronic Bronchitis
- Cor Pulmonale

***Bronchus from a fatal case of bronchial asthma in a 4-year-old child. There is partial plugging of the lumen, an intense inflammatory infiltrate and vascular congestion.***



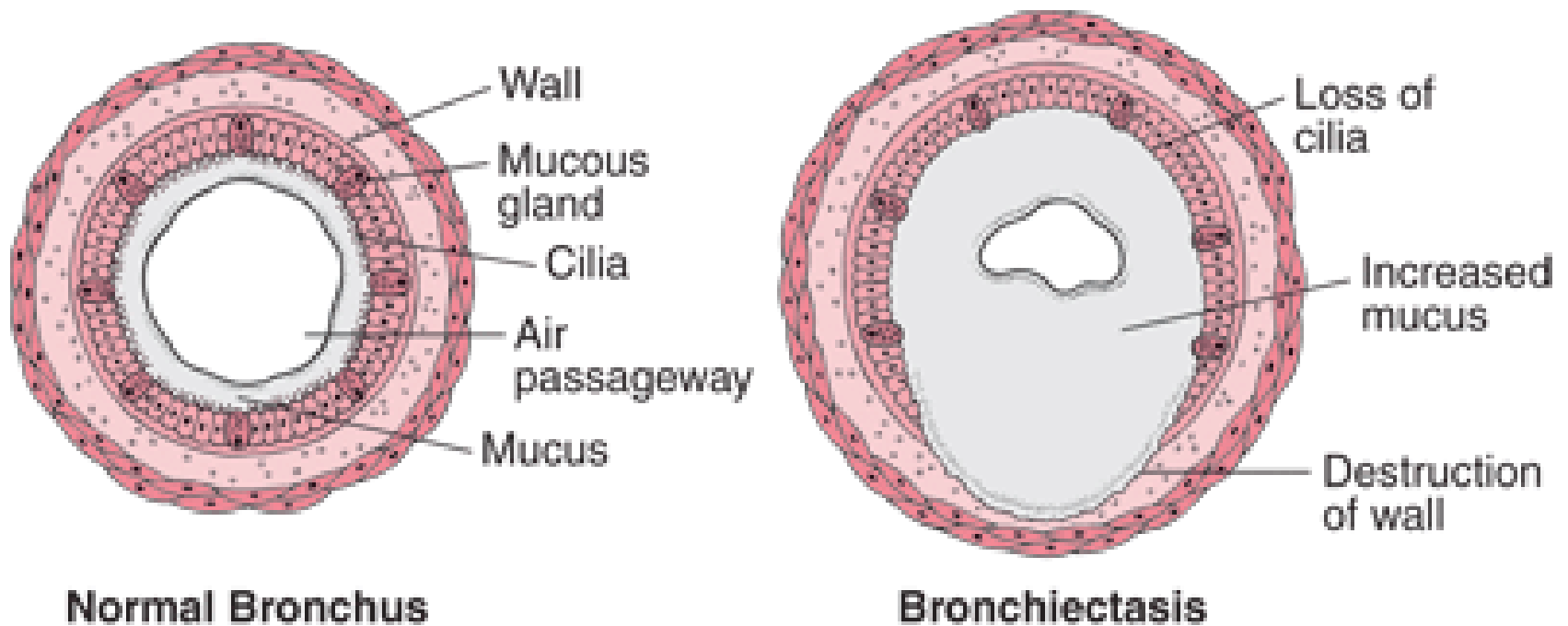
## BRONCHIAL ASTHMA - HPF



***Changes of bronchial asthma: the numerous eosinophils are prominent from their bright red cytoplasmic granules in this case of bronchial asthma***

## **2. BRONCHIECTASIS**

## Diagram of Normal & Bronchiectatic Bronchus



***In Bronchiectasis, mucus production increases, the cilia are destroyed or damaged, and areas of the bronchial wall become chronically inflamed and are destroyed .***

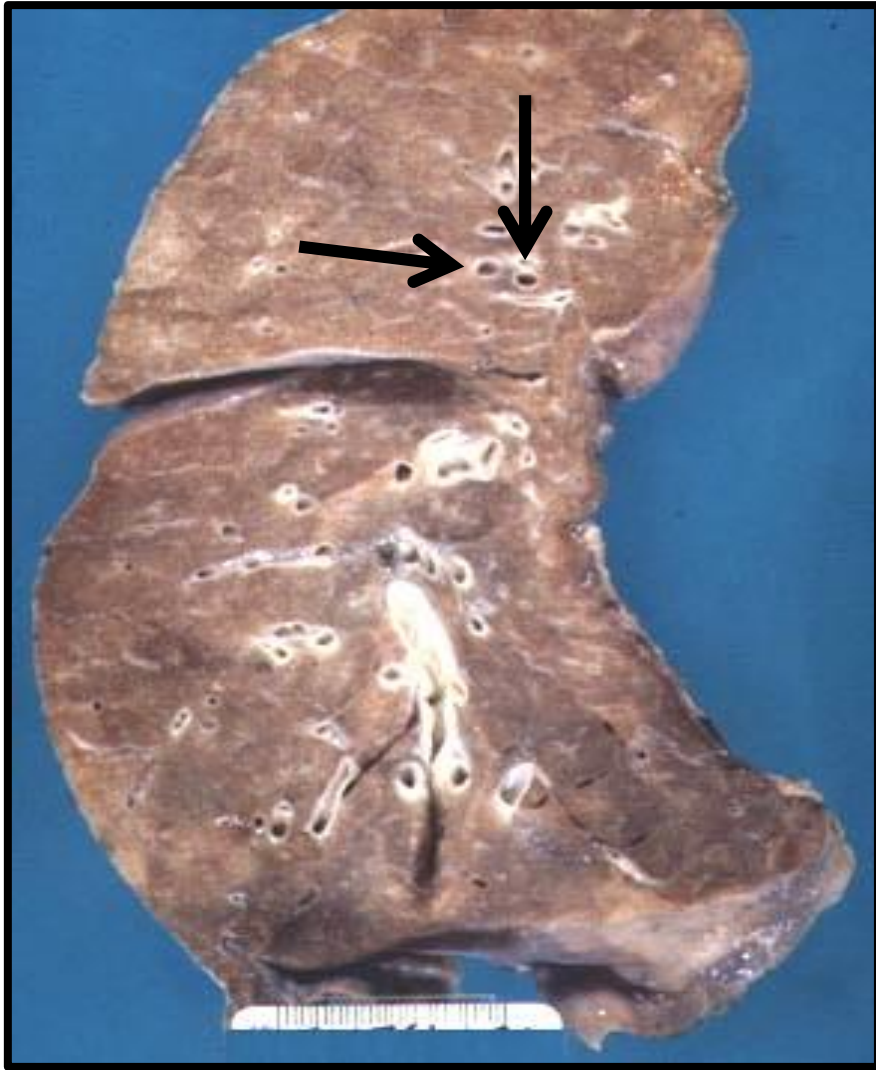


## Bronchiectasis – Gross pathology & Colored X-ray



***Permanent dilatation of bronchi and bronchioles caused by destruction of muscle and elastic tissue resulting from or associated with chronic necrotizing infection -Markedly distended peripheral bronchi.***

## Bronchiectasis – Gross pathology

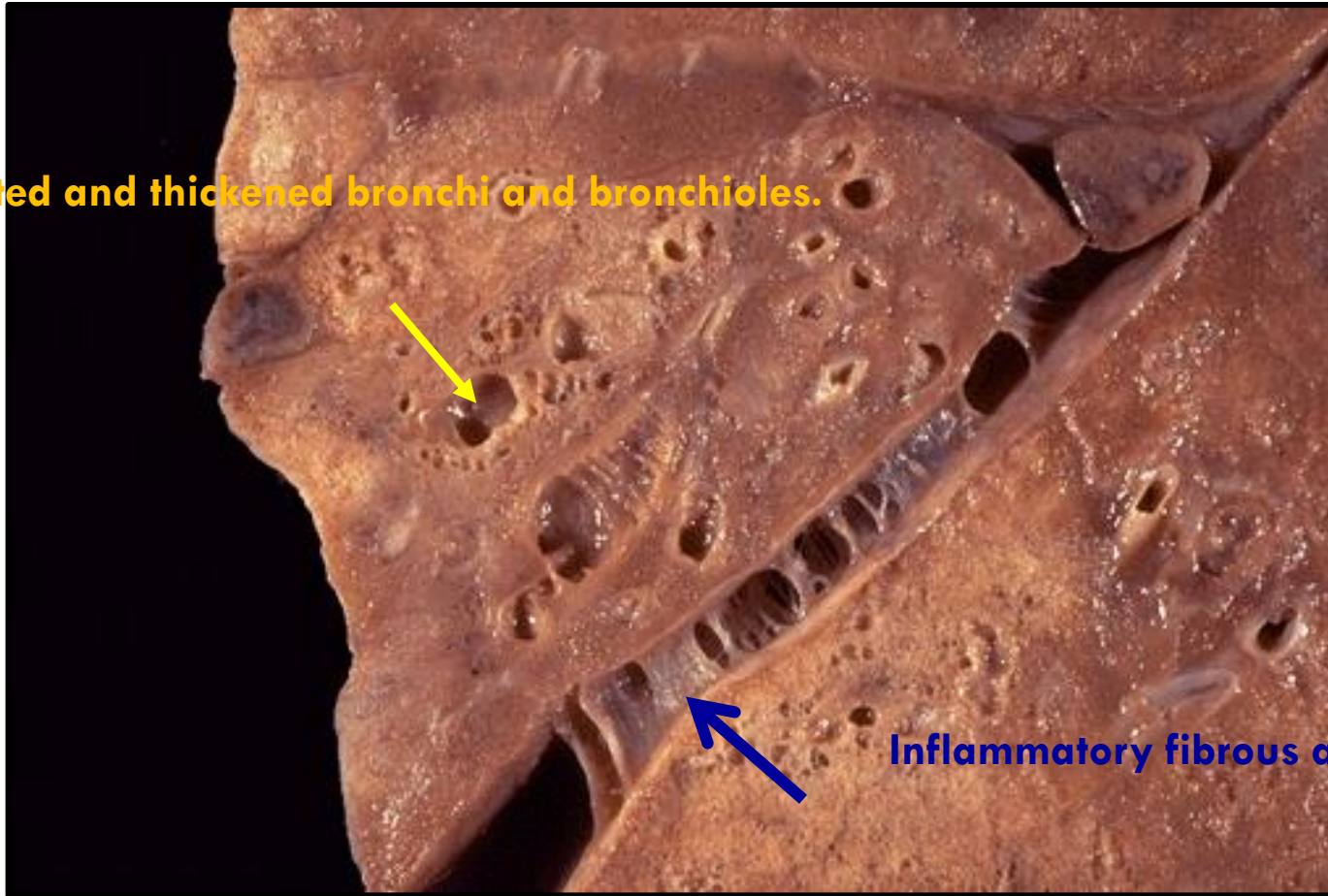


***Bronchiectasis occurs when there is obstruction or infection with inflammation and destruction of bronchi so that there is permanent dilation.***



## Bronchiectasis – Gross pathology

Dilated and thickened bronchi and bronchioles.



Inflammatory fibrous adhesions

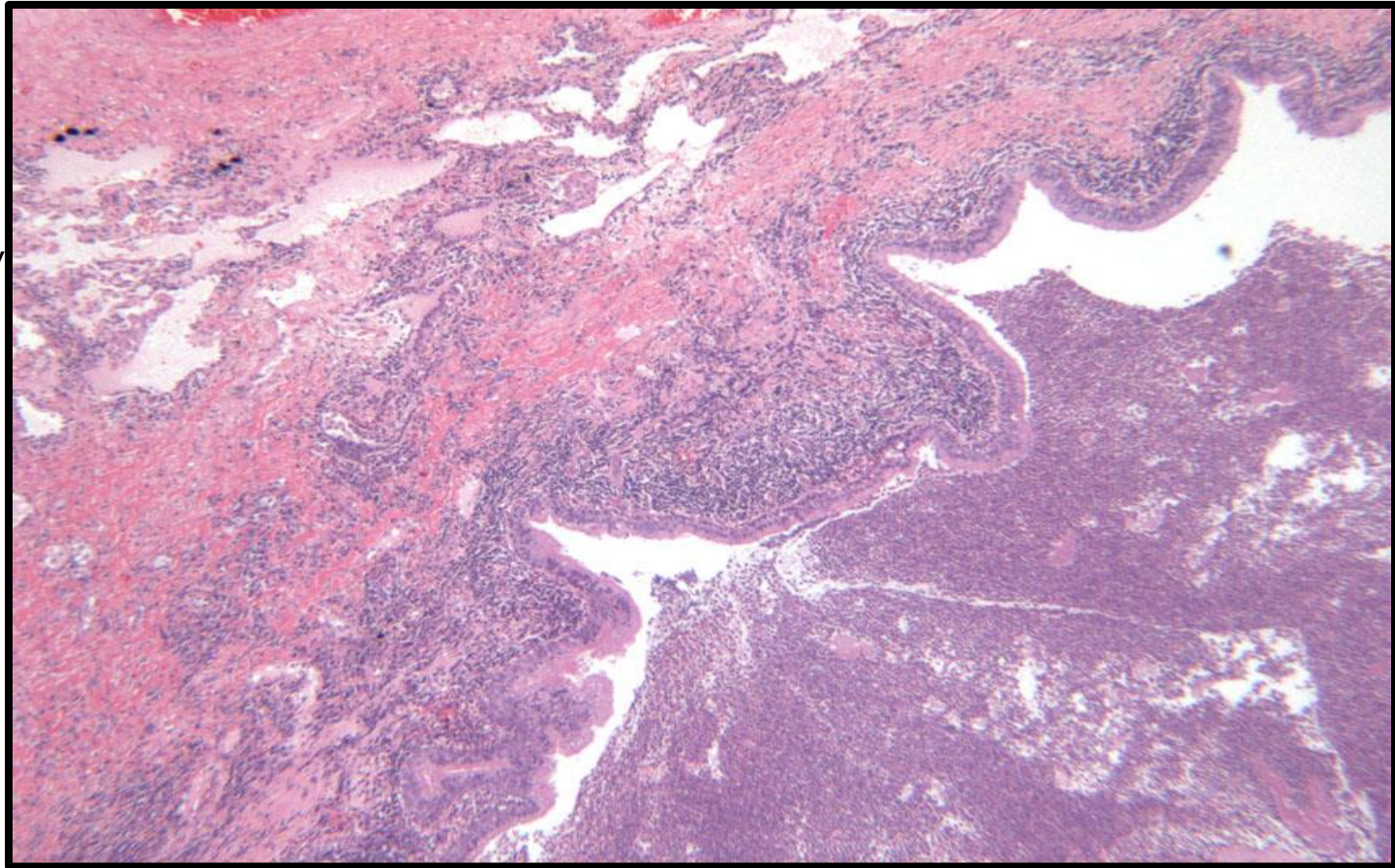
*The repeated episodes of inflammation can result in scarring, which has resulted in fibrous adhesions between the lobes. Fibrous pleural adhesions are common in persons who have had past episodes of inflammation of the lung that involve the pleura.*



# Bronchiectasis – LPF

## Predisposing causes:

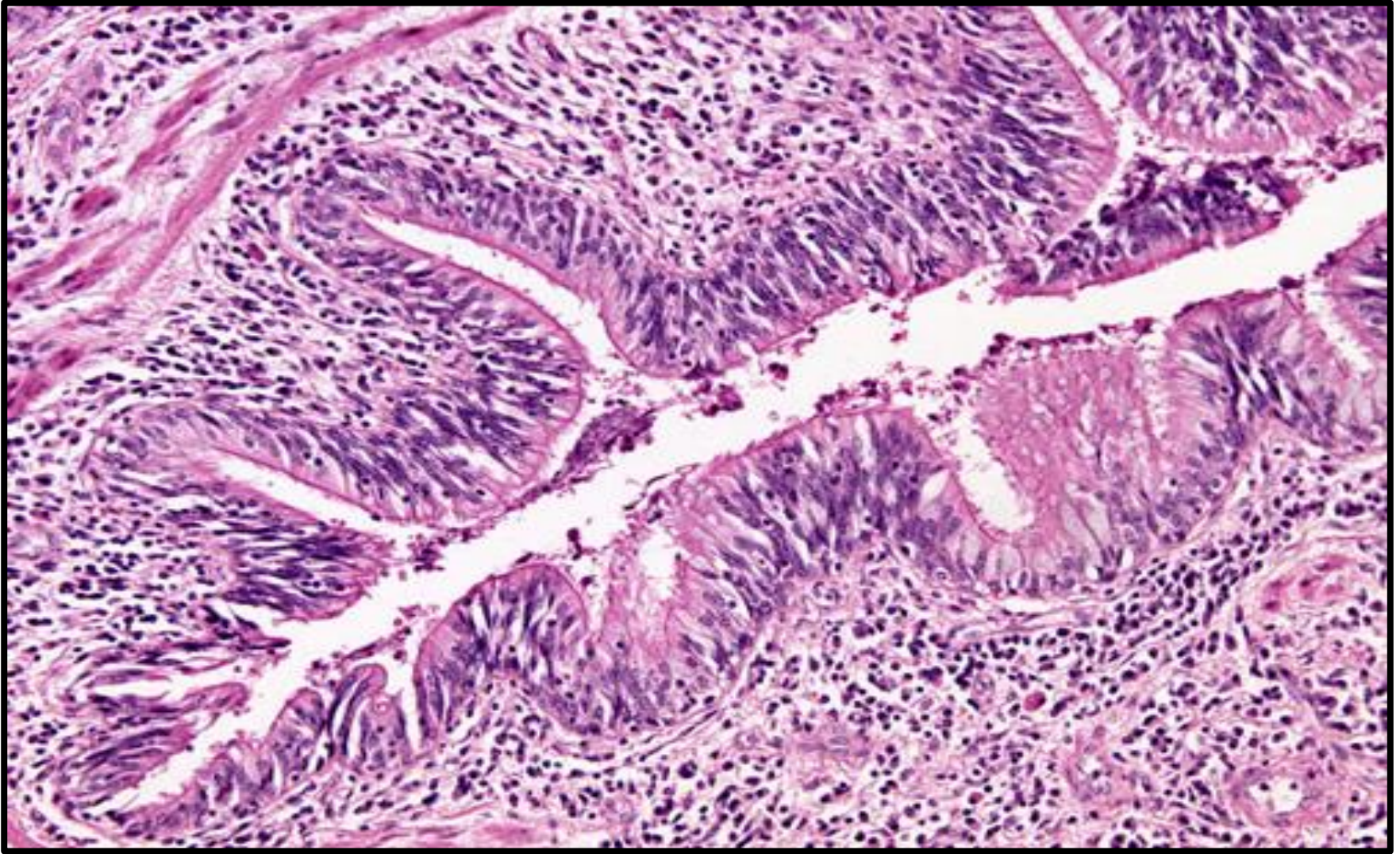
- Immotile cilia syndrome
- Cystic fibrosis
- Immunodeficiency states
- Suppurative pneumonias especially those caused by staph Aureus and Klebsiella
- Tuberculosis in endemic areas



***Section of a dilated bronchus with florid acute on chronic inflammation of the bronchial wall and surrounding interstitial fibrosis.***



## Bronchiectasis – HPF



***Chronic inflammation, Variable inflammation and fibrosis of alveoli***

# **Chronic Obstructive Pulmonary Diseases (COPD)**

**also known as**

**Chronic Obstructive Lung Disease (COLD),  
Chronic Obstructive Airway Disease (COAD),  
Chronic Obstructive Respiratory Disease (CORD)**

**Include:**

**3. Chronic Bronchitis**

**4. Emphysema,**

**a pair of commonly co-existing diseases of the  
lungs in which the airways narrow over time.**



# 3. CHRONIC BRONCHITIS

## Normal vs Chronic bronchitis

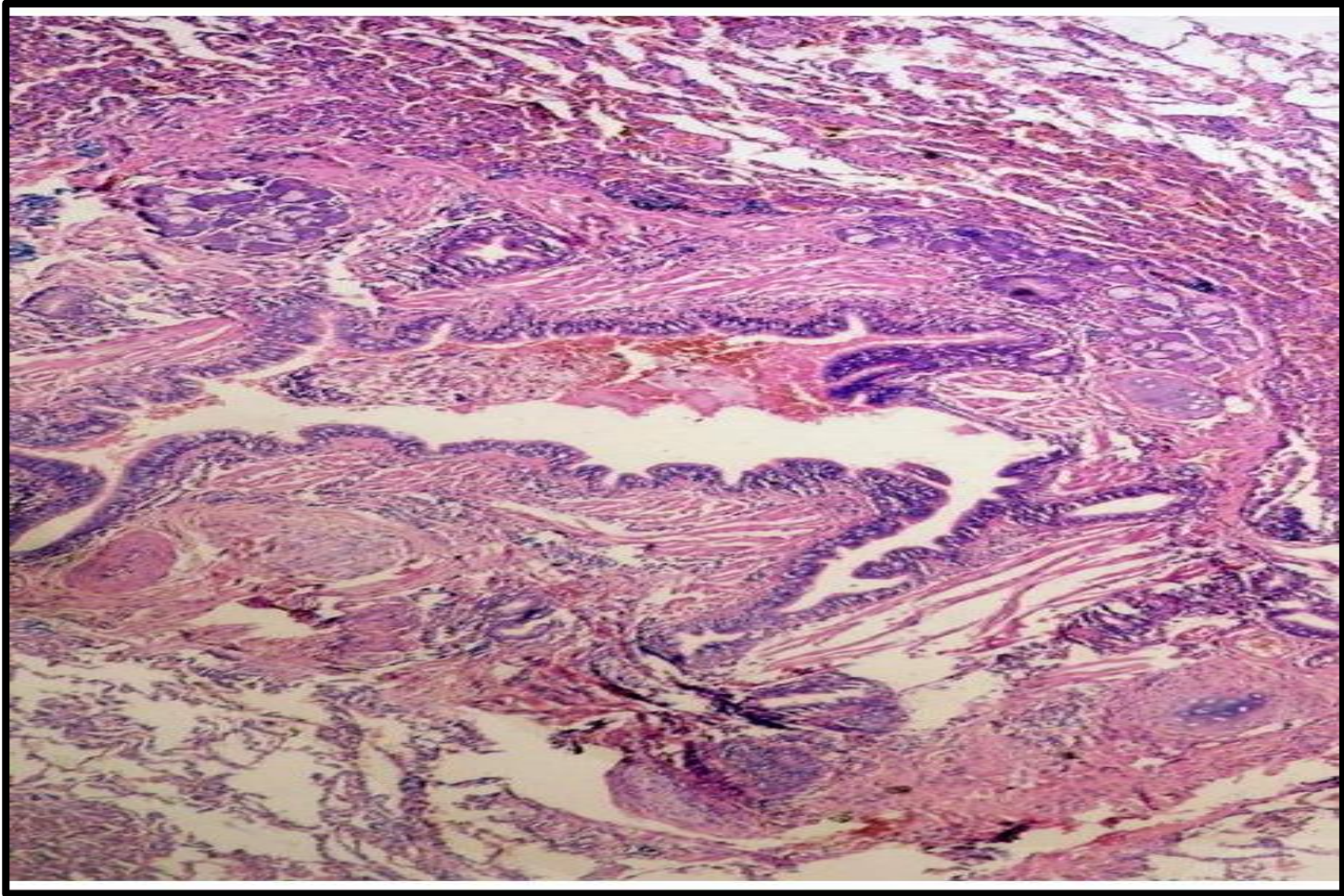


Normal



Chronic Bronchitis

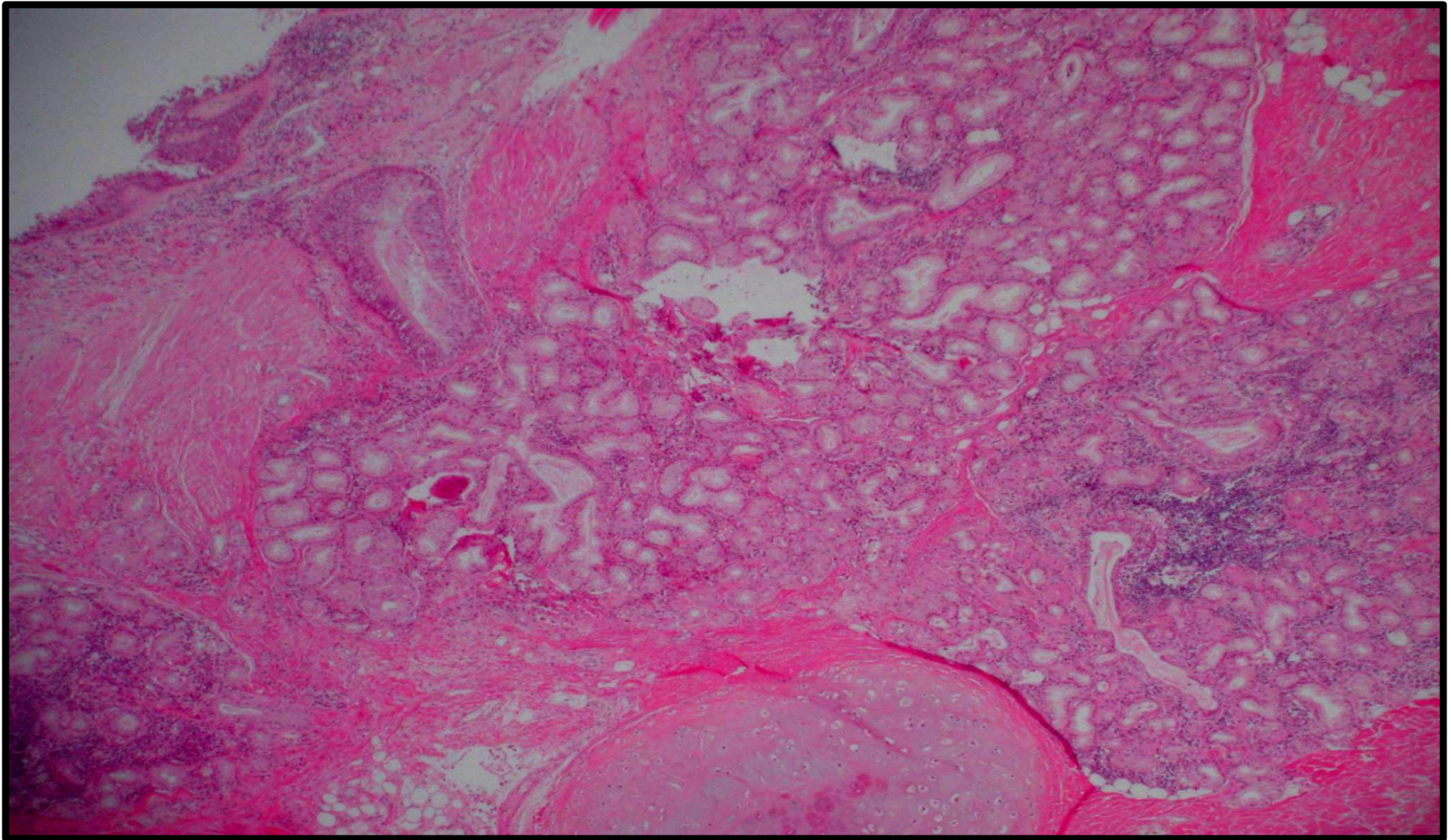
## Chronic Bronchitis - LPF



***Inflammatory infiltrate in bronchial walls is composed of lymphocytes and plasma cells. In the lumen desquamated epithelial cells (catarrhal inflammation) .In mucosa often occurs mataplasia of cylindric cilliated epithelium into multilayered squamous epithelium. Goblet cells are hyperplastic, hyperplastic are also the sero-mucous glands in the submucosal layer. Muscularis mucosae is hypertrophic***



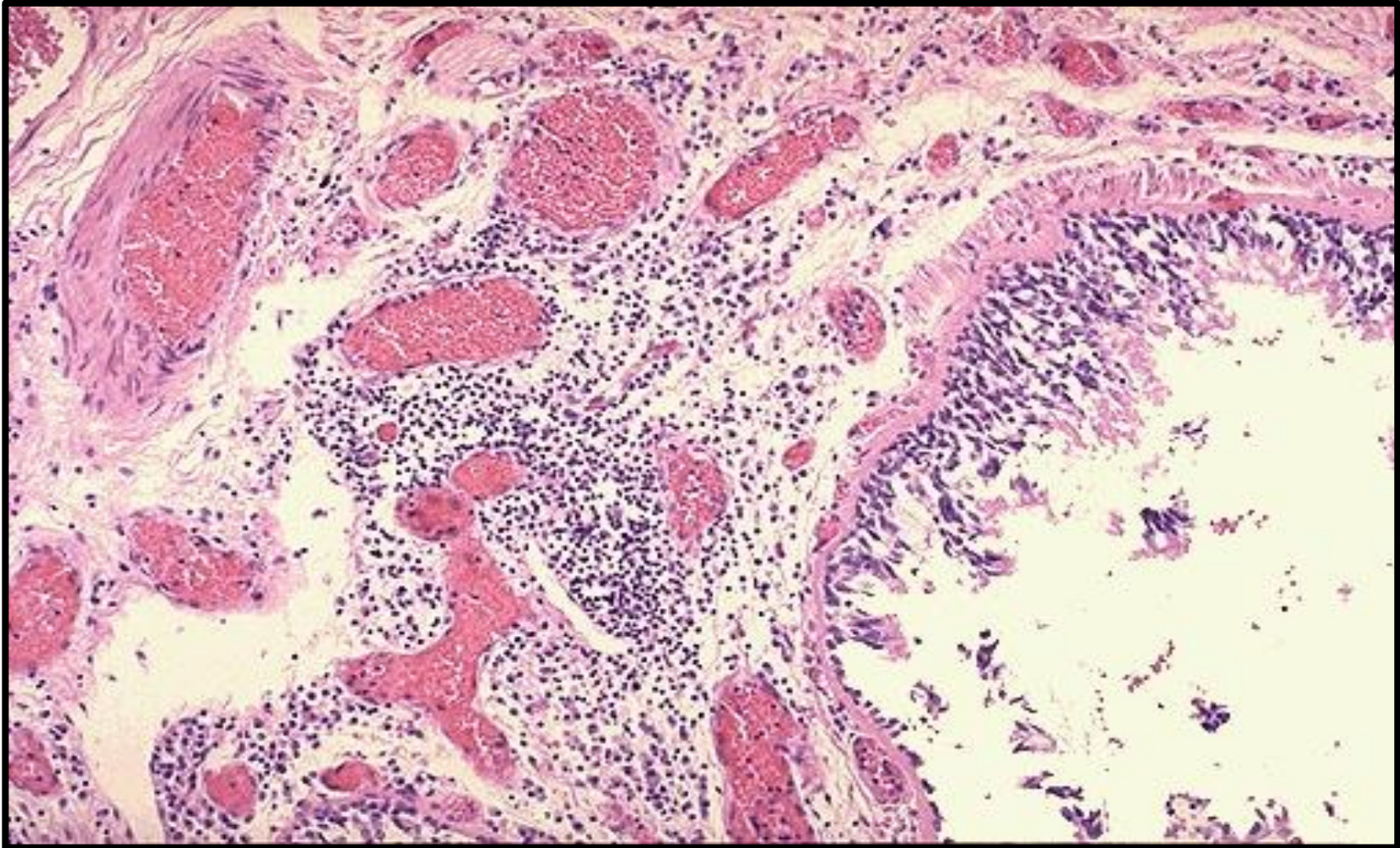
## Chronic Bronchitis - LPF



**Early - hypersecretion of mucus in large airways with hypertrophy of submucosal glands in tracheobronchial tree . Later - increase in goblet cells in small airways contributes to excessive mucus production and airway obstruction .**



## **Chronic Bronchitis - HPF**



***Chronic inflammatory infiltrates range from absent to prominent. Increased percentage of bronchial wall occupied by submucosal mucous glands, as measured by Reid index; this directly correlates with sputum production, variable dysplasia, squamous metaplasia, bronchiolitis obliterans.***

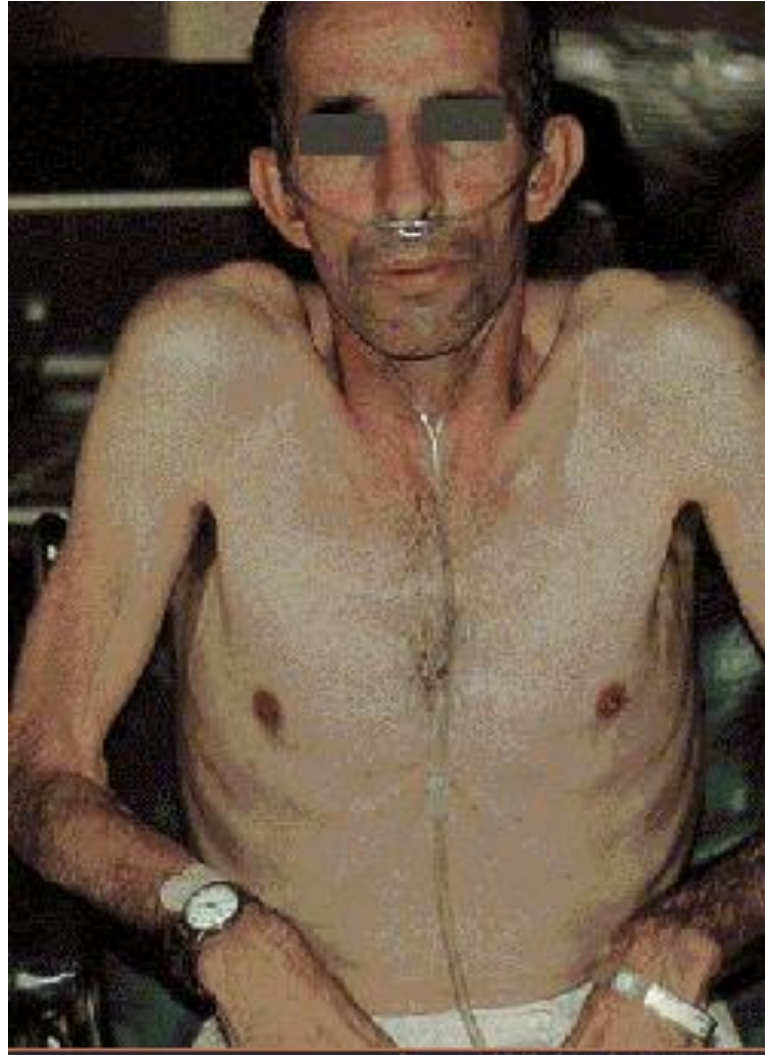
# **4. EMPHYSEMA**



# Emphysema – Clinical Features

## Complications:

- **Pulmonary hypertension.**
- **Cor pulmonale.**
- **Respiratory failure.**
- **Pneumothorax.**

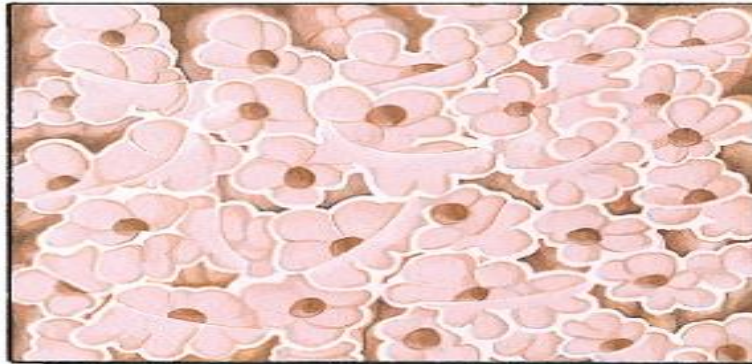


**Emphysema patient (so-called -pink puffers) exhibit dyspnea without significant hypoxemia and tend to be thin, to have hyperinflated lung fields at total lung capacity, and to be free of signs of right heart failure**

## Normal Lung

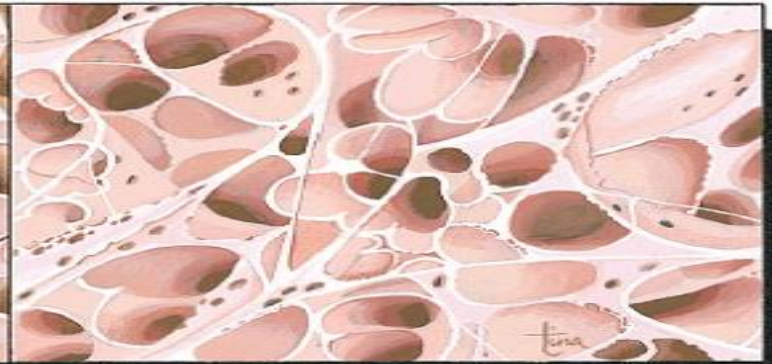


## Emphysema



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Normal Lung

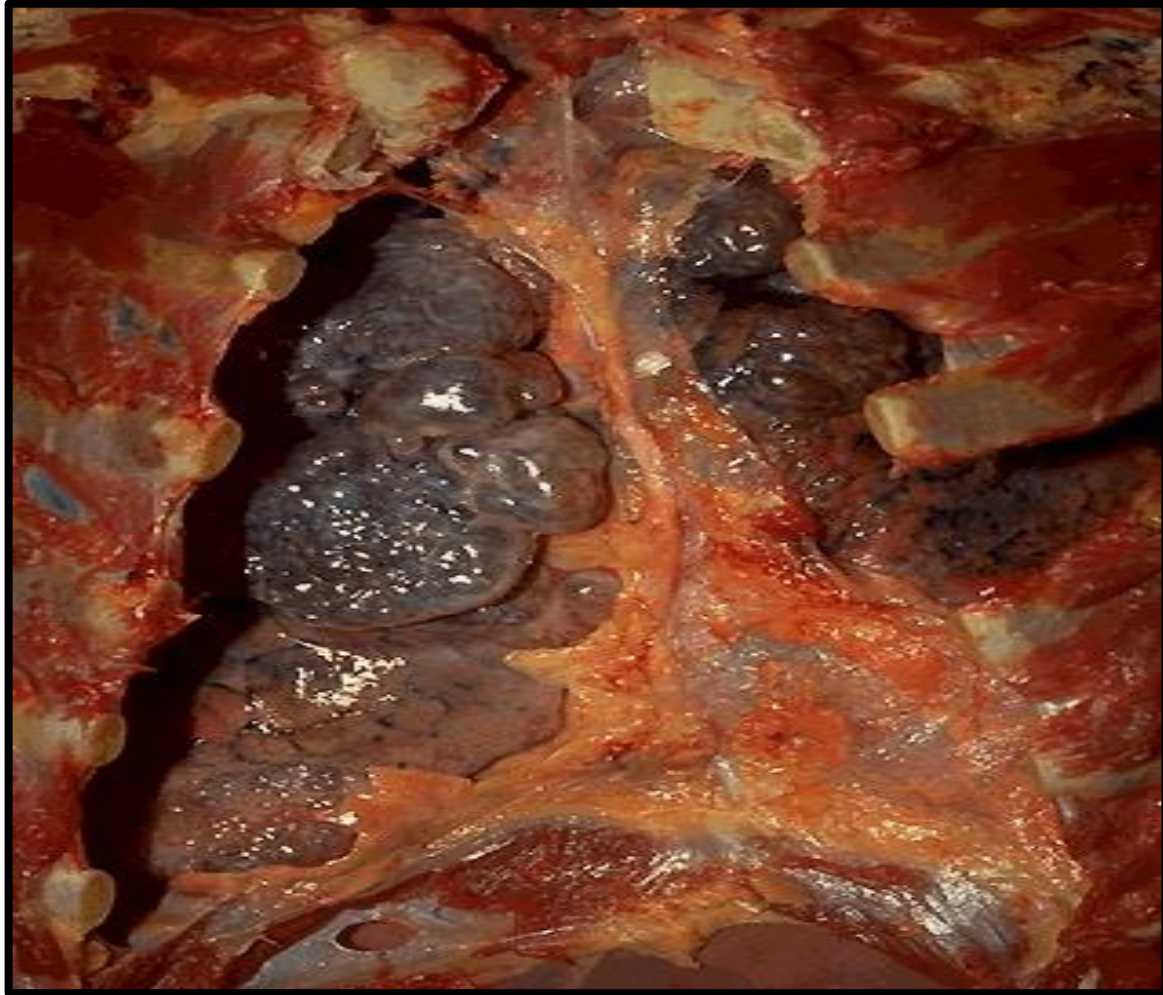


B

Emphysema



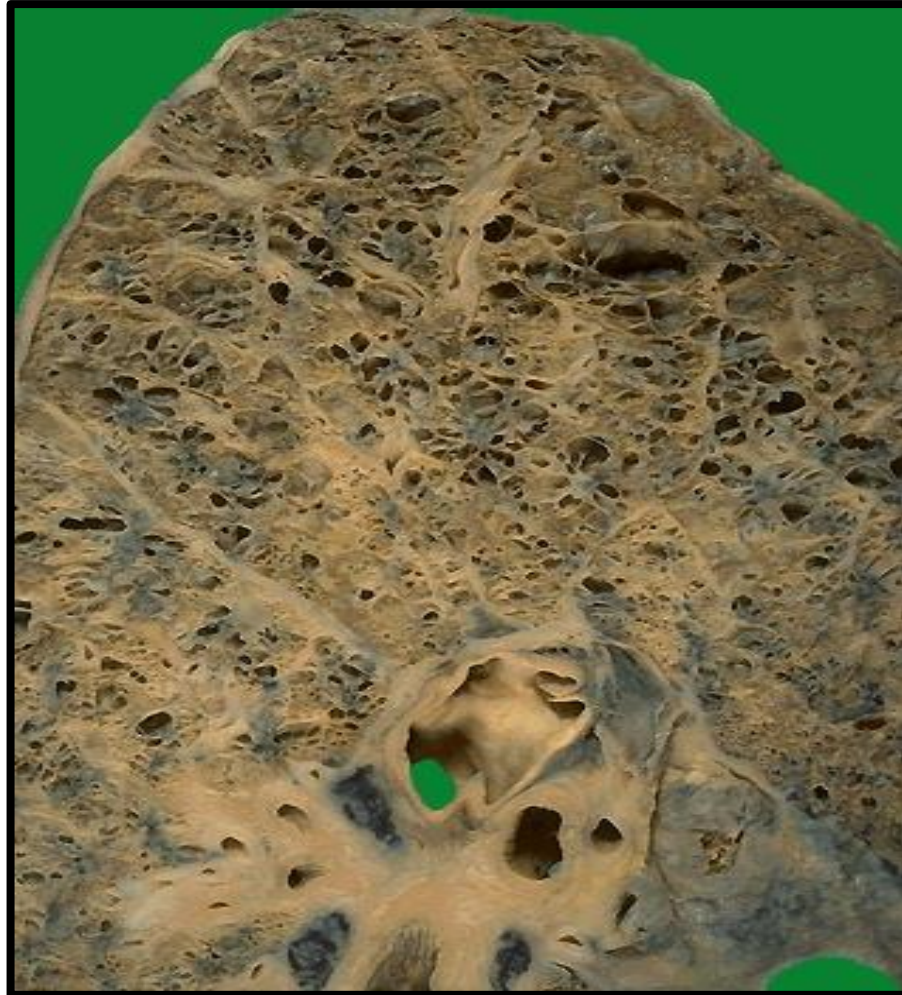
## **Emphysema – Gross Anatomy**



***The chest cavity is opened at autopsy to reveal numerous large bullae apparent on the surface of the lungs in a patient dying with emphysema. Bullae are large dilated airspaces that bulge out from beneath the pleura.***

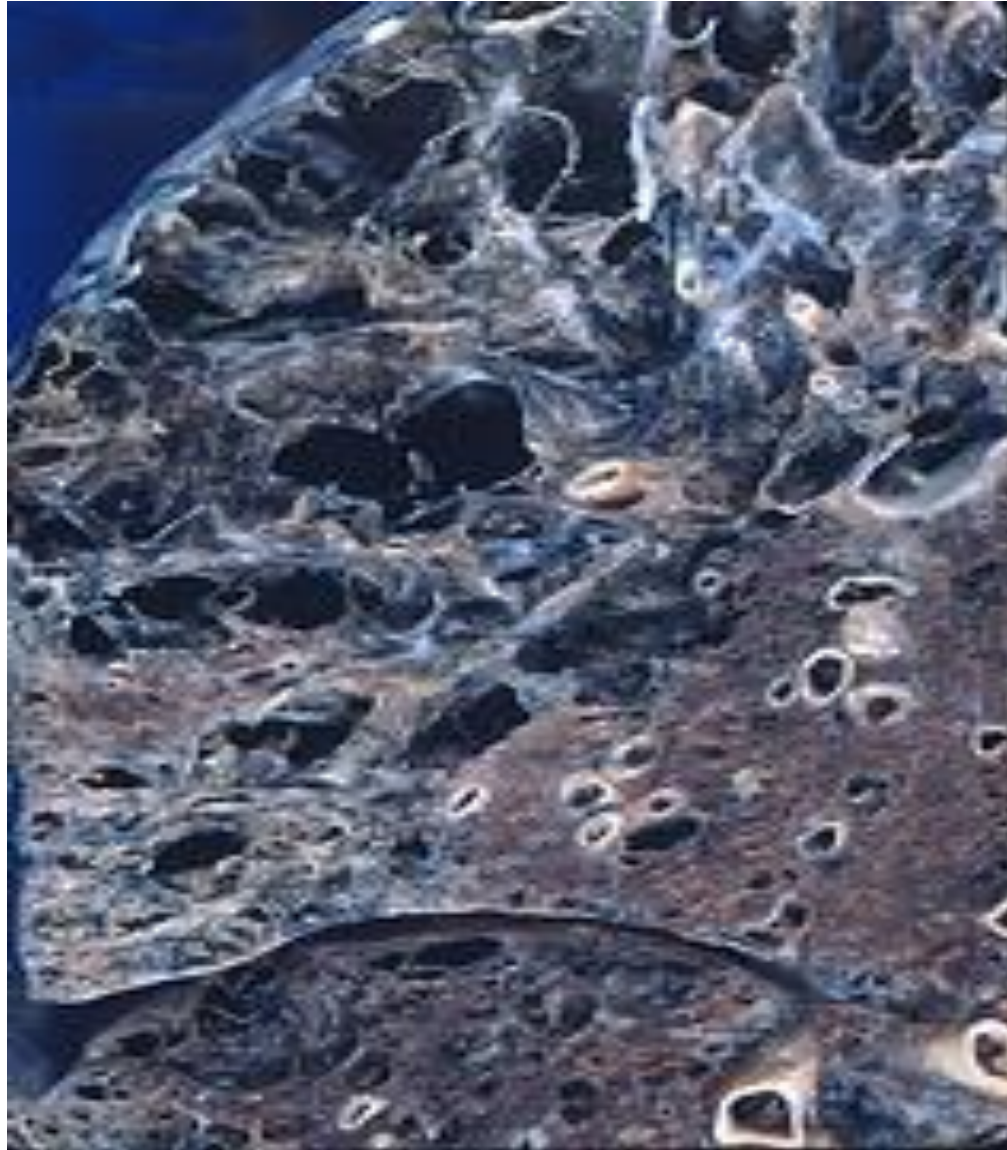


## **Emphysema – Gross pathology**



***Dilated airspaces in emphysematous lung. Although there tends to be some scarring with time because of superimposed infections, the emphysematous process is one of loss of lung parenchyma, not fibrosis***

## ***Bullous Emphysema – Gross pathology***



***A bulla is defined as an emphysematous space larger than 1 cm.***



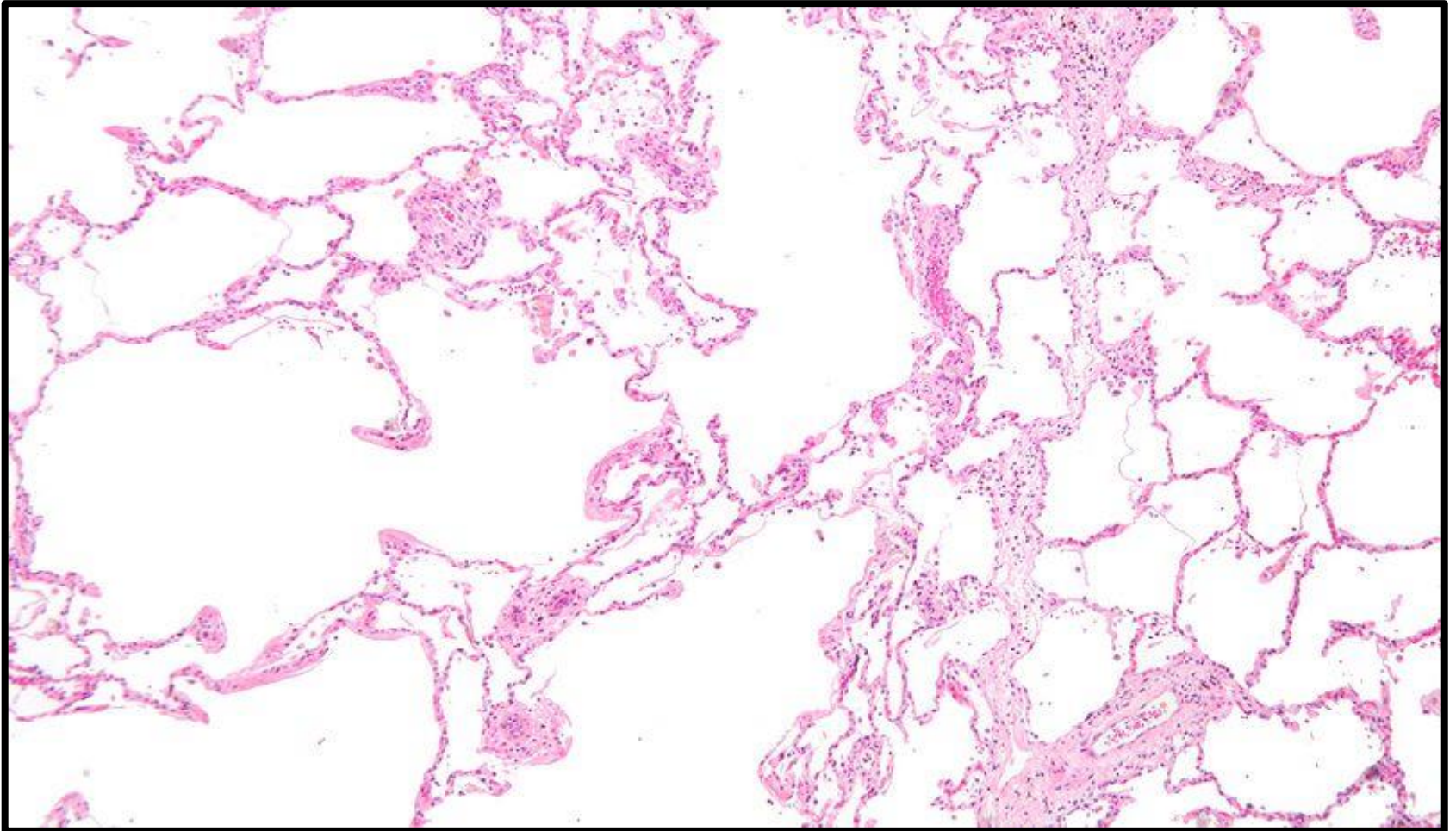
## ***Centrilobular Emphysema – Gross pathology***



***Centrilobular emphysema : Fixed, cut surface of a lung shows multiple cavities lined by heavy black carbon deposits characteristic of smoking.***

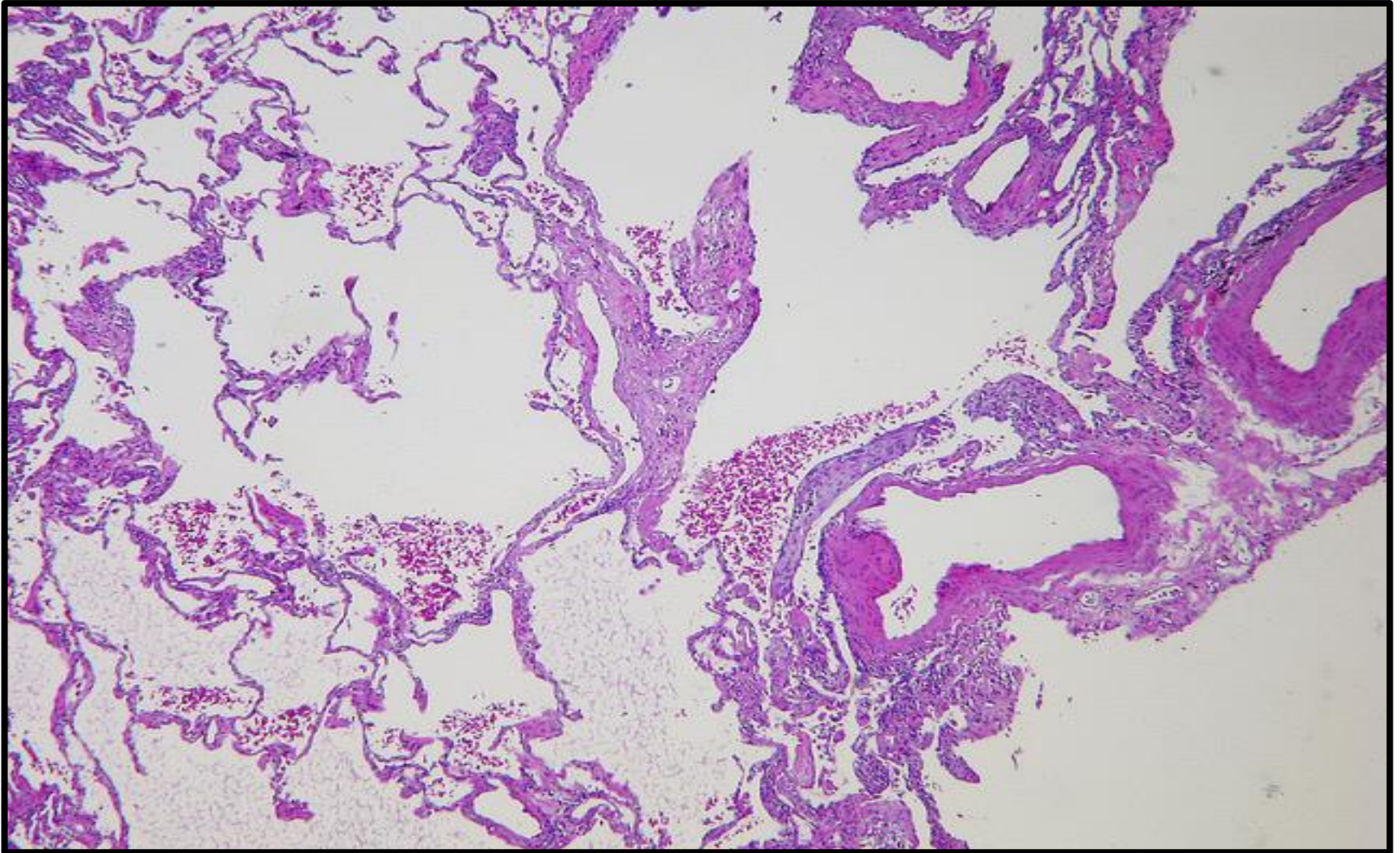


## ***Panacinar Emphysema – LPF***



- **Enlarged air spaces/alveolar spaces.**
- **Destruction of some alveolar septi.**

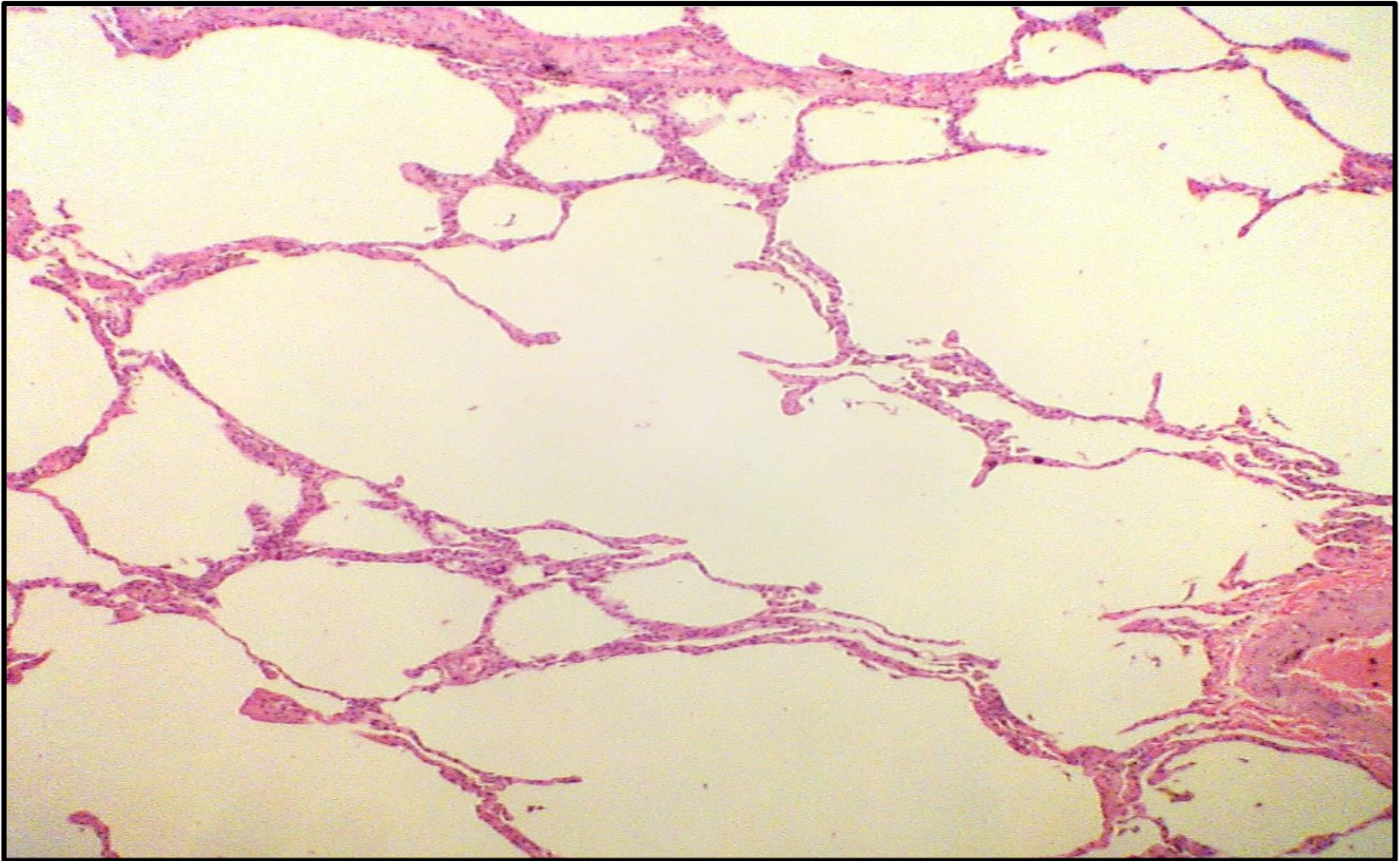
## ***Panacinar Emphysema – LPF***



***Some of the alveolar septae are ruptured and the ruptured septa project within air spaces on the form of spurs.***



## ***Panacinar Emphysema - HPF***



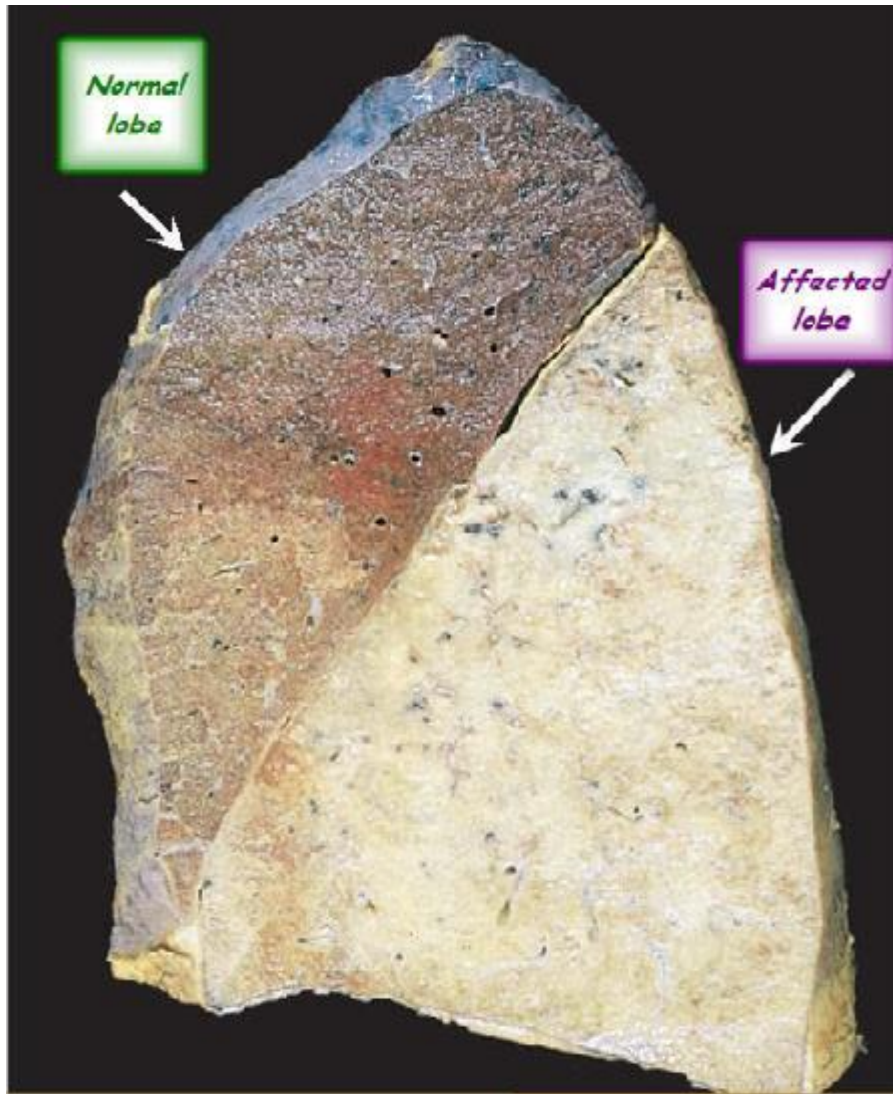
***Destruction of tissue leaves emphysematous spaces with little surface area, few capillaries, and large air spaces. Large vessel at lower right***



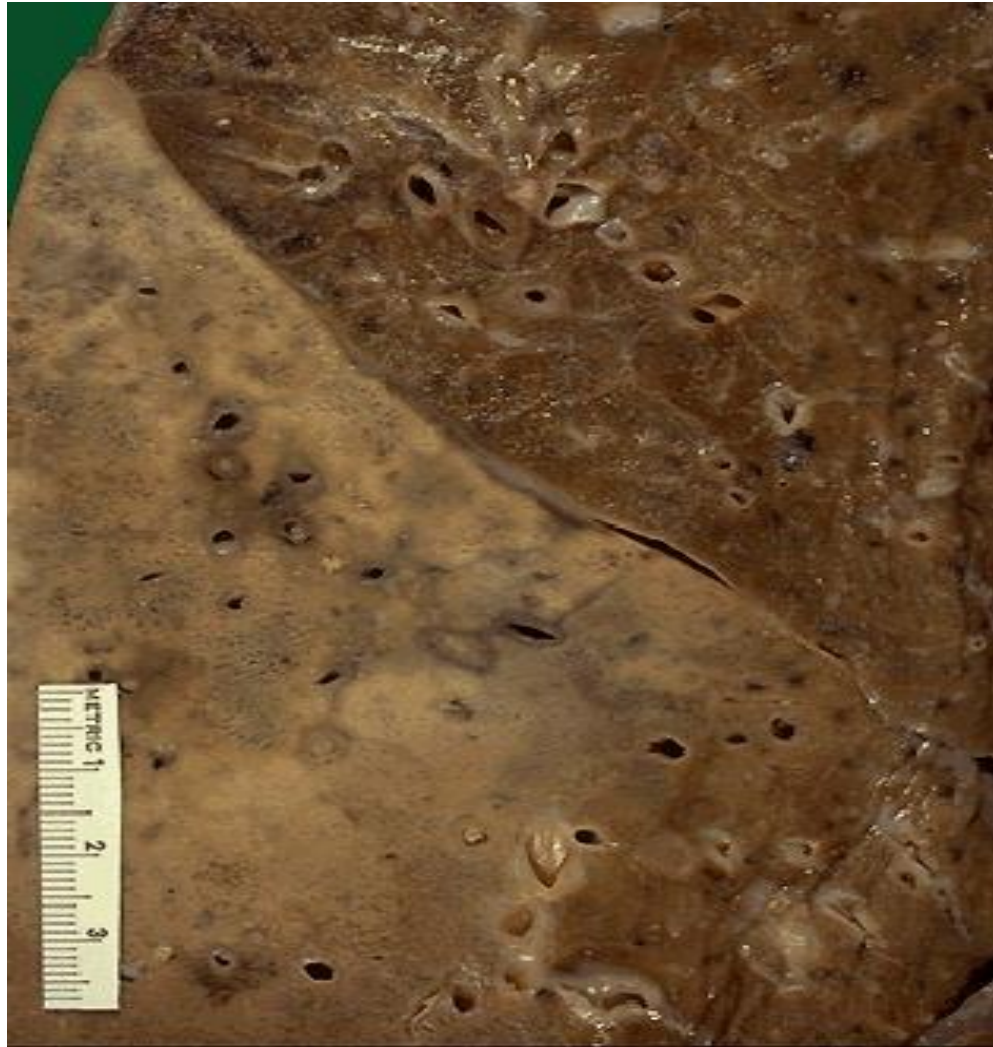
# ***LOWER RESPIRATORY TRACT INFECTIONS***

## ***1. Lobar Pneumonia***

# Lobar Pneumonia - Gross pathology



## Lobar Pneumonia - Gross pathology



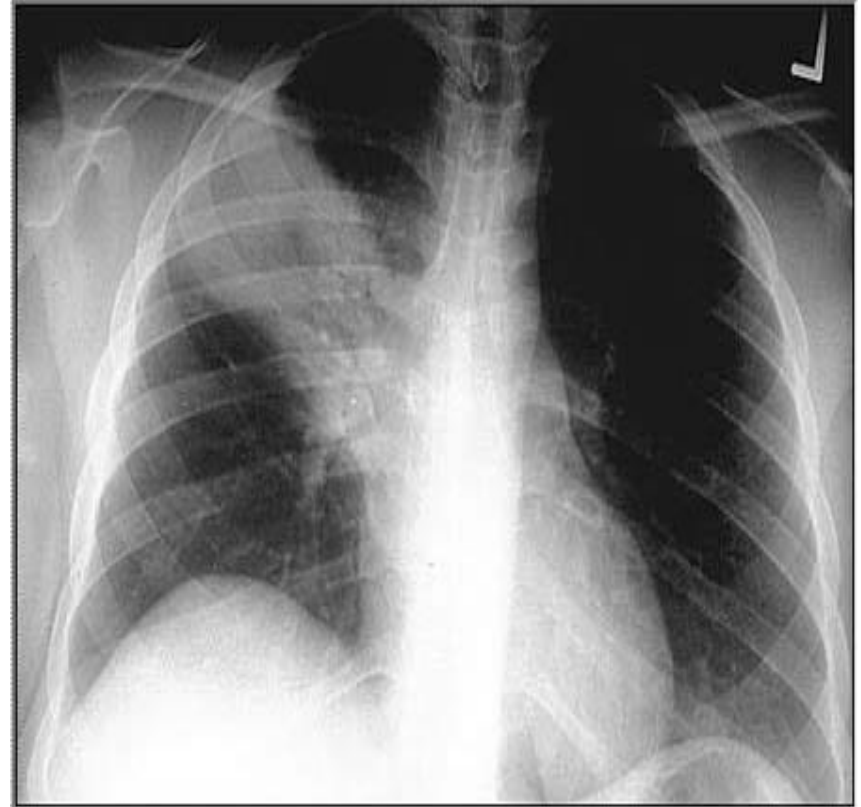
***A closer view of the lobar pneumonia demonstrates the distinct difference between the upper lobe and the consolidated lower lobe.***



## Lobar Pneumonia : X - Ray



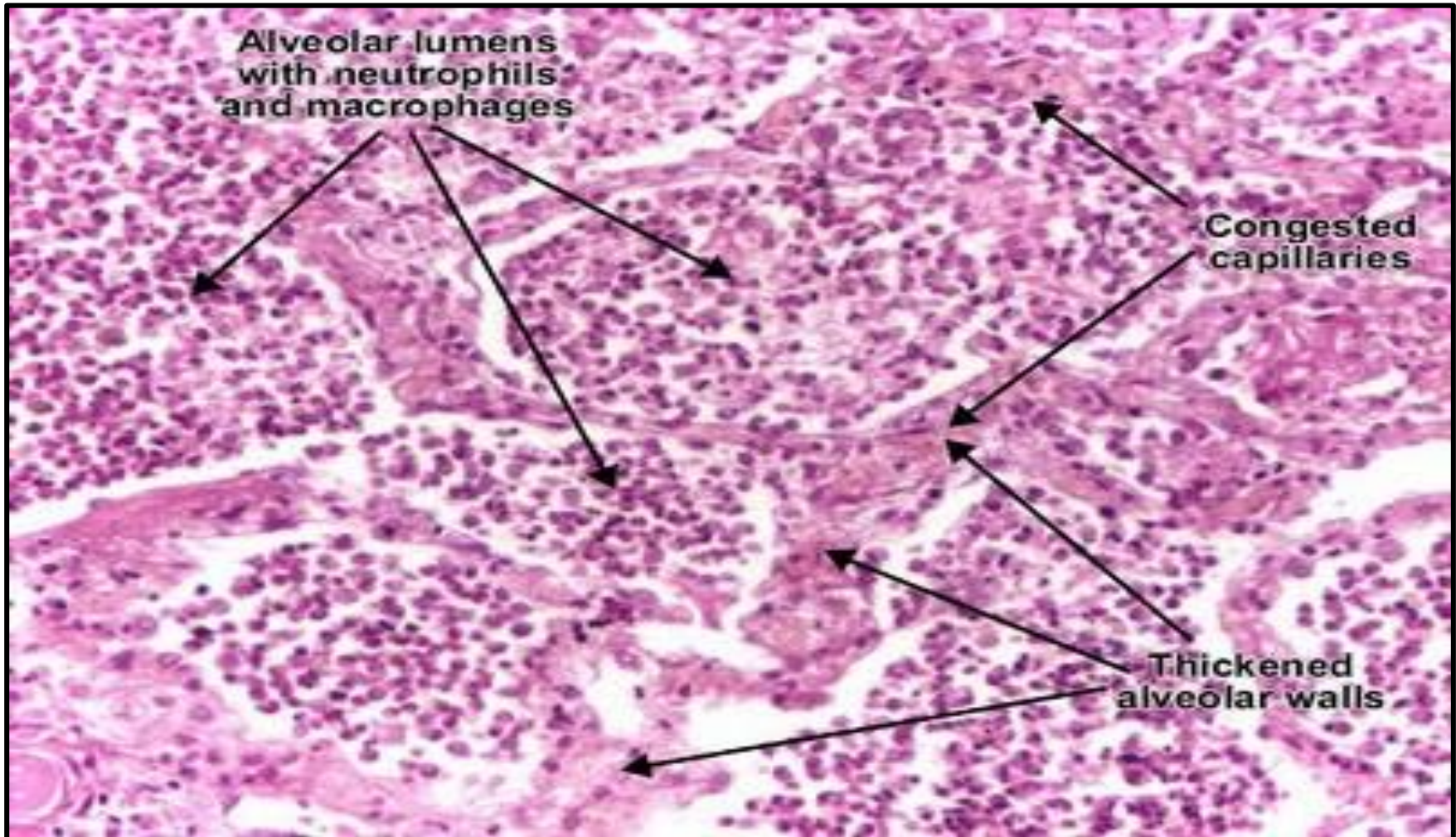
Lobar Pneumonia of the right Lower lobe



Lobar Pneumonia of the right middle lobe

***A localised focus of consolidation caused by lobar pneumonia can be seen in both X-ray films taken from 2 different patients .***

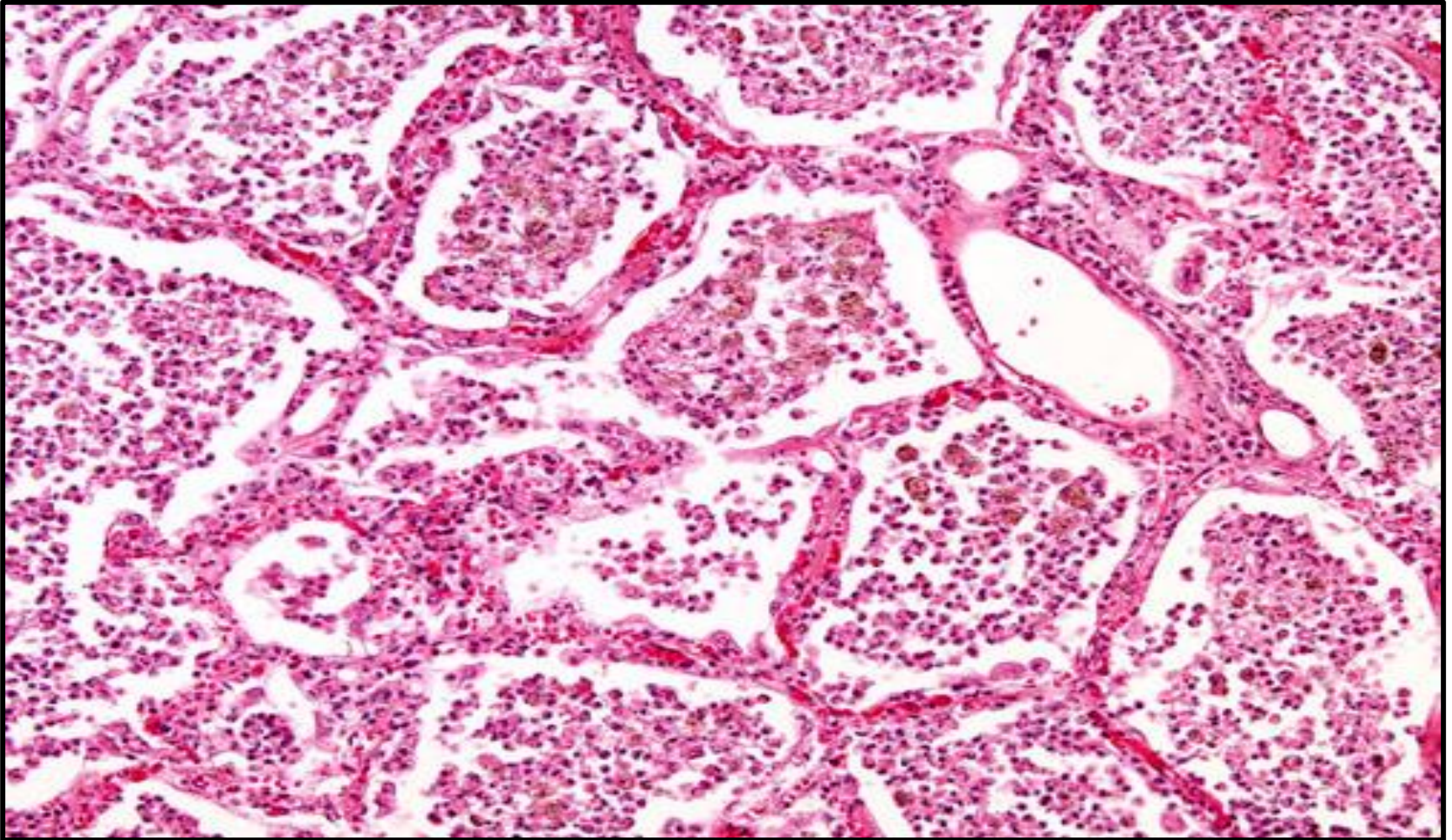
## Lobar Pneumonia - Histopathology



- \* **Congestion (first 2 days)**
- \* **Red hepatisation (fibrinous alveolitis) (2nd to 4th day)**
- \* **Grey hepatisation (leukocytic alveolitis) (4th to 8th day)**
- \* **Resolution (after 8th day)**



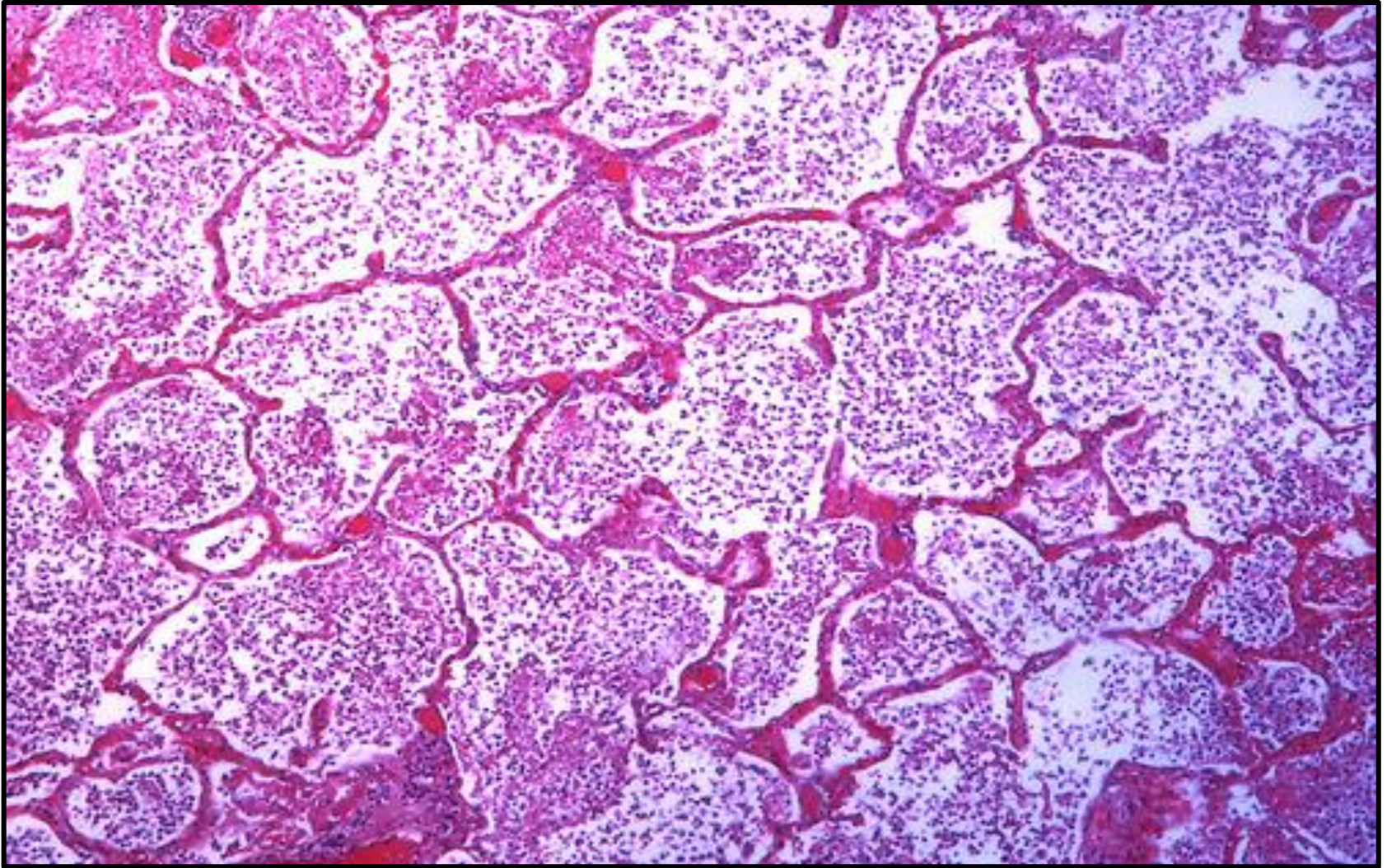
## Lobar Pneumonia - LPF



***All the alveoli are filled with fibrinous exudate containing fibrin threads, polymorphs, macrophages and red cells. Alveolar walls are congested. Pleura is covered by fibrinous exudate.***



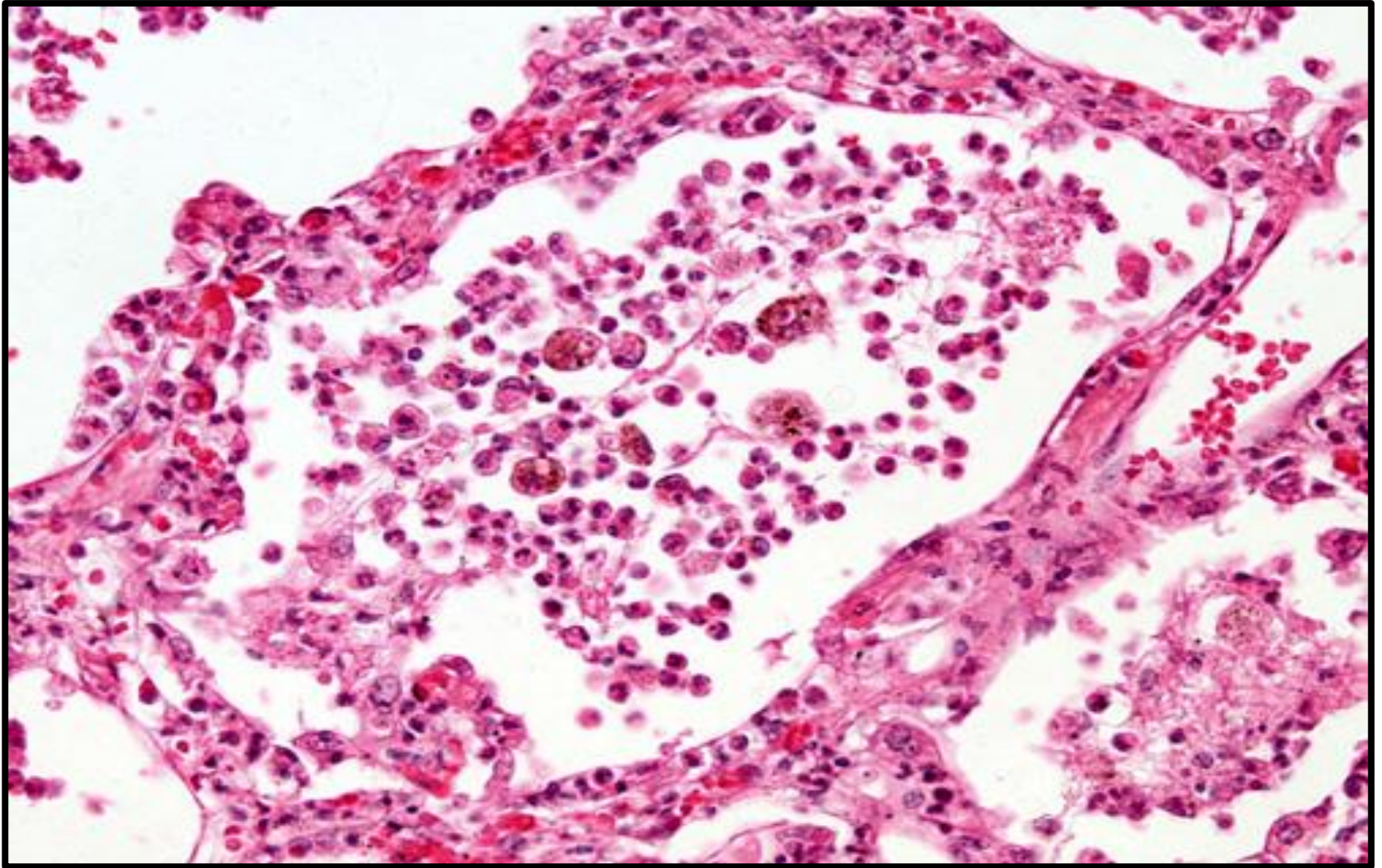
## **Lobar Pneumonia - LPF**



***the alveoli are filled with fibrinous exudate containing fibrin threads, polymorphs, macrophages and red cells***



## **Lobar Pneumonia - HPF**



***Alveoli filled with fibrinous exudate containing fibrin threads, polymorphs, macrophages and red cells. and thickened alveolar wall***

## ***2. Bronchopneumonia***

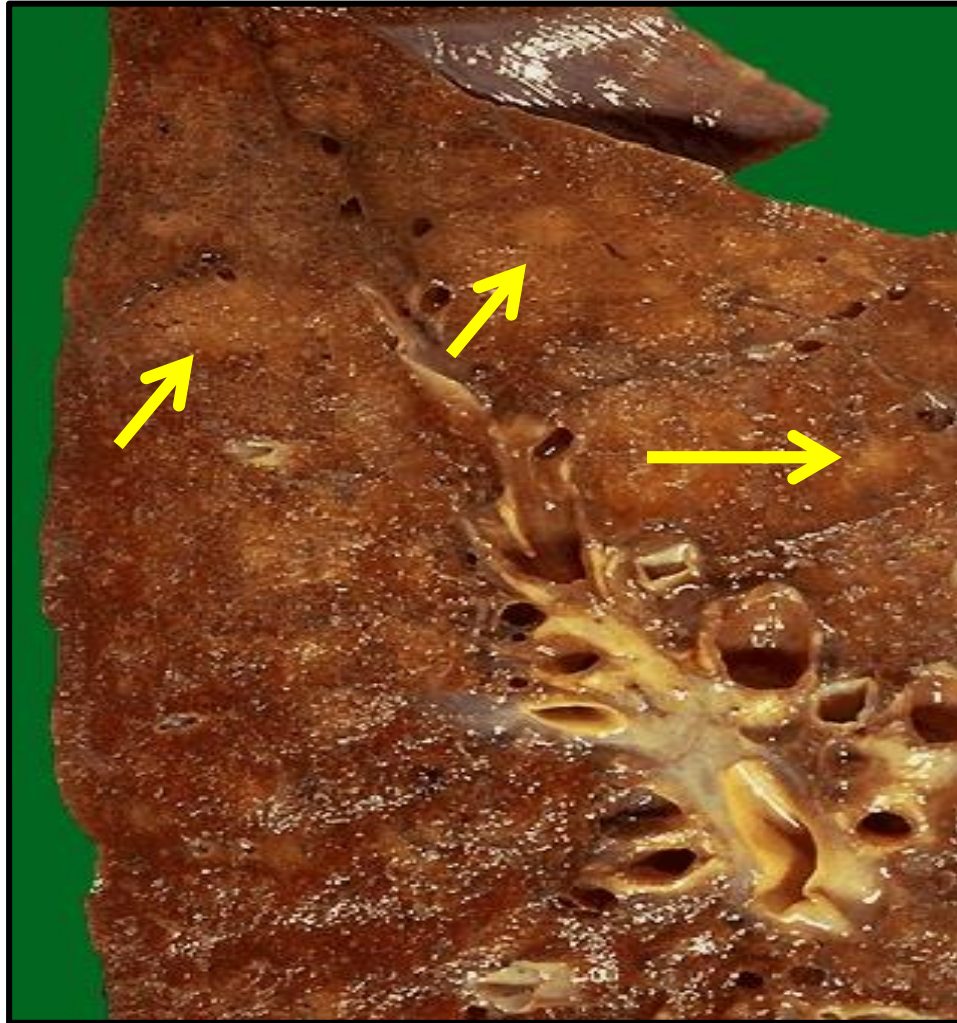


## Bronchopneumonia – Gross pathology



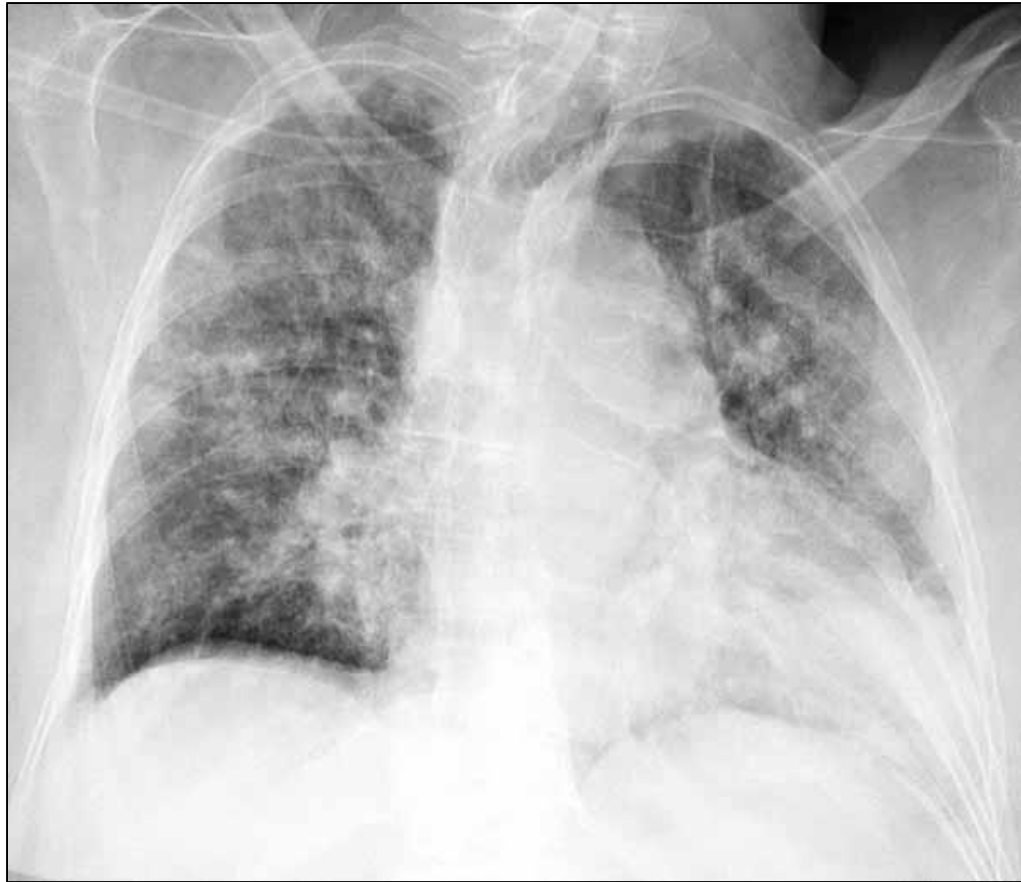
- ***In Lobular Pneumonia the consolidated areas very closely match the pattern of lung lobules (hence the term "lobular" pneumonia).***
- ***Bronchopneumonia is classically a "hospital acquired" pneumonia seen in persons already ill from another diseases e.g. DM , old age , immune deficiency process.***

## Bronchopneumonia – Cut section



***This bronchopneumonia is more subtle, but there are areas of lighter tan consolidation. The hilum is seen at the lower left with radiating pulmonary arteries and bronchi***

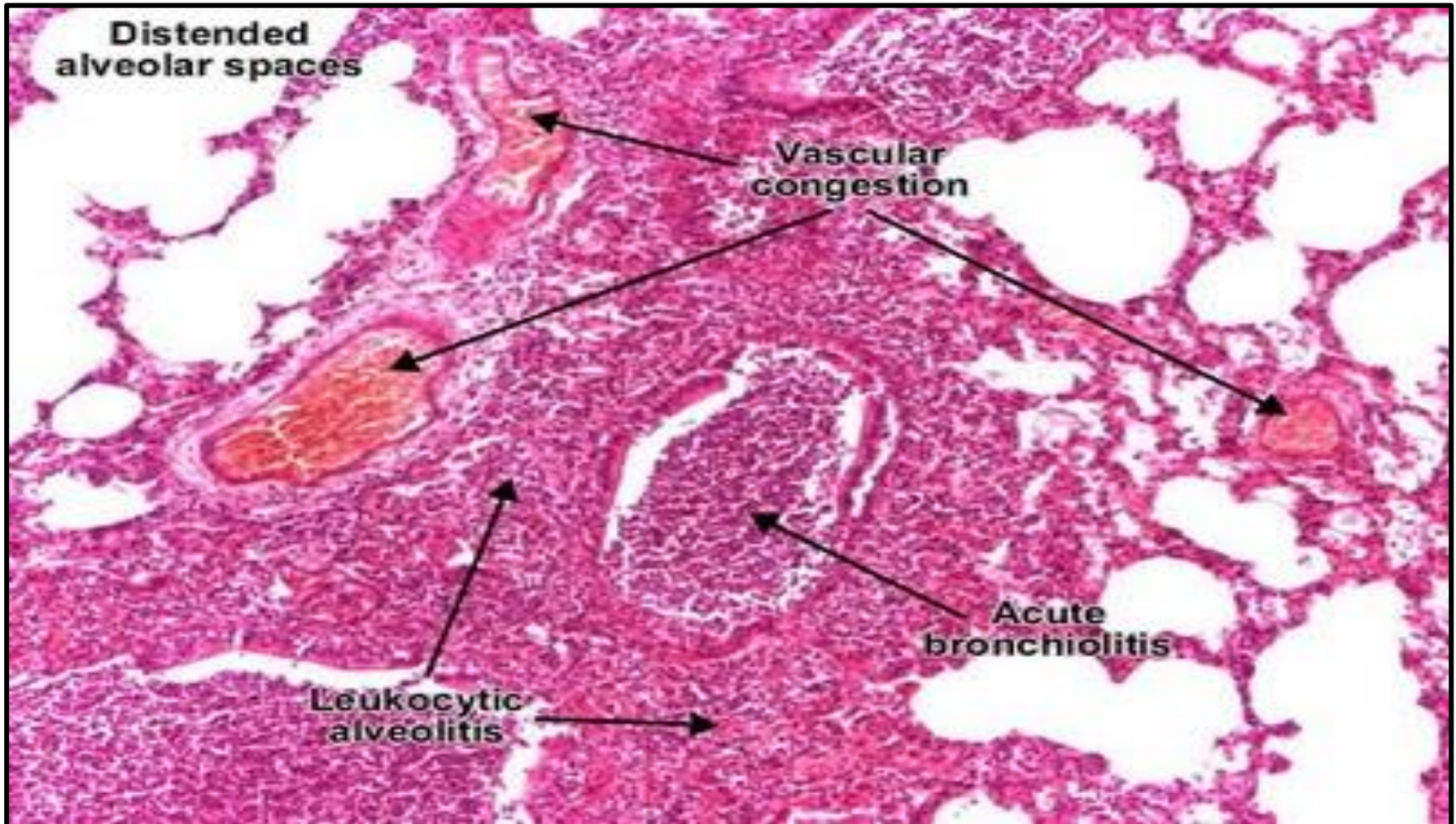
## **Bronchopneumonia – X-Ray**



***This radiograph demonstrates patchy infiltrates consistent with a bronchopneumonia from a bacterial infection.***



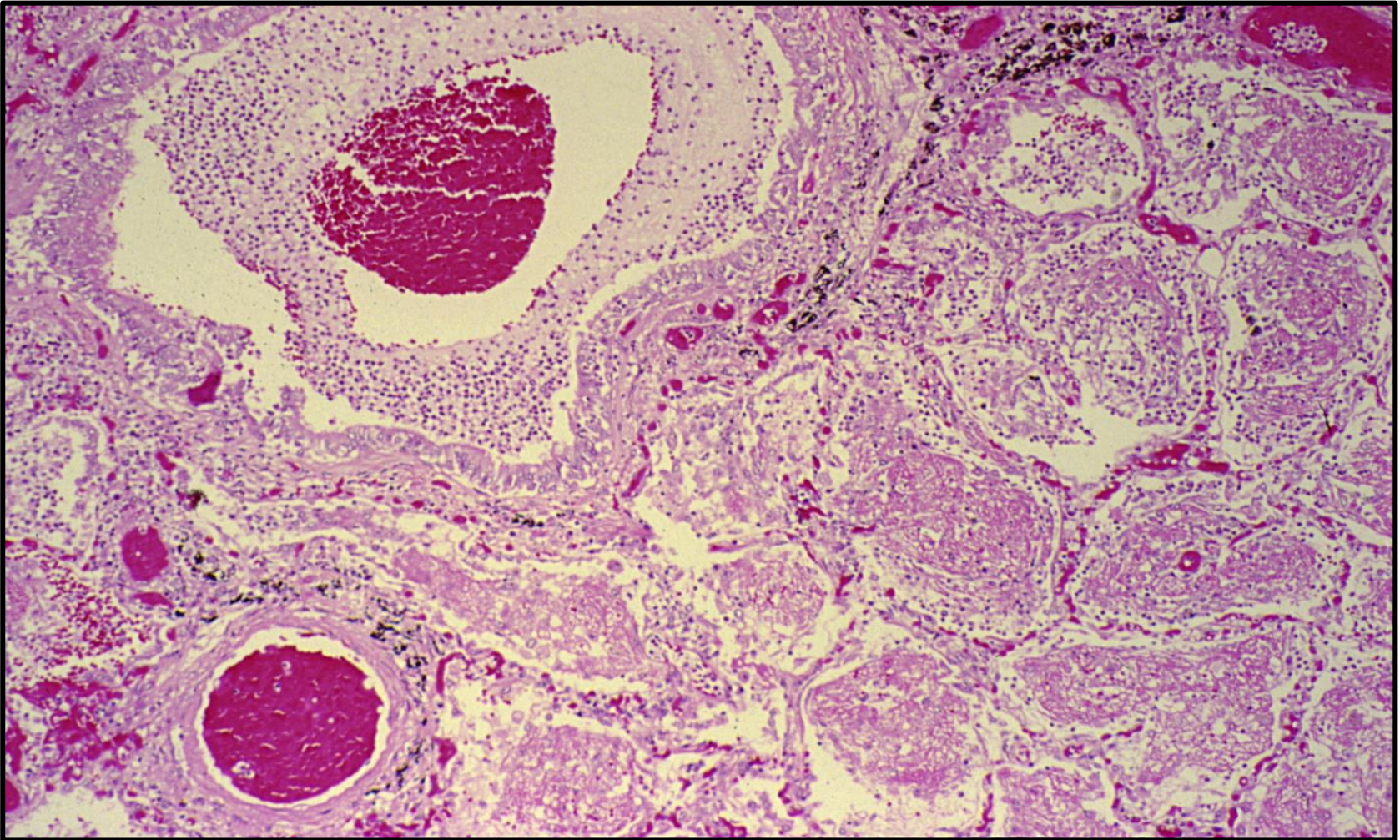
## Bronchopneumonia – Histopathology



***Bronchopneumonia (Lobular pneumonia) is an acute exudative inflammation of the lungs characterised by foci of consolidation surrounded by normal parenchyma. Usually, bronchopneumonia affects one or more lobes and is bilateral.***



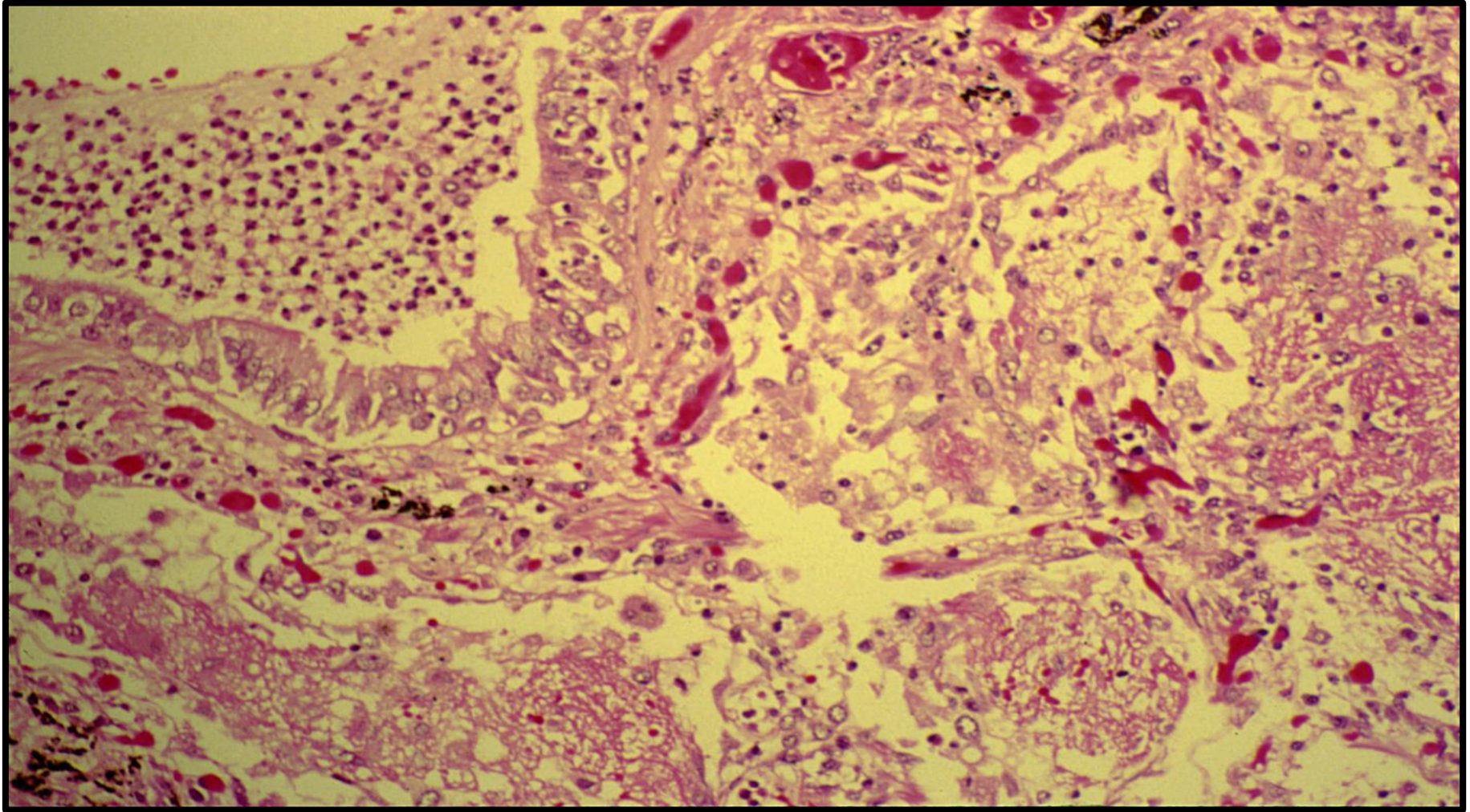
## Bronchopneumonia – LPF



**Section of the lung shows foci of inflammatory consolidation surrounding bronchioles: Bronchioles are filled with an inflammatory purulent exudate and show ulceration of mucosa, focal inflammation and necrosis of walls . Surrounding lung parenchyma shows congestion and edema**



## Bronchopneumonia – MPF

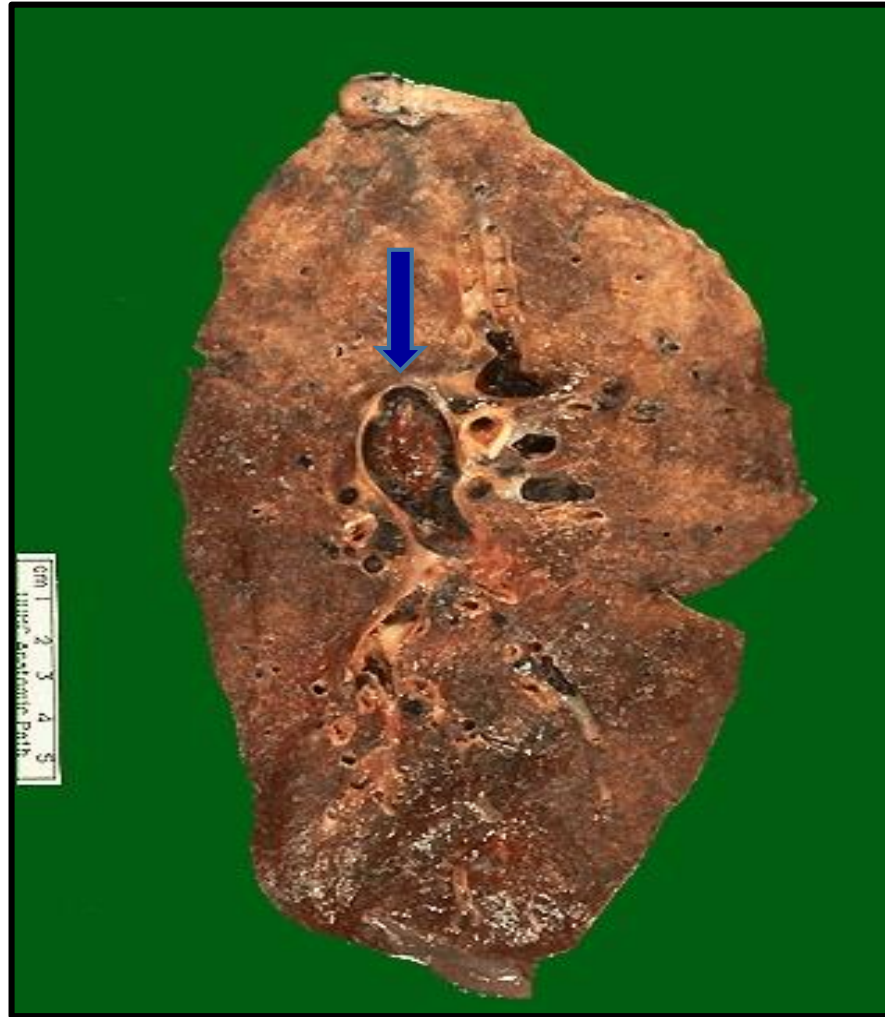


***At high magnification, the alveolar exudate of mainly neutrophils is seen. The surrounding alveolar walls have capillaries that are dilated and filled with RBC's. Such an exudative process is typical for bacterial infection. This exudate gives rise to the productive cough of purulent yellow sputum seen with bacterial pneumonias***



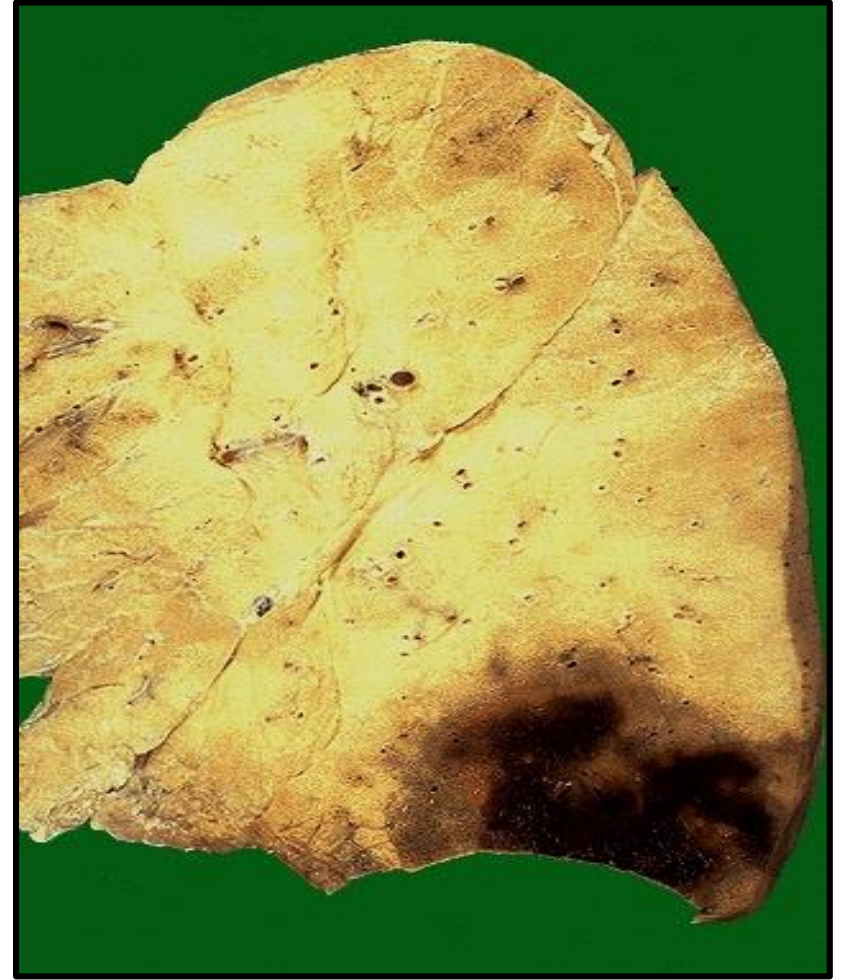
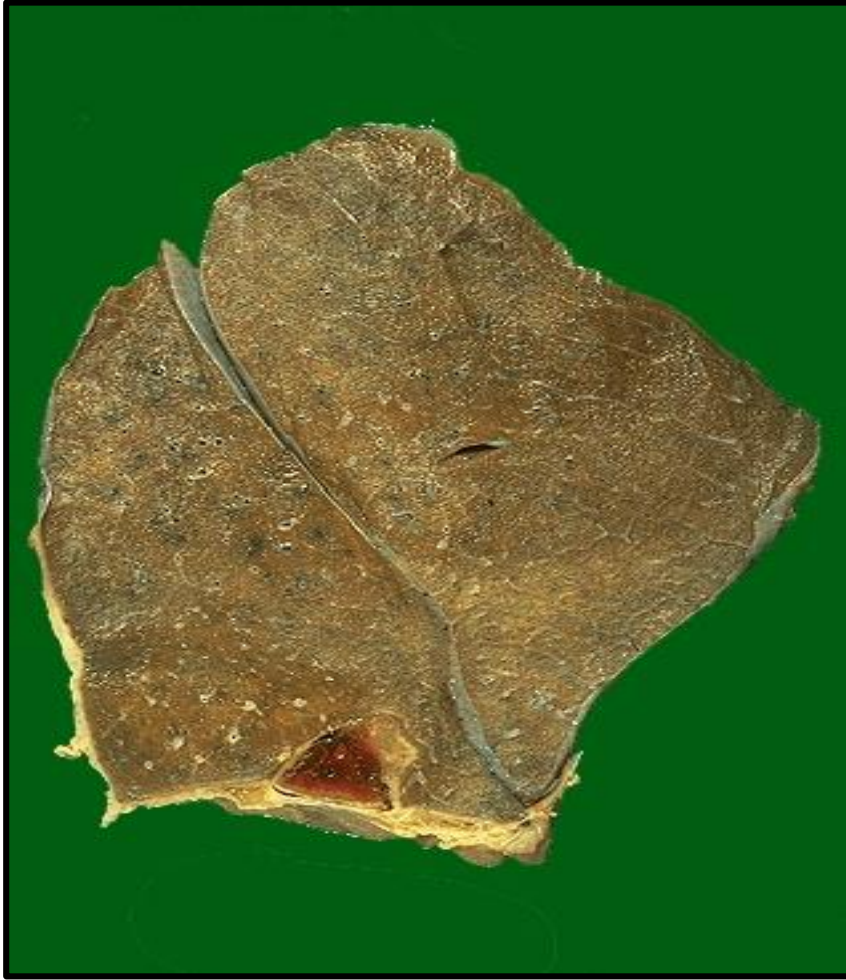
# PULMONARY EMBOLUS AND INFARCTION

## Thromboembolism in the Lung – Gross



***A large pulmonary thromboembolus is seen in the pulmonary artery to the left lung. Such thromboemboli typically originate in the leg veins or pelvic veins of persons who are immobilized***

## Thromboembolism in the Lung – Gross



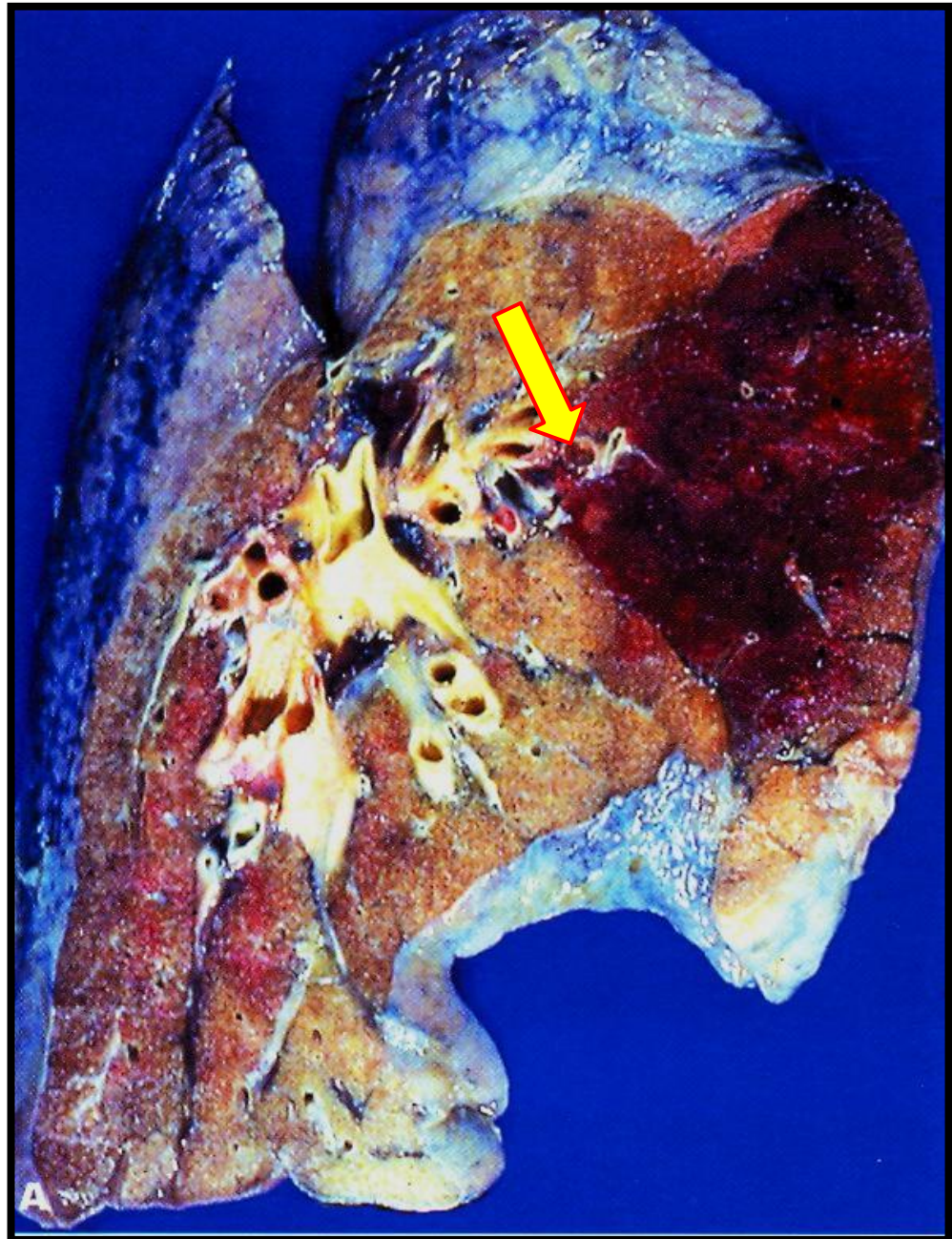
***Large thromboemboli can cause death. Medium sized thrombemboli (blocking a pulmonary artery to a lobule or set of lobules) can produce the lesion seen here -a hemorrhagic pulmonary infarction which is a wedge-shaped and based on the pleura.***



## ***Pulmonary embolus and infarction in the Lung***

***A Longitudinal transection of a lung showing a wedge shaped peripheral hemorrhagic infarction .***

***A thrombus is seen in a major branch of pulmonary artery ( arrow head ) .***

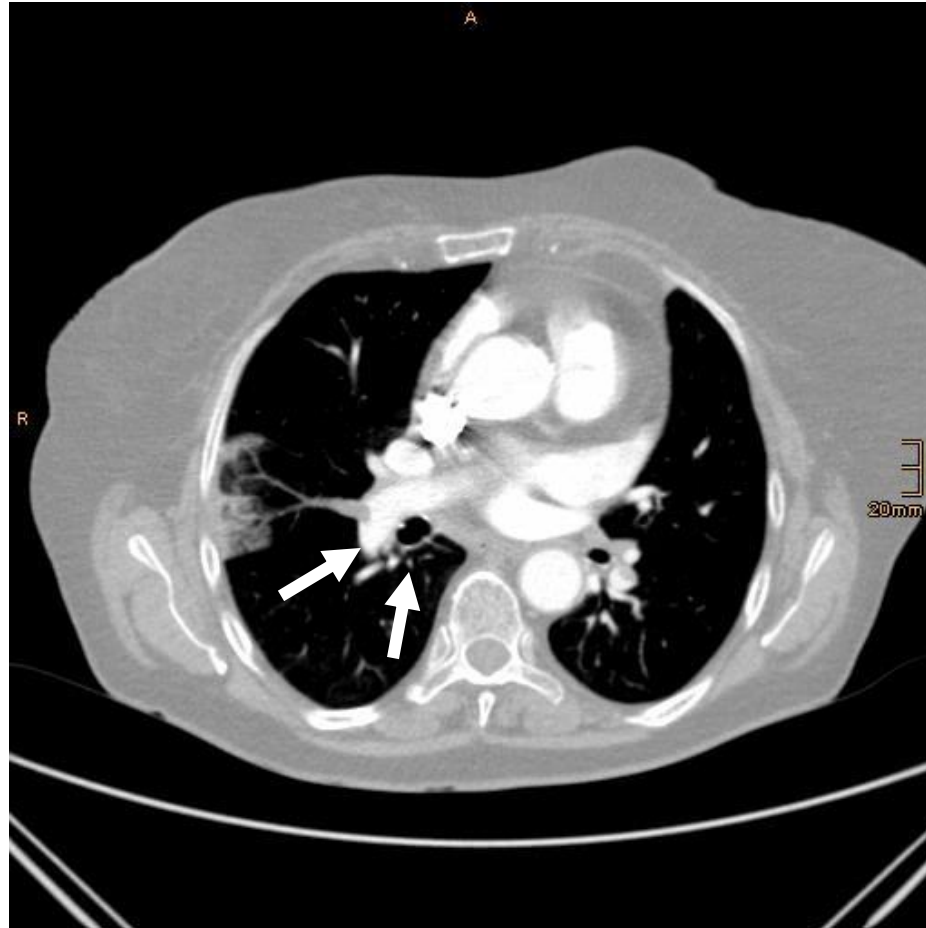


A

## **Pulmonary Embolus with infarction – CT scan**

### **Predisposing factors:**

- **Prolonged bed rest**
- **Contraceptive pills**
- **Deep vein thrombosis**
- **Immobility**
- **Hypercoagulability**
- **Carcinomatosis**



**CT scan - white arrows show pulmonary embolus with lung infarction**



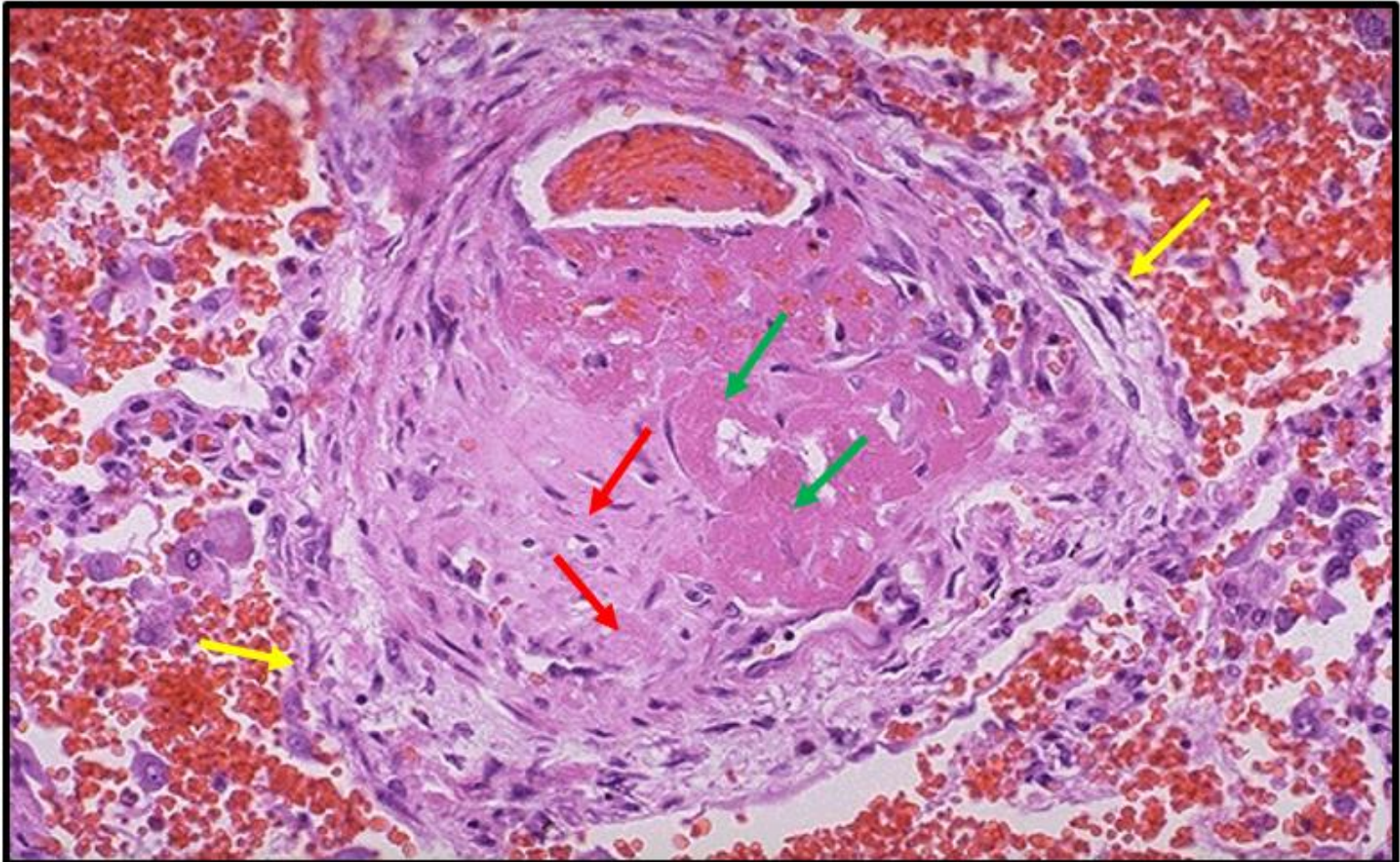
## **Pulmonary artery thromboembolus - LPF**



***Microscopic appearance of a pulmonary thromboembolus in a large pulmonary artery. There are interdigitating areas of pale pink and red that form the "lines of Zahn" characteristic for a thrombus.***

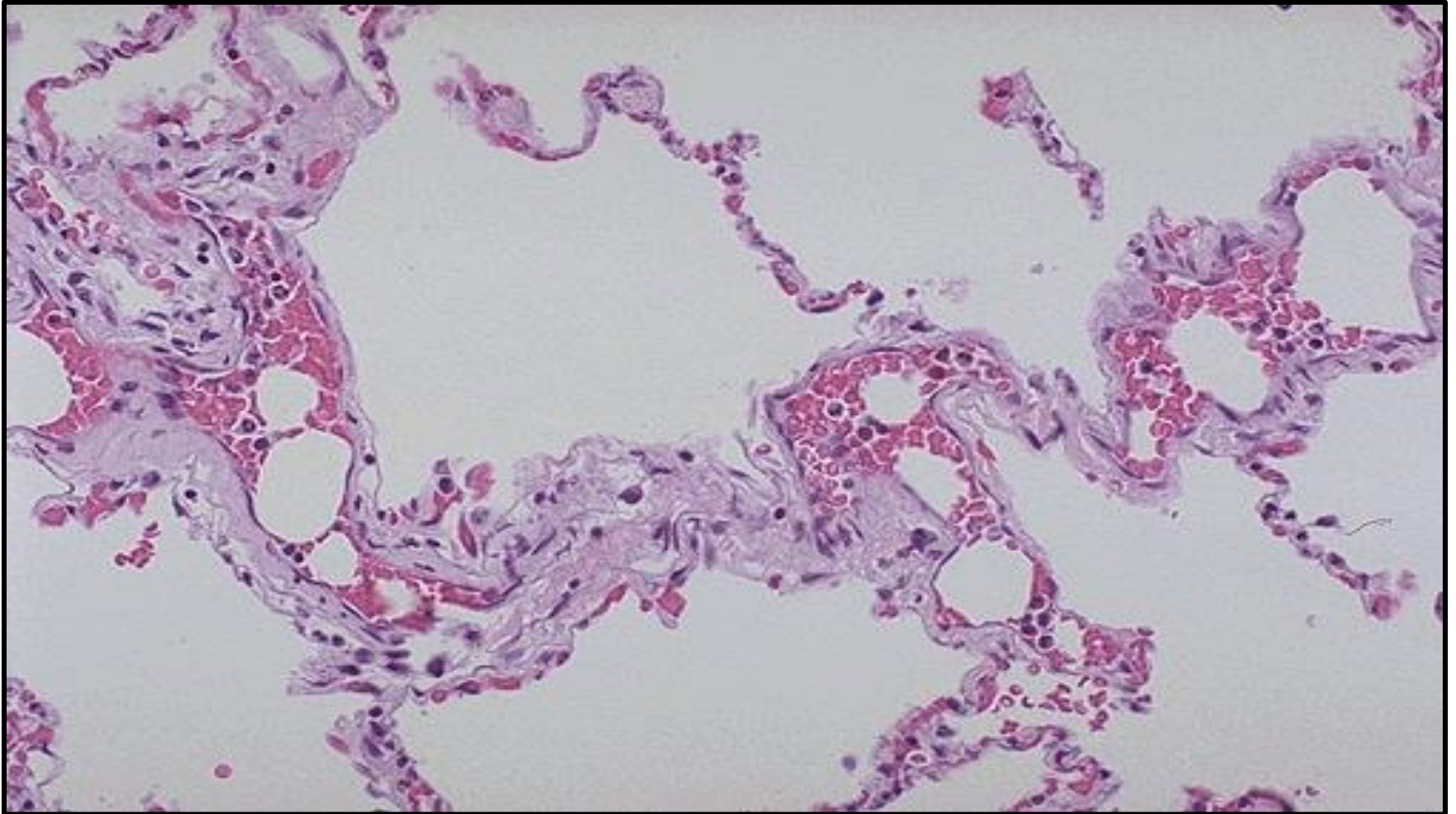


## Pulmonary artery thromboembolus - HPF



A small **peripheral pulmonary artery** thromboembolus. Lumen is occluded by **fibrin** and **fibrous tissue**.

## ***Fat Embolism in the Lung - HPF***



***The rounded holes that appear in the vascular spaces here in the lung are fat emboli. Fat embolization syndrome occurs most often following trauma with fracture of long bones that releases fat globules into the circulation which are trapped in pulmonary capillaries***



# ***SECOND PRACTICAL***

***1. TUBERCULOSIS***

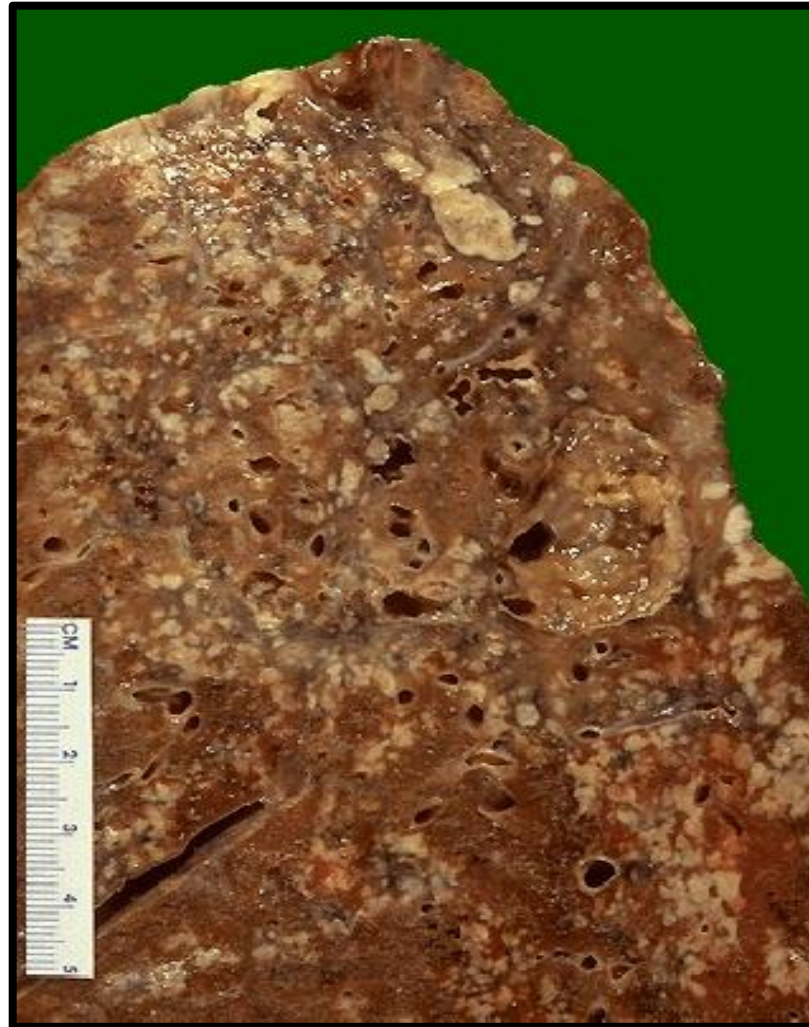
***2. CANCER OF THE LUNG***



# TUBERCULOSIS

- **Epithelioid and giant cell Granuloma, Ghon's complex or caseation is present**
- **Complications of TB are:**
  - Amyloidosis ,
  - Tuberculous pneumonia
  - Miliary tuberculosis
  - Tuberculous meningitis
  - Addison disease .

## ***Pulmonary TB – Caseous Necrosis – Gross***



***On closer inspection, the granulomas have areas of caseous necrosis. This pattern of multiple caseating granulomas primarily in the upper lobes is most characteristic of secondary (reactivation) tuberculosis***

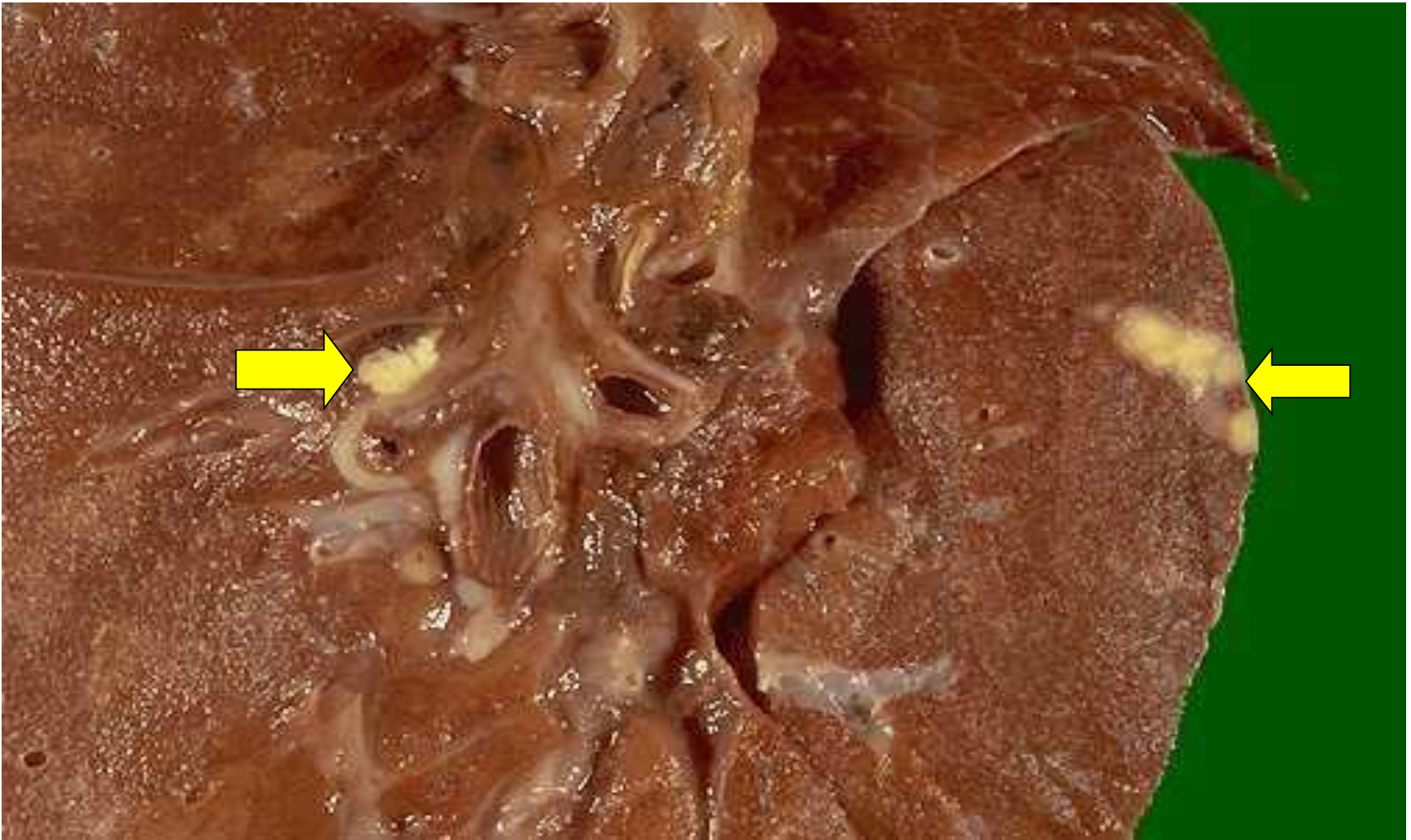
## ***Pulmonary TB – Caseous Necrosis – Gross***



***Extensive caseation and the granulomas involve a larger bronchus causing soft, necrotic center to drain out and leave behind a cavity. Cavitation is typical for large granulomas with TB. Cavitation is more common in the upper lobes.***



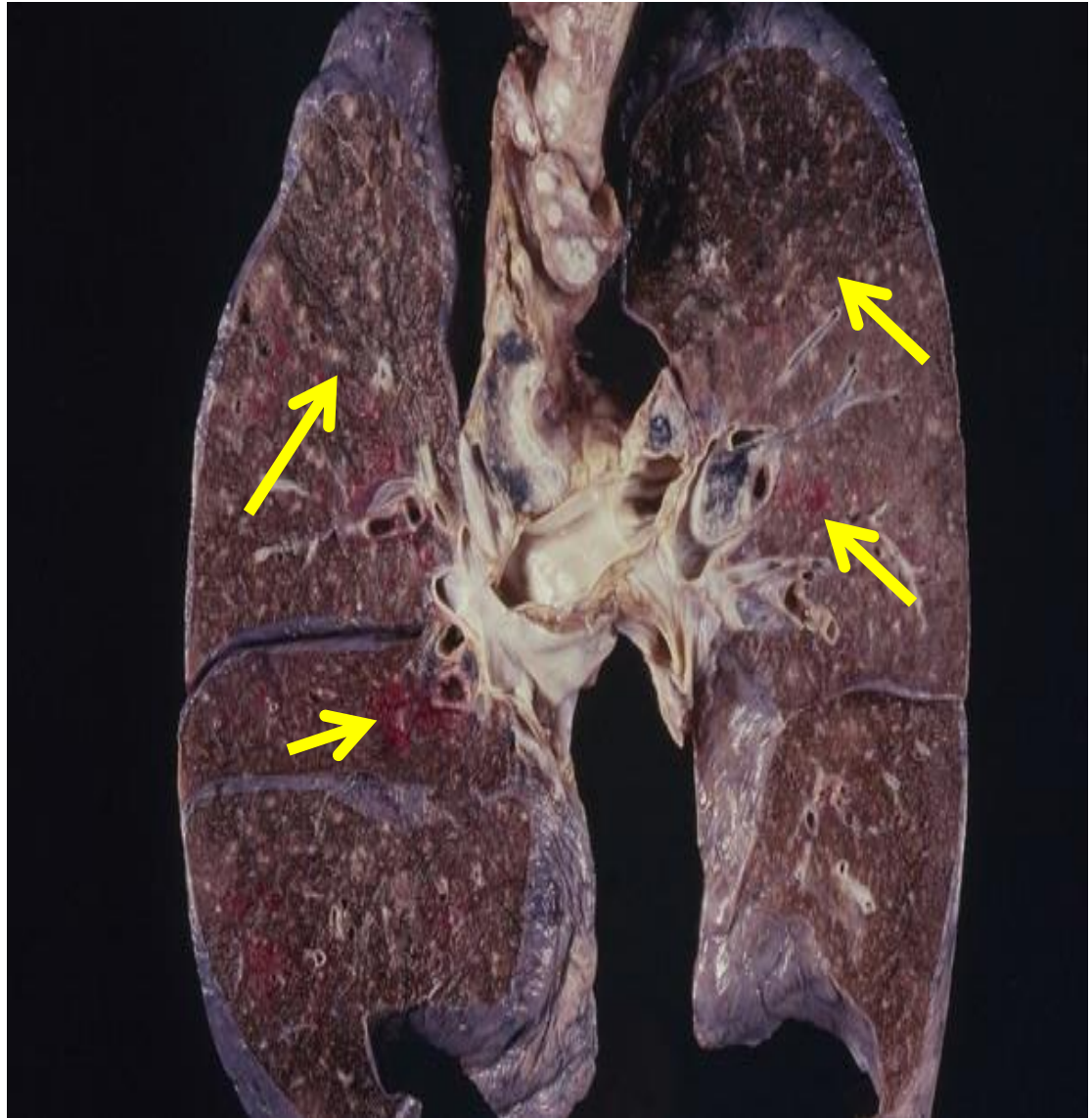
## Pulmonary TB - Ghon's Complex – Gross Pathology



***The Ghon's complex is seen here at closer range. Primary tuberculosis is the pattern seen with initial infection with tuberculosis in children. Reactivation, or secondary tuberculosis, is more typically seen in adults.***

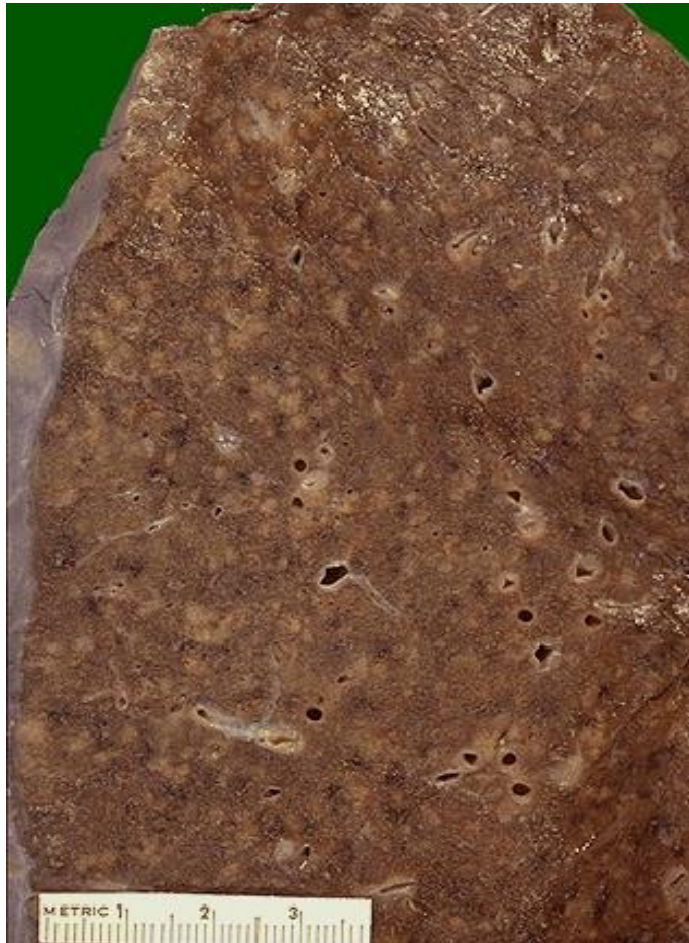
# Miliary TB of the Lungs

- **Miliary TB can occur when TB lung lesions erode pulmonary veins or when extrapulmonary TB lesions erode systemic veins.**
- **This results in hematogenous dissemination of tubercle bacilli producing myriads of 1-2 mm. lesions throughout the body in susceptible hosts.**
- **Miliary spread limited to the lungs can occur following erosion of pulmonary arteries by TB lung lesions.**





## ***Miliary TB of the Lungs – Cut section***



***This is a "miliary" pattern of granulomas because there are a multitude of small tan granulomas, about 2 to 4 mm in size, scattered throughout the lung parenchyma. The miliary pattern gets its name from the resemblance of the granulomas to millet seeds.***

## ***Miliary TB of the Lungs – X-Ray***

Miliary tuberculosis is most prominent in the liver, bone marrow, spleen, adrenals, meninges, kidneys, fallopian tubes, and epididymis.



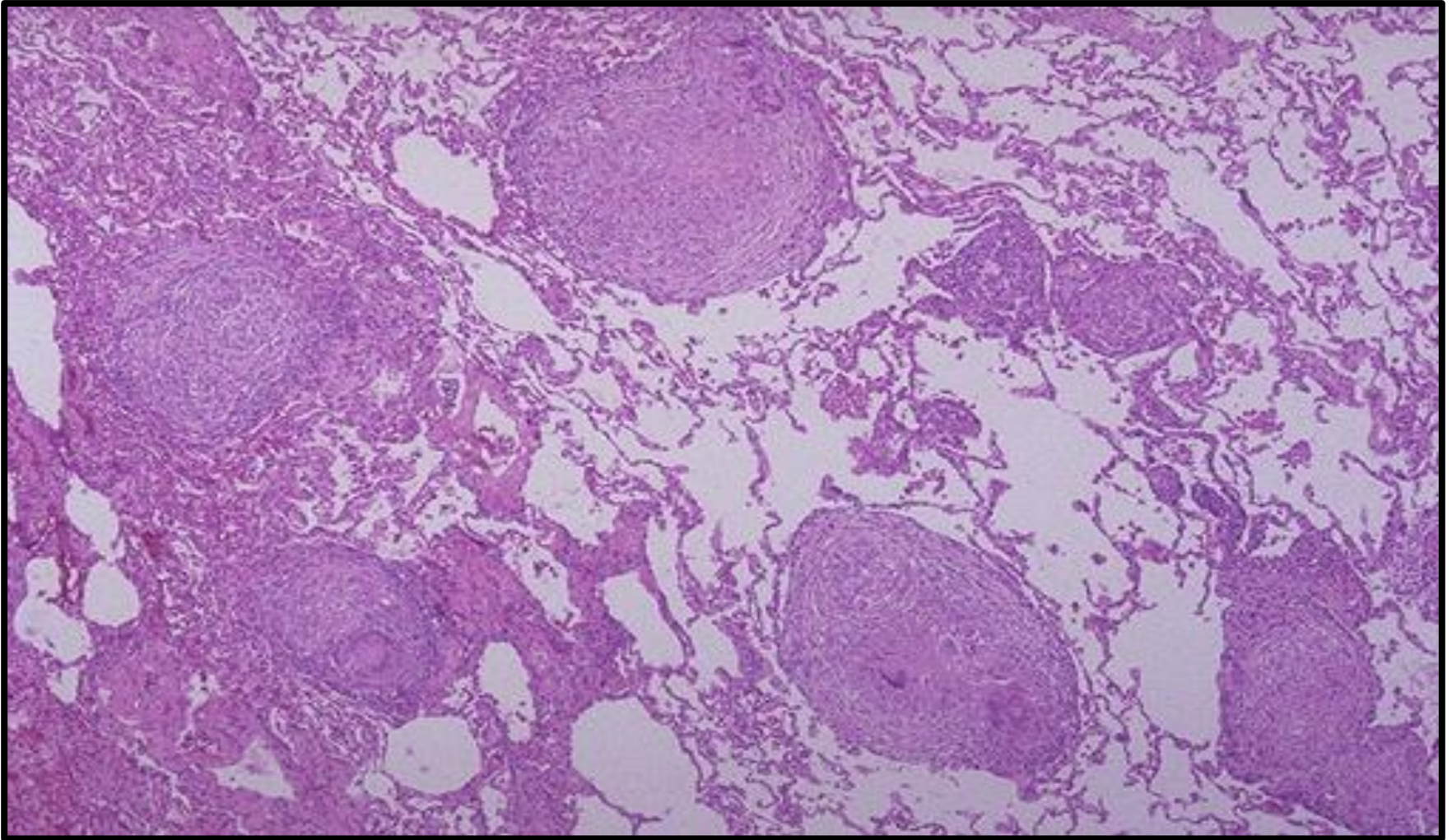
### **Complications:**

Amyloidosis  
TB meningitis  
TB spleen  
Fallopian tube TB  
TB epididymitis.  
Etc...

***This chest x-ray shows a patient with miliary TB.***



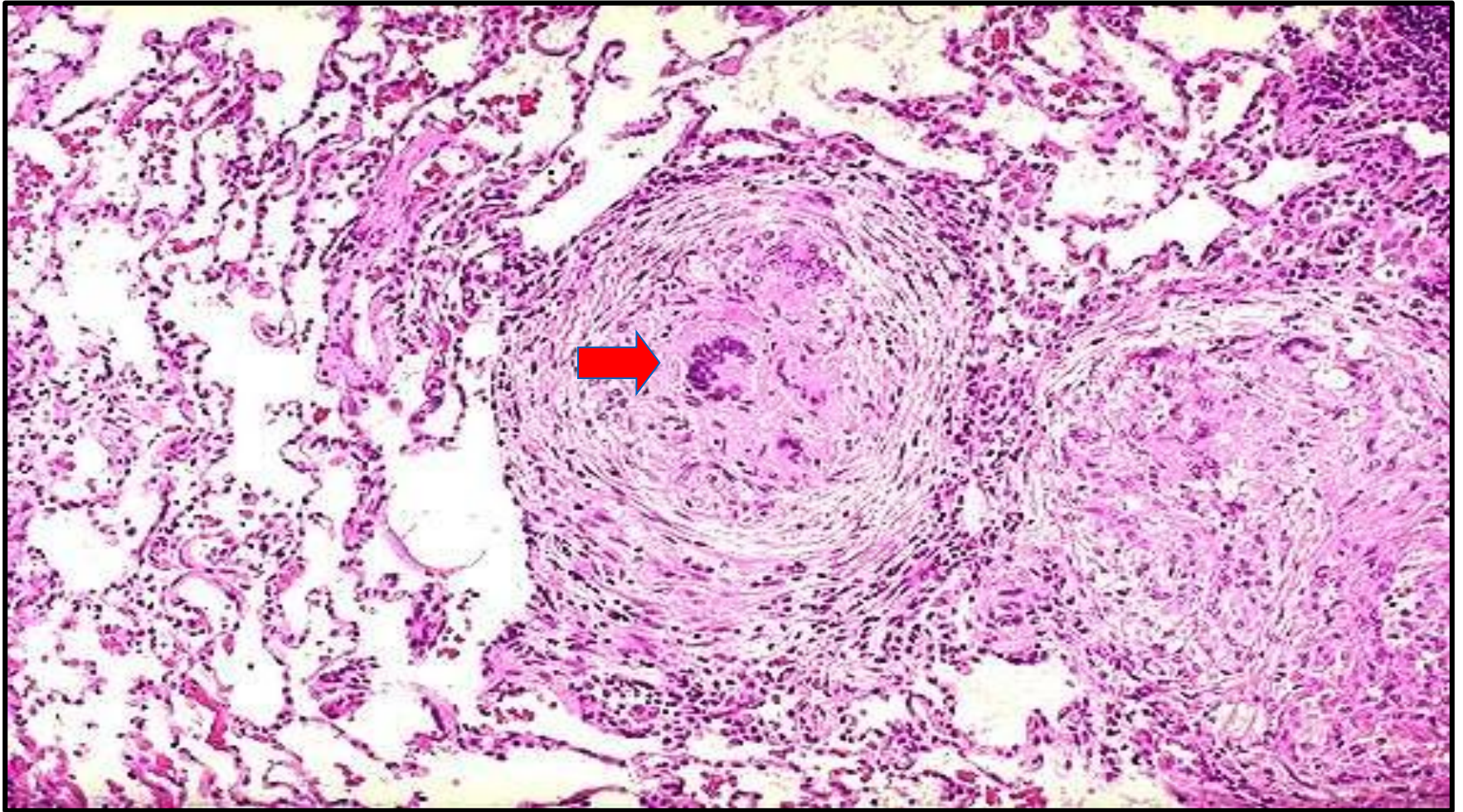
## ***Tuberculous Granulomas - LPF***



***At low magnification, this micrograph reveals multiple granulomas. Granulomatous disease by chest radiograph appear as reticulonodular densities.***



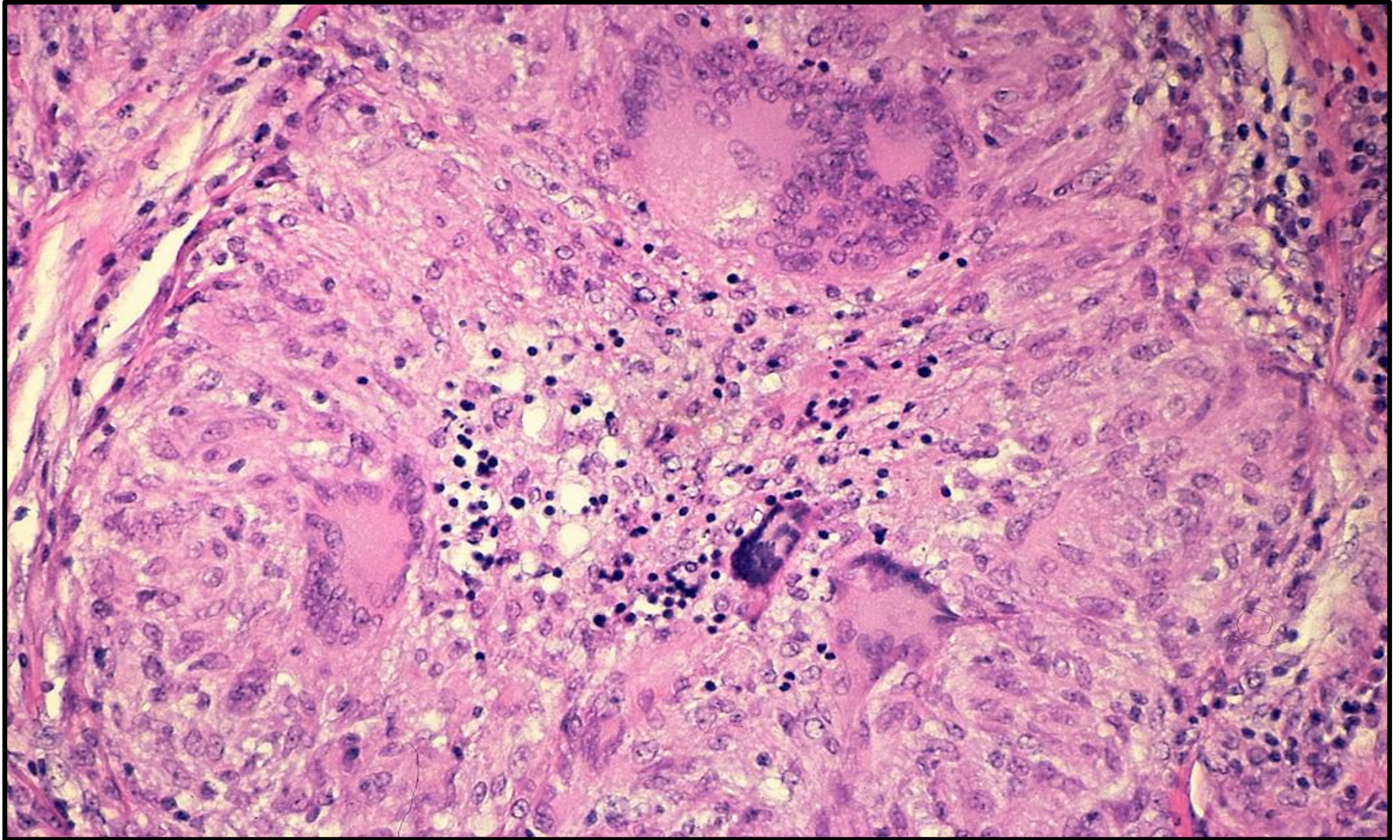
## ***Tuberculous Granulomas - HPF***



***Well-defined granulomas are seen here. They have rounded outlines. The one toward the center of the photograph contains several Langhans' giant cells. Granulomas are composed of transformed macrophages called epithelioid cells along with lymphocytes, occasional PMN's, plasma cells, and fibroblasts***



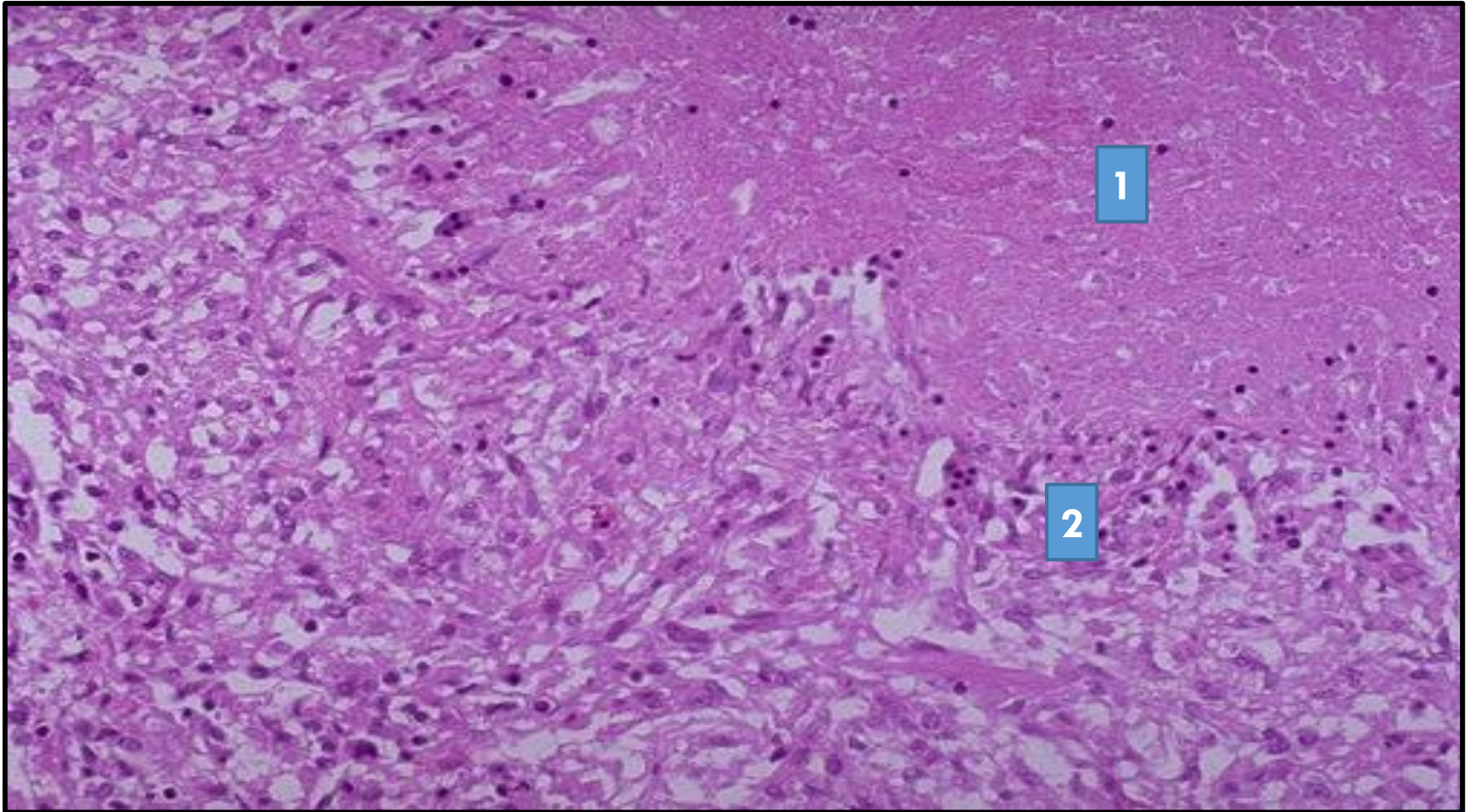
# *Pulmonary TB - Granuloma with central early necrosis*



***Epithelioid Granuloma with caseation.***



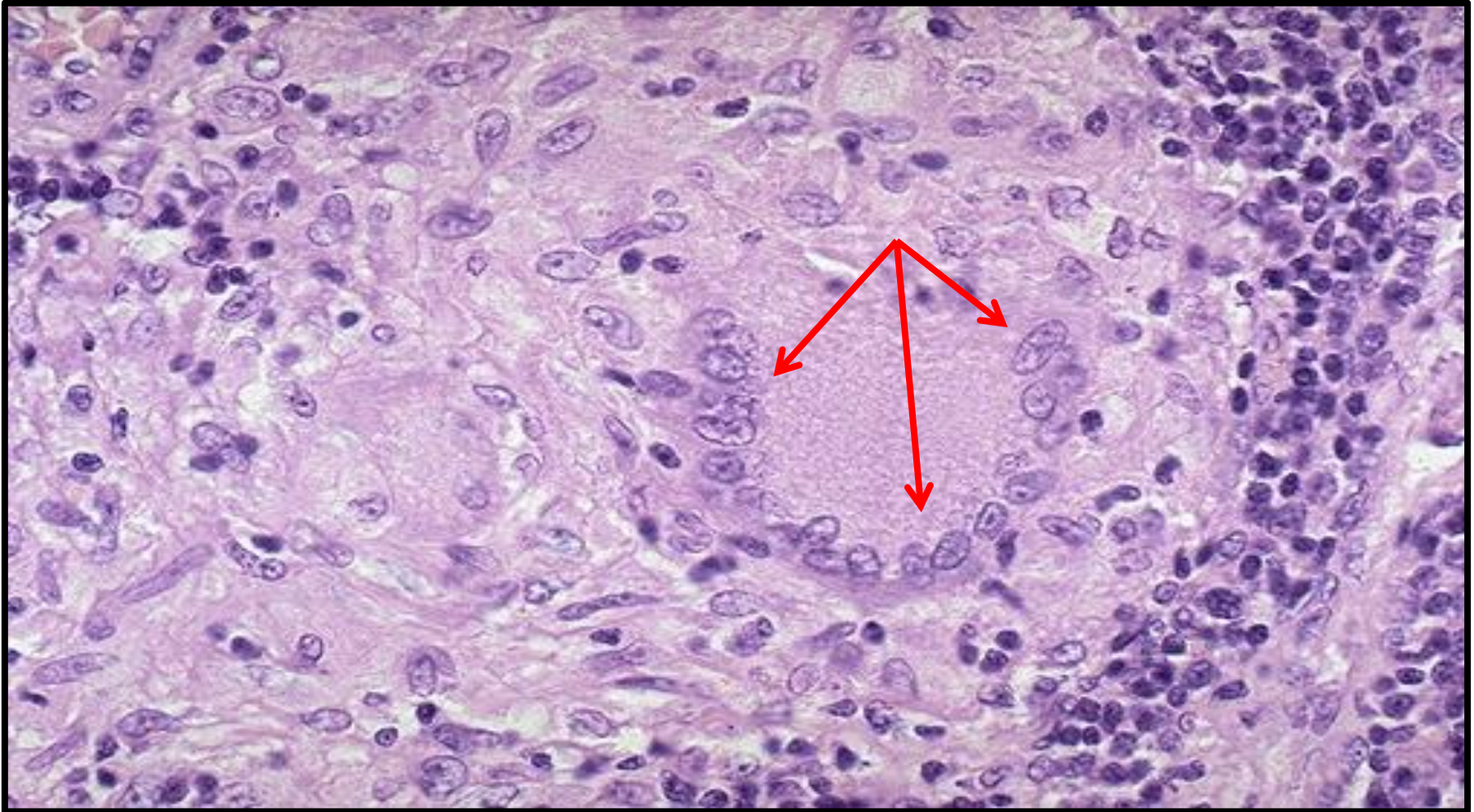
## Tuberculous Granulomas - HPF



***The edge of a granuloma is shown here at high magnification. At the upper is amorphous pink caseous material [1] composed of the necrotic elements of the granuloma as well as the infectious organisms. This area is ringed by the inflammatory component [2] with epithelioid cells, lymphocytes, and fibroblasts.***



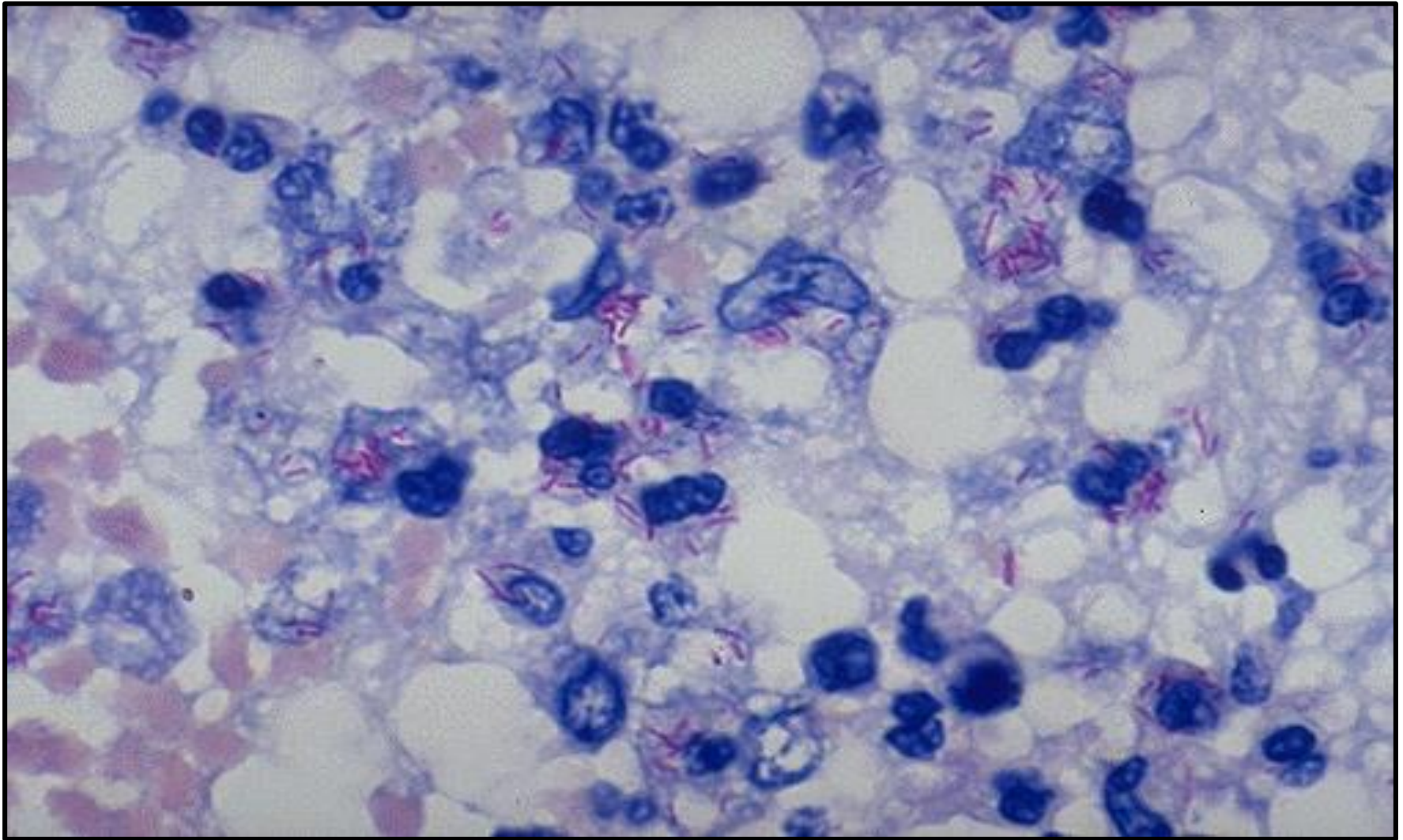
# Epithelioid & Giant cell Granulomas in *Tuberculosis*



***At high magnification, the granuloma demonstrates that the epithelioid macrophages are elongated with long, pale nuclei and pink cytoplasm. The macrophages organize into committees called giant cells. The typical giant cell for infectious granulomas is called a Langhan's giant cell and has the nuclei lined up along one edge of the cell***



## *Acid Fast bacilli of Mycobacterium TB in the Lung*



*A stain for **Acid Fast Bacilli** is done (**AFB** stain) to find the mycobacteria .  
The mycobacteria stain as red rods, as seen here at high magnification.*



# ***LUNG CARCINOMA***

# TWO TYPES OF LUNG CARCINOMA

- **NON-SMALL CELL CARCINOMA**
  1. **SQUAMOUS CELL CARCINOMA**
  2. **ADENOCARCINOMA**
  3. **LARGE CELL CARCINOMA**
- **SMALL CELL CARCINOMA**

**The NON-small cell cancers behave and are treated similarly, the SMALL cell carcinomas are WORSE than the non-small cell carcinomas, but respond better to chemotherapy, often drastically!**



# 1. Squamous Cell Carcinoma of the lung

- **Most commonly found in men and correlated with smoking.**
- **Pathology: more differentiated, more cytoplasm, keratin whorls.**
- **Transforms from carcinoma in situ.**
- **Grading is based on the amount of keratin & cytoplasm.**

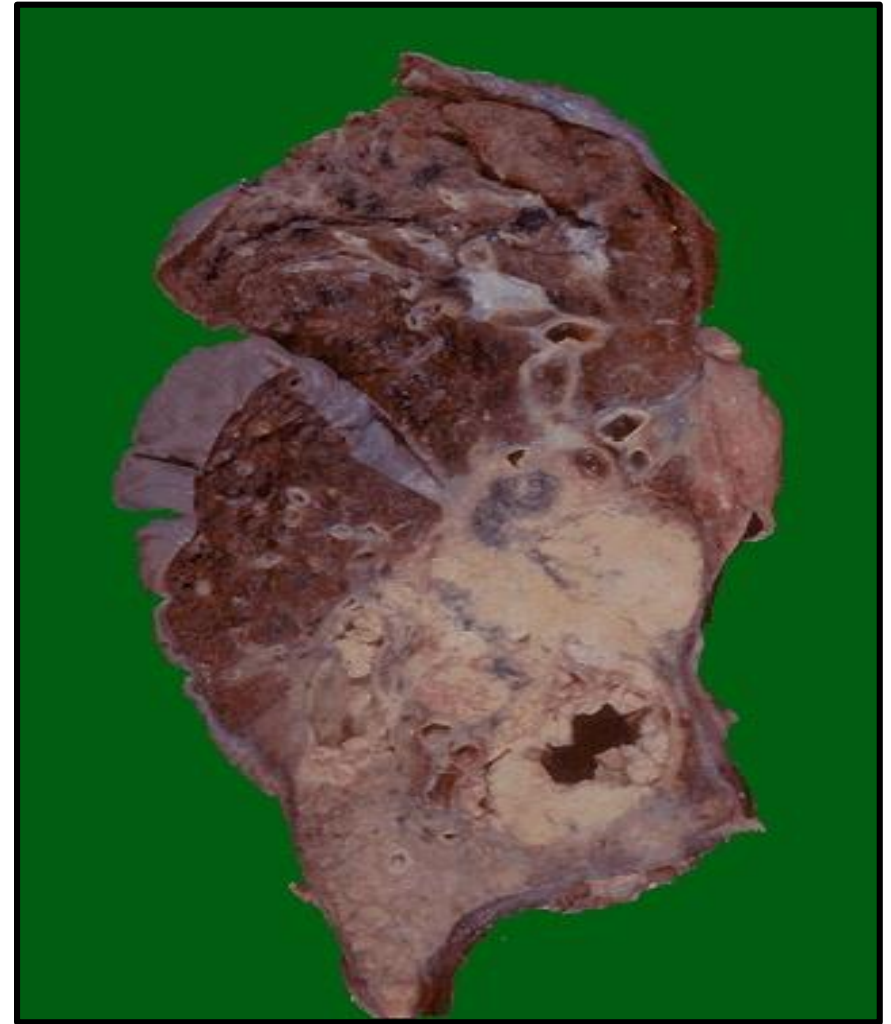
## Squamous Cell Carcinoma of the Lung - Gross



***This is a squamous cell carcinoma of the lung that is arising centrally in the lung (as most squamous cell carcinomas do). It is obstructing the right main bronchus. The neoplasm is very firm and has a pale white to tan cut surface.***



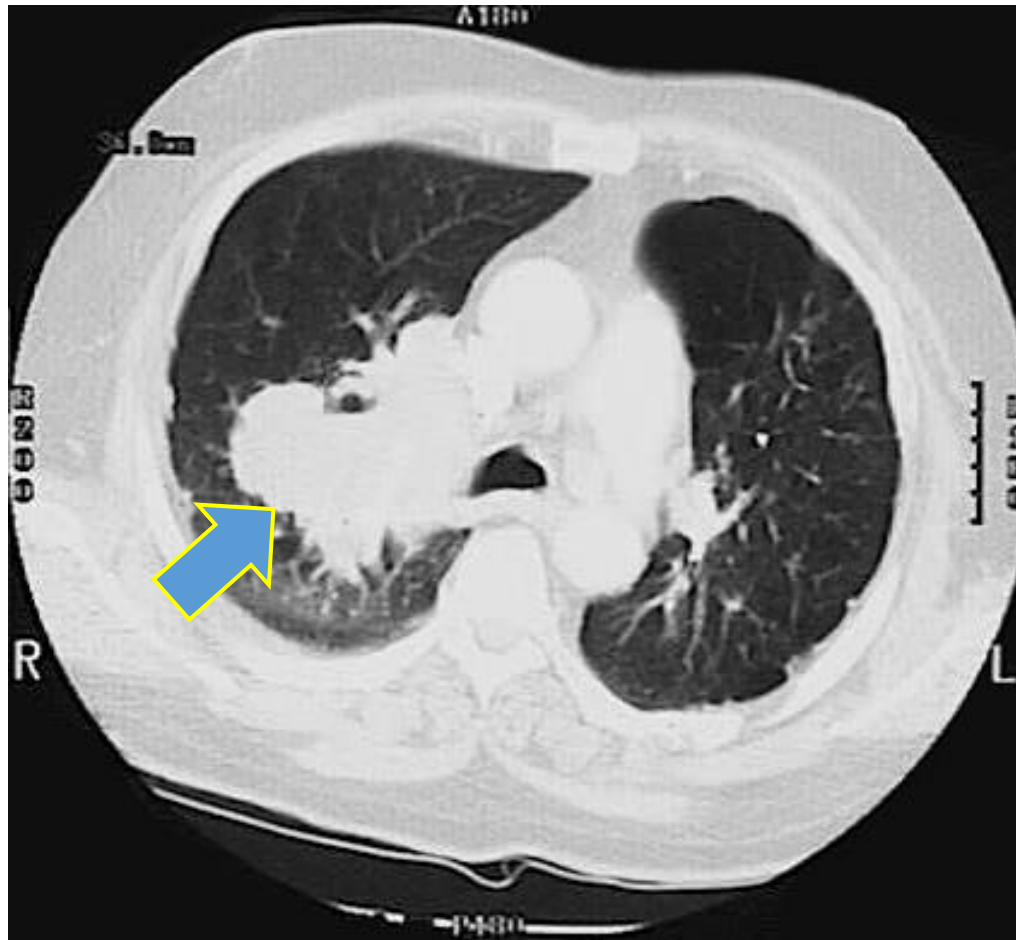
## Squamous Cell Carcinoma of the Lung - Gross



***This is a larger squamous cell carcinoma in which a portion of the tumor demonstrates central cavitation, probably because the tumor outgrew its blood supply.***

# Squamous Cell Carcinoma of the Lung – CT scan

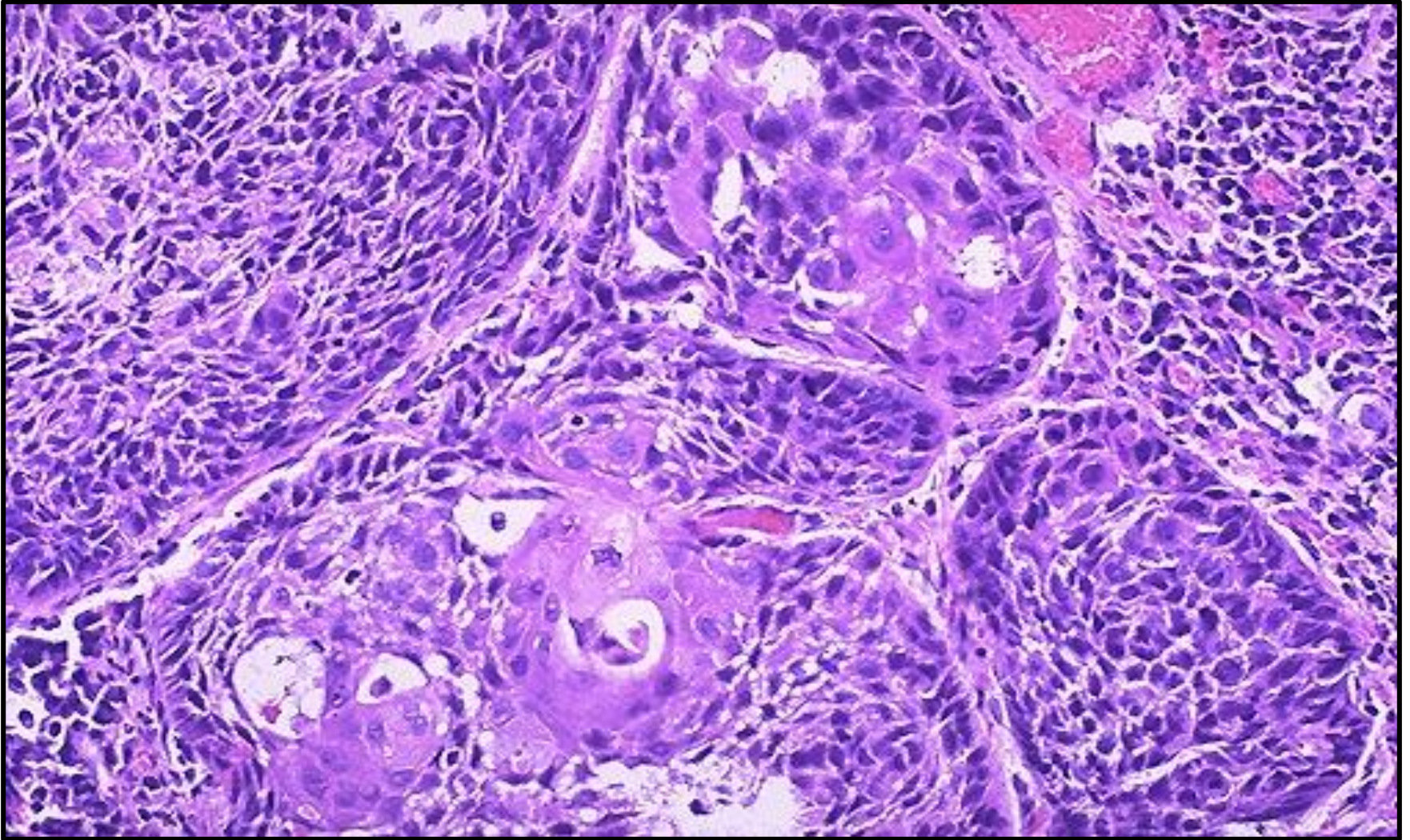
Lung cancers may develop pleural effusion causing chest pain.



***This chest CT scan view demonstrates a large squamous cell carcinoma of the right upper lobe that extends around the right main bronchus and also invades into the mediastinum and involves hilar lymph nodes.***



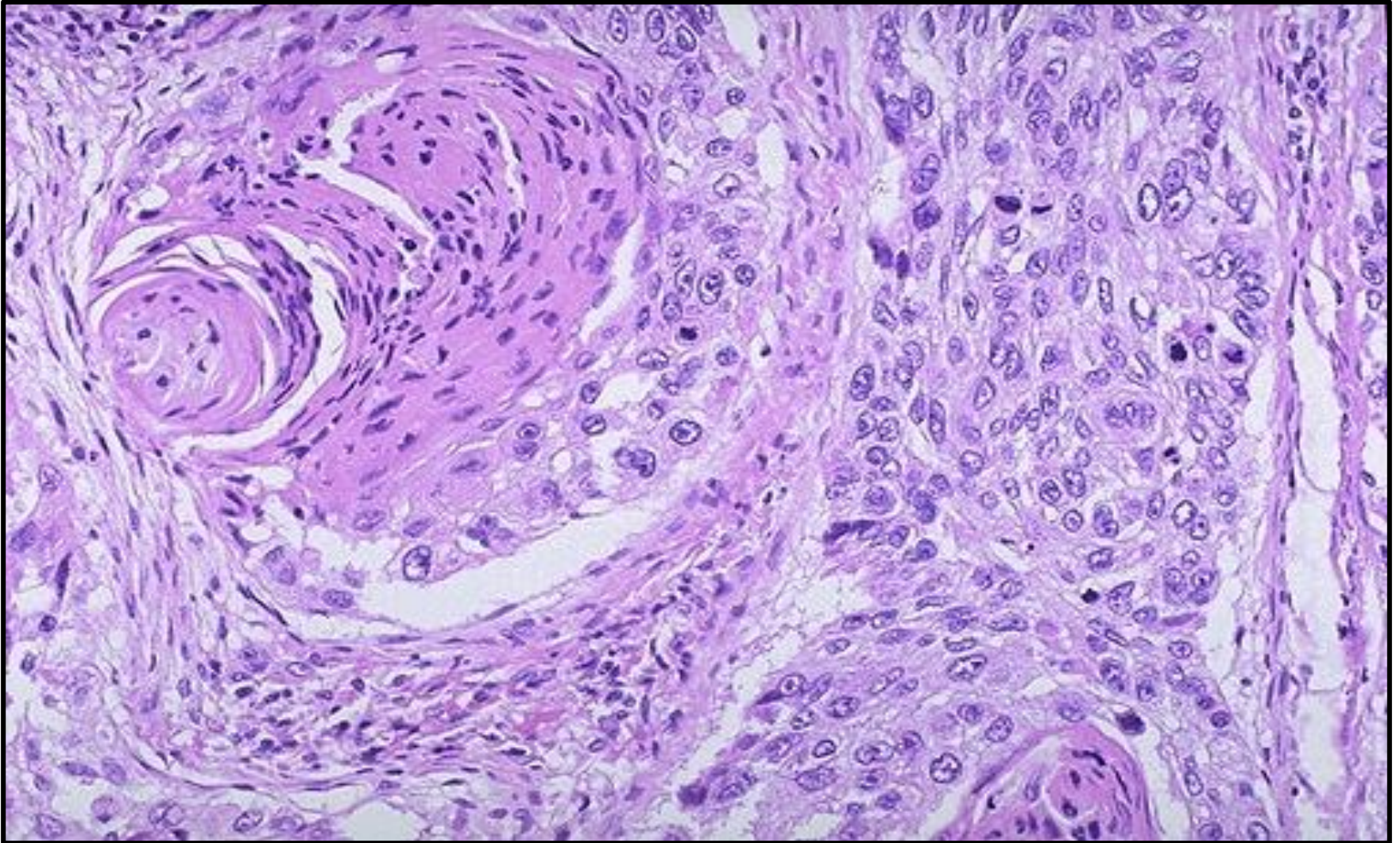
## ***Squamous Cell Carcinoma of the Lung - HPF***



**Microscopic appearance of squamous cell carcinoma with nests of polygonal cells with pink cytoplasm and distinct cell borders. The nuclei are hyperchromatic and angular.**



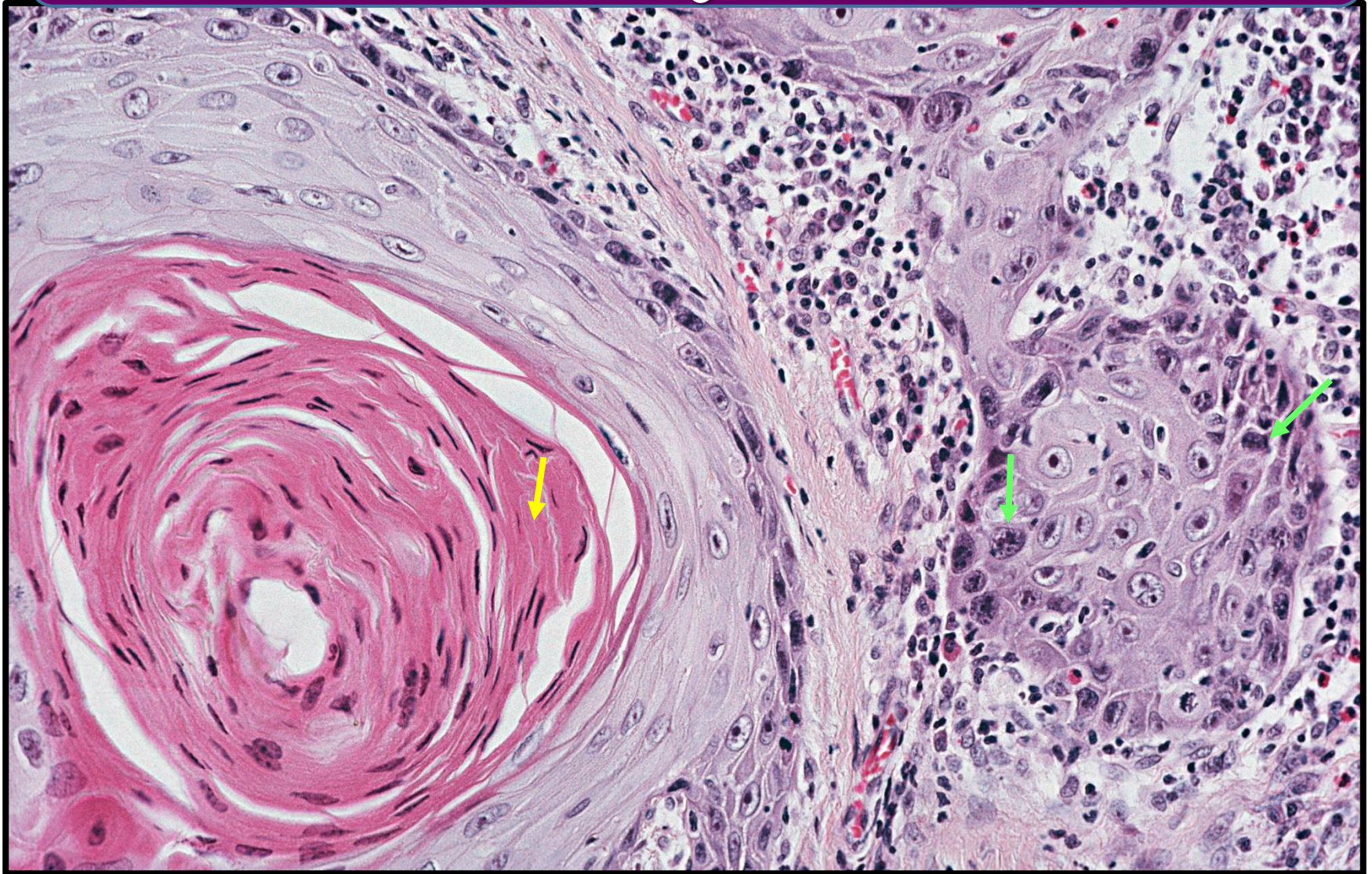
## Squamous Cell Carcinoma of the Lung - HPF



***In this squamous cell carcinoma at the upper left is a squamous eddy with a keratin pearl. At the right, the tumor is less differentiated and several dark mitotic figures are seen***



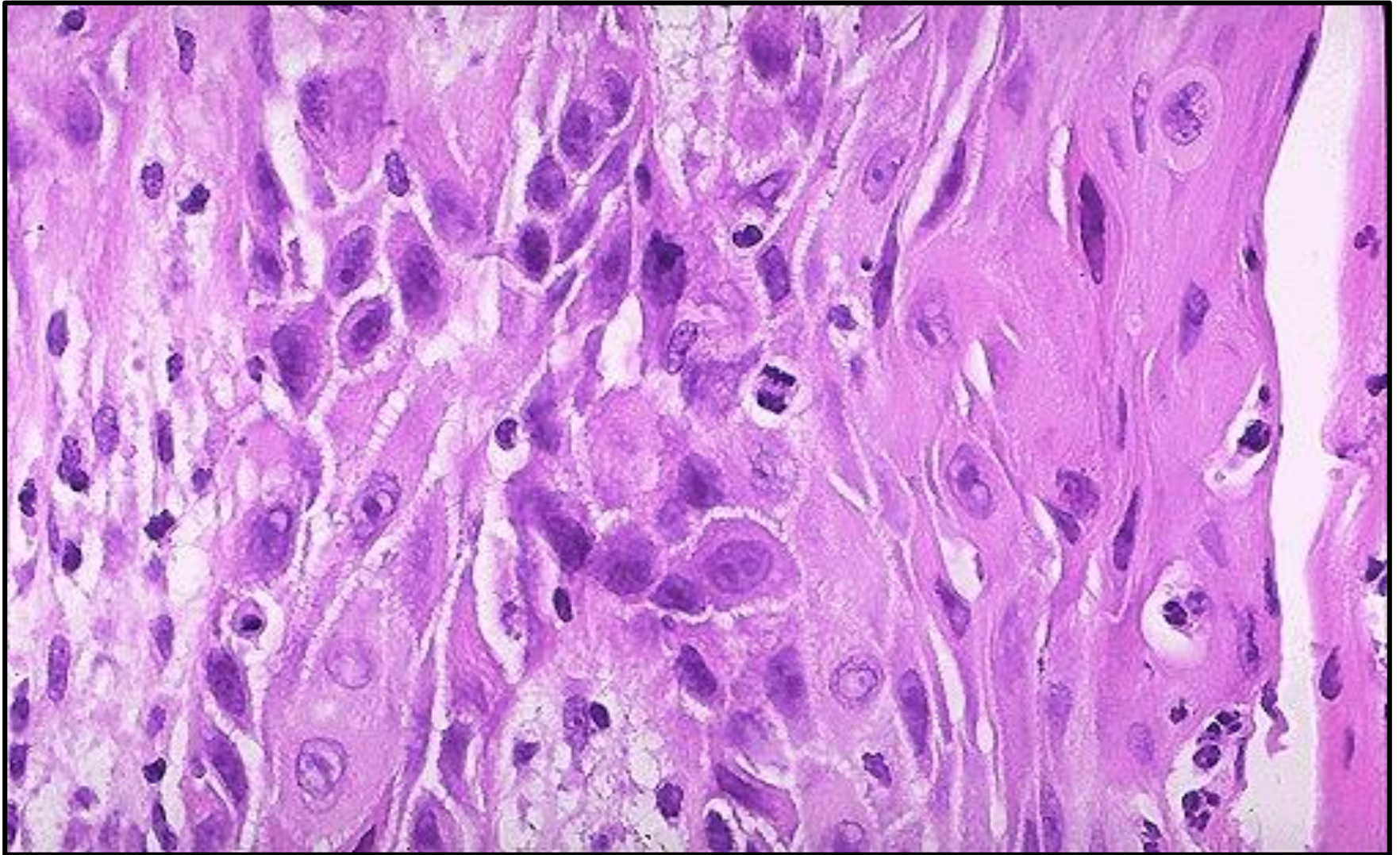
# Moderately differentiated Squamous Cell Carcinoma of the Lung - HPF



**Keratin** pearl and **malignant squamous cells** show **pleomorphism, hyperchromatism and mitoses.**



## **Squamous Cell Carcinoma of the Lung - HPF**



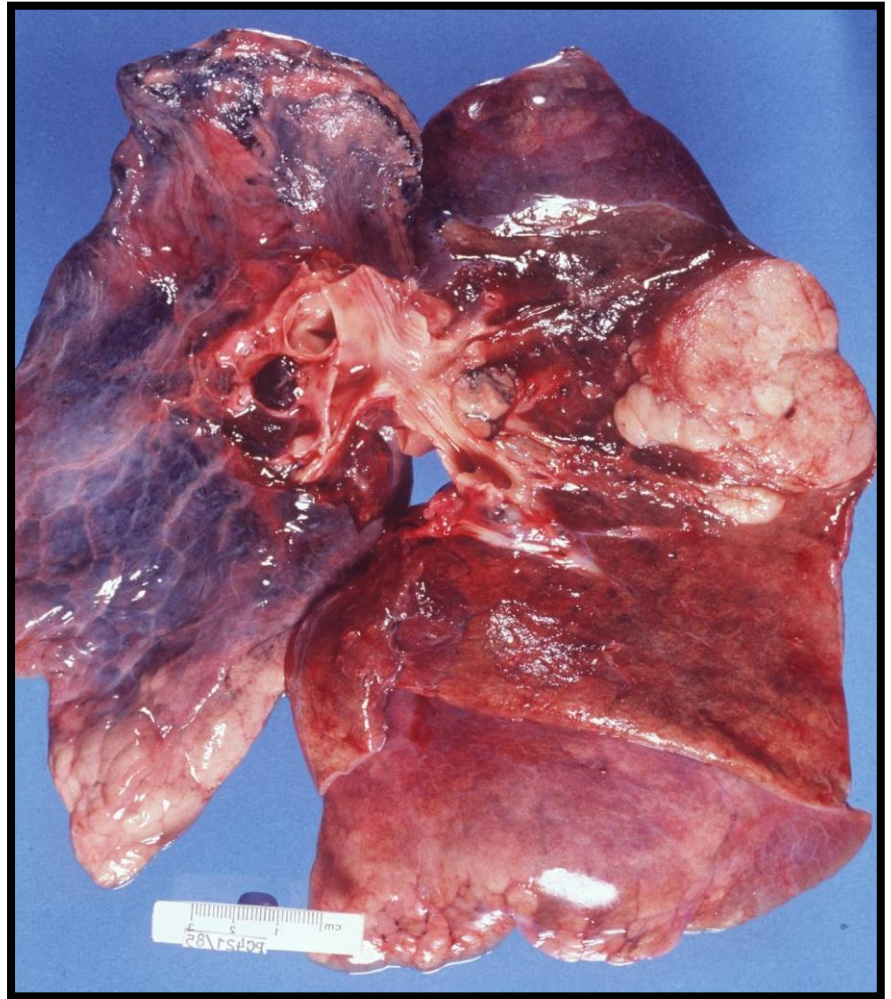
***The pink cytoplasm with distinct cell borders and intercellular bridges characteristic for a squamous cell carcinoma of the lung***



## 2. Adenocarcinoma of the lung

- The most common type of lung cancer, making up 30-40% of all cases.
- Glandular differentiation by tumor cells and 80% of those cells produce mucin.
- Not as strongly associated with a smoking history as compared to Squamous or Small Cell Carcinomas
- Adenocarcinoma in situ - called bronchoalveolar carcinoma
- Early and distant metastases
- Genetic mutations: EGFR (Epithelial Growth Factor Receptor) gene mutation and Alk (Alkaline Phosphatase enzyme) gene mutation.

## Adenocarcinoma of the Lung – Gross

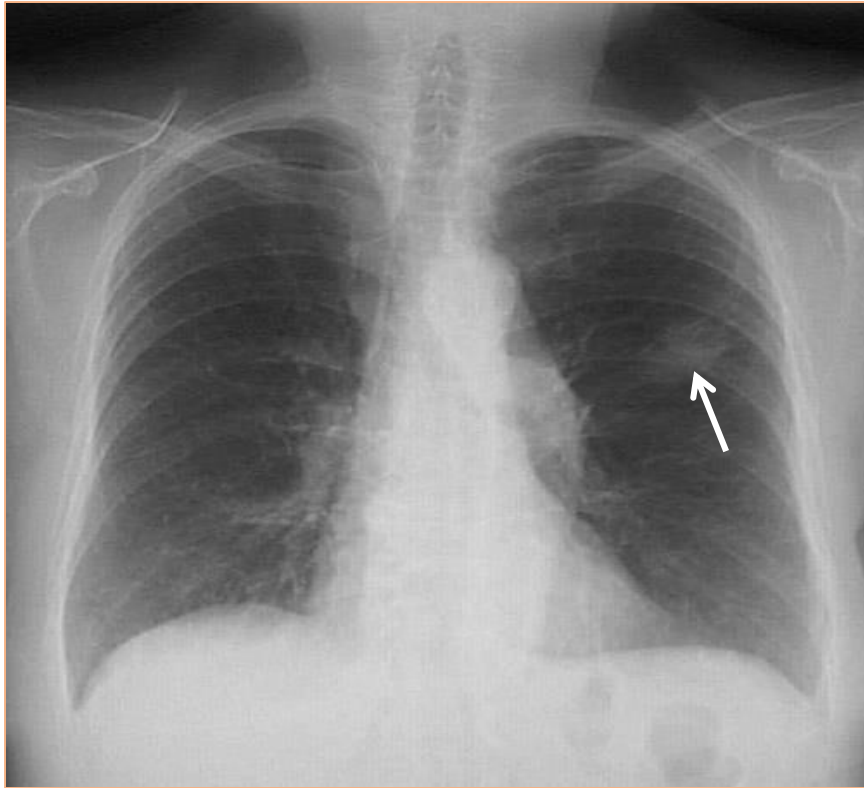


***A peripheral adenocarcinoma of the lung. Adenocarcinomas and large cell anaplastic carcinomas tend to occur more peripherally in lung. Adenocarcinoma is the one cell type of primary lung tumor that occurs more often in non-smokers and in smokers who have quit.***



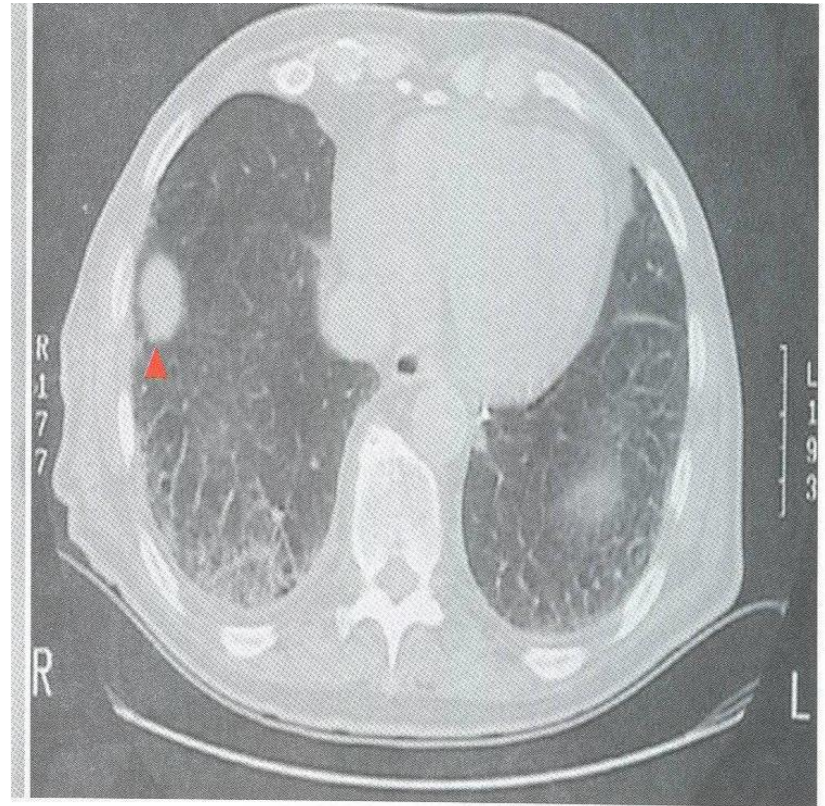
# Adenocarcinoma of the Lung

## X-Ray



***A peripheral adenocarcinoma of the lung appears in this chest radiograph of an elderly non-smoker woman.***

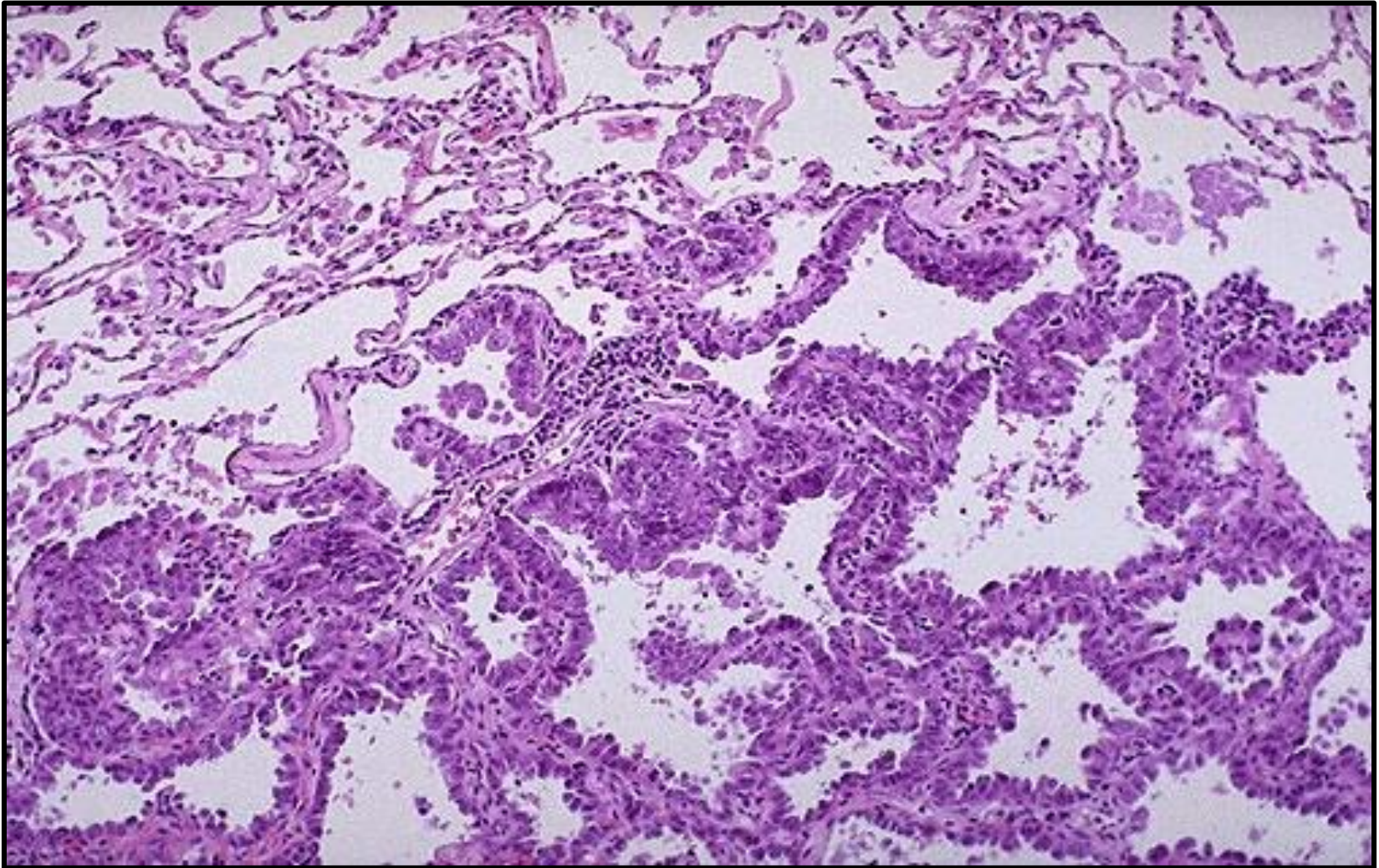
## CT scan



***Peripheral right lung nodular mass.***



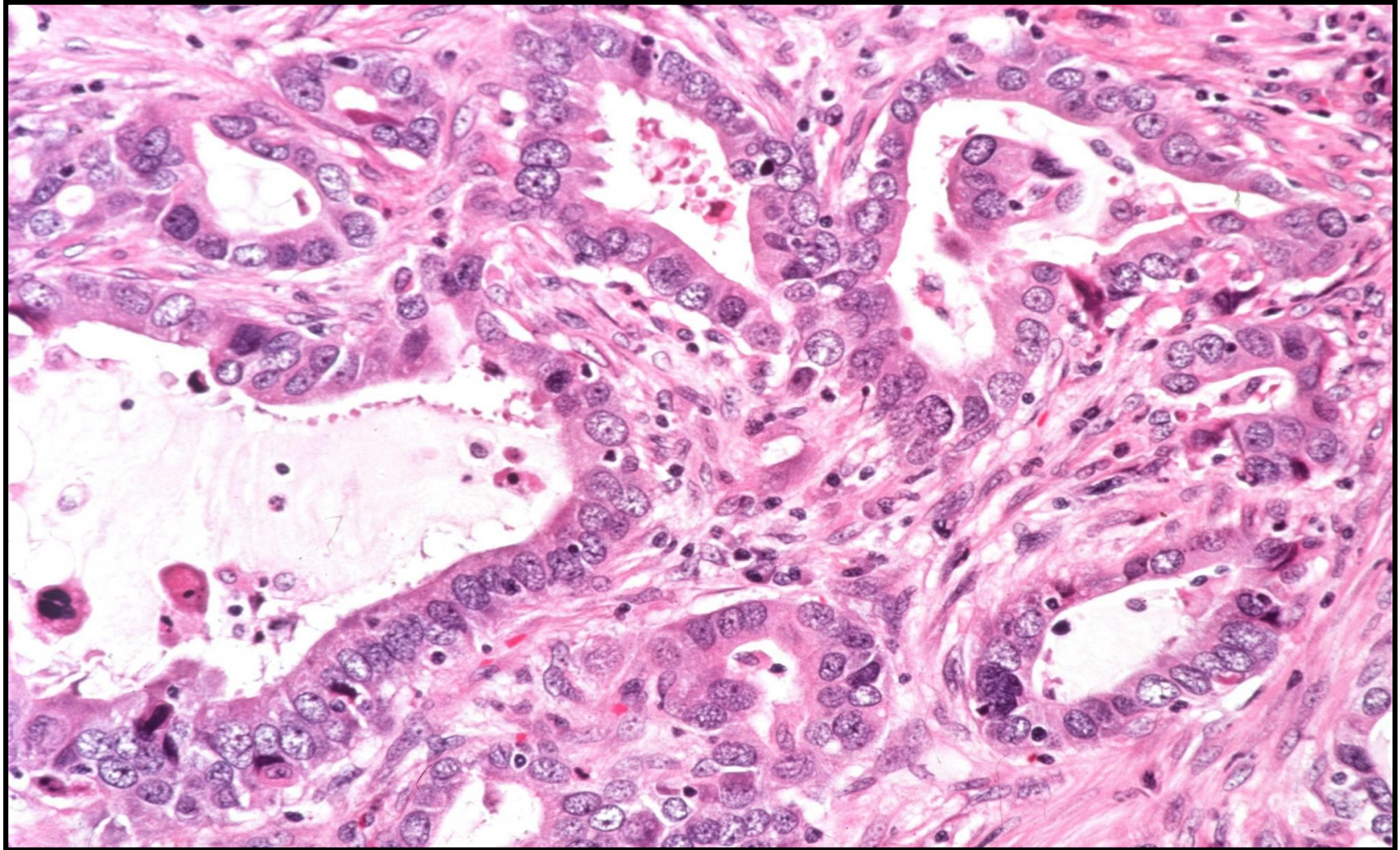
## Adenocarcinoma of the Lung – LPF



Microscopically, the **Adenocarcinoma in Situ** ( Previously named **Bronchioloalveolar Carcinoma**) is composed of columnar cells that proliferate along the framework of alveolar septae. The cells are well-differentiated.



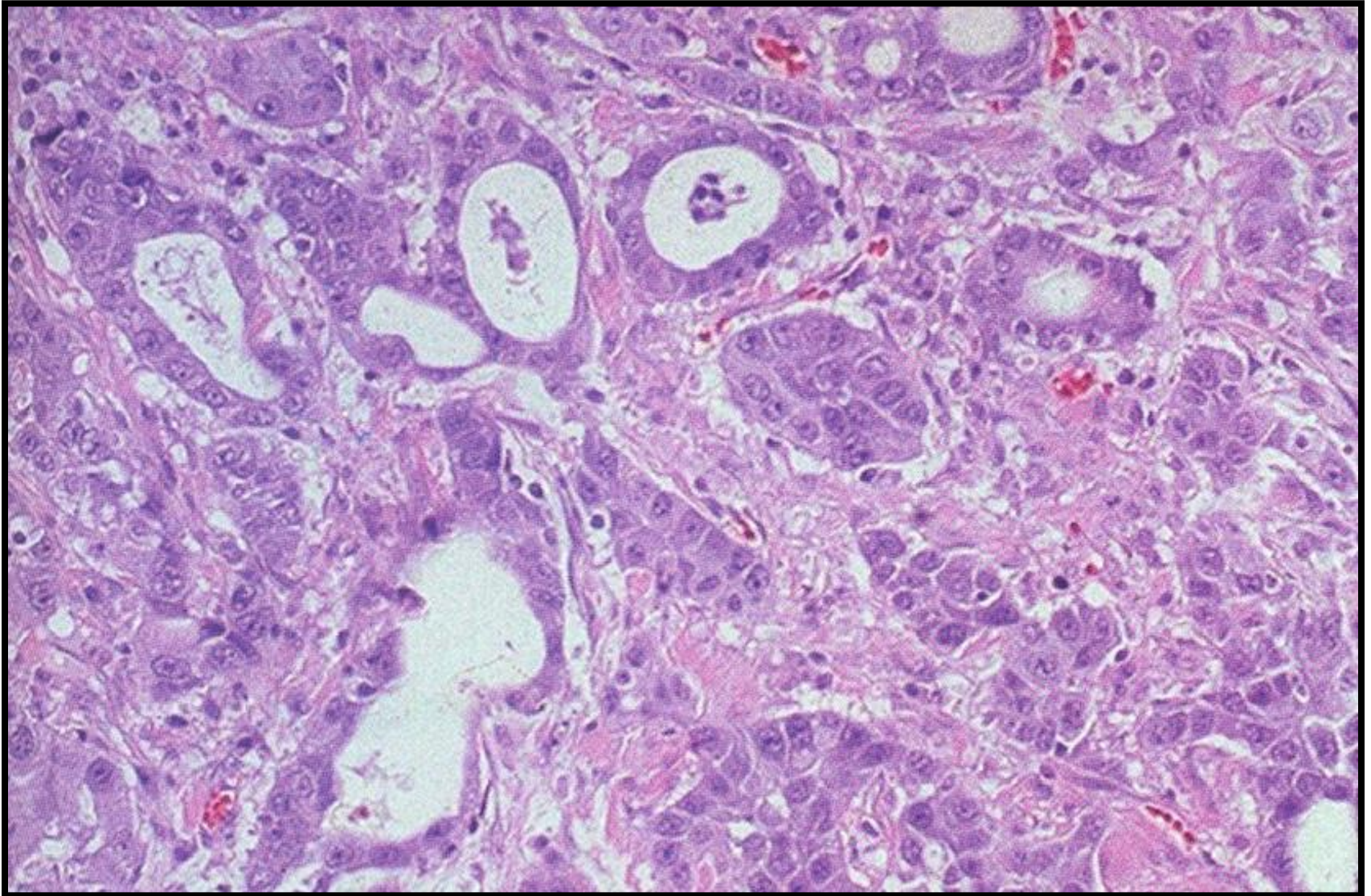
## Adenocarcinoma of the Lung – HPF



- ***Malignant glands lined by cells showing irregular nuclei and prominent nucleoli.***
- ***Desmoplastic fibro-inflammatory tissue surrounding the malignant gland.***



## **Adenocarcinoma of the Lung – HPF**



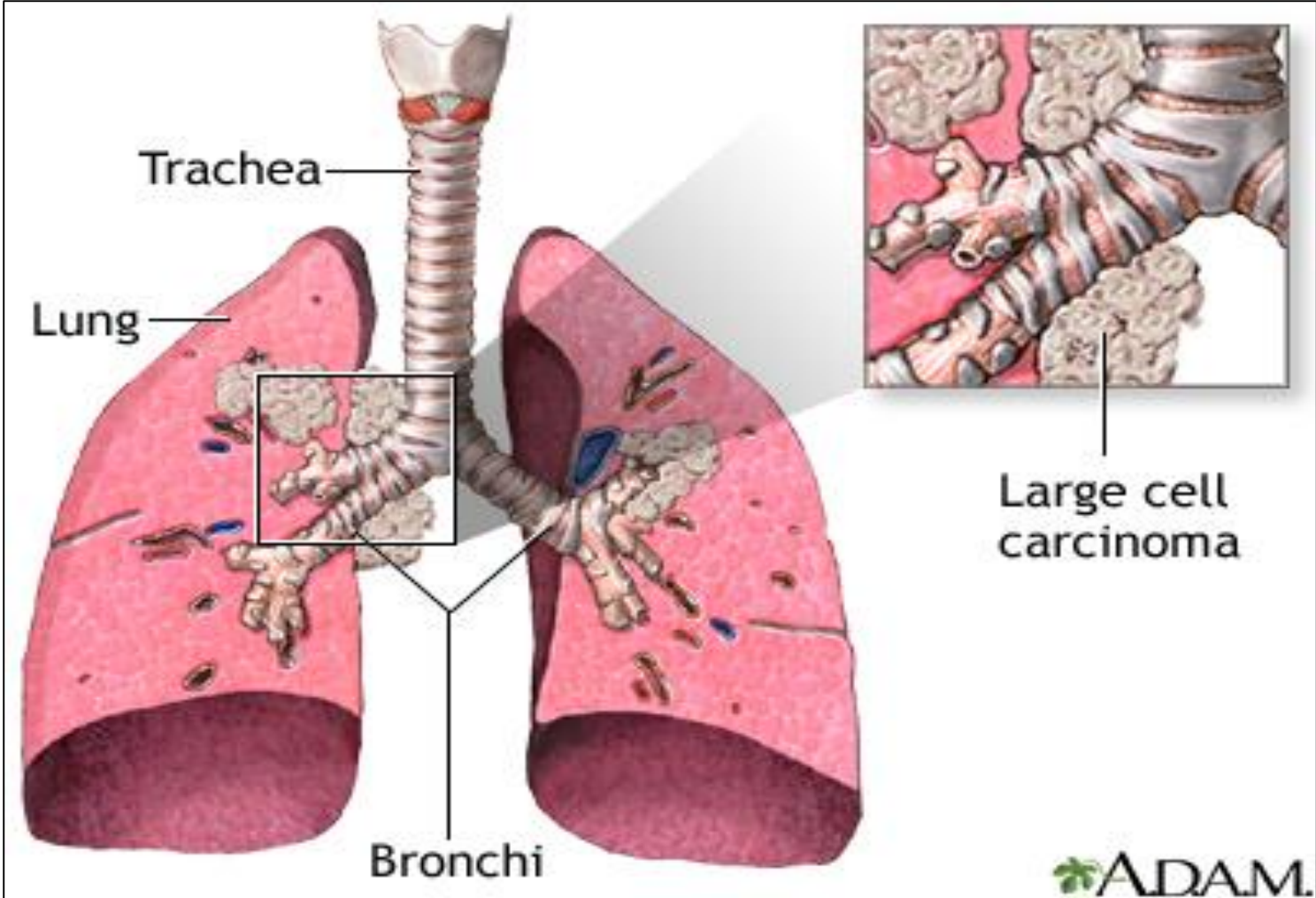
***Differentiated malignant glands lined by pleomorphic and hyperchromatic malignant cells showing conspicuous nucleoli***



## **3. Large Cell Carcinoma of the lung**

- **Can be a neuroendocrine carcinoma. Probably represents undifferentiated SCC and adenocarcinomas.**
- **Large nuclei, prominent nucleoli.**
- **Variation in size and shape.**
- **Nuclei normally do not touch due to more cytoplasm.**
- **Moderate amount of cytoplasm.**
- **Early and distant metastases, sometimes cavitating.**

# Large Cell Carcinoma of the Lung – Gross

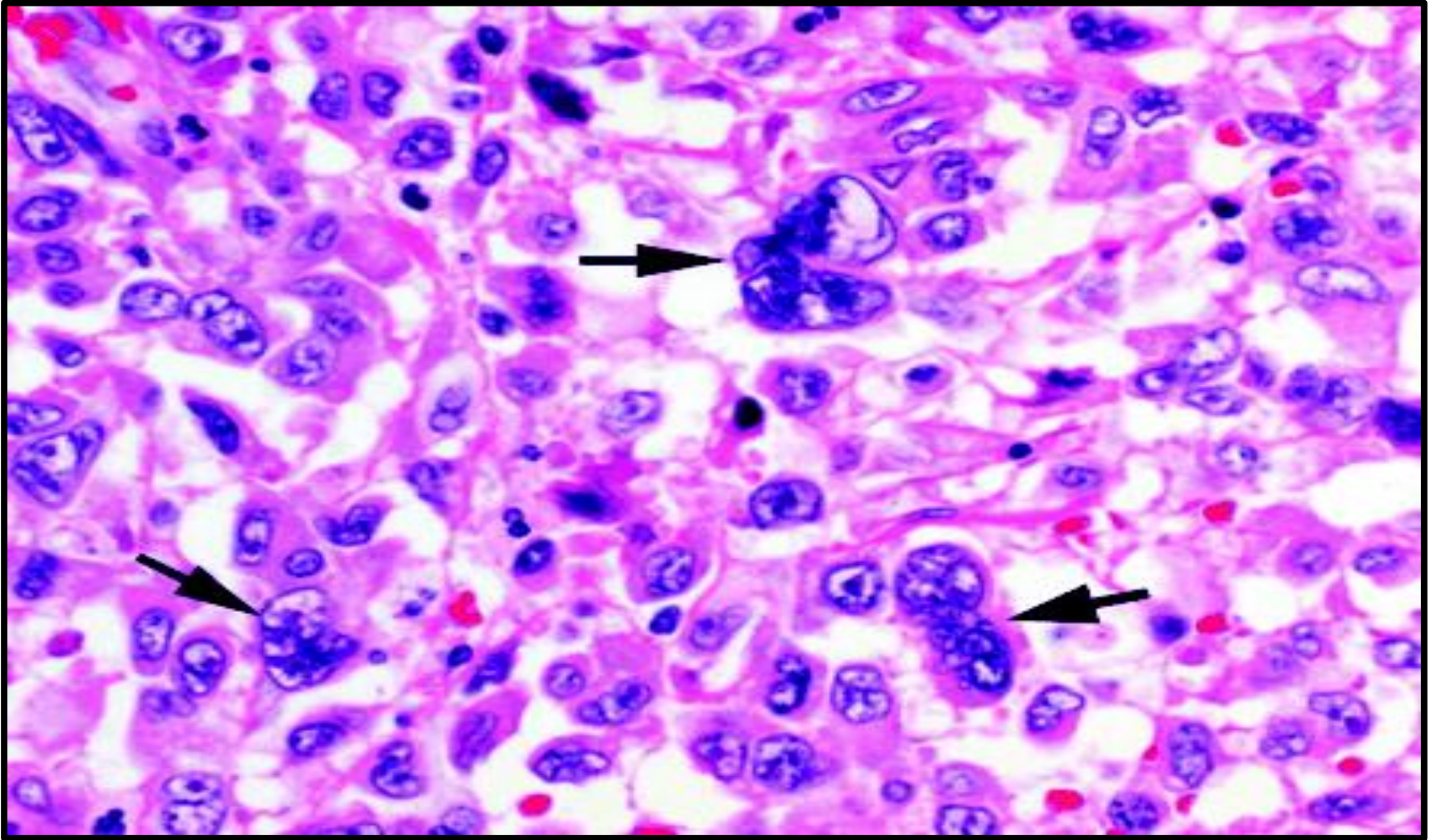




# Undifferentiated Large Cell Carcinoma of the Lung – Gross



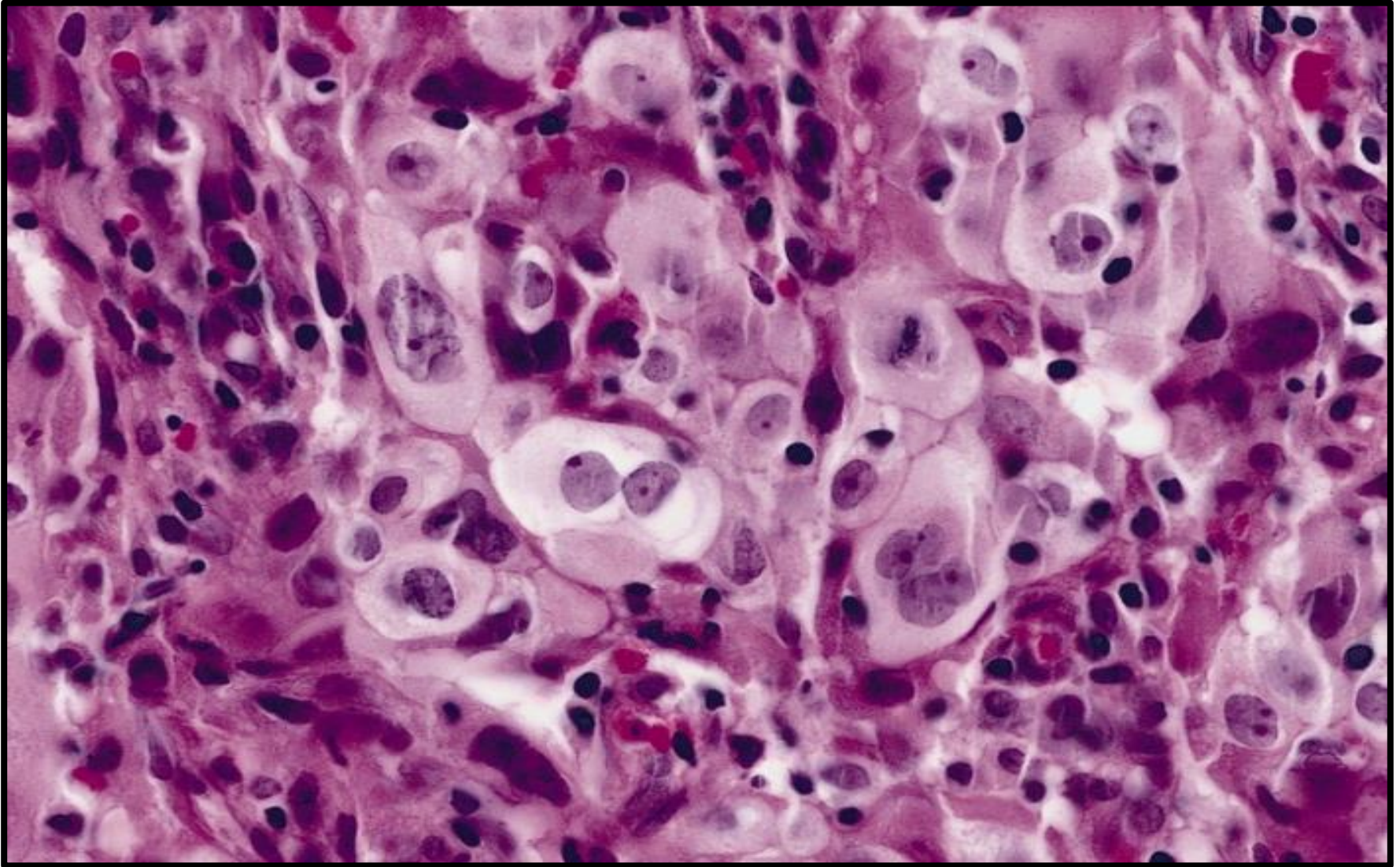
## Large Cell Carcinoma of the Lung – HPF



***Pleomorphic carcinoma of lung (large cell and giant cell subtype). It shows mixed composition of large cell carcinoma and pleomorphic multinucleated giant cells (arrows). (H and E, ×200)***



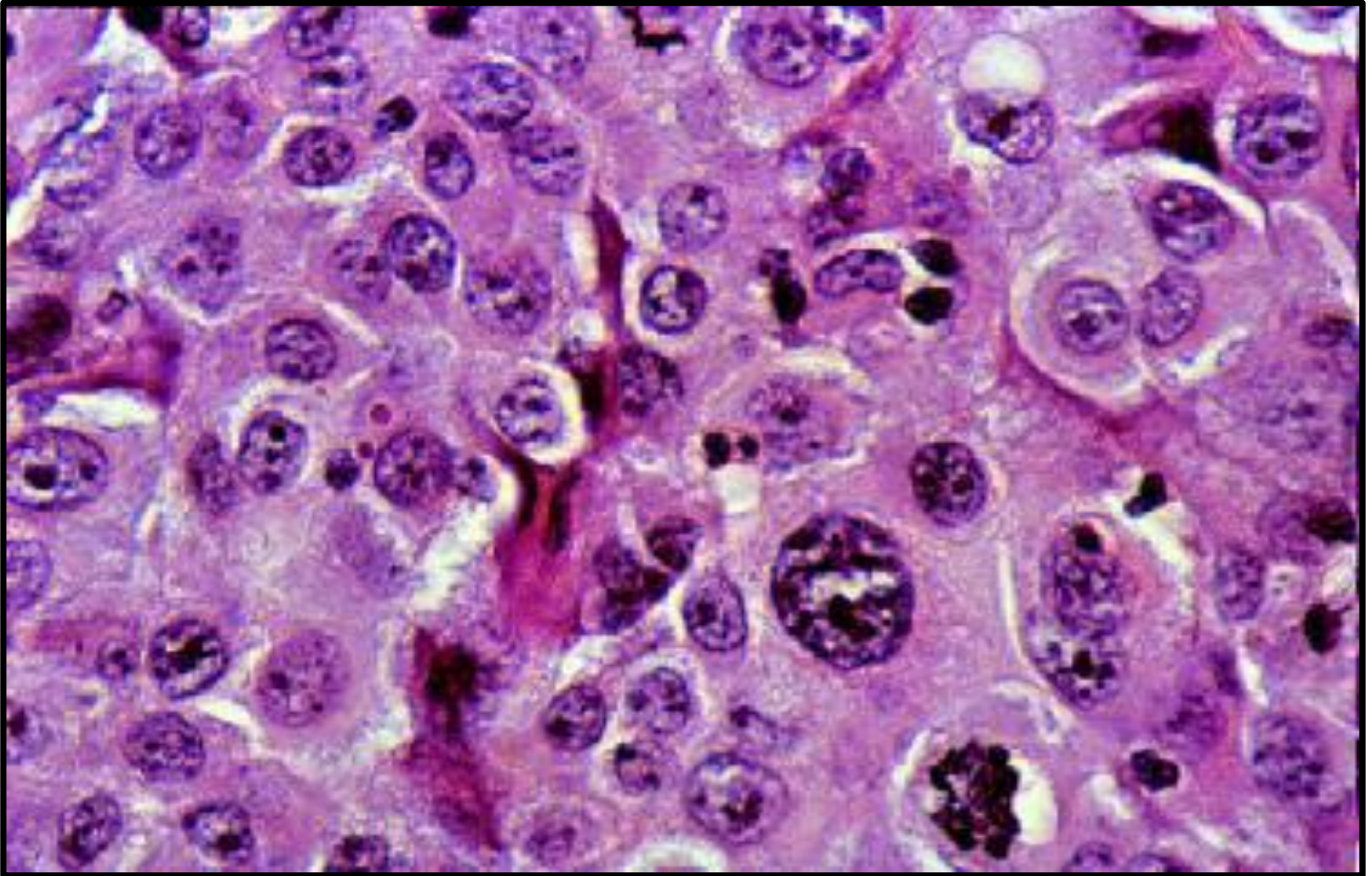
## Large Cell Carcinoma of the Lung – HPF



*This section from lower respiratory tract shows neoplastic cells with abundant pale eosinophilic cytoplasm and a surrounding infiltrate of inflammatory cells*



## ***Large Cell Carcinoma of the Lung – HPF***



***This section shows neoplastic cells with abundant pale eosinophilic cytoplasm and pleomorphic multinucleated giant cells***



## ***Small cell carcinoma of the lung***

- **Highly Malignant Tumor.**
- **Cells are small, with scant cytoplasm, ill-defined borders, finely granular chromatin (salt & pepper pattern) and absent or inconspicuous nucleoli.**
- **High mitotic count and often extensive necrosis.**
- **Typically not graded as all SCLC are considered High Grade.**
- **Very strong relationship with smoking.**

## Small Cell Carcinoma of the Lung “Oat cell” – Gross



***Arising centrally in this lung and spreading extensively is a small cell anaplastic (oat cell) carcinoma. The cut surface of this tumor has a soft, lobulated, white to tan appearance. The tumor seen here has caused obstruction of the main bronchus to left lung so that the distal lung is collapsed***

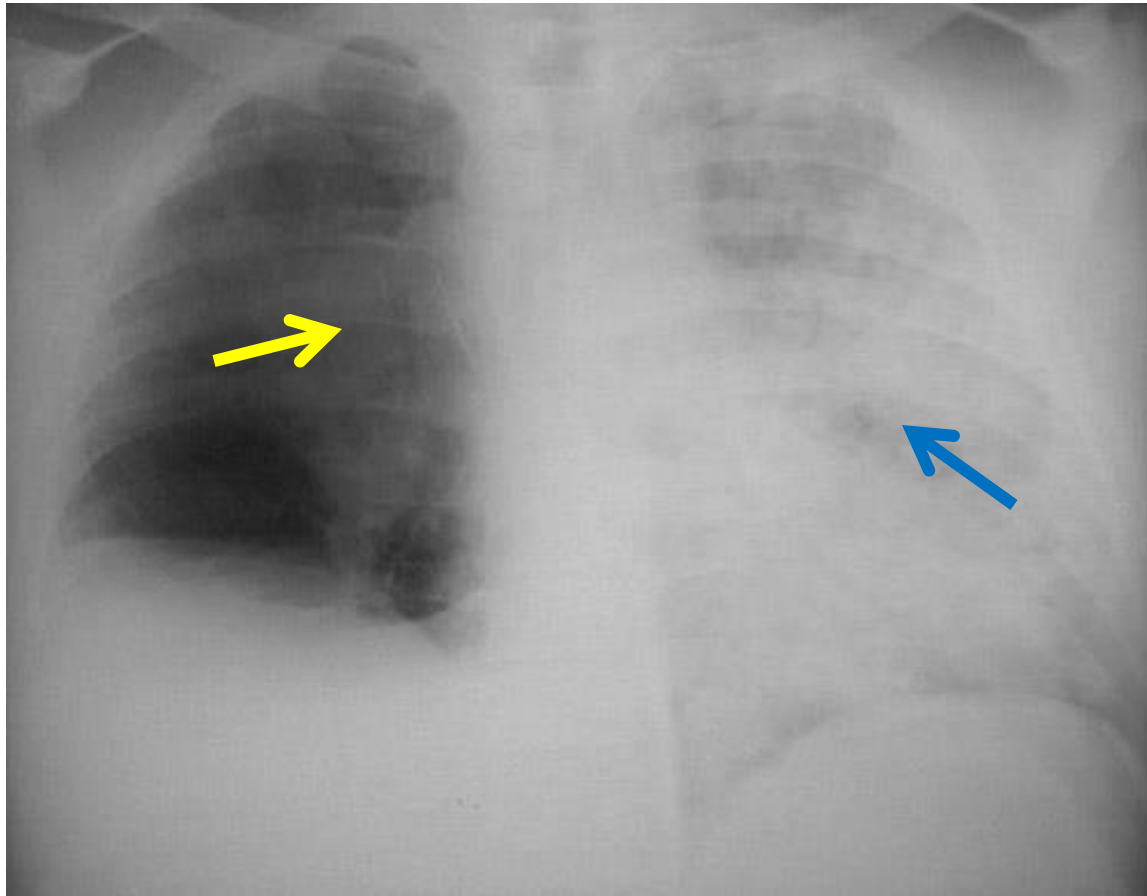


## **Small Cell Carcinoma of the Lung “Oat cell” – Gross**



***Oat cell carcinoma which is spreading along the bronchi. The speckled black rounded areas represent hilar lymph nodes with metastatic carcinoma***

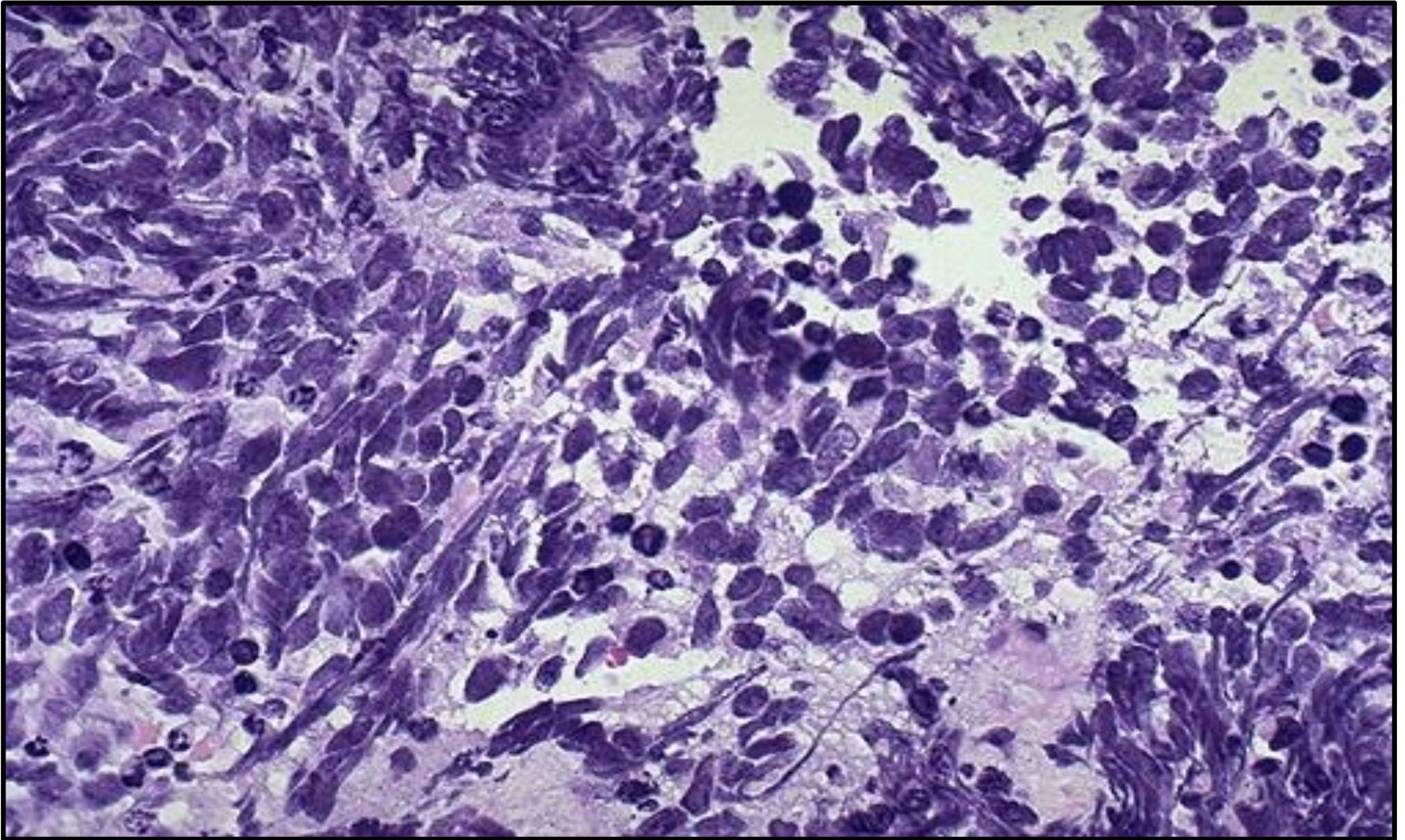
## Small Cell Carcinoma of the Lung “Oat cell” : X-Ray



***This chest radiograph demonstrates a mass lesion in the right upper lobe. This was an oat cell carcinoma (yellow arrow). It obstructed the right main bronchus, leading to atelectasis on the right, evidenced by a raised right hemidiaphragm. The patient aspirated gastric contents, producing a diffuse pneumonia (blue arrow) on the left (since aspirated material could not pass the obstruction on the right).***



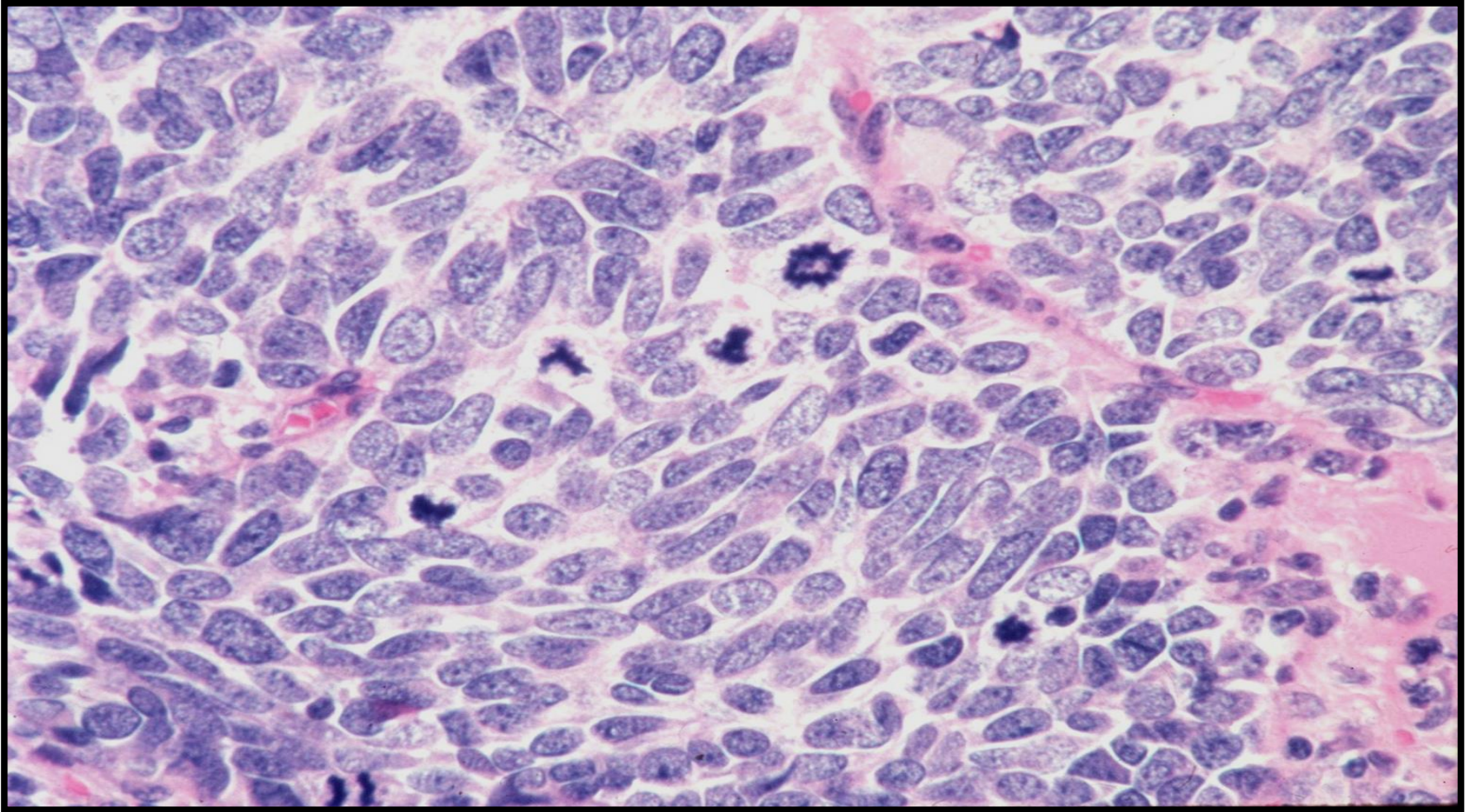
## Small Cell Carcinoma of the Lung “Oat cell” – HPF



***This is the microscopic pattern of a small cell anaplastic (oat cell) carcinoma in which small dark blue cells with minimal cytoplasm are packed together in sheets.***



## Small cell carcinoma “Oat cell” of the lung - HPF



***Section of the tumor shows clusters of malignant cells which are small , round , ovale , or spindle shaped with prominent nuclear molding , finely granular nuclear chromatin (salt and pepper pattern ) , high mitotic count and focal necrosis***



# Paraneoplastic syndromes

- In 3% to 10% of patients with lung cancer.
- (1) hypercalcemia caused by secretion of a parathyroid Hormone (most often is encountered with **squamous** cell neoplasms).
- (2) Cushing syndrome (from increased production of adrenocorticotrophic hormone).
- (3) syndrome of inappropriate secretion of anti-diuretic Hormone.
- (4) neuromuscular syndromes, including a myasthenic syndrome, peripheral neuropathy, and polymyositis (most often is encountered with **small cell** neoplasms).
- (5) clubbing of the fingers and hypertrophic pulmonary Osteoarthropathy.
- (6) coagulation abnormalities, including migratory thrombophlebitis, nonbacterial endocarditis, and disseminated intravascular coagulation (most often is encountered with **adenocarcinomas**).

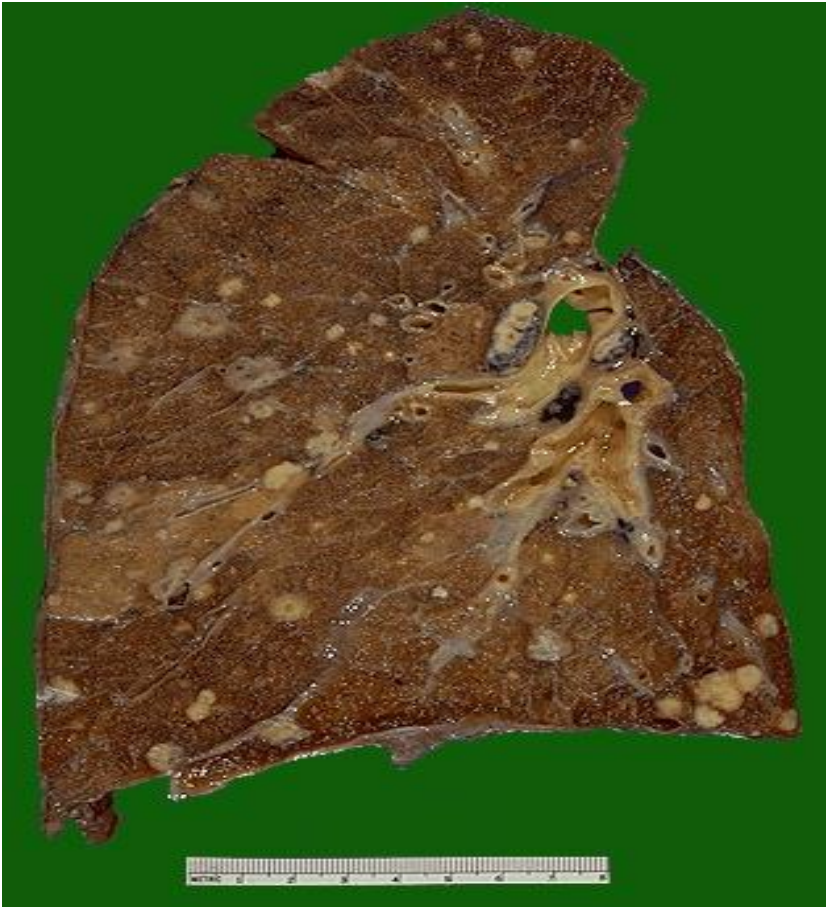
# Metastatic tumours of the lung



# **METASTATIC TUMORS**

- **LUNG** is the **MOST COMMON** site for all metastatic tumors, regardless of the site of origin.
- It is the site of **FIRST CHOICE** for metastatic sarcomas for purely anatomic reasons !

## **Metastatic Tumors of the Lung – Gross & X-ray**



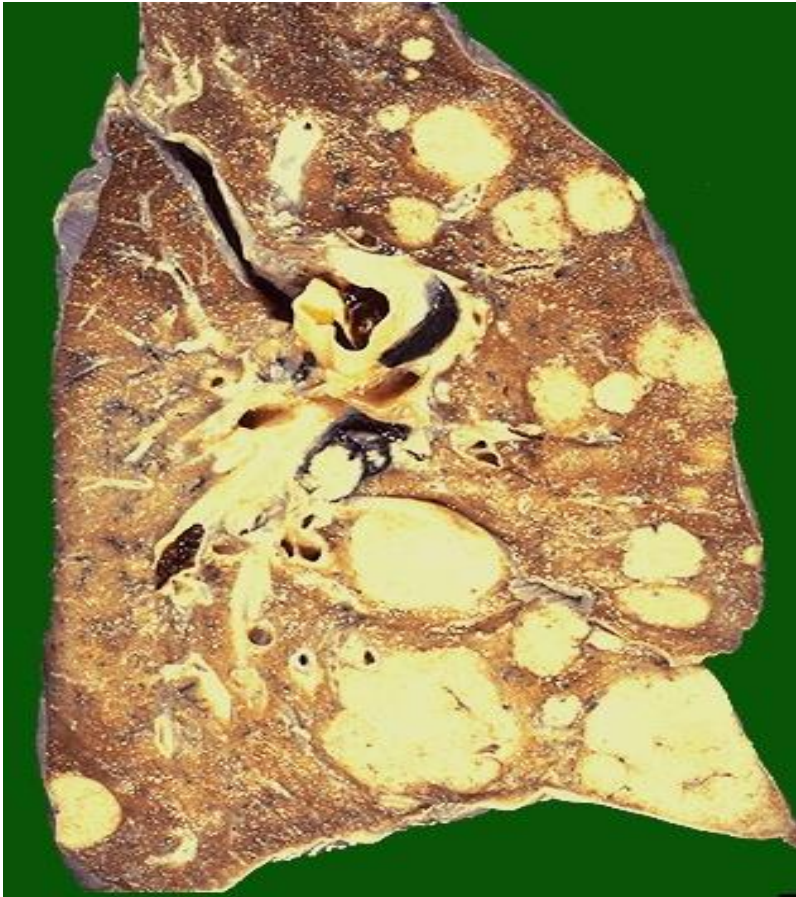
**Multiple variably-sized masses are seen in all lung fields. These tan-white nodules are characteristic for metastatic carcinoma. Metastases to the lungs are more common even than primary lung neoplasms**



**Chest X-ray showing multiple cannon ball opacities in both lung fields.**



## **Metastatic Tumors of the Lung – Gross & CT scan**



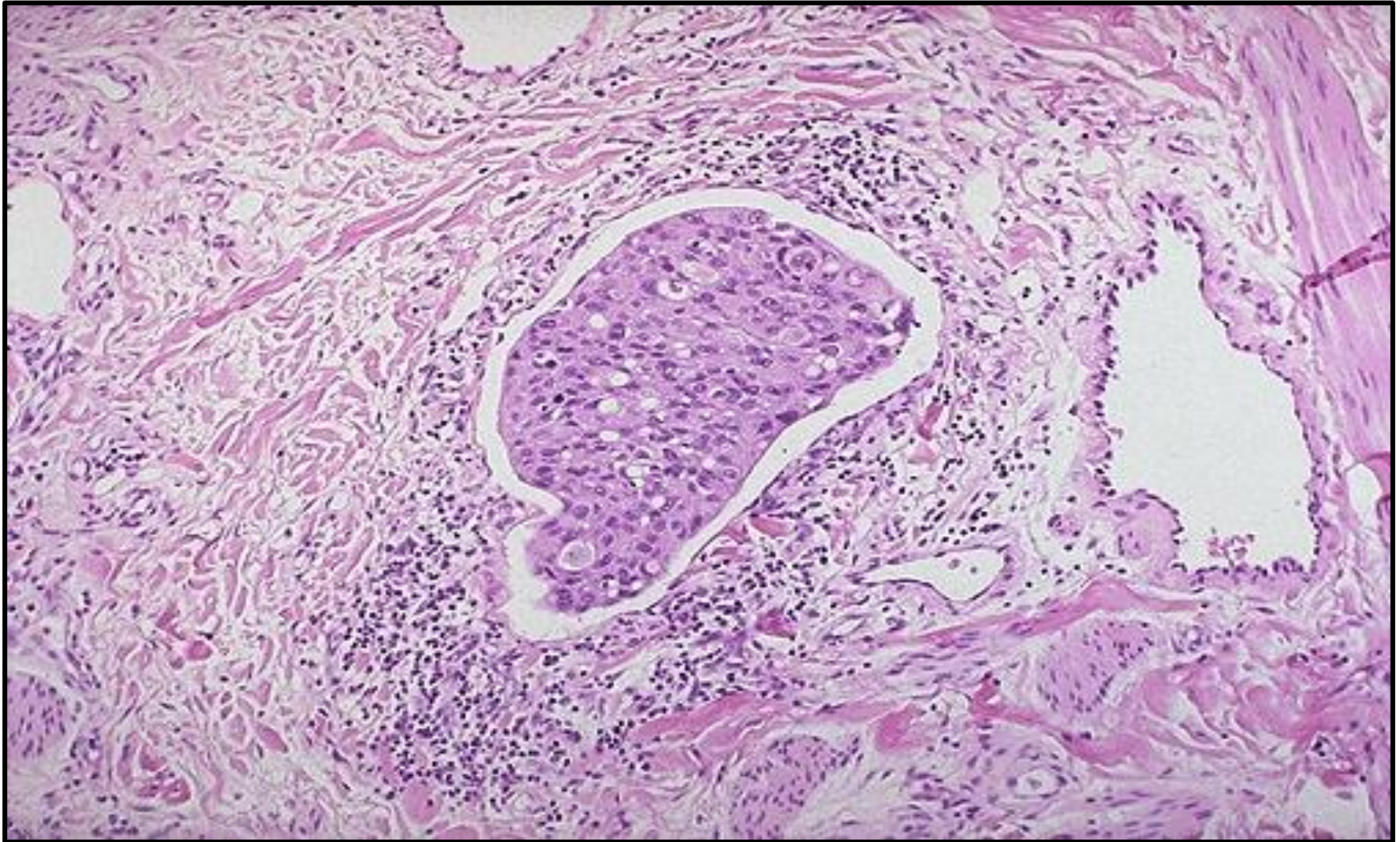
***Here are larger but still variably-sized nodules of metastatic carcinoma in lung.***



***CT Lung shows Cannonball Metastases-large, hematogenously spread metastatic lesions in the lungs of varying sizes most often from colon, breast, renal, thyroid primaries***



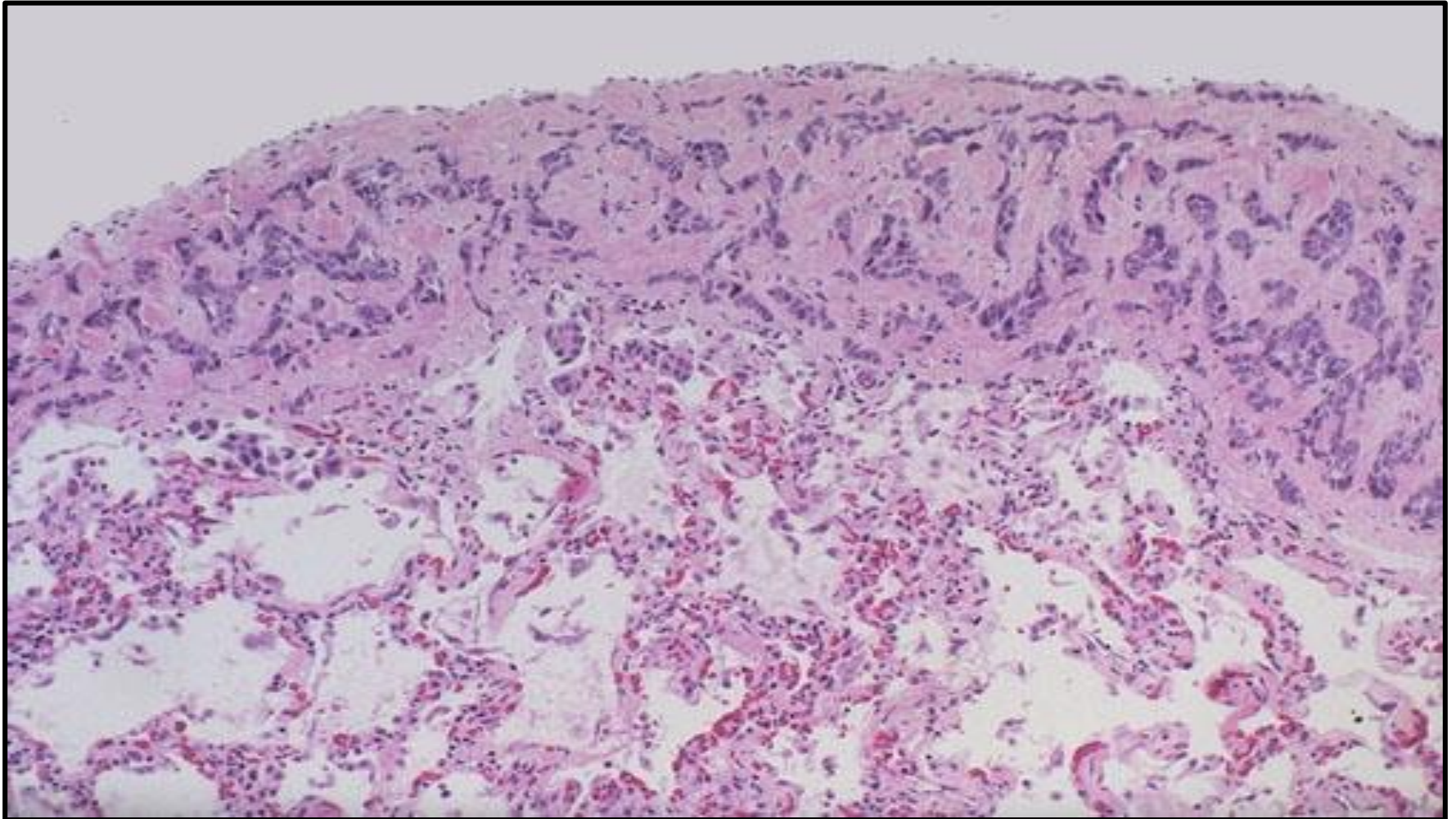
## ***Metastatic Tumors of the Lung – LPF***



***A nest of metastatic infiltrating ductal carcinoma from breast is seen in a dilated lymphatic channel in the lung. Carcinomas often metastasize via lymphatics.***



## **Metastatic Tumors of the Lung – LPF**



***A focus of metastatic carcinoma from breast is seen on the pleural surface of the lung. Such pleural metastases may lead to pleural effusions, including hemorrhagic effusions, and pleural fluid cytology can often reveal the malignant cells***

# Mesothelioma of the lung

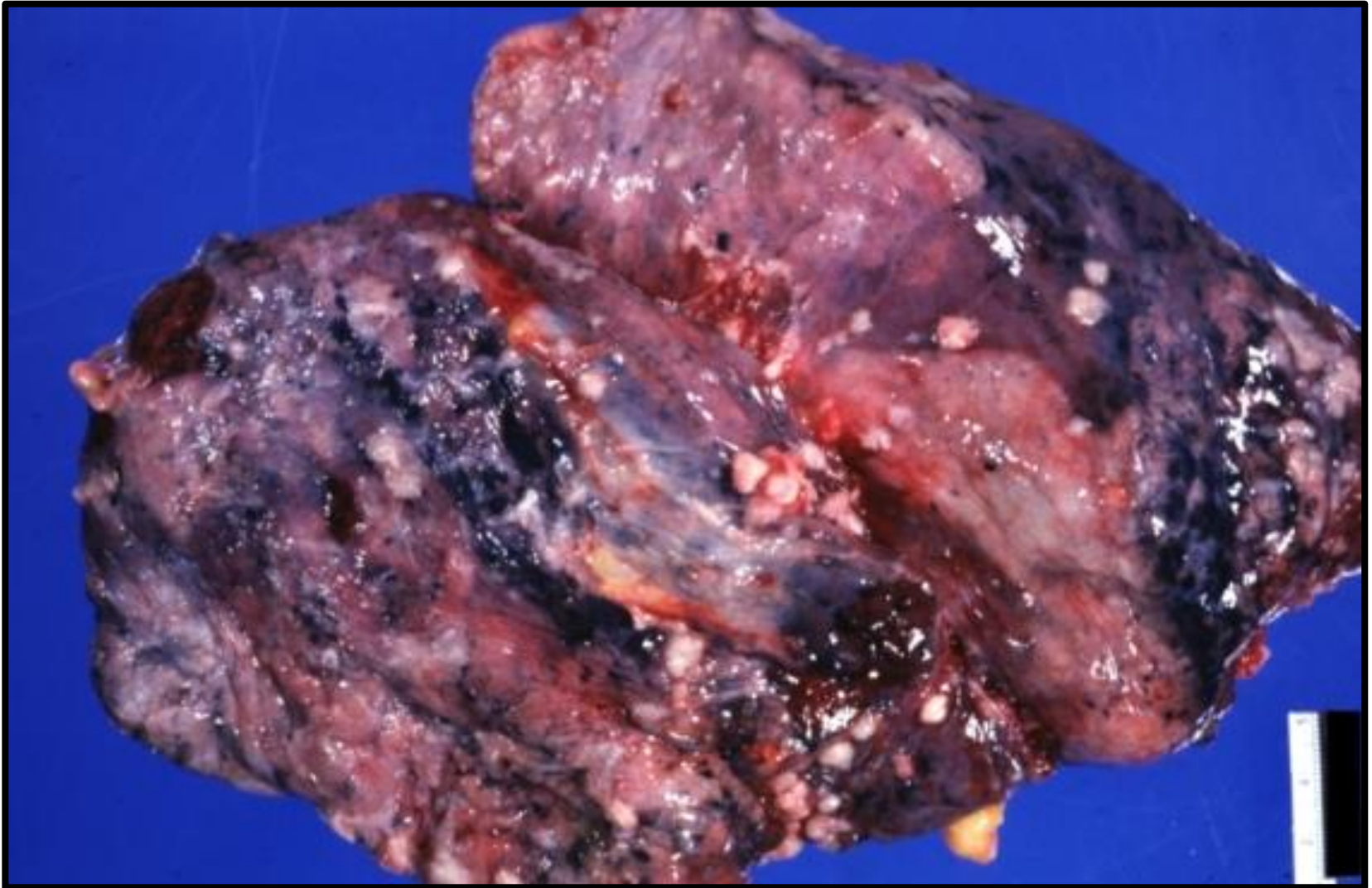


## Mesothelioma of the Lung – Gross



***The dense white encircling tumor mass is arising from the visceral pleura and is a mesothelioma. These are big bulky tumors that can fill the chest cavity. The risk factor for mesothelioma is asbestos exposure.***

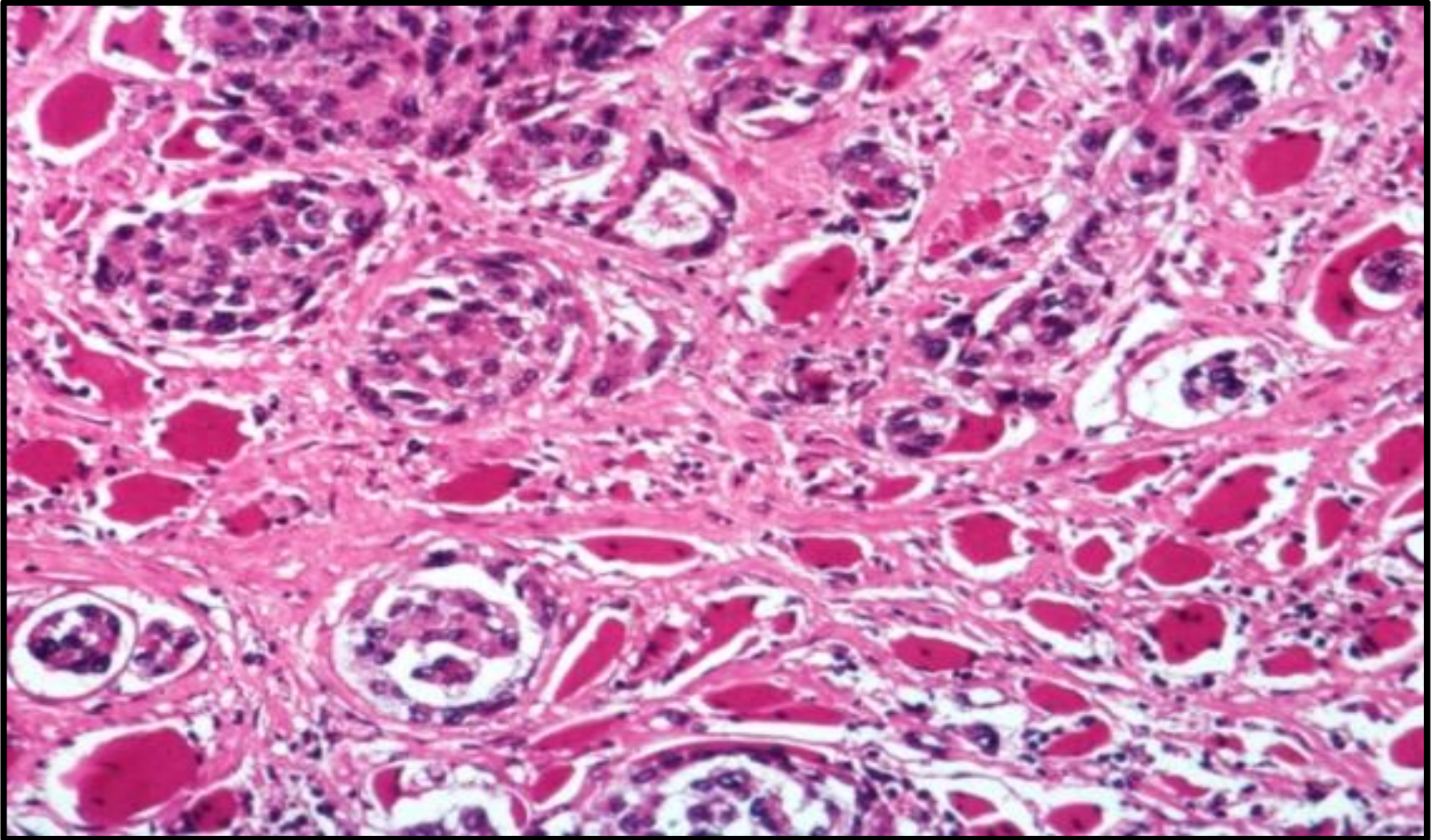
## **Mesothelioma of the Lung – Gross**



***RESPIRATORY: Pleura: Mesothelioma: Gross natural color external view of lung with nodules of tumor on pleura***



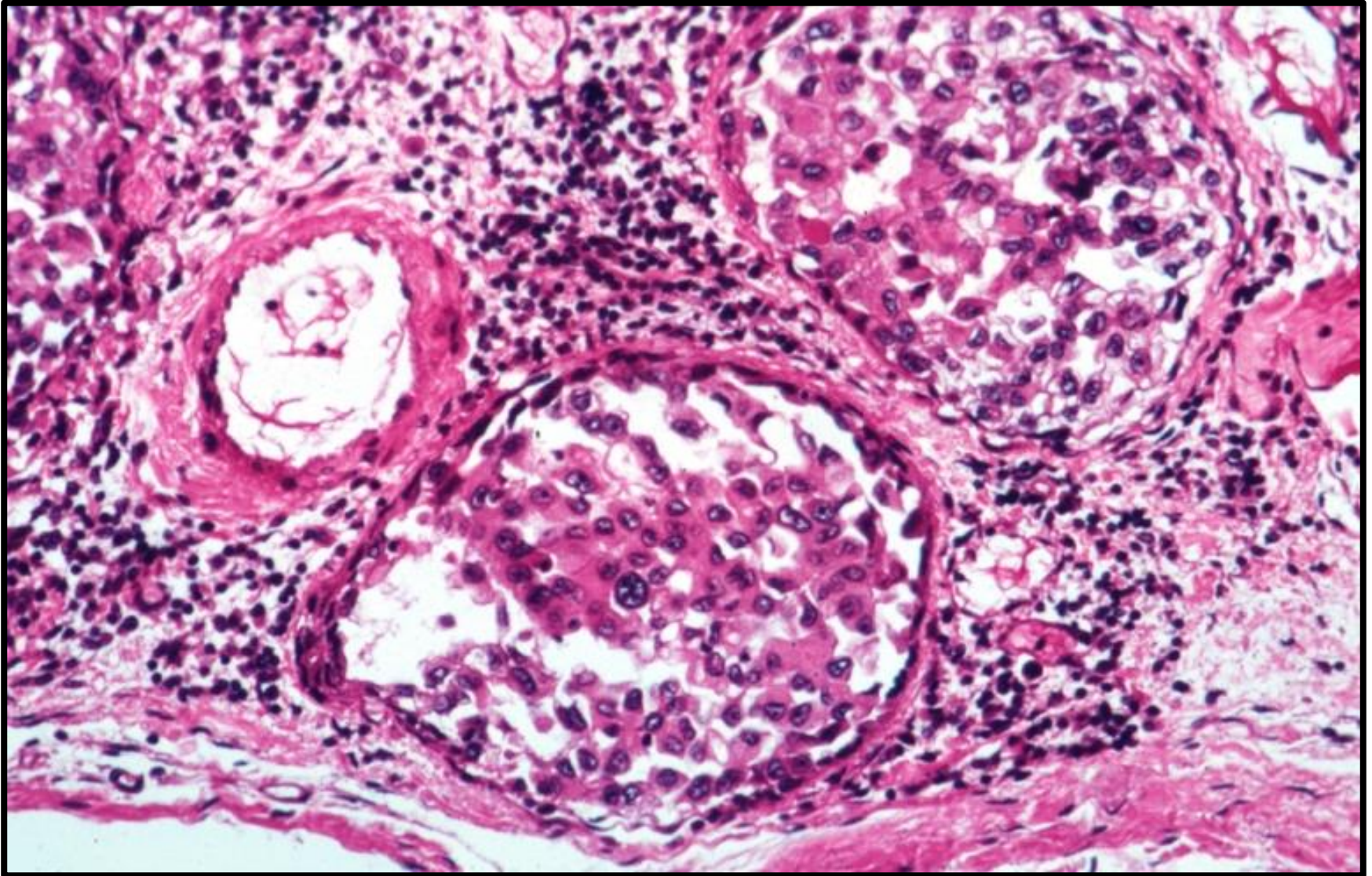
## **Mesothelioma of the Lung – MPF**



***Mesotheliomas have either spindle cells or plump rounded cells forming gland-like configurations, as seen here at high power microscopically. They are very difficult to diagnose cytologically.***



## **Mesothelioma of the Lung – HPF**



***Mesothelioma: Micro epithelial pattern spindle cells or plump rounded cells forming gland-like configurations***



**GOOD *LUCK***