

وَقُلْ رَبِّ زِدْنِي عِلْمًا



# RESPIRATORY SYSTEM

## HAYAT BATCH



SUBJECT : Pathology

LEC NO. : "6"

DONE BY : Sadeel Altaeer

# Respiratory System

## RS

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# Definition of Pneumonia :

اليوم ان شاء الله رح نبدا بموضوع جديد ، موضوع بلشنا  
ناخذ فيه بالميكرو ، و رح نمشي عنده بالفارما ، عشان هيبك  
الدكتور ما بهما غير ال pathology

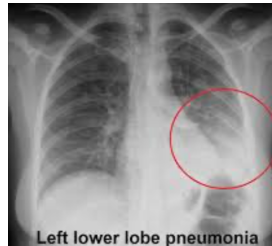
**Pathological :** اي infection يصيب ال parenchyma

- Any infection of the lung parenchyma distal to the terminal bronchioles. يعني بأحد أجزاء ال acinus

**Clinical:**

- A constellation of symptoms & signs with at least one opacity on chest x-ray.

منطقة داكنة على الصدر بتصوير الأشعة



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## THE FACTS ABOUT PNEUMONIA

Pneumonia is the largest infectious cause of death in children around the world, being responsible for over 920,000 deaths in children under the age of 5 in 2015.

**What is Pneumonia?**

It is an infection of the lungs that inflames air sacs, which may fill with fluid. This can happen in one or both lungs.

**Is Pneumonia fatal?**

Yes, especially for children in developing countries where proper care is not available. It is always a threat despite age.

**Visit your doctor if you notice the following symptoms:**

Fever

No appetite

Coughing up bloody or yellow phlegm

- Normally, the lung parenchyma remains sterile because of the highly effective immune and nonimmune defense mechanisms.

لكن ممكن يصير impairment خلل في هذول ال defense mechanisms و يصير عننا pneumonia و التهابات بالرئة

## Impairment of defense mechanisms leading to pulmonary infections :

- 1-Loss or suppression of cough reflex: coma, anesthesia, drugs
- 2-Injury to mucociliary apparatus: smoke, viral
- 3-Decrease in macrophage function: alcohol, smoking
- 4- Impaired immune system: chronic diseases, immune deficiency diseases, aging.
- 5-Existing pulmonary disease: atelectasis, COPD. ← المريض يكون عنده lung diseases من يلي حكينا عنهم
- 6- Unusually virulent infecting organism

بالعادة clinically احنا بنصنف ال infection in lung حسب ال etiologic agent المسبب يعني ، لكن مش دائماً بنقدر نعرف ال pathogen المسبب ، عشان هيك بنصنفهم ل category اعتماداً على ال clinical setting ، وين بصير ال infection ؟ community ، ولا بالمستشفى ؟ ، acute or chronic ، immunocompromised or not ، ليش بنعمل

هيك ؟ لتسهيل العلاج ، لأنه يكون معروف بكل وحدة منهاي ال syndrome or categories في organisms معين هم اكثر اشئ شائعين لحتى يسببوا هاد ال infection ، بالتالي بنصير نقدر نقلل انواع treatment يلي بدنا نستخدمهم

Pneumonia is classified according to the specific etiologic agent or, if no pathogen can be isolated, by the clinical setting in which the infection occurs.



Classification according to clinical setting will considerably narrow the list of suspected pathogens for administering empirical antimicrobial therapy.

ال syndromes يلي رح نتكبر عنهم

1. Community-Acquired Acute (typical) Pn.
2. Community- Acquired Atypical Pn.
3. Nosocomial Pneumonia
4. Aspiration Pneumonia
5. Lung Abscess
6. Chronic Pneumonia
7. Pneumonia in the Immunocompromised host

6/7 → موضوع المحاضرة الجاي .

# 1. Community-Acquired Acute Typical Pneumonia

## □ Aetiology: *السبب*

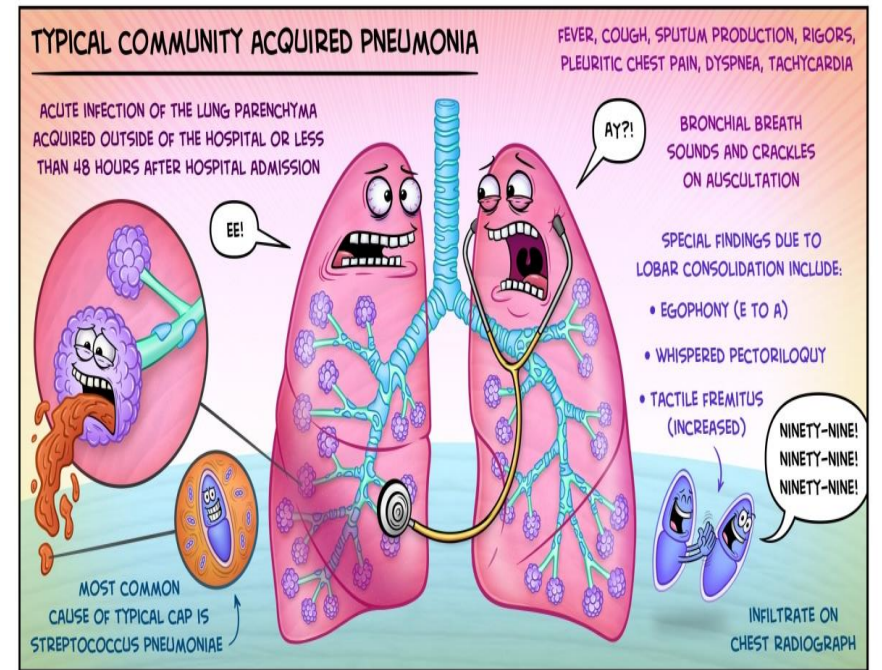
*most common → streptococcus pneumoniae*

- Bacteria, fungi, viruses, parasites.

## Streptococcus pneumoniae

- The most common cause of community-acquired acute pneumonia *↪ Not hospitalized*

- The presence of numerous neutrophils in sputum containing the gram-positive, lancet-shaped diplococci supports the diagnosis.



## □ Other common causes:

رح نحكي عن اهم خصائصهم in pathology مش microbiology

### -Haemophilus influenzae and Moraxella catarrhalis:

يعني ممكن مريض COPD و فجأة يتأزم وضعه و يصير عنده superimposed infection ، غالباً يكون بسبب هدول النوعين

- Both are associated with acute exacerbations of COPD.

### -Staphylococcus aureus:

- Usually secondary to viral respiratory infections.
- High incidence of lung abscess and empyema.
- Associated with intravenous drug abuse.

غالباً بتتبعي بعد viral infection ومعروف  
لها تبعه complication كثير بال lung  
وغالباً بتتبعي اكثر شي ال IV drug abuse

### -Klebsiella pneumoniae

- Observed in patients who are chronic alcoholics.
- Thick and gelatinous sputum is characteristic.

Empyema :  
انه ال infection and abscess  
يتراكم بال pleural space

## -Pseudomonas aeruginosa

Hospitalized

- **Most commonly seen in nosocomial settings.**
- Seen in persons with **cystic fibrosis**, in **burn victims**, and patients with **neutropenia**.
- Has a propensity to **invade blood vessels** at the site of infection, with consequent **extrapulmonary spread**.

بالتالي ممكن تعمل necrosis بالمنطقة يا حوالها وممكن تعمل

## -Legionella pneumophila

- Seen particularly in **organ transplant recipients**.

Immunocompromised disease due to organ transplantation



# Clinical Features

## □ An abrupt onset of:

○ Fever, Chills, rigors

○ SOB

○ Cough

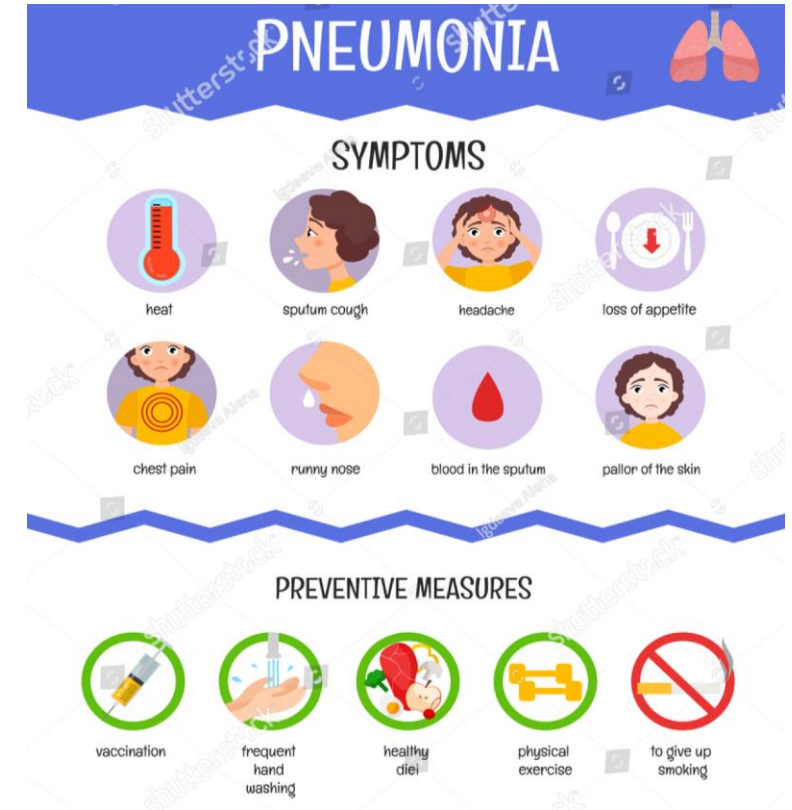
○ Expectorations of sputum

○ Occasional patients have hemoptysis *Cough with blood*

○ Pleuritic chest pain (with pleuritis).

لو كان الالتهاب واصل ال pleura ، بصير المريض  
كل ما ياخذ نفس بصاحبه وجع بال chest

( تزي اعراض أي infection )



# Morphology:

رج نحكي عن ال bacteria لأنها ال most common type

Acute bacterial pneumonia has two patterns of anatomic distribution:

1. Lobular bronchopneumonia.

2. Lobar pneumonia.

- The term “**consolidation**” refers to the “solidification” of the lung due to the replacement of the air by an exudate in the alveoli.

مهم جداً جداً أنه نميز ال morphology ، هاد رح ننسأل فيه

**Lobular Bronchopneumonia:** Patchy consolidation of the lung and generally involves **more than one lobe**. من اسمها اشبي اصغر من ال lobe ، بتصيب ال lobule ف رح تكون patchy مش diffuse.

**Lobar pneumonia:** Consolidation of **a large portion of a lobe** or of an **entire lobe**

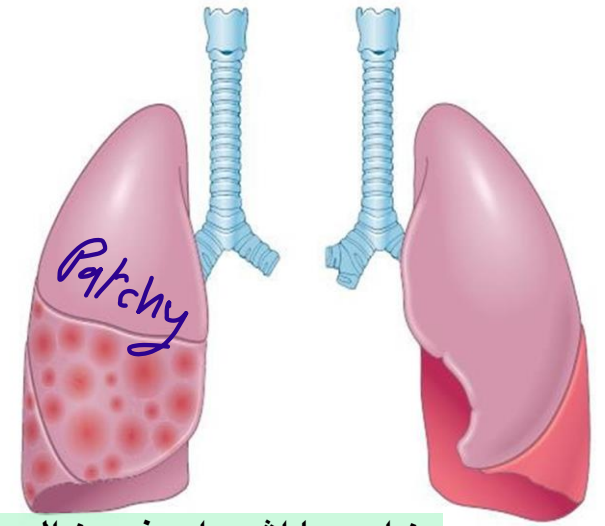


Figure 12-31 The anatomic distribution of bronchopneumonia and lobar pneumonia.

## There are 4 stages of inflammatory evolution in Lobar pneumonia

### 1- Congestion:

يعني الأوعية الدموية بتكون مليانة خلايا دم حمراء زي بداية أي التهاب ال lung بتكون very heavy ولونها أحمر وبنشوف ال inflammation أكثر اشني intra alveolar exudate يكون مكون من بكتيريا و شوية neutrophils و بعد أيام بننتقل للمرحلة الثانية

- Heavy red lungs
- Severe vascular congestion
- Intra alveolar exudate with few neutrophils
- Bacteria +++
- Watery sputum

الهيميشي

### 2- Red hepatization

- ❑ Firm, airless, red liver-like lung
- ❑ Fibrinopurulent pleuritis
- ❑ Intra alveolar exudate: organisms ++, cells:  
Red cells  
Neutrophils  
Fibrin

بتصير طبيعة ال lung بتشبه ال liver و لونها احمر ، و بنشوف intra alveolar exudate بصير يقل ال bacteria شوي لكن بالمقابل بزيدوا ال RBCs and neutrophils ، بعد يومين ثلاث بننتقل للمرحلة الثالثة

بتضل نفس ال consistency لل  
liver لكن لون الرئة بصير grey على  
رمادي لأنه ال RBCs بتبلش تقل و  
ال neutrophils كمان ، لكن بالمقابل  
ال fibrin and macrophages رح  
يزيدوا و طبعاً هاي التغيرات رح  
تكون جوا ال alveoli

### 3- Grey hepatization :

- Dry grey-brown cut surface
- ↑ intra alveolar fibrin & macrophages
- Disintegrating neutrophils & ↓ RBC's

### 4- Resolution:

- Exudate within the alveolar spaces is broken down by enzymatic digestion to produce granular, semifluid debris that is resorbed, ingested by macrophages, expectorated, or organized by fibroblasts growing into it.

عالجنا المريض و الالتهاب بده يروح ، بتزيد اكر شي ال macrophages  
بهاي الحالة ، و بصير في ingestion لل exudate وال secretion ،

بصير اول اشي digestion بسبب انزيمات بتنفرز و بعدين ال  
macrophages بتعمل ingestion و تحاول تنظف المنطقة .

او من خلال ال cough بتطلع ال secretion .

او ممكن يصير الها organizing على شكل organizing pneumonia  
يعني بصير fibrosis جوا الحويصلات

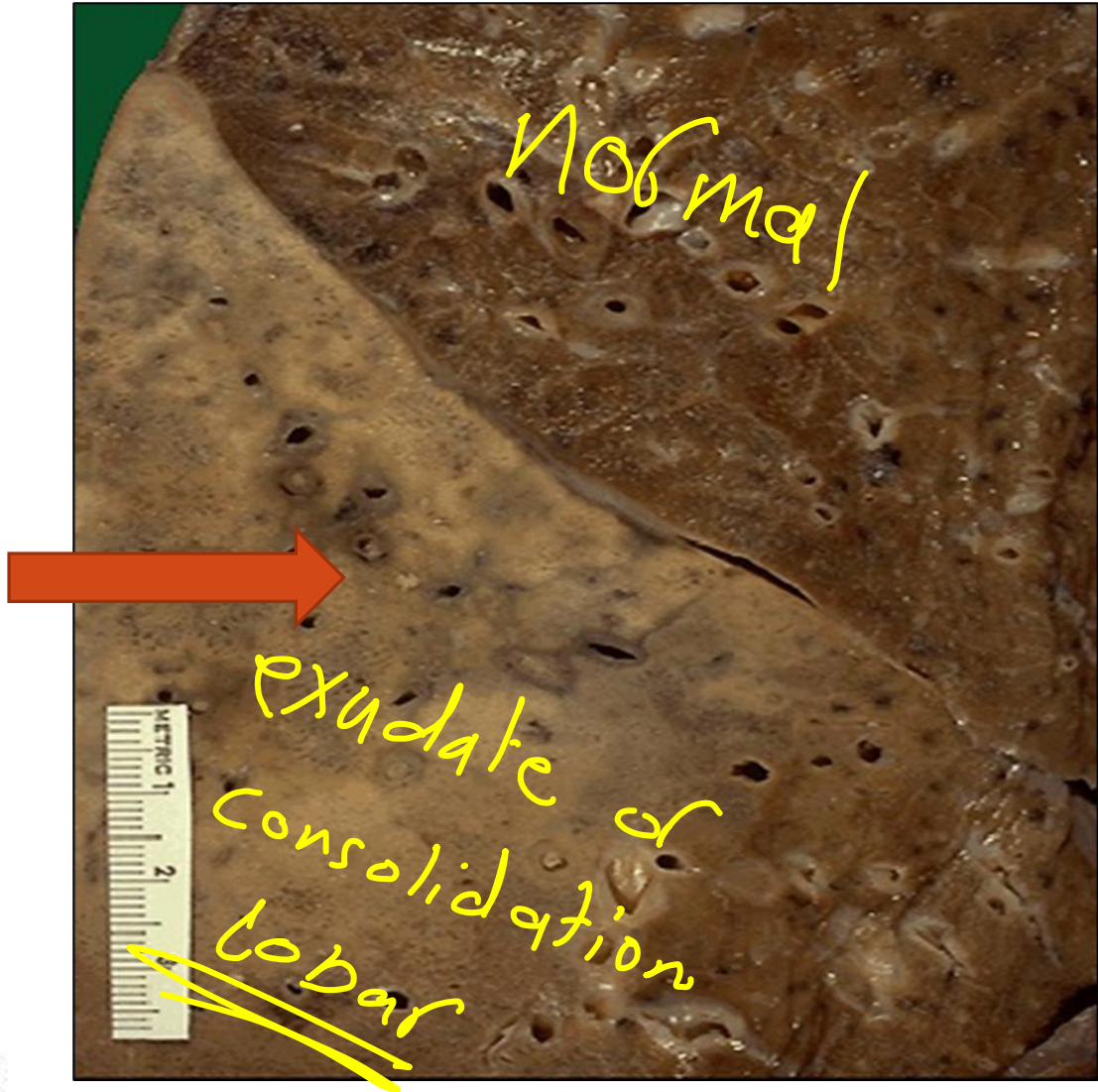
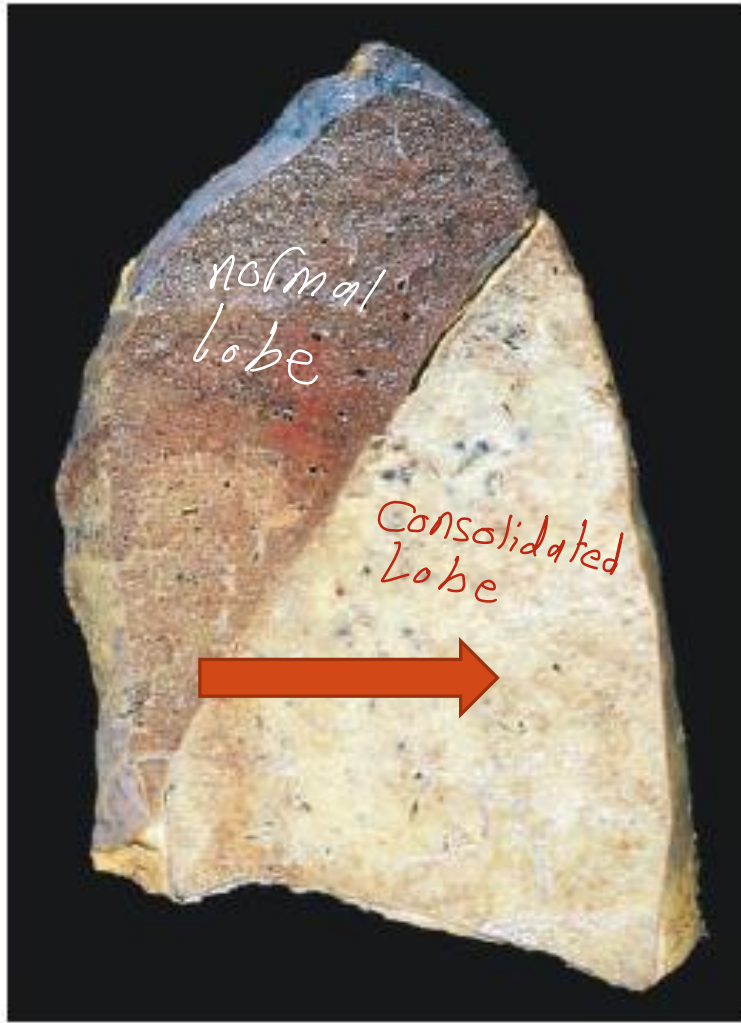
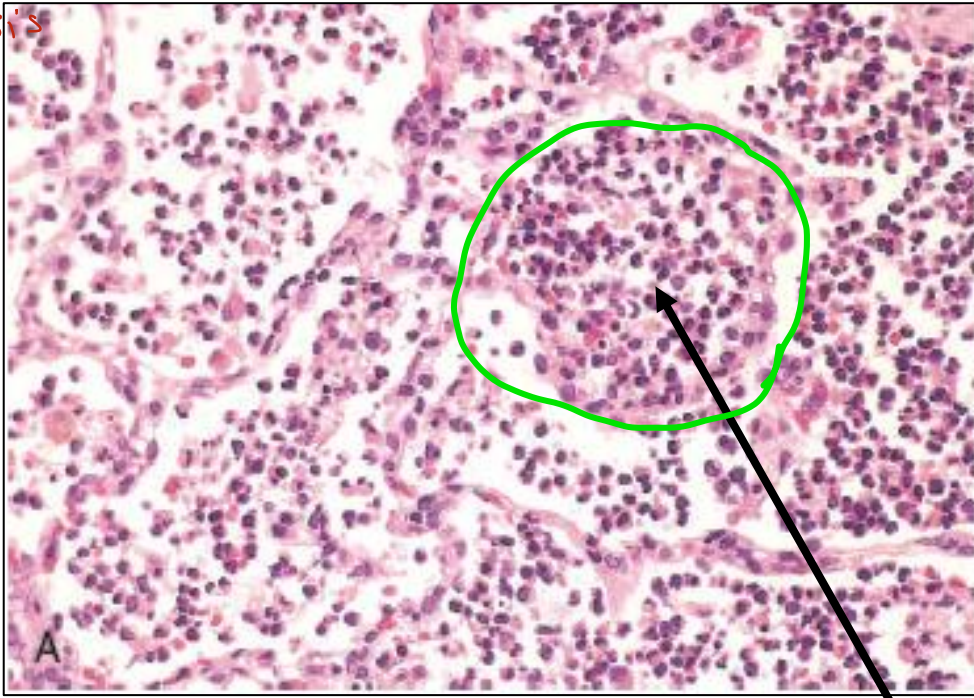


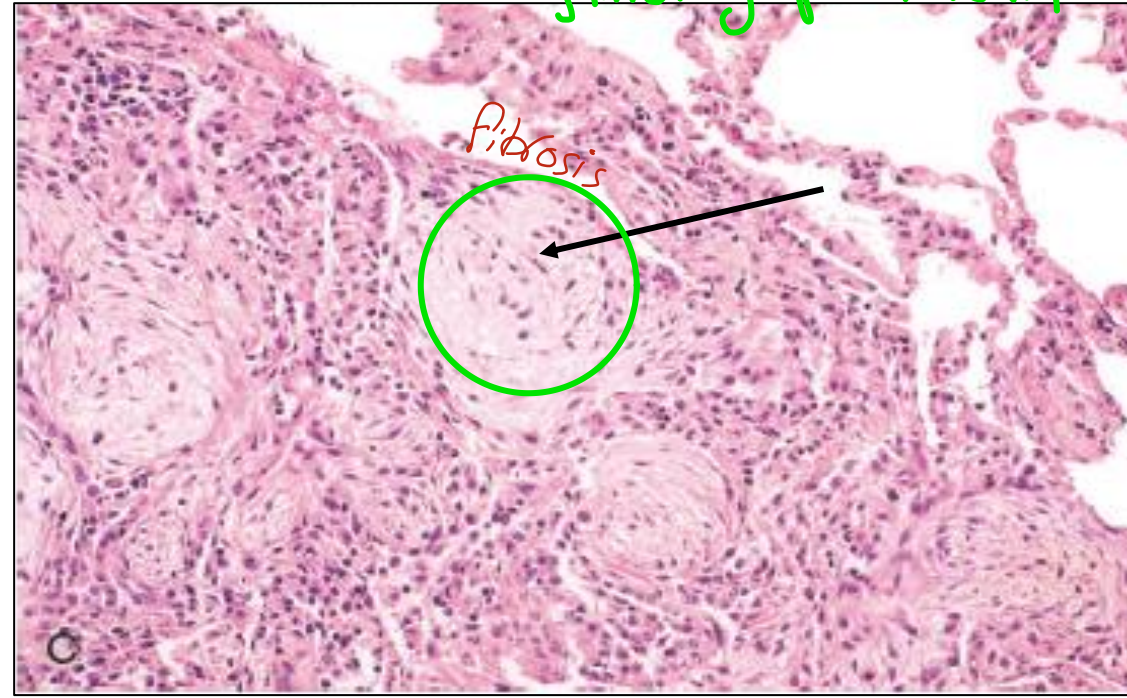
Fig. 13.30 Lobar pneumonia with gray hepatization. The lower lobe is uniformly consolidated.

neutrophilic alveoli cell infiltration during the acute phase of pneumonia

fibrosis



organizing pneumonia



(A) Acute pneumonia. Extensive neutrophil exudation into alveoli corresponds to early red hepatization.

(C) Advanced organizing pneumonia, featuring transformation of exudates to fibromyxoid masses richly infiltrated by macrophages and fibroblasts

هيك بنكون خلاصنا ال lobar pneumonia

حكيما بتكون التغييرات patchy يعني منطقة normal منطقة abnormal و  
بتكون عادة multilobar ، و ممكن bilaateral يعني 2lungs are affected

## Lobular Bronchopneumonia

- The consolidation may be confined to one lobe but is more often multilobar and frequently bilateral.
- The lesions are slightly elevated, dry, granular, gray-red to yellow
- The lung substance surrounding the areas of consolidation may be hyperemic, edematous or normal
- Pleural involvement is less common than in lobar pneumonia.
- **Histologically**, a neutrophil-rich exudate fills the bronchi, bronchioles, and adjacent alveolar spaces.

نفس ال lobar بس الفرق انه بنشوفهم كمان بال bronchi and bronchiole مش بس ال alveoli

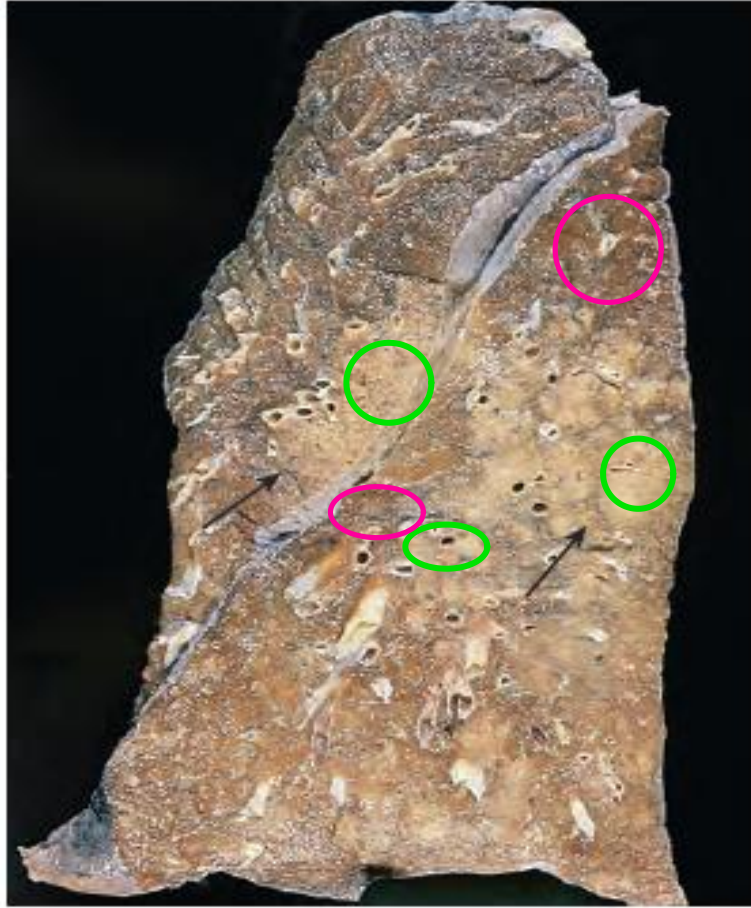
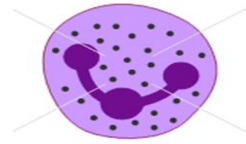


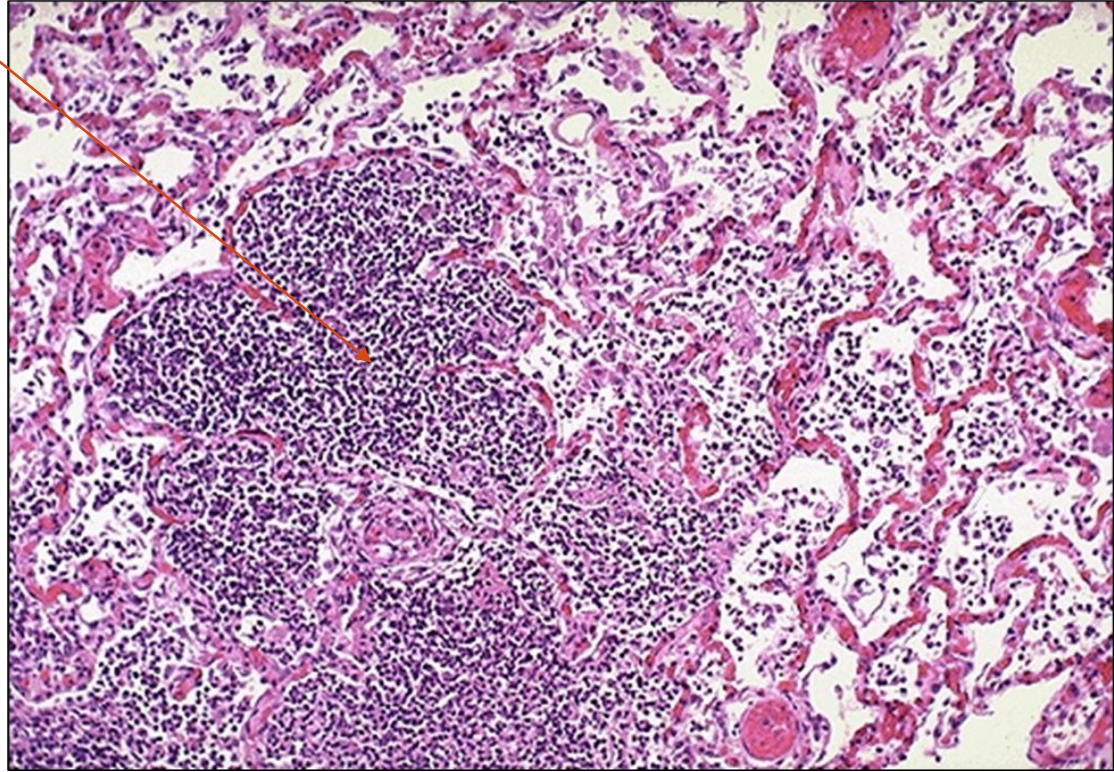
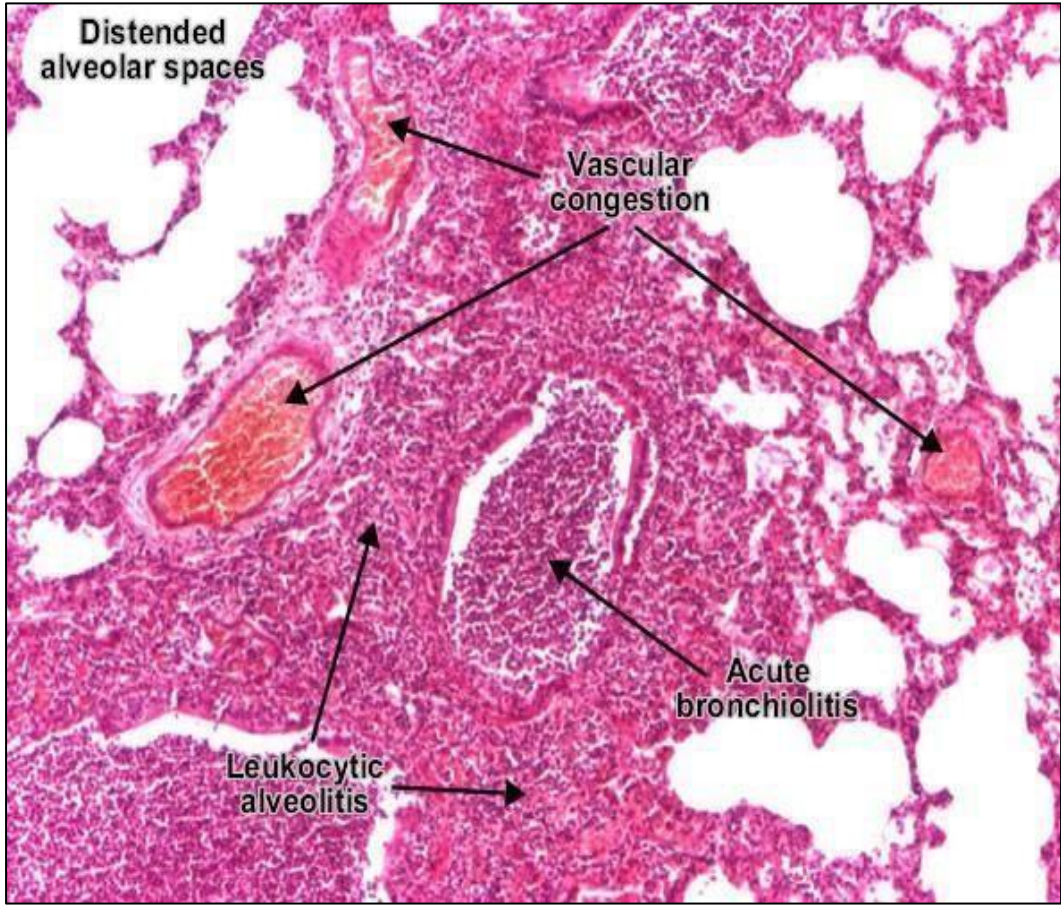
Figure 15-33 Bronchopneumonia. Section of lung showing patches of consolidation (arrows).

○ → white consolidation  
○ → normal





Broncho-pneumonia, suppurative inflammation of the bronchiole with the extension of the inflammation to the surrounding alveoli



## هيك خلاصنا ال Acute community acquired typical pneumonia ، نحكي ملخص سريع عنها

١. بتصير بال community
٢. عادة اسبابها بكتيريا اكر
٣. بنصنفها ك morphology لنوعين : Lobar pneumonia and lobular bronchopneumonia

### ال Lobular

- بتكون patchy  
و ال acute inflammation neutrophils موجودة بال bronchi , bronchioles, alveoli

### ال Lobar

- بتكون more diffuse  
بتكون intra alveolar  
بتمر بعدة مراحل :

١. مرحلة ال congestion بكون فيها اكر اشئ organisms
٢. Red hepatization بزيدوا ال RBCs و ال neutrophil
٣. Grey hepatization بقلوا ال RBCs و ال neutrophils و بزيد ال fibrin و ال macrophages
٤. Resolution بزيدوا ال macrophages و اخر اشئ بتحولوا إلى organizing pneumonia

برضو نوع من ال acute lung infection يلي بتصير بسبب organism بتعرضلها المريض و هو بال community عايش حياته بشكل طبيعي، لكن ليش بسموها Atypical ( انذكر الموضوع بال micro ) لأنها بتحمل خصائص غير عن ال typical ، وهاي الخصائص مذكورة بالسلايد

## 2. Community-Acquired Atypical Pneumonia:

- An acute febrile respiratory disease characterized by patchy inflammatory changes in the lungs, largely confined to the alveolar septa & pulmonary interstitium.

- The term **atypical** denotes:

1. Cough with moderate amounts of sputum. صح عنده cough بس ما في كميات كبيرة من ال sputum زي بال typical.
2. The absence of a physical finding of consolidation. لما الدكتور يفحصه ما رح يلاقي كثير signs انه عنده lung consolidation بال.
3. Lack of alveolar exudate. ما بنشوف exudate جوا ال alveoli و هالأ رح نركز عليها بال morphology.
4. Moderate elevation of WBC count. حتى ال elevation in WBCs count ما بكون كثير عالي زي ال typical.

## □ Causes

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- ✓ **Mycoplasma pneumonia** is the most common
- ✓ Other causes include viruses, such as influenza, SARS virus ...etc.
- ✓ Chlamydia – Psittacosis
- ✓ Rickettsiae

زى اى infection ، ممكن upper respiratory tract infection ، اذا المريض  
immunocompromised ممكن يصير severe infection ، او manifestation العادية زي fever ,  
cough , minimal amount of sputum

## □ Clinically:

- It is variable and may simulate URT infection, called a chest cold.
- It may present as a fulminant life-threatening infection in immunocompromised individuals.
- The onset is that of acute illness with fever, headache & malaise, and later cough with minimal sputum, and alveolar-capillary block occurs due to edema causing respiratory distress.

## □ Morphology:

❖ Grossly : *lobe to involve ممكن و patchy ممكن distribution ك*

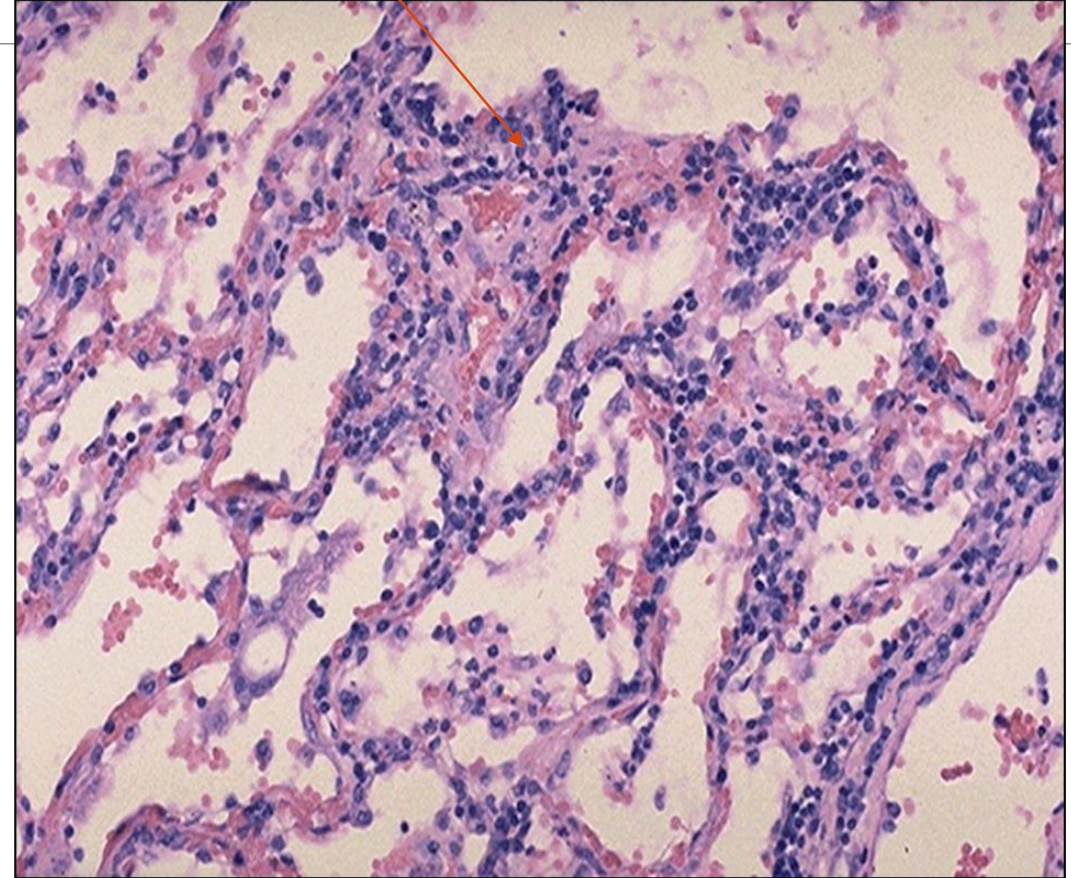
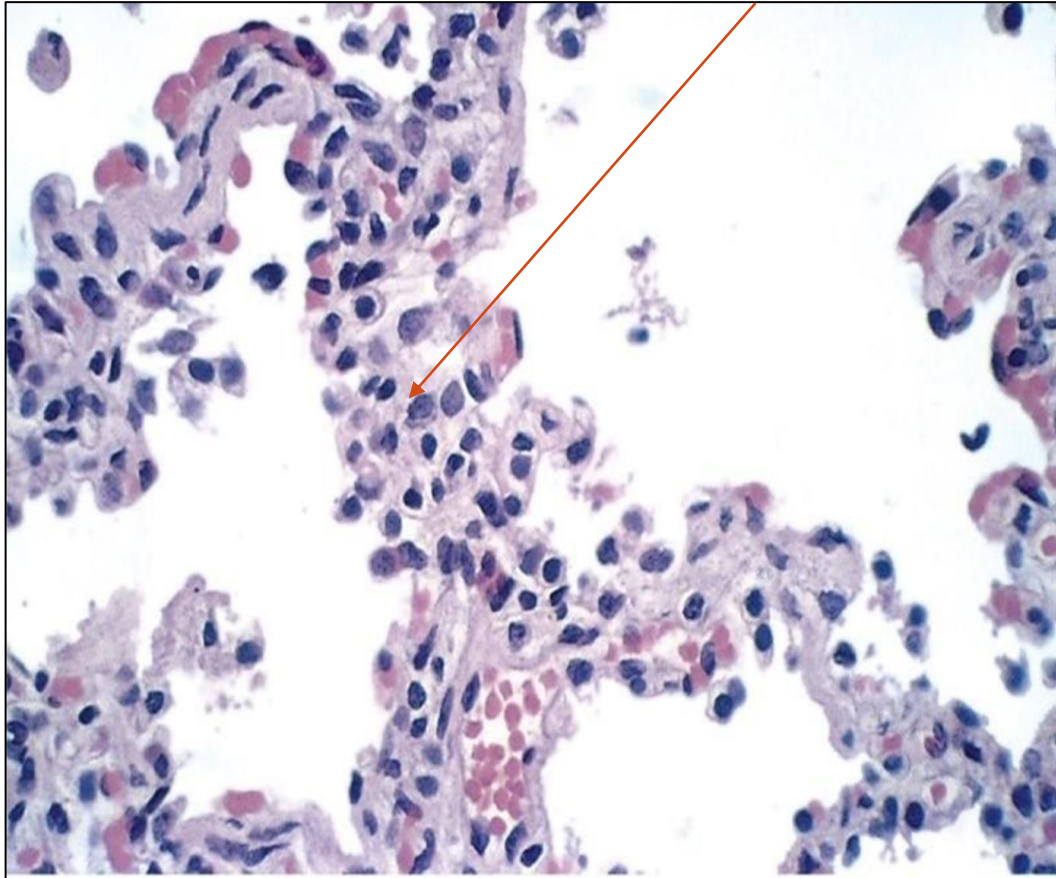
- May be patchy or involve whole lobes bilaterally or unilaterally.
- The areas are red-blue, congested & the pleura is smooth un-inflamed

❖ Microscopically : *، inflammation mainly in the wall of alveoli ال رح نشوف ال هاد يلي بهمنا ،  
typical intra alveolar مش interstitial inflammation بنسبيه زي ال*

- **The inflammatory reaction is largely confined to the wall of the alveoli (interstitial).**
- The septa are widened & edematous; they usually contain **mononuclear inflammatory cells**, including lymphocytes, histiocytes & occasionally plasma cells.

- **The alveolar spaces are FREE of cellular exudate in classic cases.** *، inflammatory cell يعني  
، mononuclear like lymphocyte  
، histiocyte, plasma cell بال غالباً  
neutrophils بكونوا*

Atypical pneumonia, showing widened thickened alveolar septa infiltrated by lymphocytes with proliferating pneumocytes type II & congested capillaries.

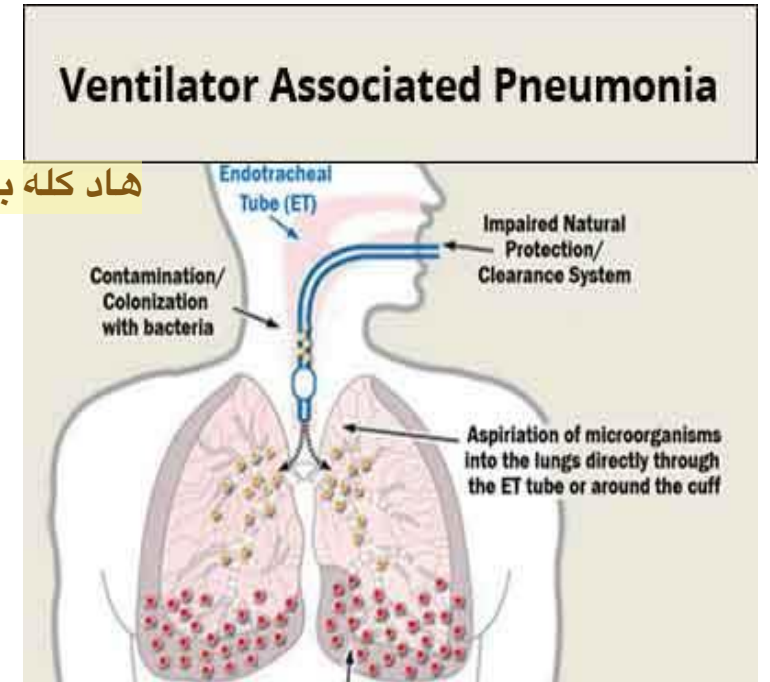


لاحظوا كيف ال inflammation بال alveolar septa بينما جوا ال alveoli ما في اشي

من اسمه هو نوع من الlung infection يلي بصيب المريض و هو داخل بالمستشفى ، وشرط انه at least 48 hours  
after admission ، يعني مريض عمل عملية و بعد يومين من دخوله صار عنده اعراض pulmonary infection

### 3- Nosocomial pneumonia ( Hospital-acquired pneumonia ):

- ❖ Is a pulmonary infection acquired during hospital stay (at least 48 hours after admission).  
had klah bkhali al mriyaz ykon at risk انه يصير عنده infection
- ❖ It is common among hospitalized patients with severe underlying disease, immune suppression, or prolonged antibiotic therapy.  
لأنه يكون عندهم tube ممكن من خلاله يدخل الهم ال infection  
و ممكن كمان يآثر على ال defence mechanism
- ❖ Those on mechanical ventilation represent a high-risk group.
- ❖ Gram-negative rods like enterobacteria & pseudomonas sp. & Gram-positive staph. Aureus are the most common isolates.





## 4- Aspiration pneumonia:

يعني بصير aspiration لل gastric contents و تطلع للرئة بدل ما تضل بالمعدة ، بالتالي بصير التهاب بالرئة ، غالباً بصير عند الناس ال unconscious مش واعيين ، زي يلي عندهم stroke او شخص بصيرله vomiting كثير بصير يفتح مجرى النفس و بتروح للرئة ، بالتالي لما ال gastric content يصيروا موجودين جوا الرئة رح تعمل injury ، و طبعا جزء من هاي ال injury يكون جزء chemical ( لأنه ال acidity عالية بتكون ) و الجزء الثاني bacterial

و غير هيك بصير عندهم نوع من ال infection مع necrosis بالرئة بنسميه necrotizing pneumonia بدنا نعرف انه ال aspiration pneumonia مثل اشفي سهل و بسيط ، خصوصاً لو كان المريض عنده stroke او هو اصلاً ال functionality عنده low ممكن يموت بسبب هاد ال infection and necrosis يلي بصير بالرئة ، لكن يلي بعيشوا و بتعدوا مرحلة الخطر ، ممكن نشوف تغيرات بال lung زي ال abscess formation او نشوف نفس ال foreign material يلي طلعت من المعدة و راحت للرئة ، و رح نلاحظ انه يكون حولها granulomatous, inflammation و يكون يحتوي على giant cells ( هاي ال granuloma صارت ك reaction لهاد الجسم الغريب بحاول الجسم يحيط فيه . اذا هم يا بصير عندهم necrotizing pneumonia او abscess formation او granulomatous inflammation

لو أخذنا culture من المكان ممكن يطلع انواع مختلفة من ال infection حسب الجسم يلي طلع من ال stomach لل lung

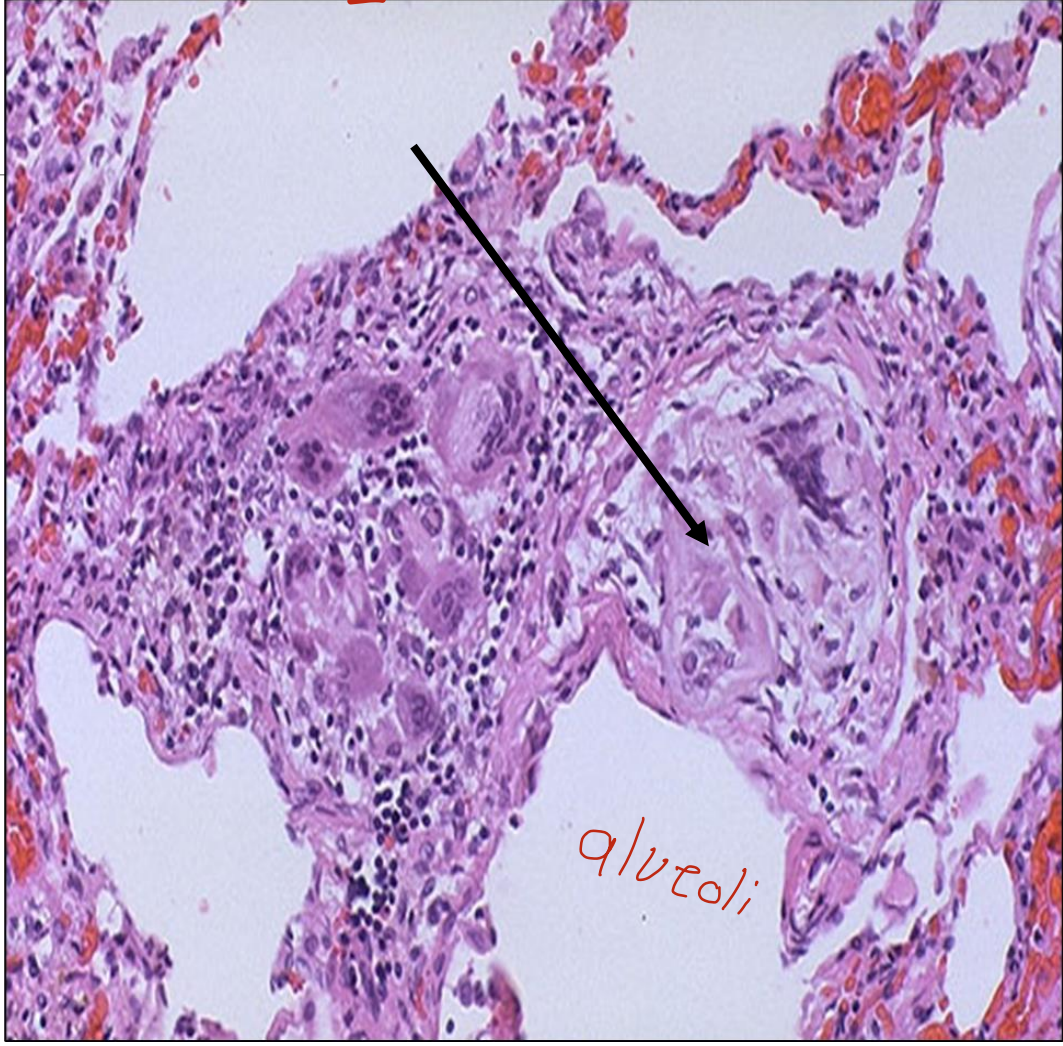
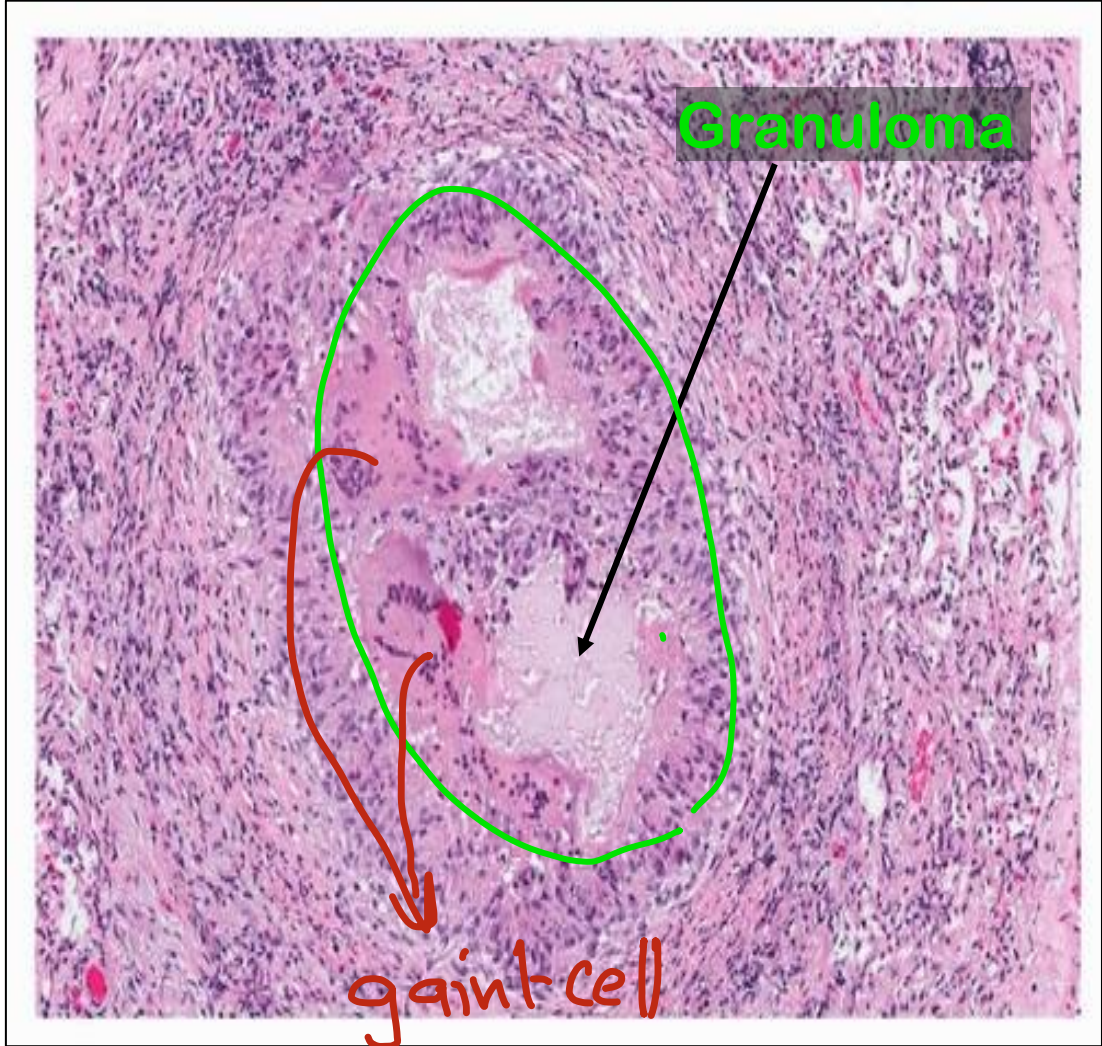
↓ شرح الدكتور هاد السلايد .

## 4- Aspiration pneumonia:

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- Caused by aspiration of gastric contents either while the patient is unconscious (e.g. stroke) or during repeated vomiting.
- The resultant pneumonia is partly chemical, resulting from the irritating effect of gastric acid, and partly bacterial.
- It is **necrotizing pneumonia** that may be fatal, especially in debilitating patients, but in those who survive, complications like **abscess formation & foreign-body giant cell granulomas are common**.
- Typically, more than one organism is recovered on culture, aerobes being more common than anaerobes

نفس الشئ



الرئة زيها زي اي عضو بالجسم ممكن يصير abscess formation

## 5- Lung abscess:

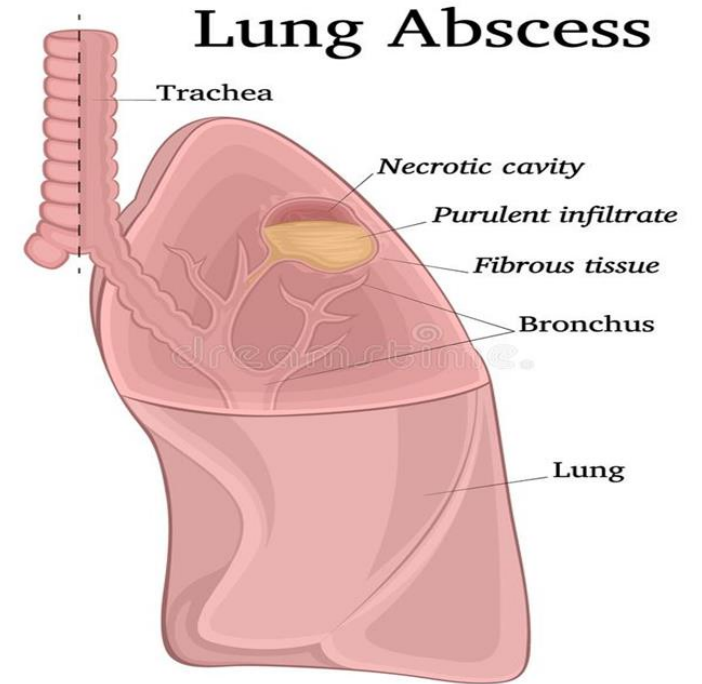
A localized area of suppurative necrosis within pulmonary parenchyma resulting in the formation of one or more large cavities.

### Mechanisms of the introduction of causative organisms :

- 1- Aspiration of infective material or gastric content.
- 2- As a complication of bacterial pneumonia & mycotic infections.   
 *↪ fungal*
- 3- Bronchiectasis.
- 4- Following bronchial obstruction as in tumors.
- 5- Septic embolism from septic thrombophlebitis or infective endocarditis.
- 6- In bacteremia. *or septicemia*

### Clinically:

- Cough with foul-smelling sputum; hemoptysis may occur.   
 *سبب infection ↪*
- Fever, malaise & clubbing of fingers.   
 *سبب ال exudate ↪*



غالباً بنشوفها على شكل cavity تجويف ، و لو اخذنا منه biopsy رح نشوف suppurative neutrophilic inflammation  
يعني بنشوف sheet of neutrophils عاملة destruction بالمكان ، بتلاحظوا انه معالم ال alveoli مش مبيينة ، ممكن نشوف حولهم حسب الحالة  
قديش chronic شوية mononuclear cell , lymphocyte , macrophages لو ال abscess صار الة فترة طويلة ، لكن mainly , mainly من شو بتكون  
ال abscess ؟ من suppurative neutrophilic inflammation

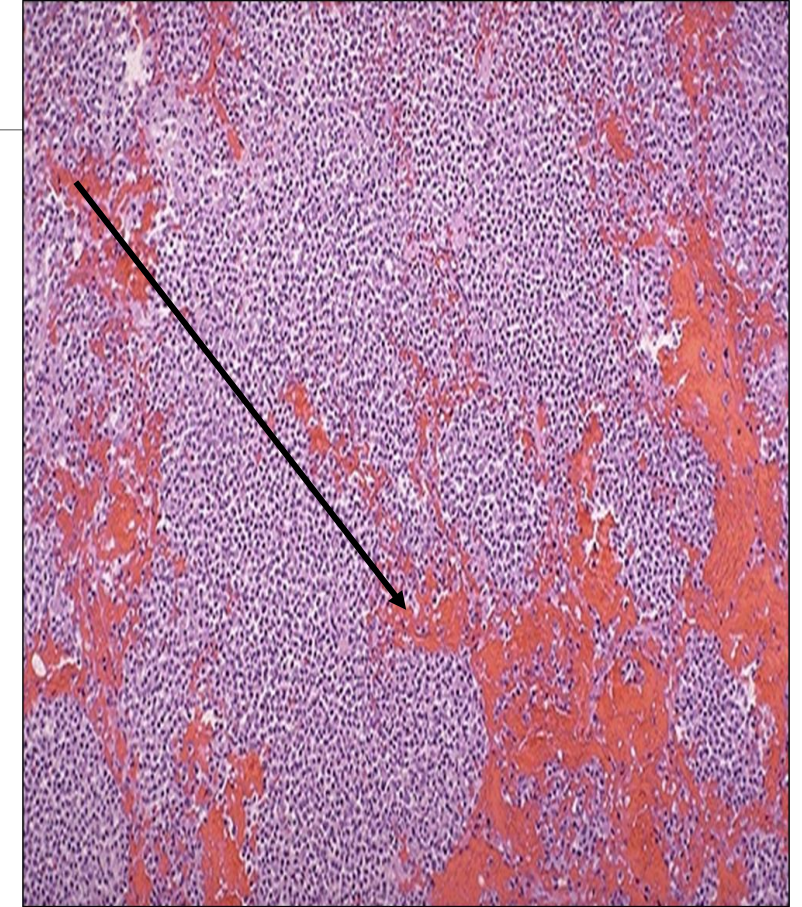
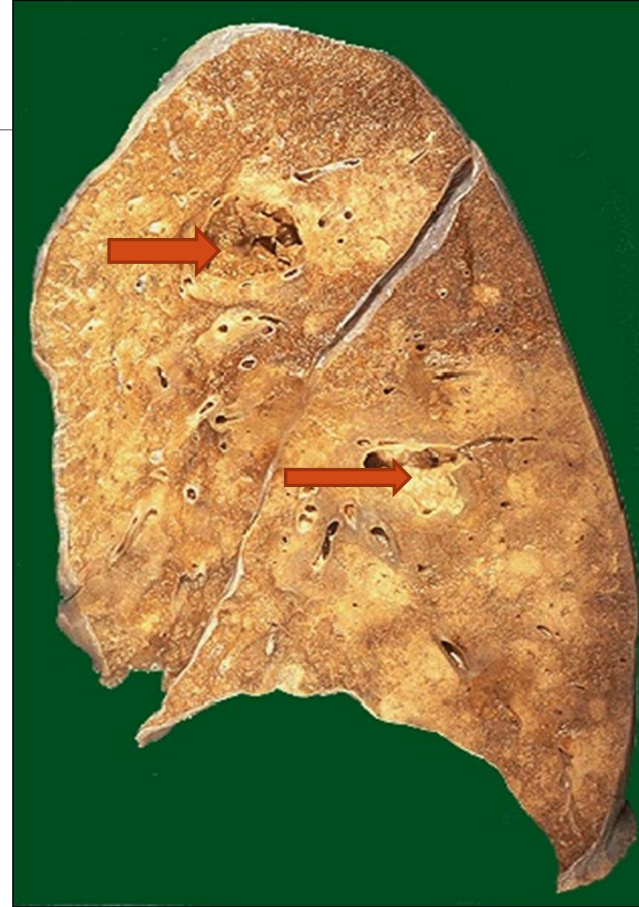
## Morphology:

- Vary from a few mm to large cavities.

## Microscopically:

There is suppurative neutrophilic inflammation surrounded by fibrous scarring & mononuclear cell infiltration, including lymphocytes, plasma cells & macrophages, depending on the chronicity of the lesion.

المهم بالمحاضرة ال morphology و تميزوا بينهم

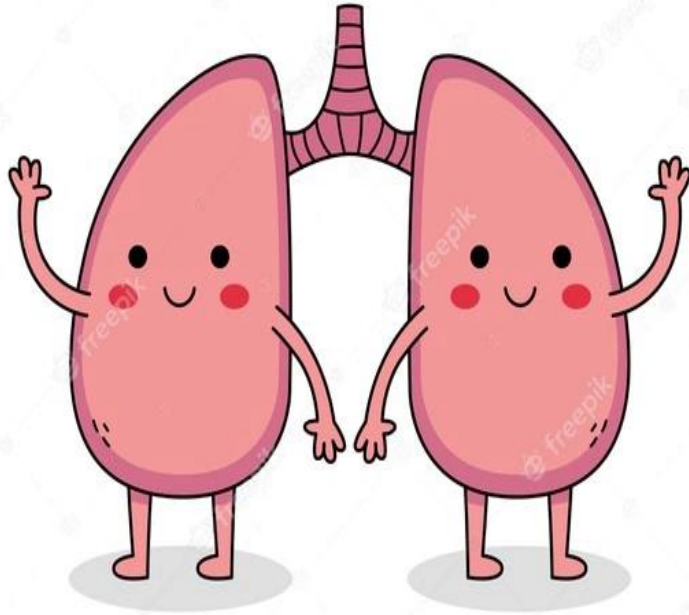


Irregular-shaped cavities within lung parenchyma

الموضوع	الفيديوهات المطلوبة 1	الفيديوهات المطلوبة 2	الفيديوهات المطلوبة 3
Upper Respiratory Tract Pathology lec1	Nasopharyngeal Carcinoma video 1 video 2	Vocal Cord Nodules and Polyps	neoplasia Laryngeal Papilloma and Carcinoma Of The Larynx
lower Respiratory Tract Pathology lec1	شوية هستو لازم تعرفوهم video	Atelectasis	Acute Respiratory distress syndrome 1. medicosis 2. osmosis
Obstructive Lung diseases 1 lec2	Emphysema video 1 video 2	Chronic Bronchitis VS Emphysema (Comparison)	Chronic Obstructive Pulmonary Diseases (COPD)
Obstructive Lung diseases 2 lec3	Asthma video 1 video 2	Bronchiectasis	
Restrictive Lung Diseases: lec 4	1.Obstructive VS Restrictive Lung Disease	2. Introduction	
Restrictive Lung Diseases: 1.fibrosing diseases lec 4	1. Idiopathic Pulmonary Fibrosis 2. Nonspecific Interstitial Pneumonia (NSIP) 3 -Cryptogenic Organizing Pneumonia (COP)	4. Pneumoconiosis: 1. Coal- workers pneumoconiosis and Silicosis 2. Asbestosis and asbestos-related diseases	4. الفقدان الحاد للخصية... 1. نقص سلاسل الكولاجين 2. استئصال الحظائر 3. كبريتات 4. "Collagen" Vascular Diseases 5. Drug- and Radiation-Induced Pulmonary Disease
Restrictive Lung Diseases: 2. Granulomatous diseases lec 5	1. Sarcoidosis: video1 video2	2. Hypersensitivity Pneumonitis	Hypersensitivity Pneumonitis VS Sarcoidosis
Restrictive Lung Diseases: 3. Smoking Related diseases lec 5	smoking related interstitial diseases	Pulmonary diseases of vascular origin: 1. Pulmonary Hypertension 2. Good pasture syndrome 3. Granulomatosis and polyangiitis (GPA)	

"ضفنا لكم على خانة ال Guidance  
جداول بتحتوي على فيديوهات بتساعدكم  
بفهم مواضيع الباثو بشكل أكبر ولتسهل  
عليكم الحفظ بتلاقوهم من  
(رفعة حياة ..Rs.. باثو.. Guidance)

و هيك بنكون خلصنا مادة الميڊ و يعطيكم ألف عافية ، بالتوفيق



Thank you

DONE BY SADEEL ALFAQEER