RESPIRATORY SYSTEM – III

PNEUMONIAS

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PNEUMONIAS

- *Pneumonia can be very broadly defined as any infection of the lung parenchyma.*

Routes of entry of micro-organisms :

- *Inhalation of the microbes present in the air*
- *Aspiration of organisms from nasopharynx (or) oropharynx*
- *Hematogenous spread from a distant focus of infection*
- *Direct spread from an adjoining site of infection*

PNEUMONIAS

PREDISPOSING FACTORS

- ***Loss or suppression of the cough reflex - coma, anesthesia, neuromuscular disorders***

- ***Injury to the mucociliary apparatus by either impairment of ciliary function or destruction of ciliated epithelium- cigarette smoke, inhalation of hot or corrosive gases, viral diseases, or genetic defects of ciliary function (e.g., the immotile cilia syndrome)***

PNEUMONIAS

PREDISPOSING FACTORS

- ***Accumulation of secretions - cystic fibrosis and bronchial obstruction***

- ***Interference with the phagocytic or bactericidal action of alveolar macrophages by alcohol, tobacco smoke, anoxia, or oxygen intoxication***

- ***Pulmonary congestion and edema***

PNEUMONIAS

- *Community-Acquired Acute Pneumonia*
- *Health Care-Associated Pneumonia*
- *Hospital-Acquired Pneumonia*
- *Aspiration Pneumonia*
- *Chronic Pneumonia*
- *Necrotizing Pneumonia and Lung Abscess*
- *Pneumonia in the Immunocompromised Host*

PNEUMONIAS

Anatomical Classification of Pneumonias

1. ***Lobar Pneumonia***
2. ***Broncho Pneumonia (Lobular Pneumonia)***
3. ***Interstitial Pneumonia***

PNEUMONIAS

Etiologic Classification of Pneumonias :

- ***Bacterial Pneumonia***
- ***Viral & mycoplasmal Pneumonia (Primary atypical Pneumonia)***
- ***Other types - Pneumocytis carinii Pneumonia***
  - ***- Legionella Pneumonia***
  - ***- Aspiration Pneumonia***
  - ***- Lipid Pneumonia***

LOBAR PNEUMONIAS

- *Involves part of lobe / entire lobe / Two lobes of one or both the lungs*

Aetiology :

Pneumococcal Pneumonia :

- *Most common caused by streptococcus Pneumoniae*
- *Commonest community – acquired Pneumonia in adults*
- *P/F : Chronic ill ness, Alcoholism, Sickle cell disease, splenectomy*

LOBAR PNEUMONIAS

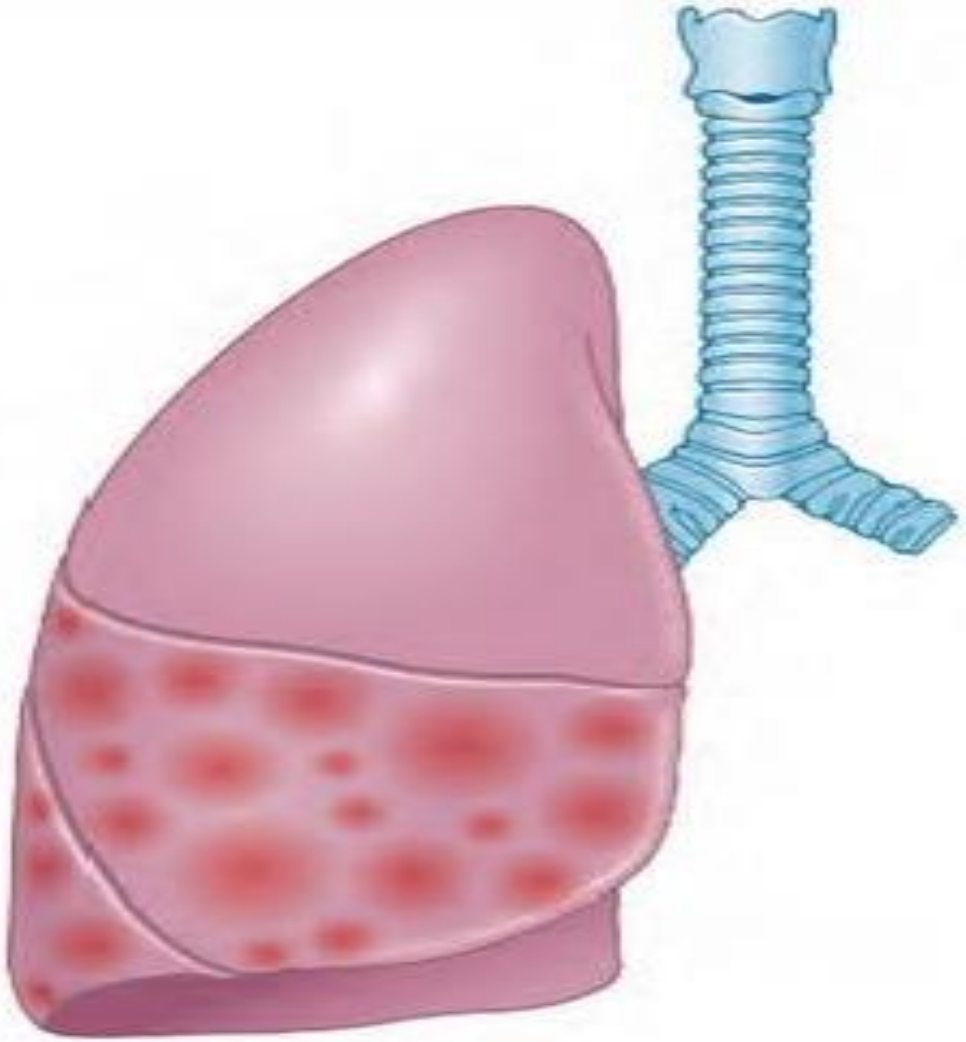
Aetiology :

- ***Staphylococcal Pneumonia : St. aureus Hematogenous spread from another focus***
- ***Streptococcal Pneumonia : β - hemolytic streptococci***
  - ***Children after measles / Influenza***
  - ***Severely debilitated elderly Pt / Diabetics***
- ***Pneumonia by Gram-negative aerobic bacteria:***
  - ***Eg: H-influenza, klebsiella, Pseudomonas etc.,***
  - ***Commonest agents to produce nosocomial pneumonia***
  - ***Major cause of Hospital morbidity and mortality***

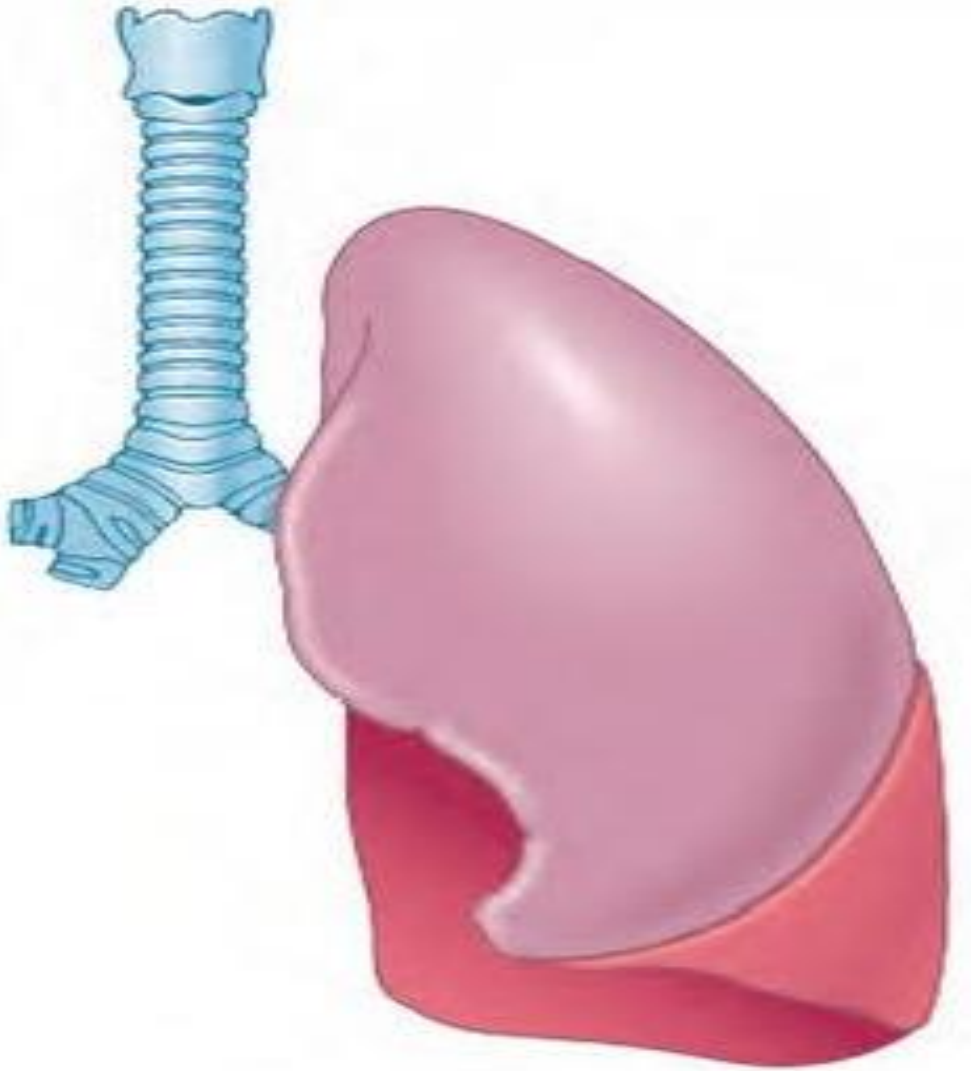
PNEUMONIAS - MORPHOLOGY

- *Lower lobes are most commonly affected*
- *Bacterial pneumonia has two patterns of anatomic distribution:*
  - *lobular bronchopneumonia*
  - *lobar pneumonia*
- *Bronchopneumonia - Patchy consolidation of the lung*
- *lobar pneumonia - while consolidation of a large portion of a lobe or of an entire lobe*

PNEUMONIAS - MORPHOLOGY

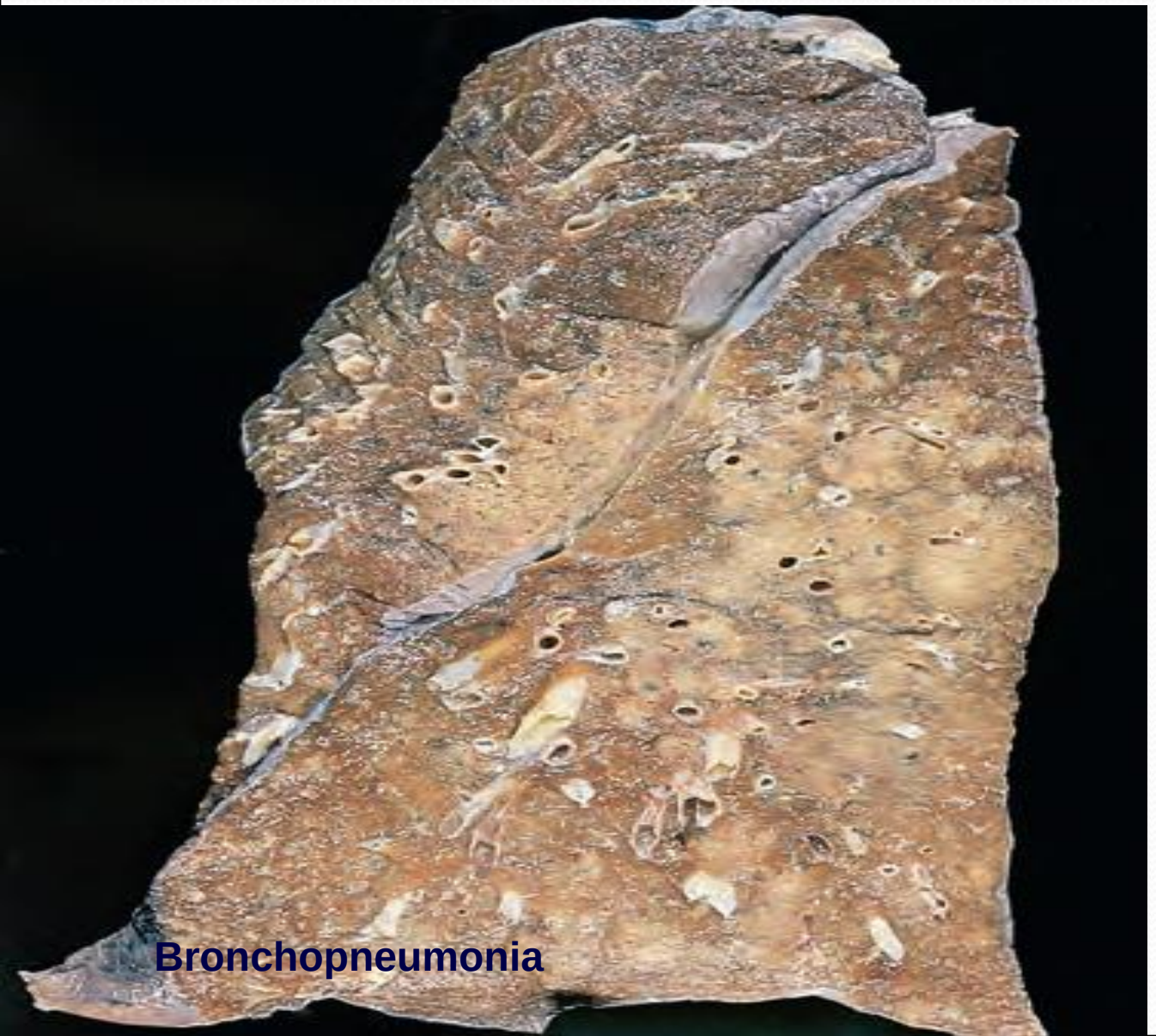


Bronchopneumonia



Lobar pneumonia

PNEUMONIAS - MORPHOLOGY



Bronchopneumonia

Lobar pneumonia

LOBAR PNEUMONIAS - MORPHOLOGY

In lobar pneumonia, four stages of the inflammatory response are

- ***Stage of congestion***
- ***Stage of red hepatization***
- ***Stage of gray hepatization***
- ***Stage of resolution***

LOBAR PNEUMONIAS - MORPHOLOGY

1. Stage of congestion (Initial phase):

- ***Early acute inflammatory response to bacterial Infection***
  Lasts for 1 to 2 days
- ***Gross : Affected lobe is enlarged, heavy, red and congested***

  C/S : Blood stained frothy fluid
- ***Microscopy :***

  i) Dilatation and congestion of capillaries in the alveolar walls

  ii) A few RBC and neutrophils in intra alveolar fluid

  iii) Numerous bacteria in alveolar fluid

LOBAR PNEUMONIAS - MORPHOLOGY

Stage of Red Hepatisation (Early Consolidation)

Lasts for 2-4 days

Gross : Affected lobe is red, firm and consolidated

C/S : Dry, granular with liver-like consistency

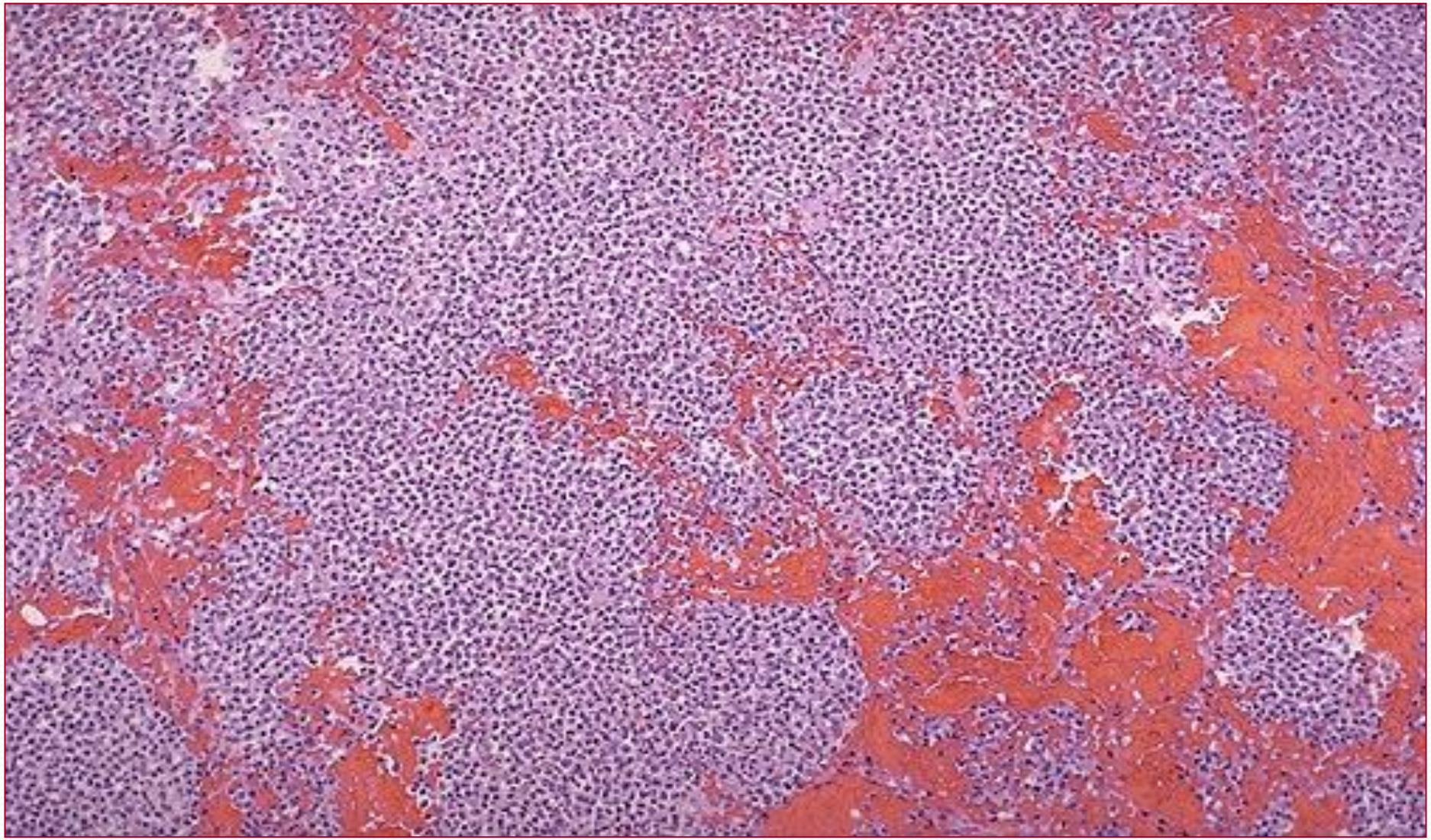
Micro scopic examination:

i) Edema fluid is replaced by strands of fibrin

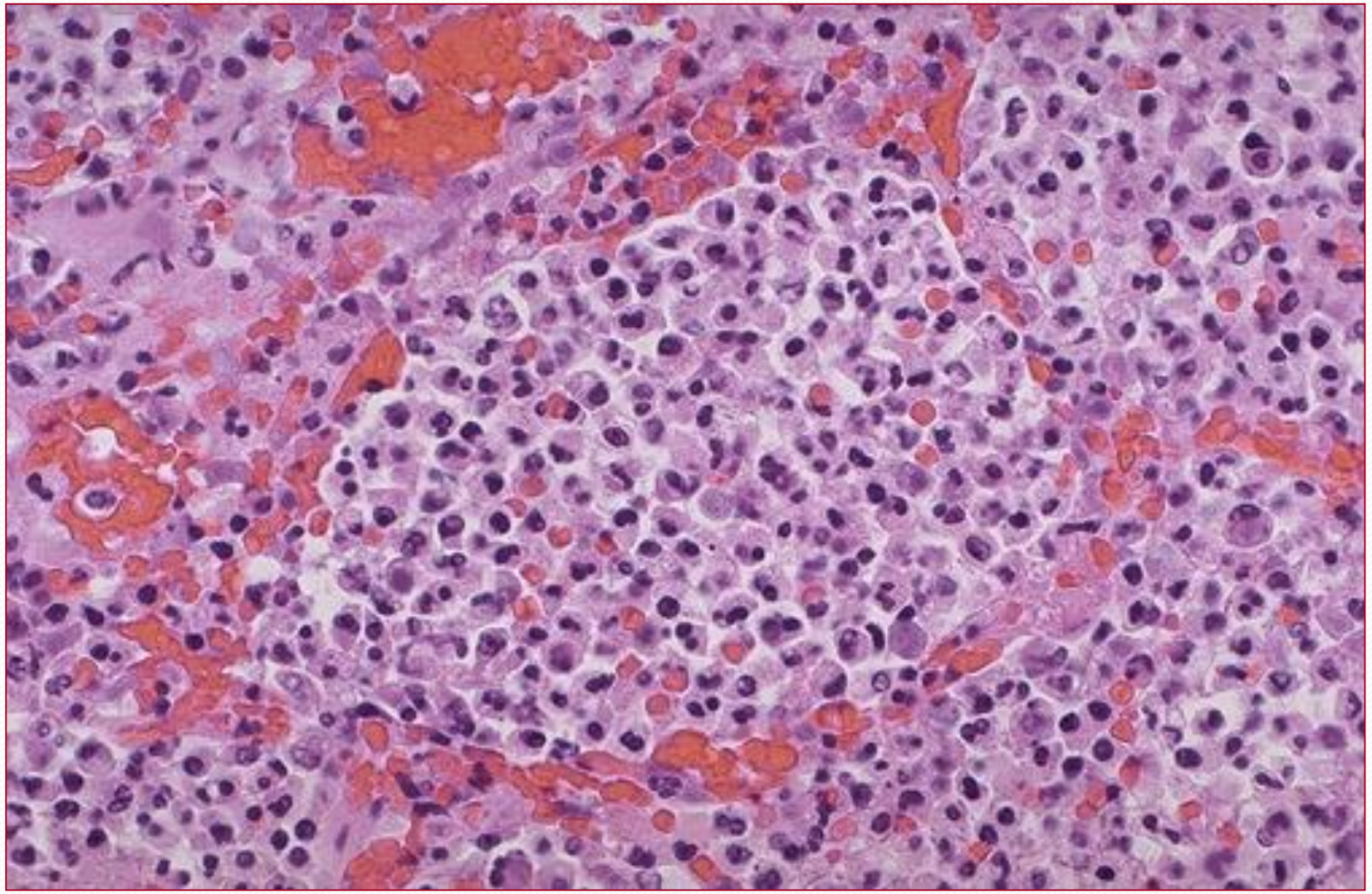
ii) Marked cellular exudate of neutrophils and extravasation of RBC

iii) Many neutrophils show ingested bacteria

EARLY CONSOLIDATION



EARLY CONSOLIDATION



LOBAR PNEUMONIAS - MORPHOLOGY

3. Stage of Grey Hepatisation (Late Consolidation)

This phase lasts for 4 to 8 days

Gross : Affected lobe is firm and heavy

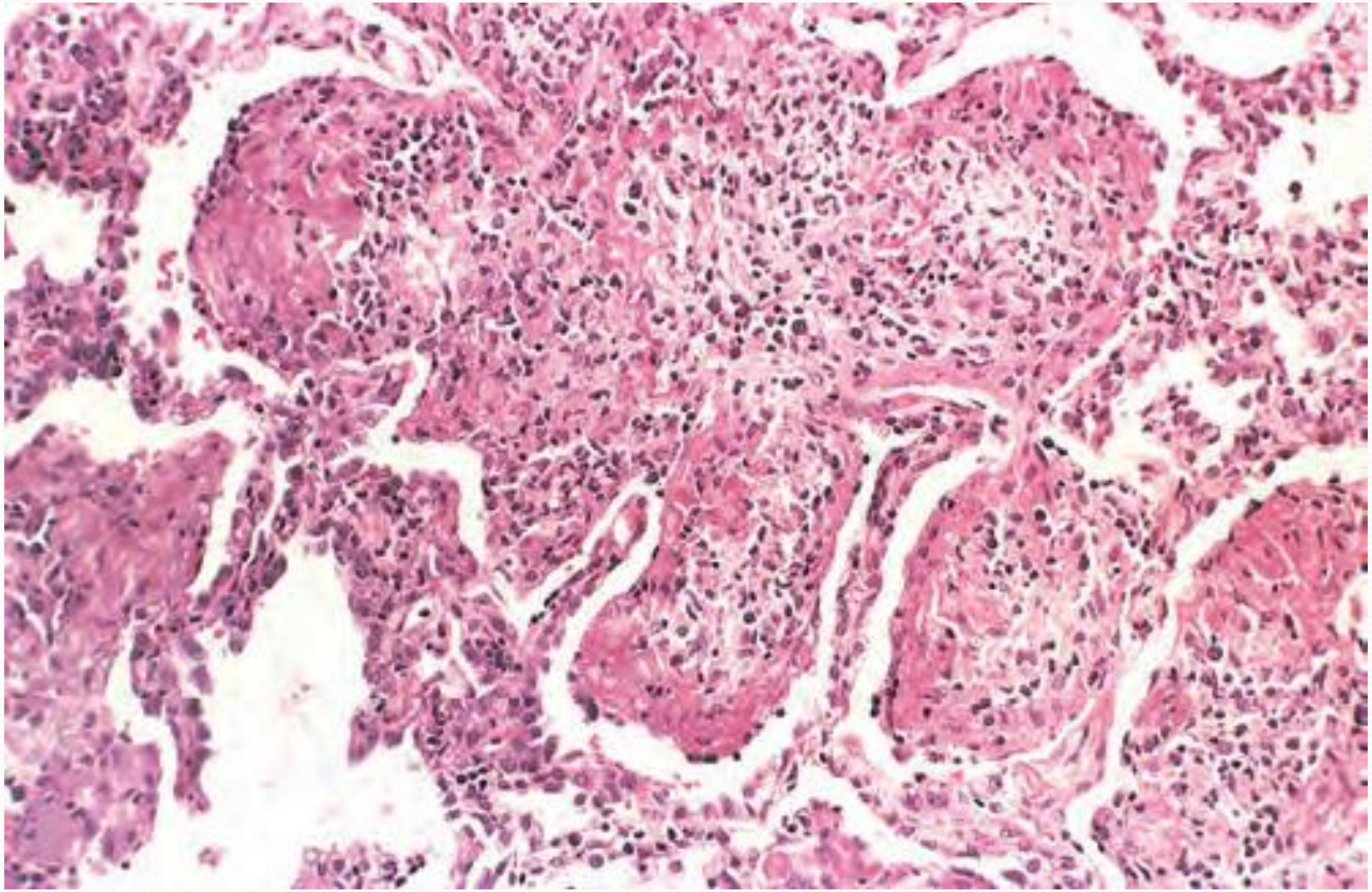
C/S : Dry, granular and grey in appearance with liver like consistency

Microscopic examination :

i) Fibrin strands are dense and more numerous

ii) Disintegration of inflammatory cells (neutrophils) and appearance of macrophages in the exudate

LOBAR PNEUMONIAS - MORPHOLOGY



LOBAR PNEUMONIAS - MORPHOLOGY

4. Stage of Resolution :

Begins by 8th to 9th day – if no chemotherapy

With antibiotic therapy- 3rd day

Gross - Solid fibrinous exudate → enzymatic action → liquefied

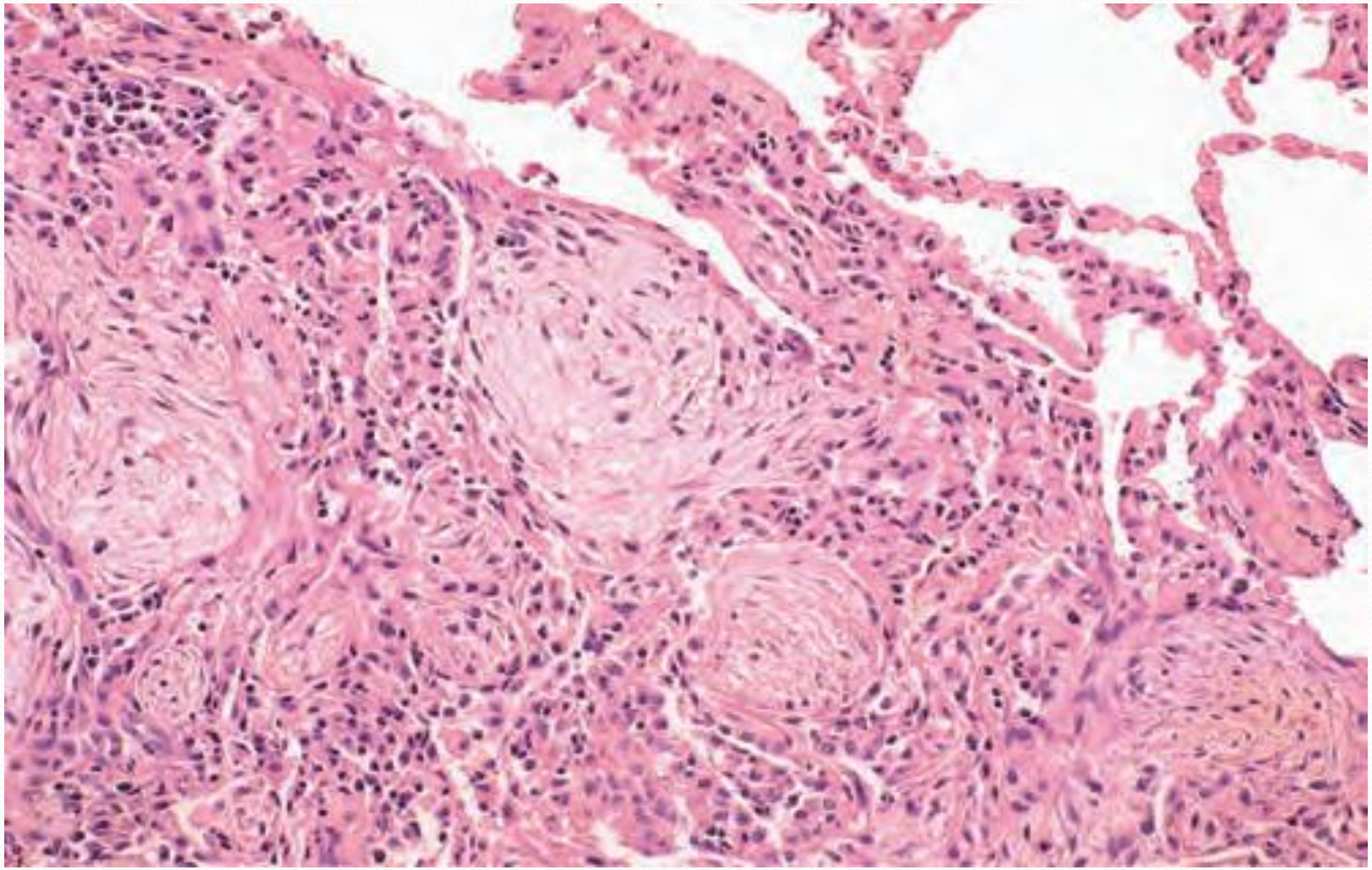
- Process of softening begins centrally → spreads to periphery

Microscopic examination

i) Macrophages are predominant cells .Many macrophages contain engulfed neutrophils and debris

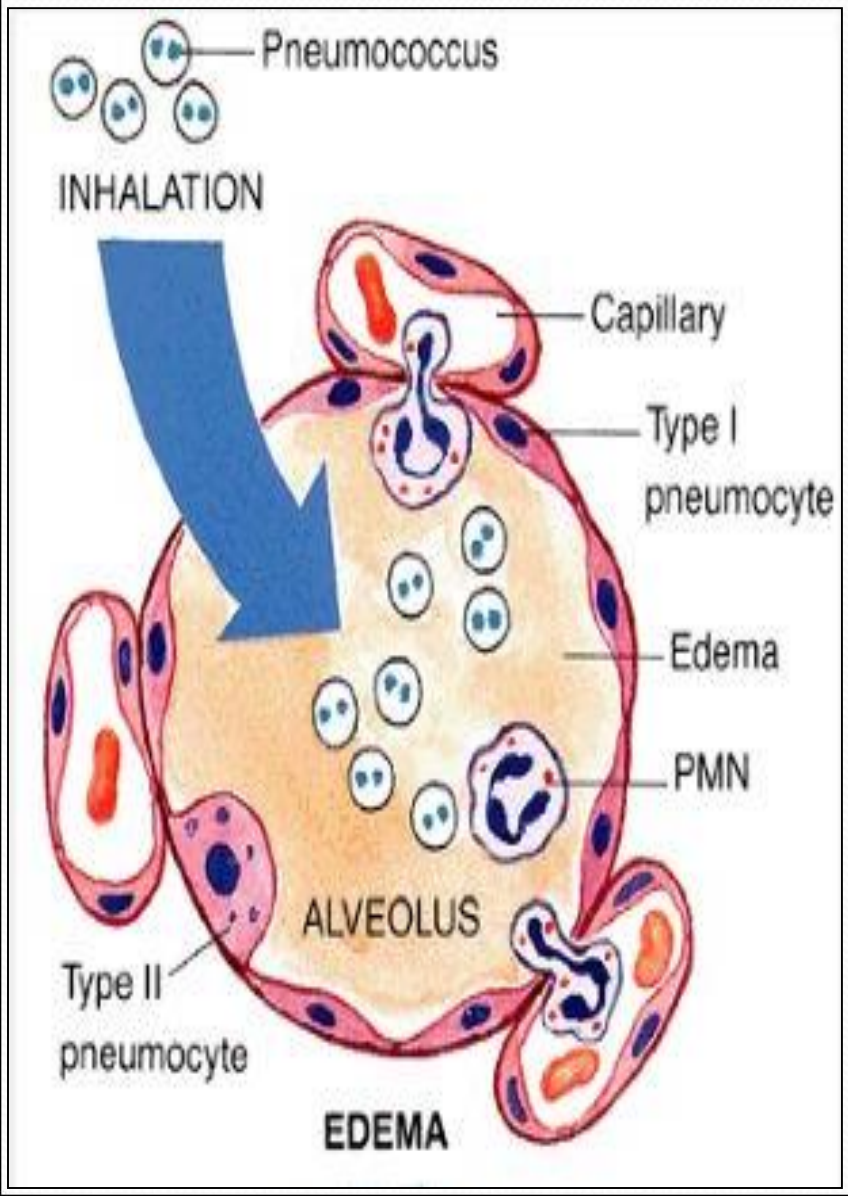
ii) Engorged alveolar capillaries

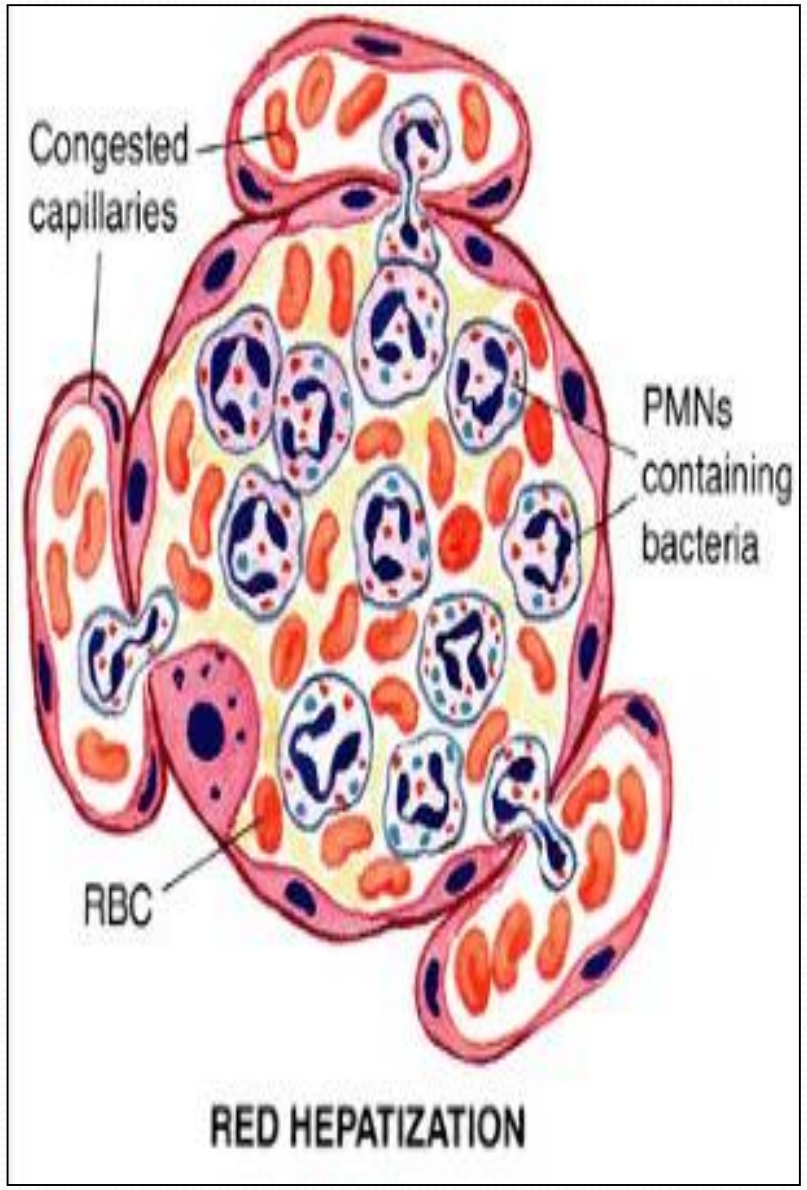
ADVANCED ORGANIZING PNEUMONIA

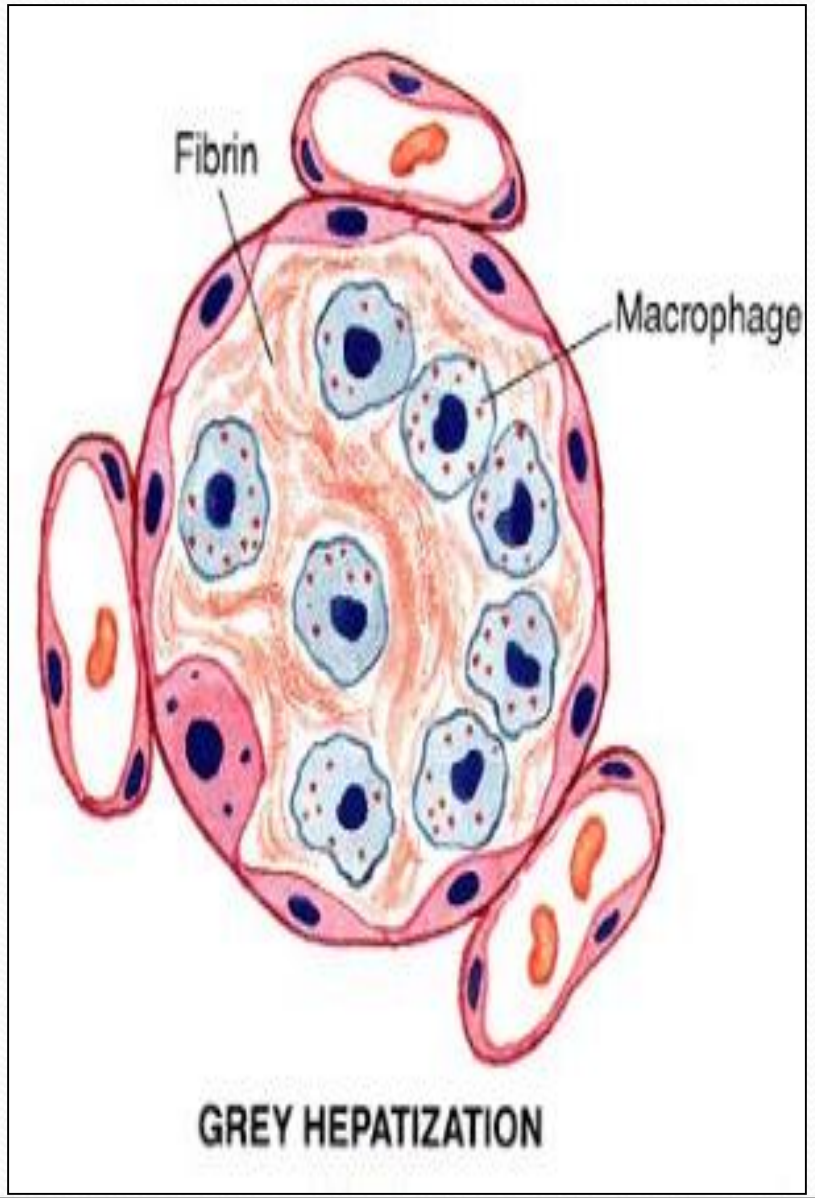


The exudates have been converted to fibromyxoid masses rich in macrophages and fibroblasts.

STAGES OF LOBAR PNEUMONIAS







COMPLICATIONS OF LOBAR PNEUMONIA

- *With advent of antibiotics – serious complications uncommon*
- *Seen only in untreated / Immuno compromised patients*
- *Organization : 3% of cases with residual scarring Post-Pneumonic fibrosis – carnification*
- *Pleural effusion*
- *Empyema and lung abscess*
- *Pulmonary gangrene*
- *Pneumatocele formation*
- *Metastatic infection : Pericarditis, IE, myocarditis otitis media, mastoiditis, meningitis and purulent arthritis*

CHRONIC BACTERIAL PNEUMONIA

If changes are persistent for at least 1 month in normal host

Most common infectious agents are:

- *H. infuenza (41%)*
- *α. Hemolytic streptococci*
- *Staphylococcus aureus*
- *Pseudomonas aeruginosa*

Investigations :

- *Neutrophilic leucocytosis*
- *Positive blood cultures in 30 % of cases*

BRONCHO PNEUMONIA (LOBULAR PNEUMONIA)

- *Hemophilus Infections of terminal bronchioles that extends into the surrounding alveoli → patchy consolidation of lung*
- *Common in extremes of life (Infancy and old age)*
- *Aetiology : Staphylococci, Streptococci, Pneumococci, Klebsiella*

Gross

- *Patchy areas of red or grey consolidation with involvement of one or more lobes (lower lobes)*
- *- Bilateral*

C/S : Dry, granular, firm areas of 3 to 4 cms size

MORPHOLOGICAL CHANGES IN BRONCHO PNEUMONIA

Microscopy :

i) Acute bronchiolitis

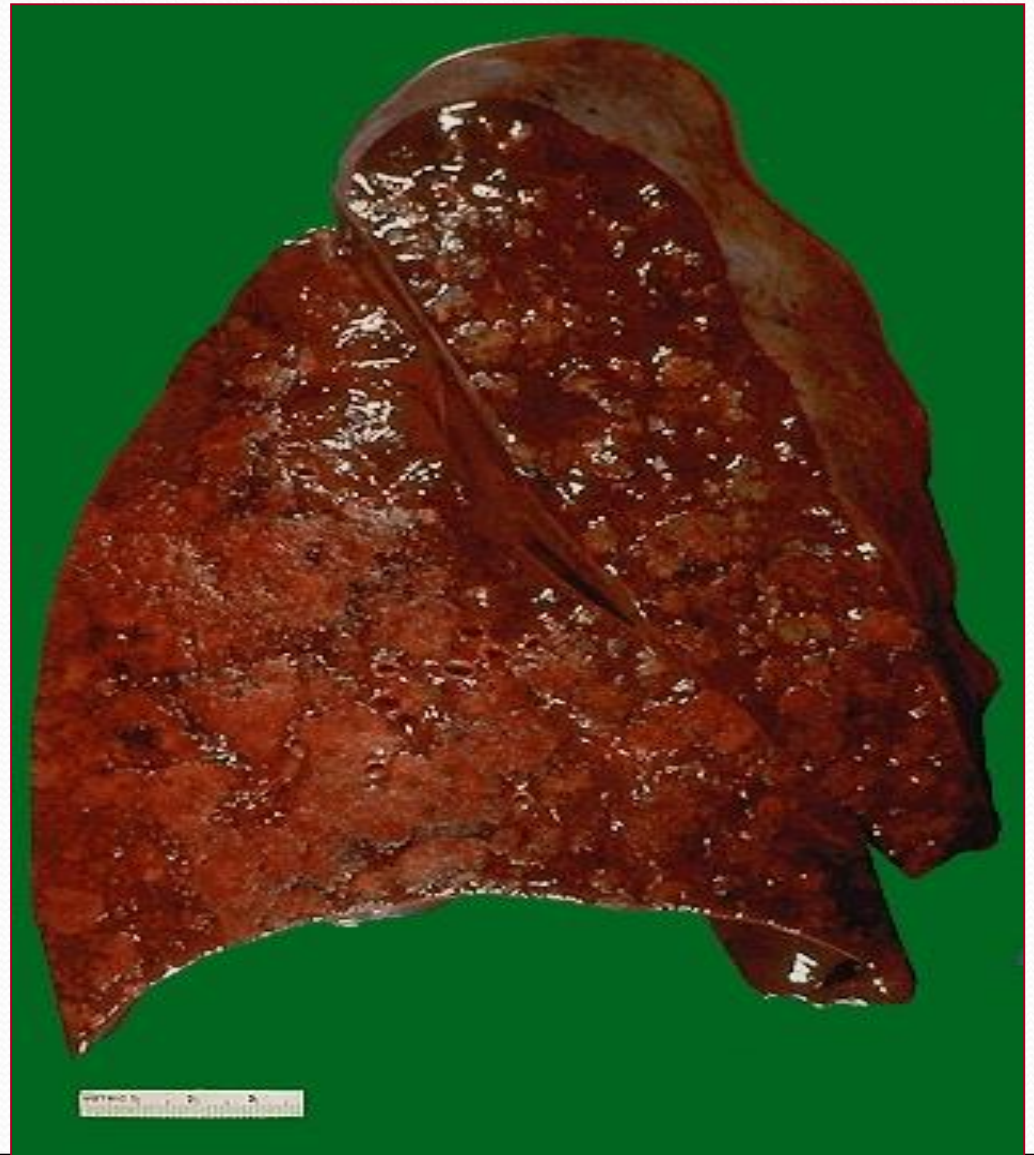
ii) Suppurative exudate consisting chiefly of neutrophils

iii) Thickening of alveolar septa by congested capillaries and leukocyte infiltration

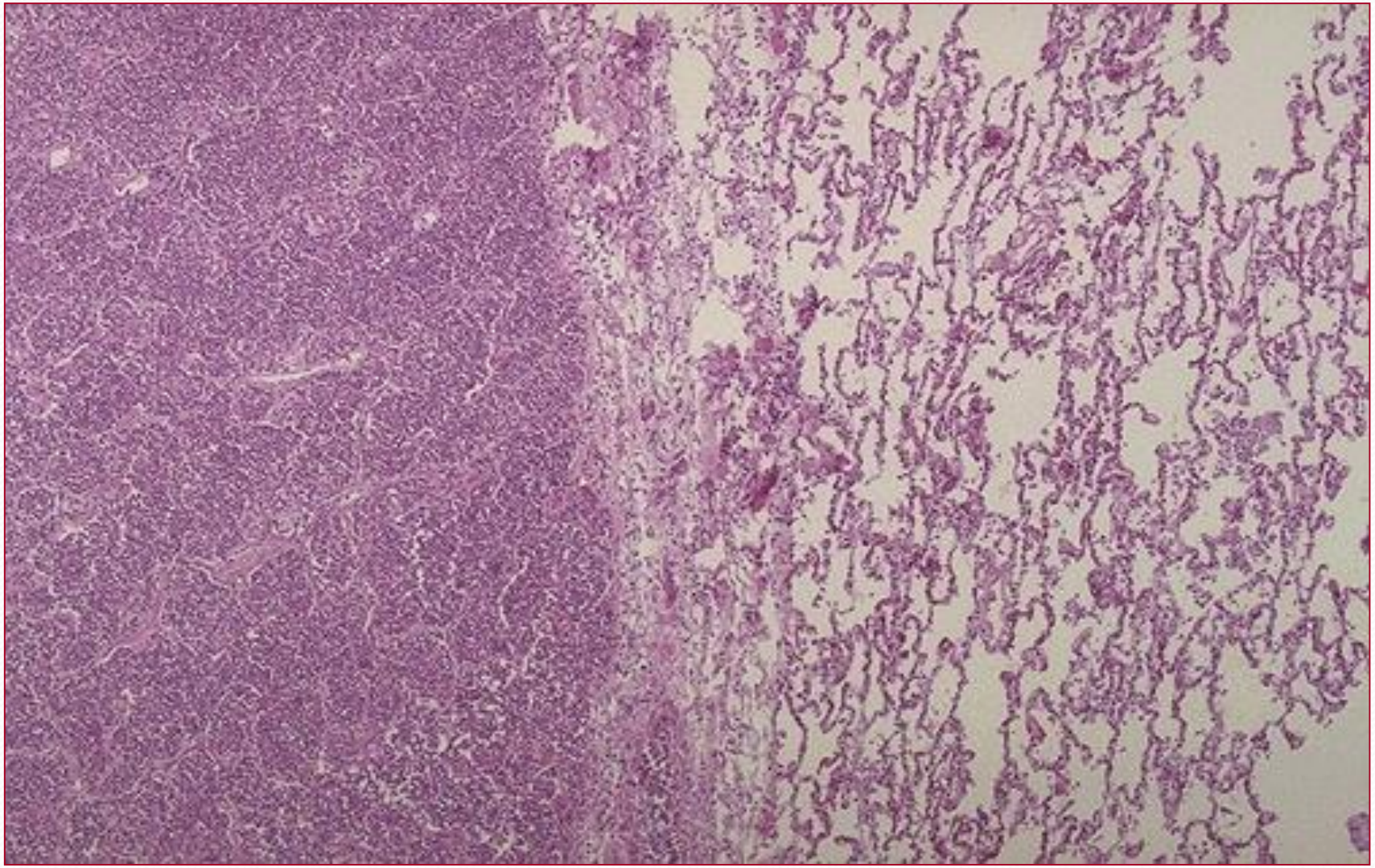
Complications :

- ***Same of Lobar Pneumonia***
- ***Complete resolution is uncommon***
- ***Some degree of destruction of the bronchioles → foci of bronchiolar fibrosis → Bronchiectasis***

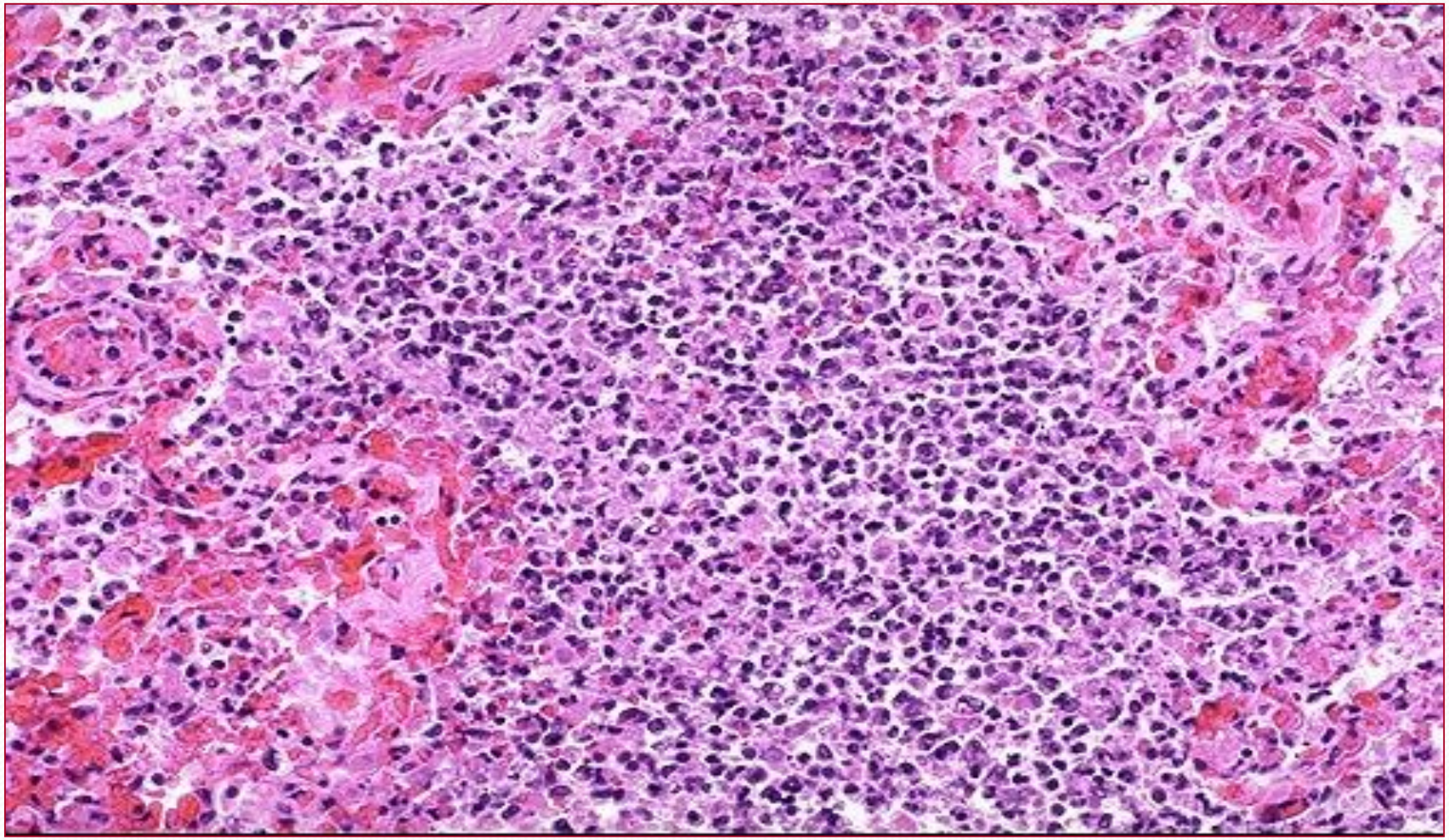
BRONCHOPNEUMONIA



BRONCHOPNEUMONIA - NEUTROPHILIC EXUDATE



BRONCHOPNEUMONIA – EARLY ABSCESSING PNEUMONIA



VIRAL PNEUMONIA (PRIMARY ATYPICAL PNEUMONIA)

- ***Interstitial Pneumonitis : Confined to interstitial tissue, localised within the walls of the alveoli***
- ***Atypical : Absence of alveolar exudate***
- ***Occur in all age groups***

Aetiology : Most common organism : RSV (Respiratory Syncytial Virus)

Others : Mycoplasma Pneumoniae, Influenza, Adeno, Rhino, Coxsackie, CMV

VIRAL PNEUMONIA

Severe Acute Respiratory Syndrome

- *Severe acute respiratory syndrome (SARS) first appeared in November 2002 in China*
- *The cause of SARS was a new coronavirus.*
- *Many upper respiratory infections are caused by coronaviruses, but the SARS virus differed from other coronaviruses in that it infected the lower respiratory tract and spread throughout the body*

VIRAL PNEUMONIA (PRIMARY ATYPICAL PNEUMONIA)

Gross:

Heavy, congested.

C/S: small amount of frothy or bloody fluid

Microscopy

i) Interstitial inflammation:

Mononuclear cells: lymphocytes macrophages,and plasma cells

ii) Necrotising bronchiolitis

iii) Reactive changes: Proliferation of lining epithelium of bronchioles and alveoli. Multinucleate giant cells and syncytia in bronchiolar and alveolar walls

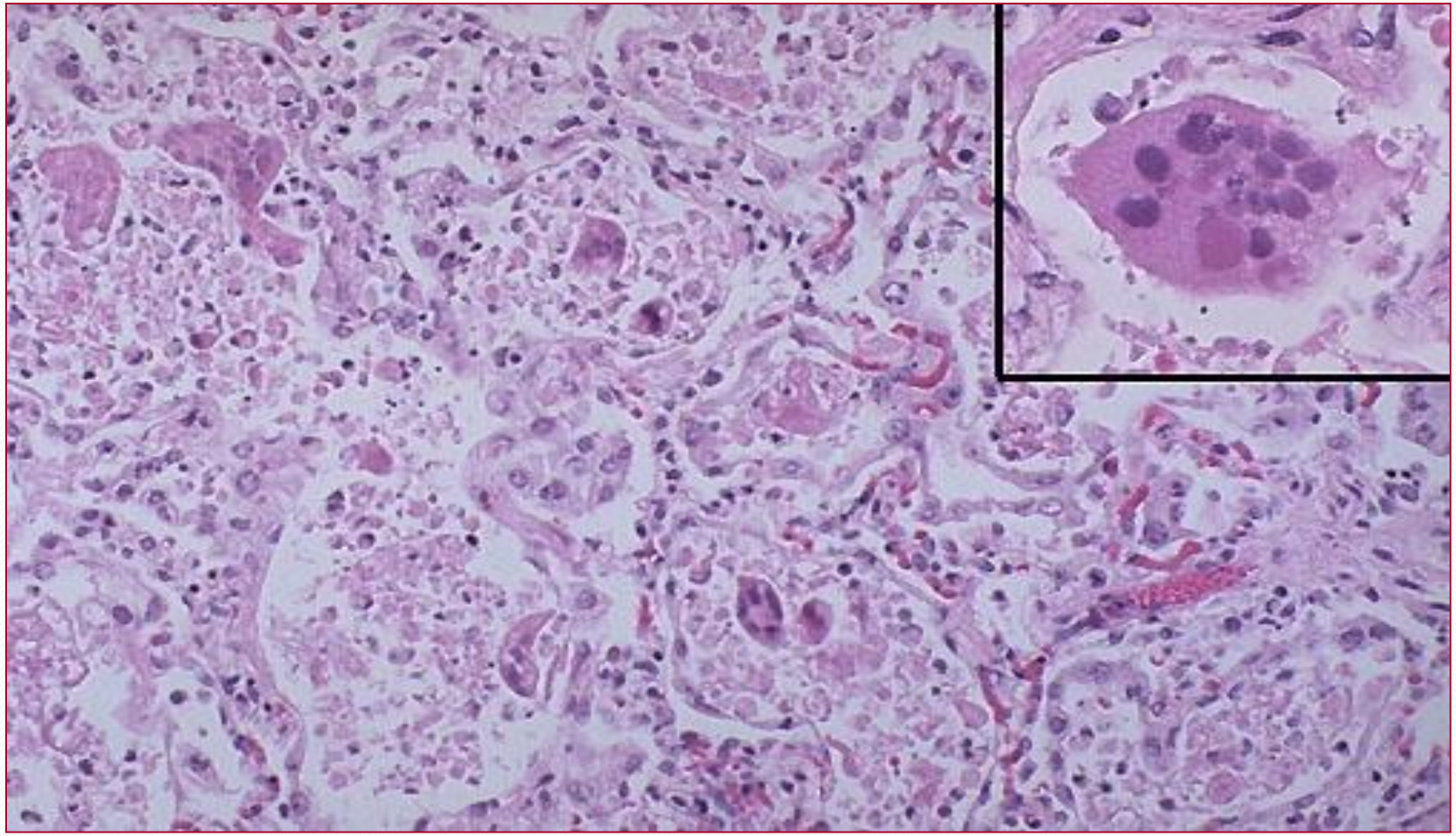
iv) Alveolar changes: In severe cases alveolar lumina contain edema fluid, fibrin and exudate

VIRAL PNEUMONIA
(PRIMARY ATYPICAL PNEUMONIA)

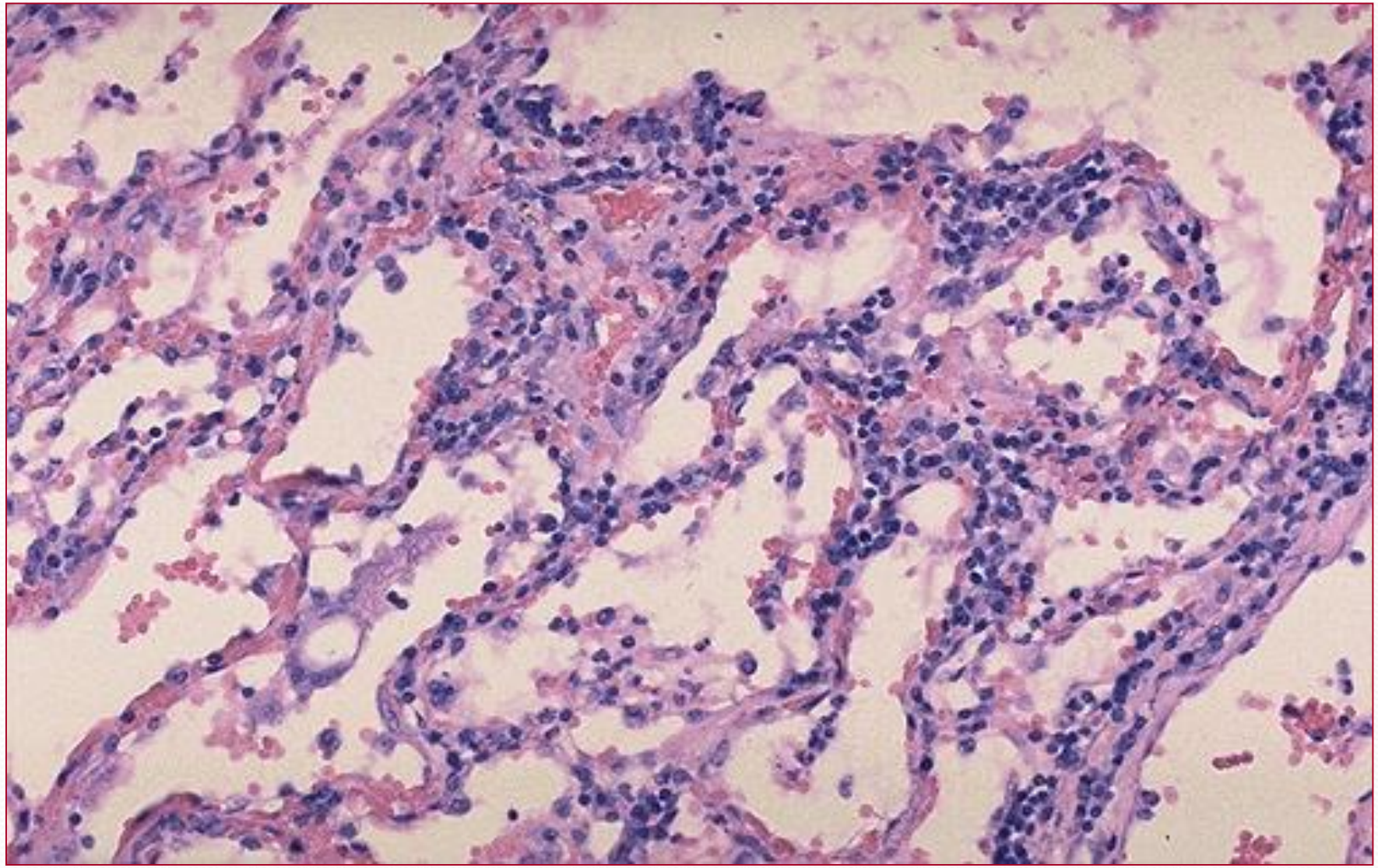
Complications:

- ***Most of the cases recover completely***
- ***Superadded bacterial infections***
- ***Interstitial fibrosis → permanent damage***

RSV - GIANT CELL WITH, PINK INTRACYTOPLASMIC INCLUSION



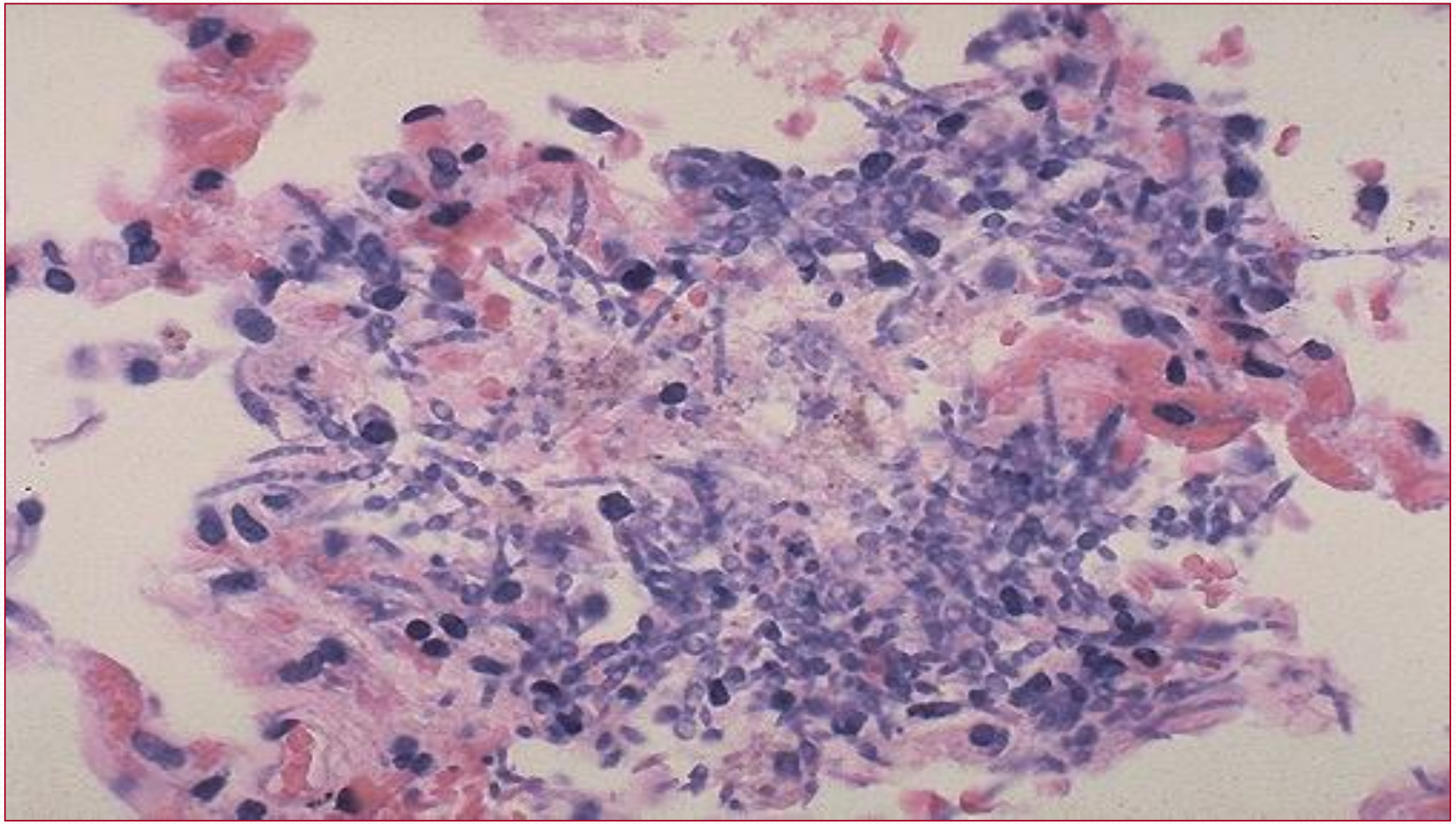
VIRAL PNEUMONIA WITH INTERSTITIAL LYMPHOCYTIC INFILTRATES



PNEUMONIA SECONDARY TO FUNGAL INFECTION

- *Pneumonia can be caused secondary to fungal infections of lung.*
- *Some of the fungal infections affecting the lung are*
  - *Candida*
  - *Aspergillus*
  - *Mucor mycosis*
  - *Histoplasmosis*
  - *Blastomycosis*
  - *Coccidioidomycosis*

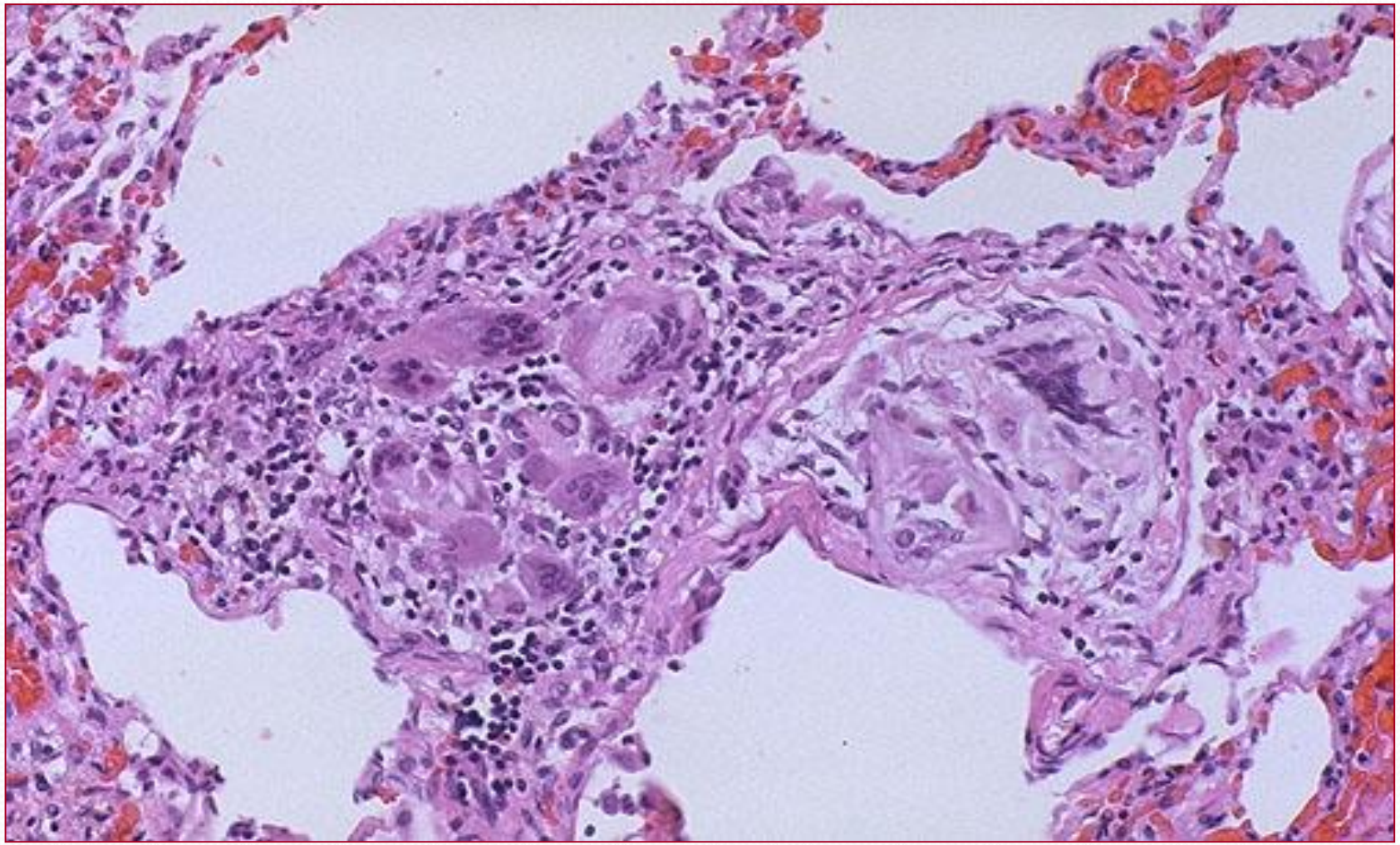
PNEUMONIA SECONDARY TO CANDIDA



ASPIRATION PNEUMONIA

- *Aspiration pneumonia occurs in markedly debilitated patients and unconscious patients who aspirate gastric contents due to abnormal gag and swallowing reflex.*
- *The resultant pneumonia is partly chemical due to the irritating effects of gastric acid, and partly bacterial (from the oral flora).*
- *On culture both aerobes (more common) and anaerobes are recovered.*
- *This type of pneumonia is often necrotizing, pursues a fulminant clinical course, and is a frequent cause of death.*
- *Surviving patients may develop lung abscess as complication.*

A LOCALIZED FOREIGN BODY GIANT CELL RESPONSE TO THE ASPIRATED MATERIAL



LIPID PNEUMONIA

Lipid pneumonia is non-infective pneumonia which is of two types –

- *Exogenous lipid pneumonia*
- *Endogenous lipid pneumonia*

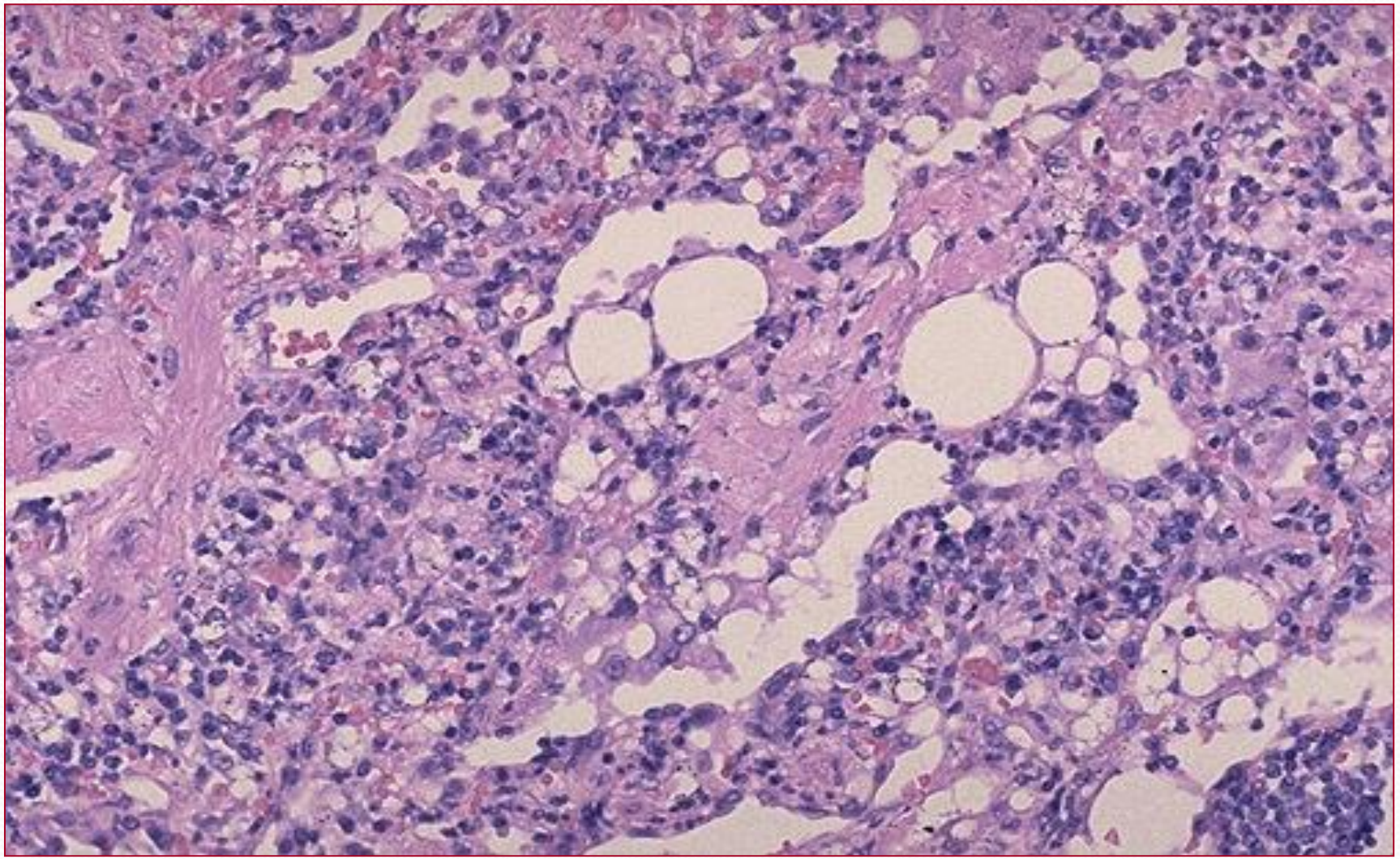
- ***Exogenous lipid pneumonia** – due to aspiration of oily materials*

  Eg . Inhalation of oily nasal drops, Regurgitation of oily medicines from stomach etc

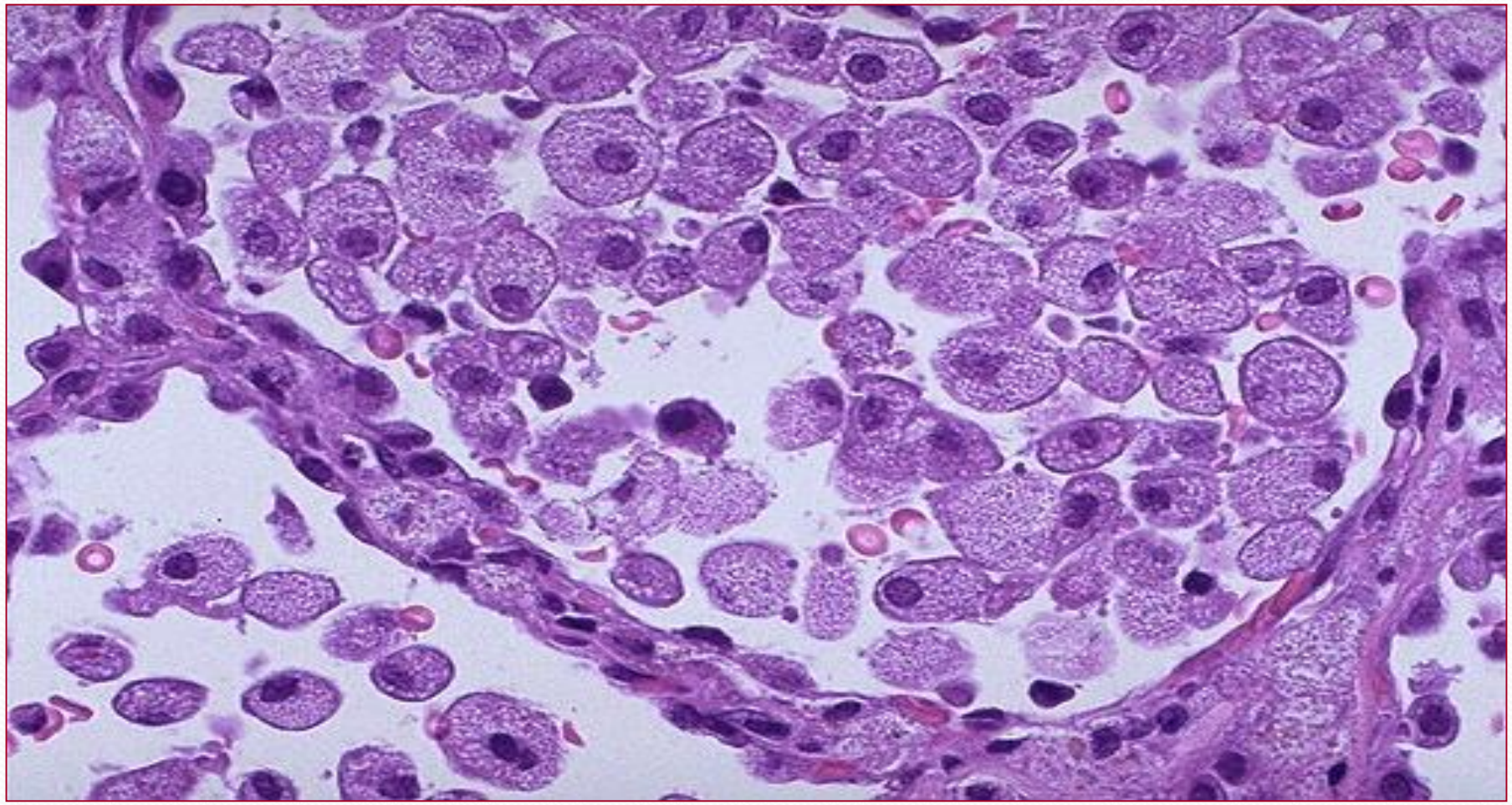
- ***Endogenous lipid pneumonia** – the origin of lipids is tissue breakdown following obstruction to airways*

  Eg. Bronchogenic cancer , TB.

LIPID PNEUMONIA - EXOGENOUS



LIPID PNEUMONIA - ENDOGENOUS



Short notes

1. Classify pneumonia. What are the stages of lobar pneumonia
2. Morphology of Lobar Pneumonia and complications
3. What are the types of pneumonia; write about the morphology of Lobar pneumonia and its complications
4. Stages of Lobar Pneumonia
5. Broncho Pneumonia
6. Lobar pneumonia
7. Gross and microscopic picture of lobar pneumonia

Very short notes

1. **Complications of Lobar Pneumonia**
2. **Lobar pneumonia**

As you sow abundantly, you reap abundantly. what you give to others will return to you many many times

- Master Choa kok Sui

THANK YOU