جامعة الملك سعود
King Saud University

Pathology Practical

Respiratory Block
Med435

Classification of respiratory diseases:

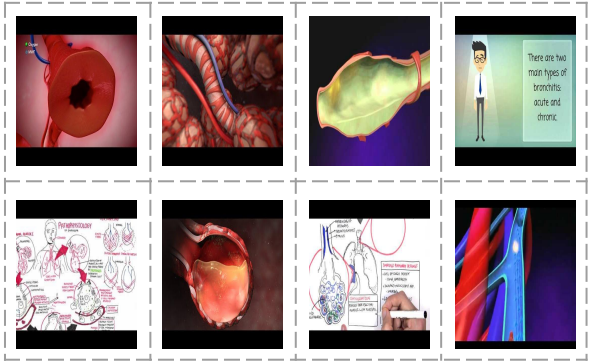
1.Inflammatory lung diseases:
(Asthma, cystic fibrosis, & COPD)
2. Restrictive lung diseases:
(Allergic Alveolitis)
3. Obstructive lung diseases :
(Bronchial Asthma, Bronchiectasis, & (COPD- Ch. Bronchitis & Emphysema))
4. Respiratory tract infections:
-Upper resp. tract infection (sinusitis, tonsillitis, otitis media, pharyngitis & laryngitis)
-Lower resp. tract infection (Pneumonia & Bronchopneumonia , T.B.)
5.Malignant tumors(SquamousCC, 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.)

The main differences between Obstructive and Restrictive lung diseases:

Obstructive: decrease lung capacity

Restrictive: decrease in the expansion of the alveolar sacs

Some helpful videos

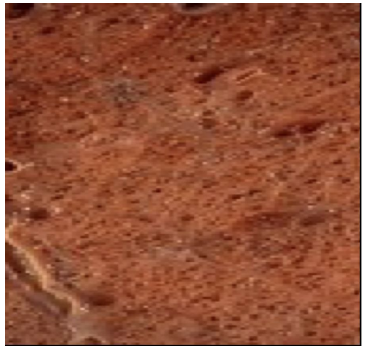


RESTRICTIVE LUNG DISEASES Hypersensitivity Pneumonitis (HP)

Restrictive Lung Disease (Honeycomb lung) – Gross

- Represent 15% of non-infectious diseases of lungs.
- End-stage: diffuse interstitial pulmonary fibrosis (Honeycomb lung).
- Acute: Acute Respiratory Distress Syndrome
- Chronic : Occupational: Asbestosis, silicosis, coal worker pneumoconiosis.
- Interstitial lung disease (interstitial pneumonia), Idiopathic pulmonary fibrosis
- Etiology: pigeon's

Restrictive Lung Disease (Honeycomb lung) – Cut section

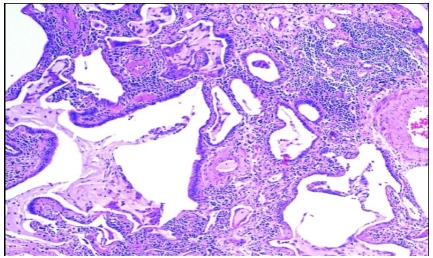
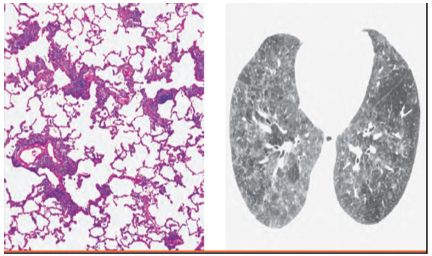
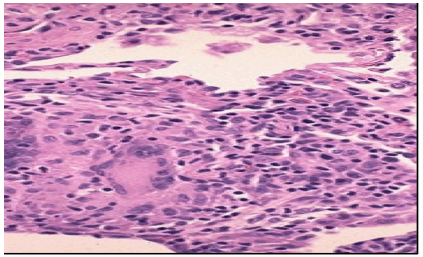
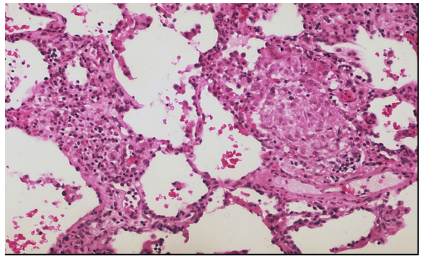


Most common gross feature is:

“Honeycomb" lung, with cystic fibrosis filled with hemorrhage.

(End result: extensive fibrosis from restrictive lung disease)

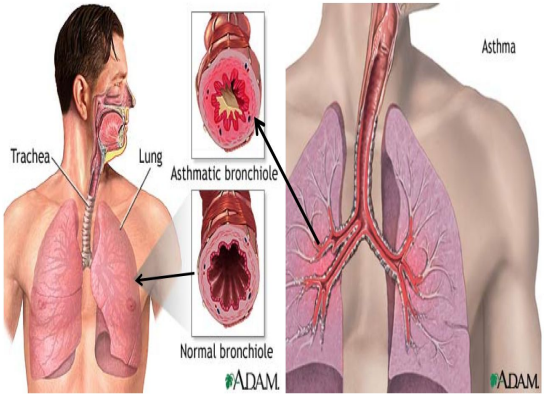
RESTRICTIVE LUNG DISEASES Hypersensitivity Pneumonitis (HP)

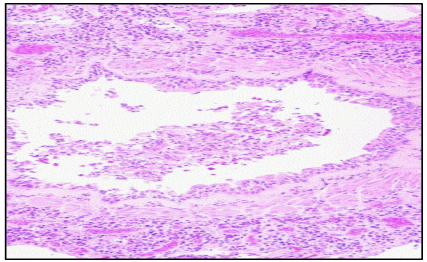
Restrictive Lung Disease (Honeycomb lung) – LPF	***Hypersensitivity Pneumonitis– Histopathology & Radiogram***	***Hypersensitivity Pneumonitis (HP)***	***Hypersensitivity Pneumonitis (HP)***
			
Restrictive Lung Disease: 1-Pulmonary fibrosis with extensive interstitial collagen deposition. 2-minimal lymphocytic inflammatory infiltrates 3-residual airspace dilation.	extrinsic allergic alveolitis: Histopathology: shows interstitial inflammation along alveolar ducts (bronchiolocentric distribution). The inflammation is diffuse, lacks nodularity. Radiologically: a ground-glass pattern	1-lymphocytes, plasma cells and inflammatory cells 2-Interstitial fibrosis 3- Giant cells 4- Histiocytes 5- Macrophages	1-lymphocytes, plasma cells and inflammatory cells 2-Interstitial fibrosis 3- Giant cells 4- Histiocytes 5- Macrophages

OBSTRUCTIVE LUNG DISEASES,Bronchial Asthma

Bronchial Asthma: Type 1 Hypersensitivity reaction characterized by inflammation of the airways causes airflow into and out of the lungs to be restricted.

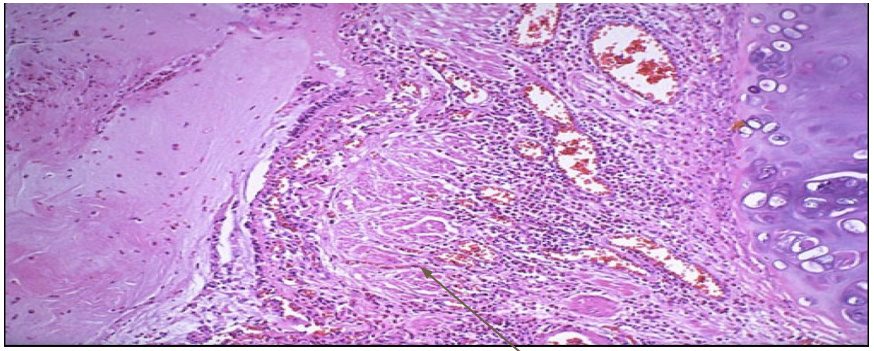
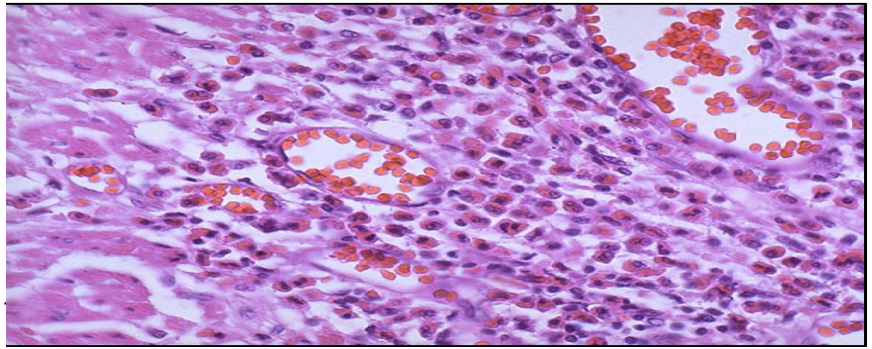
- Sever case of asthma is the status asthmaticus and it leads to death.
- pathologic morphological changes that can occur in asthma as a result of airway remodeling:
- 1- Sub-basement membrane fibrosis and thickening.
- 2- Hypertrophy of bronchial glands and smooth muscles.
- 3-Increased submucosal vascularity.
- (signs of obstruction):
- 1- Muscle of the bronchial tree becomes tight
- 2- swelling of the air passage
- 3- wheezing sound





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.

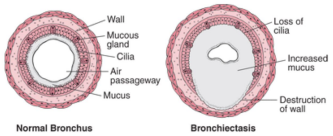
OBSTRUCTIVE LUNG DISEASES,Bronchial Asthma

LPF	HPF
	
- Lumen filled with mucus - Smooth muscle hypertrophy - Edema - Inflammatory cells (Eosinophil) The peripheral eosinophil count or the sputum eosinophils can be increased during an asthmatic attack.	- Smooth muscle hypertrophy - Edema - Eosinophil - Vascular congestion - Several “Needle-like” structures/crystals known as Charcot Leyden Crystals can be seen in the sputum of these patients.

OBSTRUCTIVE LUNG DISEASES, Bronchiectasis

- Bronchiectasis is an Irreversible & Necrotizing disease giving rise to dilatation of the bronchi and bronchioles.
- can be related to a congenital disorder such in Kartagener's Syndrome (KS) (also called immotile ciliary syndrome) which is an autosomal recessive disease characterized by immotile cilia causing abnormalities of the respiratory tract and infertility in males.

Diagram of Normal & Bronchiectatic Bronchus



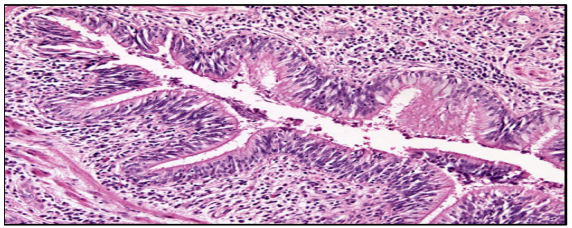
In Bronchiectasis, mucus production increases, the cilia are destroyed or damaged, and areas of the bronchial wall become chronically inflamed and are destroyed .

Colored X-ray

Permanent dilatation and necrotizing of bronchi and bronchioles caused by destruction of muscle and elastic tissue resulting from or associated with chronic necrotizing infection

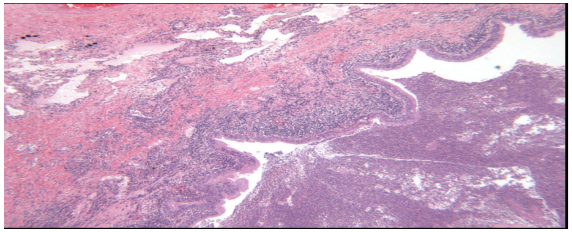
-Markedly distended peripheral bronchi

LPF



1- Chronic inflammation
2- ulceration of bronchial wall
3- ossification of bronchial cartilage, thickened pleura .
4-Variable inflammation and fibrosis of alveoli

HPF



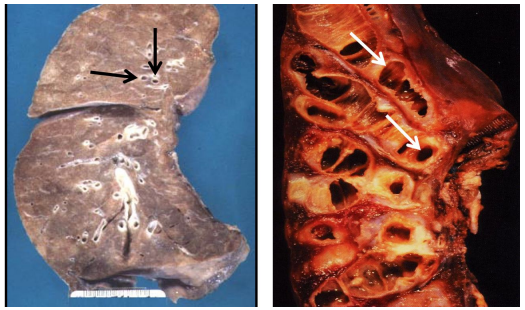
Section of a dilated bronchus with florid acute on chronic inflammation of the bronchial wall and surrounding interstitial fibrosis.

OBSTRUCTIVE LUNG DISEASES, Bronchiectasis

Bronchiectasis – Gross pathology

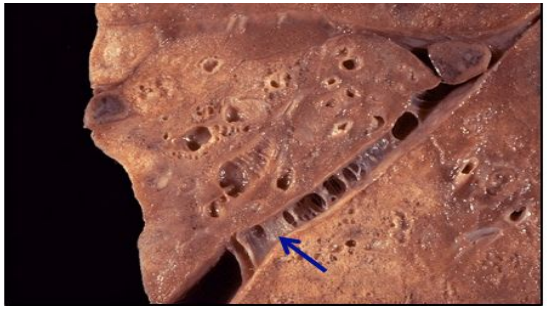
Permanent dilatation of bronchi and bronchioles caused by destruction of muscle and elastic tissue resulting from or associated with chronic necrotizing infection
-Markedly distended peripheral bronchi.

Bronchiectasis – Gross pathology



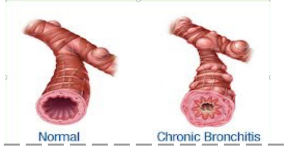
Bronchiectasis occurs when there is obstruction or infection with inflammation and destruction of bronchi so that there is permanent dilation surrounded by fibrosis.

Bronchiectasis – Gross pathology



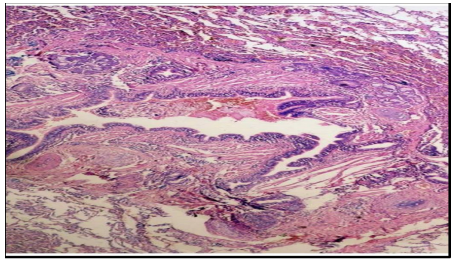
Scar formation with adhesion fibrosis between the lobes.
Fibrous pleural adhesions are common in:
persons who have had past episodes of inflammation of the lung that involve the pleura.

COPD:Chronic bronchitis



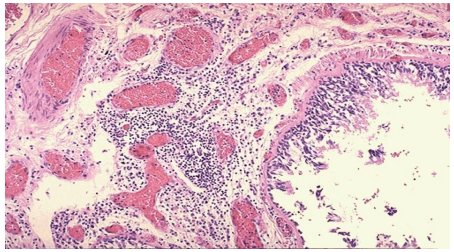
- Clinical Definition of Chronic bronchitis: The Diagnosis of Chronic Bronchitis is based on clinical features, Persistent productive cough (with sputum) for at least 3 consecutive months in at least 2 consecutive years.
- Inflammatory process mostly associated with viral and bacterial infections
- usually seen in smokers.
- Reid index 0.4: ratio of outer surface till the epithelium by glands.

Chronic Bronchitis - LPF



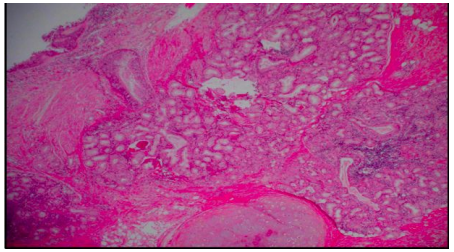
- Narrowed lumen
- hyperplasia of the submucosal glands
- Chronic inflammatory cells
- Congested blood vessels

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 cylindrical 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 - HPF



- Chronic inflammatory infiltrates range from absent to prominent.
- Increased percentage of bronchial wall is occupied by submucosal mucous glands, (this directly correlates with sputum production)
- variable dysplasia
- squamous metaplasia
- bronchiolitis obliterans

COPD: Emphysema

Clinical feature:

Clinical features:

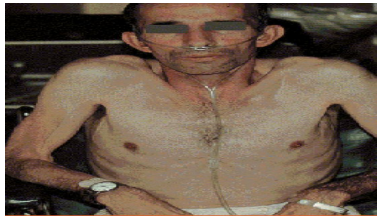
- Thin “pink puffer” patient
- Hyperinflated chest (Barrel chest)
- Weight loss

Complications:

- Cor pulmonale
- Congestive heart disease
- Pulmonary hypertension
- Pulmonary hypertension
- Death due to:

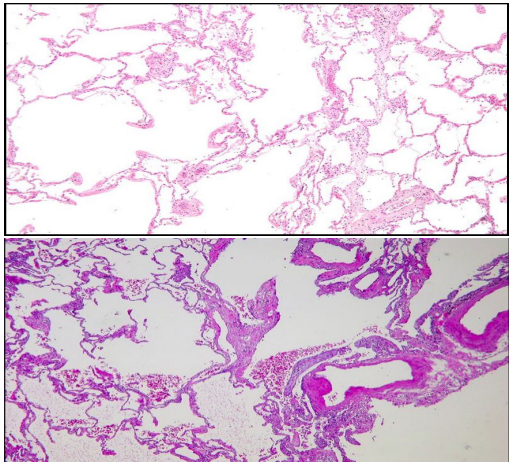
1.Respiratory acidosis and coma
2.Right side heart failure
3.Massive collapse due to Pneumothorax

Enzyme deficiency that can lead to this condition- Alpha-1-Antitrypsin deficiency.



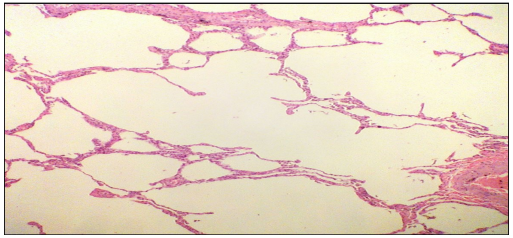
Emphysema patient (so-called pink puffers) exhibit: dyspnea without significant hypoxemia and tend to be thin, to have hyperinflated lung fields

panacinar Emphysema – LPF

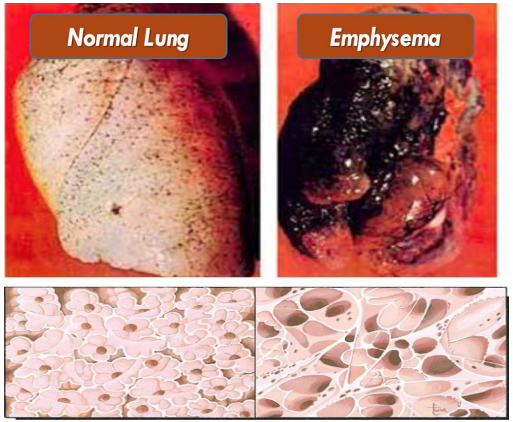


1- rapture of the alveolar septa forming spurs
2- Dilatation of the alveoli

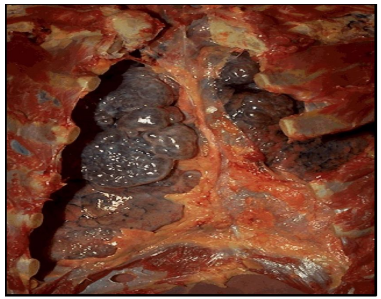
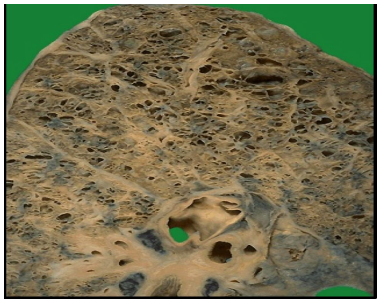
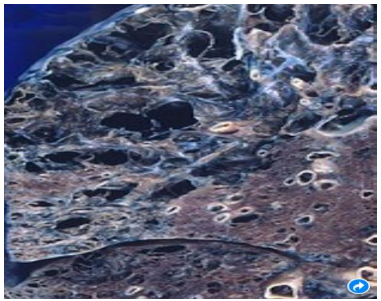
panacinar Emphysema – LPF



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



Emphysema

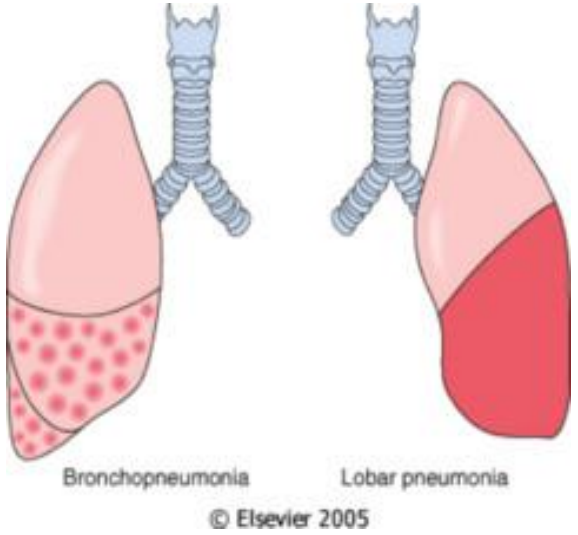
Emphysema – Gross Anatomy	Emphysema – Gross pathology	Centrilobular Emphysema – Gross pathology	Bullous Emphysema - Gross Pathology
			
Opened chest cavity shown: Numerous large emphysematous bullae. Bullae: are large abnormal dilated airspaces that bulge out from beneath the pleura. Risk: if the bullae is ruptured it will lead to pneumothorax	Dilated airspaces in emphysematous lung.	Centrilobular emphysema : multiple cavities lined by heavy black carbon deposits characteristic of smoking, usually seen in the apex . MOST COMMON TYPE.	A bulla is defined as an emphysematous space larger than 1cm. - dr shaesta A bulla is defined as fluid or air filled regions more than 0.5cm - dr Mari

Type Of Emphysema	Possible Cause
Centriacinar (Centrilobular)	smoking
Panacinar (Panlobular)	α-1 antitrypsin deficiency.
Distal acinar (Paraseptal)	unknown cause leading to pneumothorax.
Irregular emphysema	inflammatory conditions.

Infections of the lower respiratory tract:

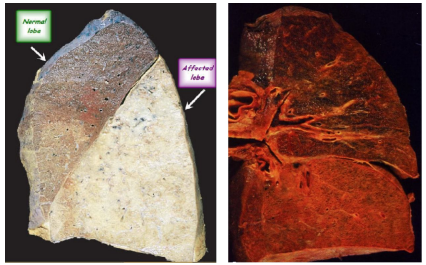
- any infection in the lung is called Pneumonia.
- Microorganisms involved or the etiology of pneumonia:
- 1- Streptococcus
- 2- Staphylococcus
- 3- H-influenza
- Main difference between Lobar pneumonia and lobular pneumonia:
- Lobar: entire lobe is involved.
- Lobular: small small areas or patches around the bronchioles.“ Bronchopneumonia”

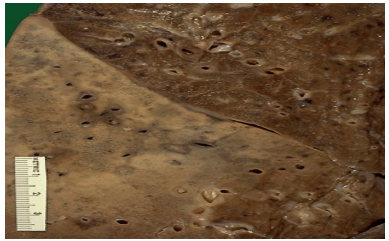
an extra image showing the difference:



Infections of the lower respiratory tract: Lobar pneumonia

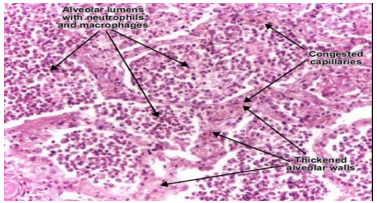
Lobar Pneumonia - Gross pathology

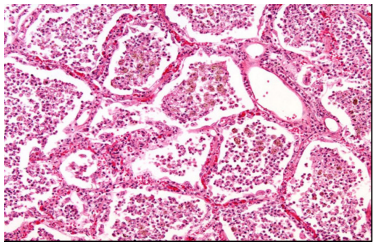




Diffuse consolidation of the entire lobe, caused by inflammation.

Lobar Pneumonia - Histopathology

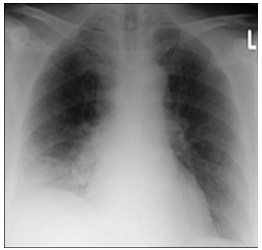




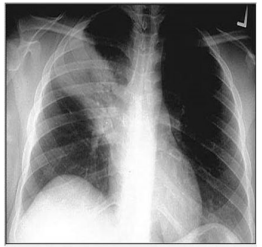
1- alveolar lumen with macrophages and neutrophils
2- congested capillaries
3-thickened alveolar walls

Four stages in lobar pneumonia:" Very Imp"
1- Congestion (first 2 days)
2- Red hepatisation (fibrinous alveolitis) (2nd to 4thday)
3- Grey hepatisation (leukocytic alveolitis) (4th to 8th day)
4- Resolution (after 8th day)

Lobar Pneumonia - X-ray



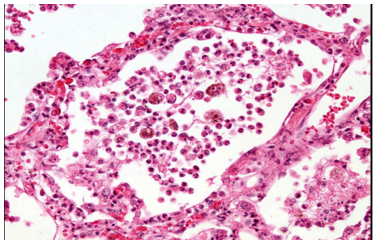
Lobar Pneumonia of the right Lower lobe

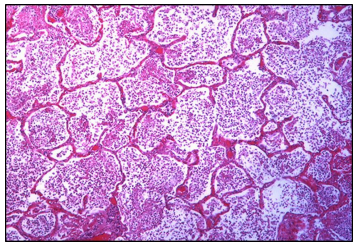


Lobar Pneumonia of the right middle lobe

Diffuse consolidation of the right lobe.

Lobar Pneumonia - LPF





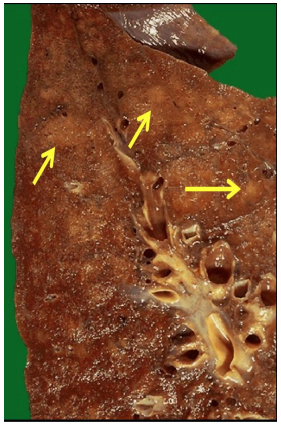
1- All the alveoli are filled with fibrinous exudate containing fibrin threads, polymorphs, macrophages and red blood cells.
2- Alveolar walls are congested.
3- Pleura is covered by fibrinous exudate.

Infections of the lower respiratory tract: Bronchopneumonia

Bronchopneumonia – Gross pathology

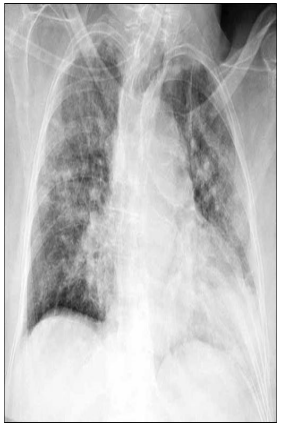
The consolidated areas here very closely match the pattern of lung lobules (hence the term "lobular" pneumonia). Bronchopneumonia is classically a "hospital acquired" pneumonia seen in persons already ill from another diseases e.g. DM , old age , immune deficiency process.

Bronchopneumonia – Cut section



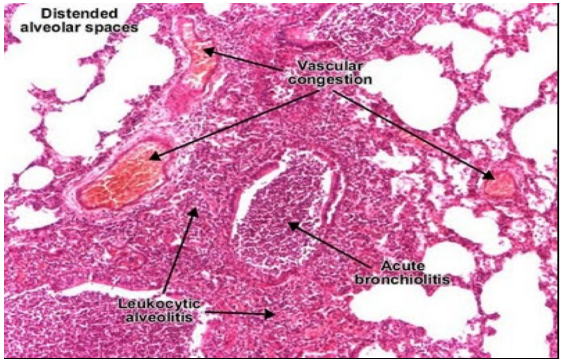
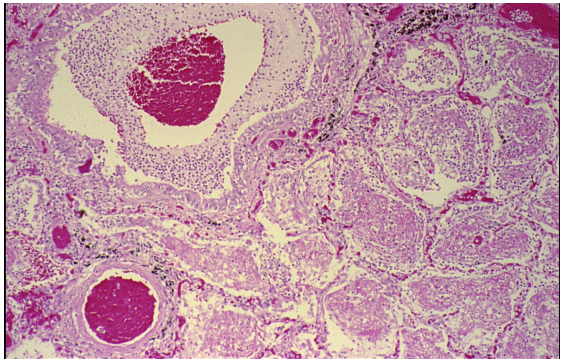
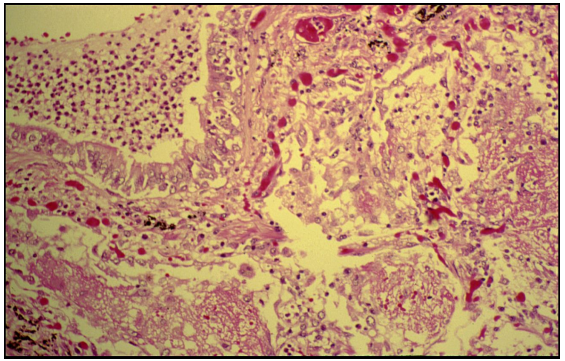
This bronchopneumonia is more subtle, but there are areas of lighter tan consolidation. The hilum is seen at the lower left with radiating pulmonary arteries and bronchi

Bronchopneumonia – X-ray



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

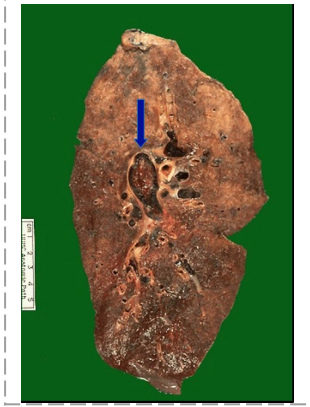
Infections of the lower respiratory tract:Bronchopneumonia

Bronchopneumonia – Histopathology	***Bronchopneumonia – LPF***	***Bronchopneumonia – MPF***
		
1- Foci of consolidation surrounded by normal parenchyma 2- Vascular congestion 3- Acute bronchiolitis 4-Leukocytes alveolitis	1-Section of the lung shows foci of inflammatory consolidation surrounding bronchioles: Bronchioles are filled with an inflammatory purulent exudate and show ulceration of mucosa 2- focal inflammation and necrosis of walls . 3- Surrounding lung parenchyma shows congestion and edema	1- the alveolar exudate ,neutrophils. 2-The surrounding alveolar walls have capillaries that are dilated and filled with RBC's. Such an exudative process is typical for bacterial infection. 3- This exudate gives rise to the productive cough of purulent yellow sputum seen with bacterial pneumonias

PULMONARY EMBOLUS AND INFARCTION

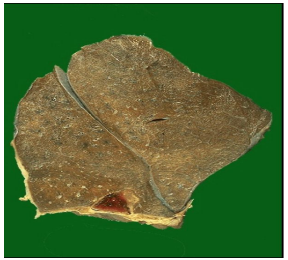
what is an embolus? a blood clot, air bubble, piece of fatty deposit, or other object that has been carried in the bloodstream to lodge in a vessel and cause an embolism. جلطات

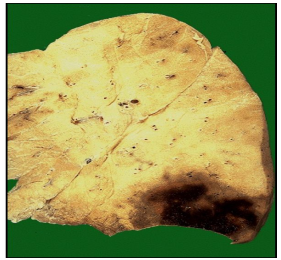
Thromboembolism in the Lung – Gross



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.

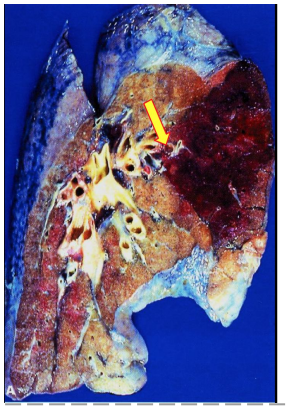
Thromboembolism in the Lung – Gross





- Hemorrhagic infarction/ischemic area
- Large thromboemboli can cause death.

Pulmonary embolus and infarction in the Lung



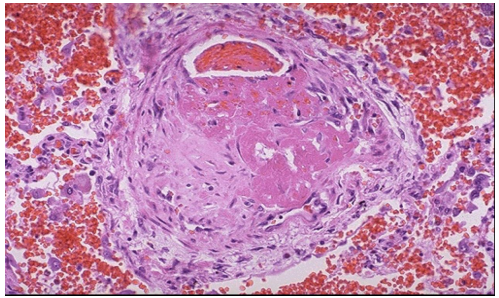
A Longitudinal transection of a lung showing a wedge shaped peripheral hemorrhagic infarction . A thrombus is seen in a major branch of pulmonary artery (arrow head) .

Thromboembolism: a mass within the cardiovascular system
Embolism: moving thrombus (commonly from the leg to the pulmonary artery/tract)

CT scan - white arrows show pulmonary embolus with lung infarction

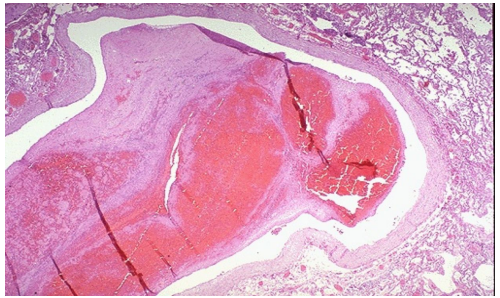
PULMONARY EMBOLUS AND INFARCTION

Small pulmonary artery thromboembolus - HPF



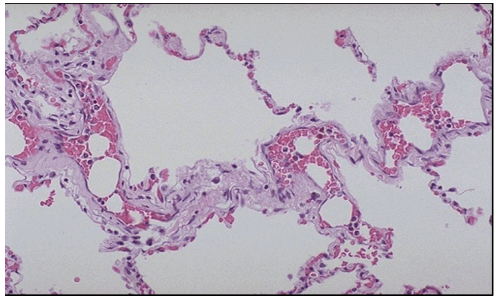
A small peripheral pulmonary artery thromboembolus. If these small PE are showered into the pulmonary circulation at once or over a period of time will lead to pulmonary hypertension

Pulmonary artery thromboembolus - LPF



- Congested blood vessels
- Lines of Zahn (dark and light alternating lines/platelet, fibrin, RBC)

Fat Embolism in the Lung - HPF



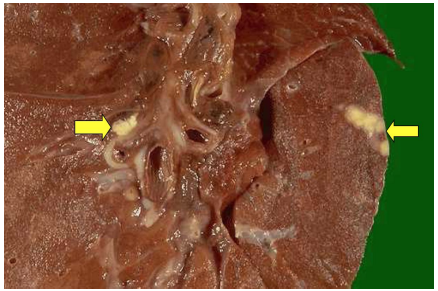
The rounded holes that appear in the vascular spaces here in the lung are fat emboli.
Fat embolization syndrome occurs most often following trauma with fracture of long bones that releases fat globules into the circulation which are trapped in pulmonary capillaries

difference between congestion and blood clutt:
Congestion: RBC, Short time
Clutt: Fibrin,RBC, Period of time, “Lines of zahn”

Tuberculosis of the lung

- Root of dissemination by airborne droplets.
- an infectious diseases caused by mycobacterium tuberculosis
- 3 types of tuberculosis: 1- primary TB 2-secondary TB 3- Miliary TB
- Characterized by epithelioid and giant cell (langhans giant cell) Granuloma, Ghon's complex or caseous necrosis is present, rim of lymphocytes.
- Complications of TB are: Amyloidosis - Tuberculous pneumonia - Miliary tuberculosis - Tuberculous meningitis - Addison disease .

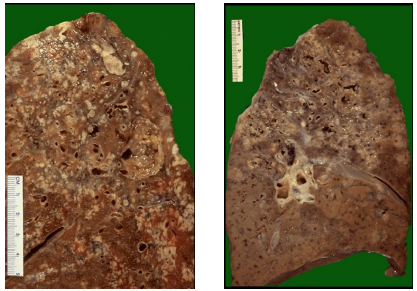
Pulmonary TB - Ghon's Complex – Gross Pathology



Primary tuberculosis of whitish caseous necrosis of Ghon's complex seen in children.
Site of primary TB: lower part of upper lobe or the upper part of the lower lobe.

- Ghon's complex: expansion of the tubercle into the lung parenchyma and lymph node involvement.

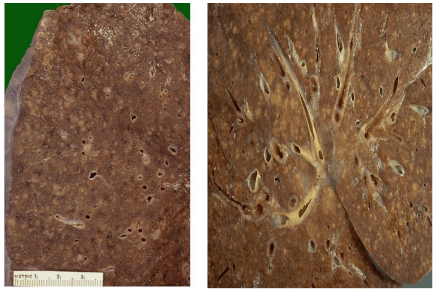
Pulmonary TB – Caseous Necrosis – Gross



- Multiple caseating granulomas primarily in the upper lobes is most characteristic of secondary tuberculosis
- Mass composed of caseous necrosis and cavitation

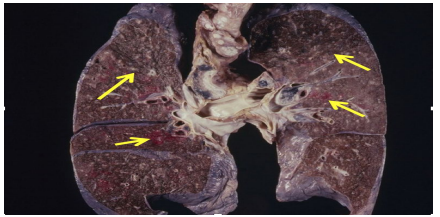
Reactivation, or secondary tuberculosis, is more typically seen in adults.

Miliary TB of the Lungs – Cut section



- Erosion of pulmonary veins
-The miliary pattern gets its name from the resemblance of the granulomas to millet seeds.

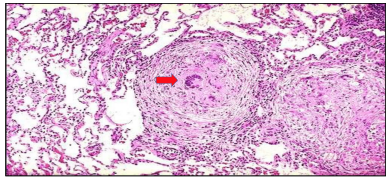
Miliary TB of the Lungs



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,
The route by which the organisms have spread:
following erosion of pulmonary arteries by TB lung lesions

Tuberculosis of the lung

Tuberculous Granulomas - HPF

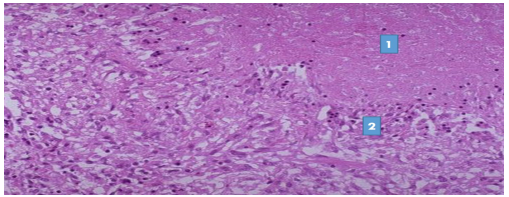


several Langhan's giant cells.

Granulomas are composed of:

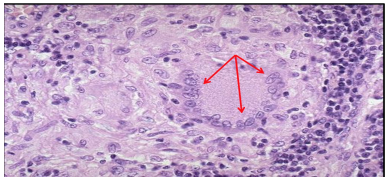
- transformed macrophages called epithelioid cells along with lymphocytes.
- occasional PMN's
- plasma cells
- and fibroblasts

Tuberculous Granulomas - HPF



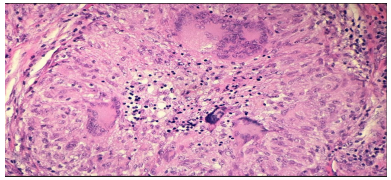
- The edge of a granuloma is shown here.
- At the upper is amorphous pink caseous material [1] composed of the necrotic elements of the granuloma as well as the infectious organisms.
- This area is ringed by the inflammatory component [2] with epithelioid cells, lymphocytes, and fibroblasts.

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

Pulmonary TB - Granuloma with central early necrosis

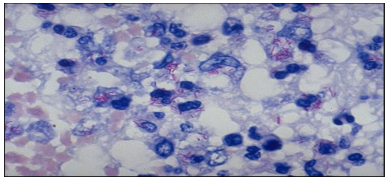


Giant cells and epithelioid histiocytic granulomas with caseous necrosis

Miliary TB of the Lungs – X-Ray

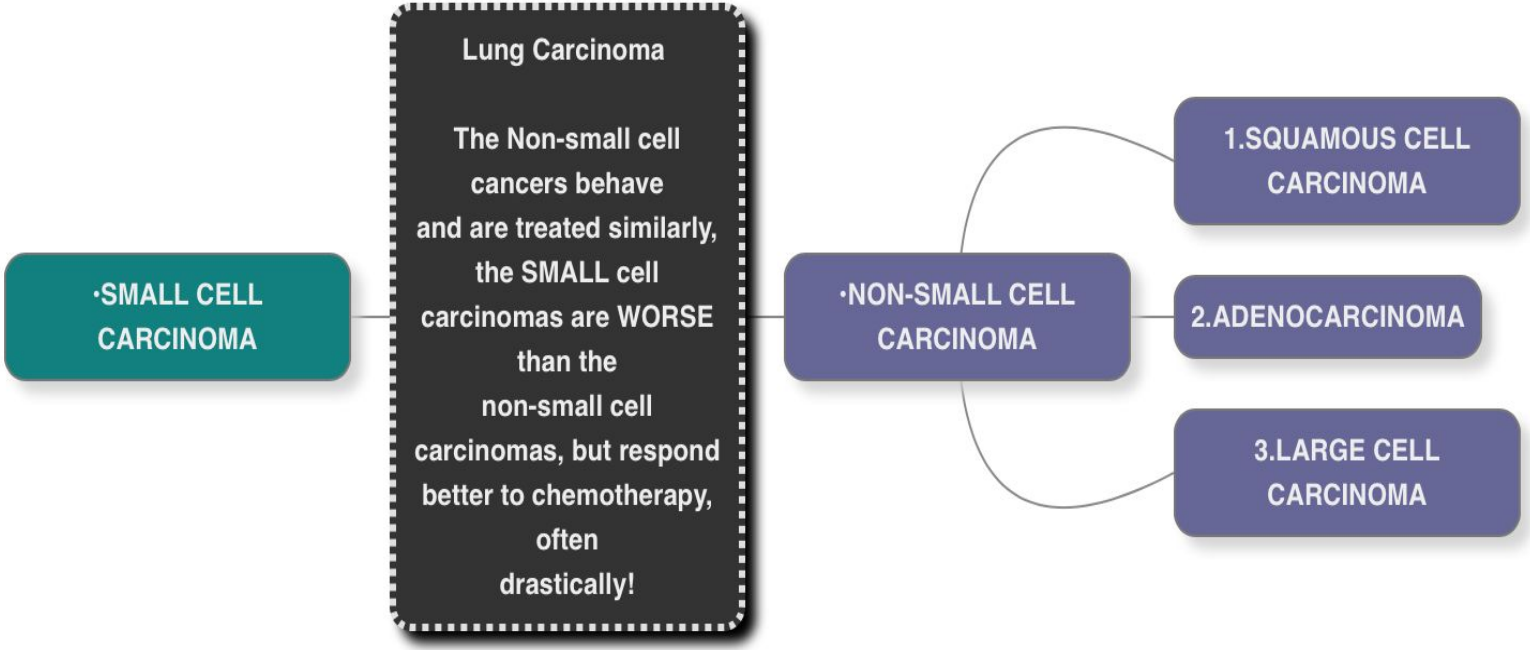
This chest x-ray shows a patient with miliary TB showing:
1- **miliary nodules 2- Reticular shadows.**

Acid Fast bacilli of Mycobacterium TB in the Lung



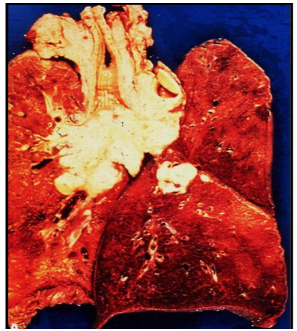
- ZN or ACFB stain done for TB.
- A stain for Acid Fast Bacilli is done (AFB stain) to find the mycobacteria .
- The mycobacteria stain as red rods.

Lung carcinoma



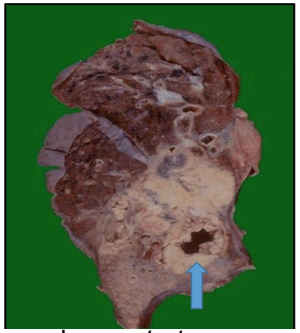
Lung carcinoma,NON-SMALL CELL CARCINOMA: Squamous Cell Carcinoma of the lung

Squamous Cell Carcinoma of the Lung - Gross



- Irregular and invaded large mass in the lung parenchyma.
- centrally in the lung
- 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



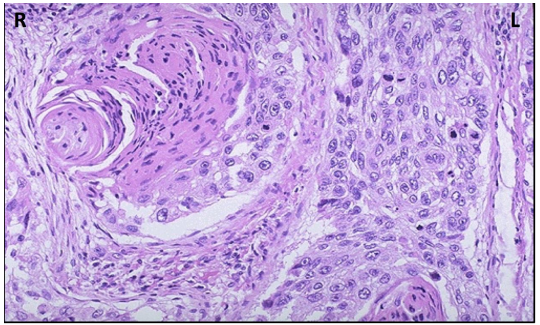
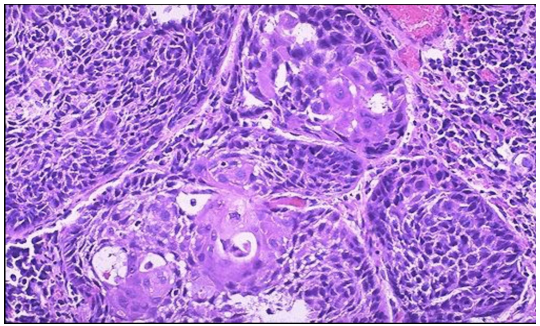
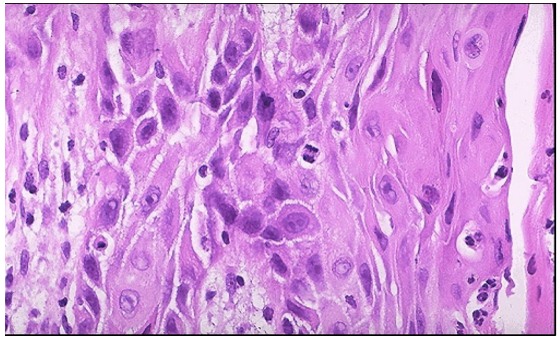
which a portion of the tumor demonstrates central cavitation, probably because the tumor outgrew its blood supply.

Squamous Cell Carcinoma of the Lung – CT scan

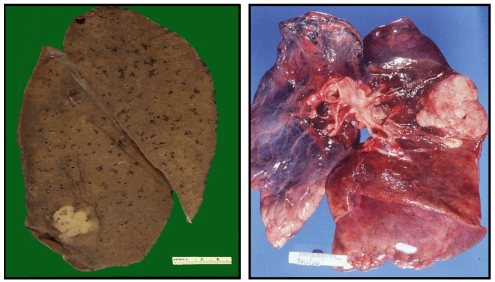
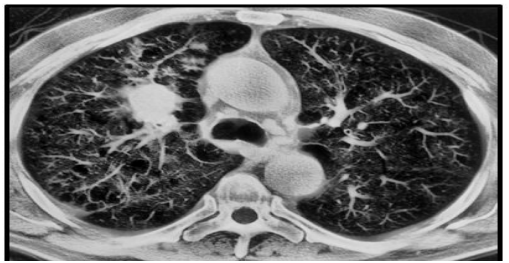
This chest CT scan view demonstrates a large squamous cell carcinoma of the right upper lobe that extends around the right main bronchus and also invades into the mediastinum and involves hilar lymph nodes

- Most commonly found in men and correlated with smoking.
- Pathology: more differentiated, more cytoplasm, keratin whorls.
- Grading is based on the amount of keratin & cytoplasm.
- Hypercalcemia is the neoplastic syndrome associated with SCS.

Lung carcinoma,NON-SMALL CELL CARCINOMA: Squamous Cell Carcinoma of the lung

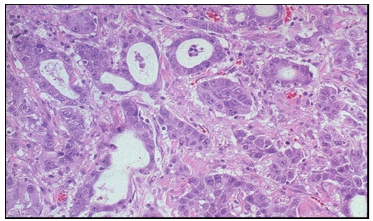
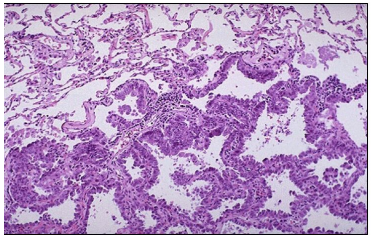
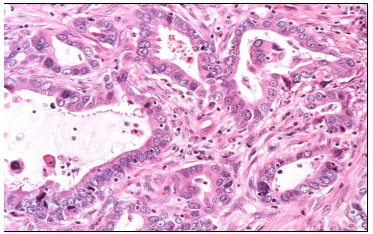
Squamous Cell Carcinoma of the Lung - HPF	*Squamous Cell Carcinoma of the Lung - HPF*	*Squamous Cell Carcinoma of the Lung - HPF*
		
- Hyperchromasia - Pleomorphism - Invasion - Mitosis - keratin pearl - more differentiated	- nests of polygonal cells with pink cytoplasm and distinct cell borders. - The nuclei are hyperchromatic and angular.	pink cytoplasm with distinct cell borders and intercellular bridges

Lung carcinoma,NON-SMALL CELL CARCINOMA: Adenocarcinoma of the lung

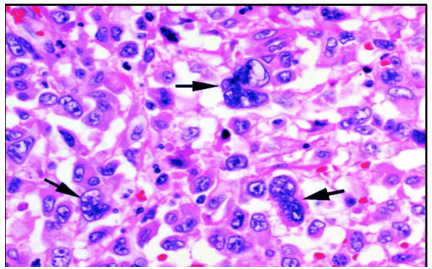
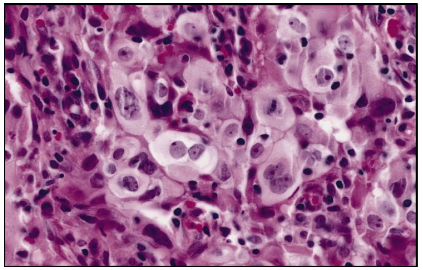
Adenocarcinoma of the Lung – Gross	*Adenocarcinoma of the Lung x-ray*	*Adenocarcinoma of the Lung CT-scan*
		
large single invaded mass in the peripherally.	A peripheral adenocarcinoma of the lung appears in this chest radiograph of an elderly non-smoker woman.	***CT scans in a 61-year-old man with adenocarcinoma of the lung***

- The most common type of lung cancer, making up 30-40% of all cases.
- mainly affect women.
- Glandular differentiation by tumor cells and 80% of those cells produce mucin.
- Not as strongly associated with a smoking history.
- Adenocarcinoma in situ - called bronchoalveolar carcinoma
- Early and distant metastases
- Adenocarcinomas and large cell anaplastic carcinomas tend to occur more peripherally in lung.

Lung carcinoma,NON-SMALL CELL CARCINOMA: Adenocarcinoma of the lung

Adenocarcinoma of the Lung – HPF	*Adenocarcinoma of the Lung – LPF*	*Adenocarcinoma of the Lung – HPF*
 - Differentiated malignant glands - pleomorphic and hyperchromatic malignant cells	 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. (no invasion)	 Section of the tumor shows moderately differentiated malignant glands lined by pleomorphic and hyperchromatic malignant cells showing conspicuous nucleoli . Note the presence of tissue desmoplasia around the neoplastic glands .

Lung carcinoma,NON-SMALL CELL CARCINOMA: Large Cell Carcinoma of the lung

Undifferentiated Large Cell Carcinoma of the Lung – Gross	*Large Cell Carcinoma of the Lung – HPF*	**Large Cell Carcinoma of the Lung – HPF**
	 Pleomorphic carcinoma of lung: 1-large cell carcinoma 2-pleomorphic multinucleated giant cells	 This section from lower respiratory tract shows neoplastic cells with abundant pale eosinophilic cytoplasm and a surrounding infiltrate of inflammatory cells

- 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, very bad prognosis.

Lung carcinoma, SMALL "oat" CELL CARCINOMA

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

elaborated include: Antiduretic hormone (ADH), Adrenocorticotropic hormone (ACTH), Parathormone, Calcitonin, and Gonadoropin.

- Treatment of small cell carcinoma is radiation therapy and chemotherapy.
- The prognosis is bad as most of the patients have distant metastasis at diagnosis and even with treatment the mean survival is 1 year after diagnosis.

Paraneoplastic syndromes due to oat cell Carcinoma:

a- Cushing syndrome (ACTH).

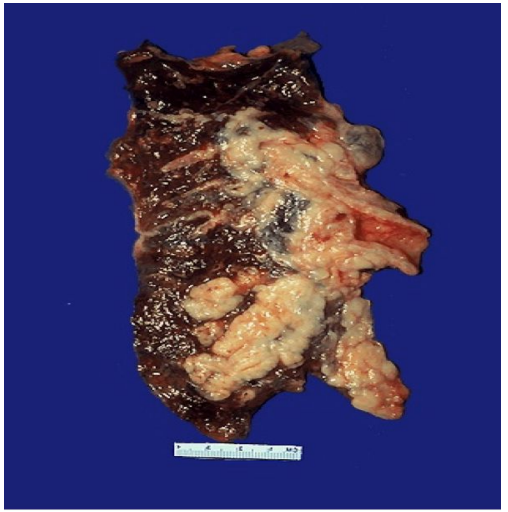
b- Inappropriate secretion of ADH.

c- Hypercalcaemia.

d- Hypertrophic pulmonary osteodystrophy.

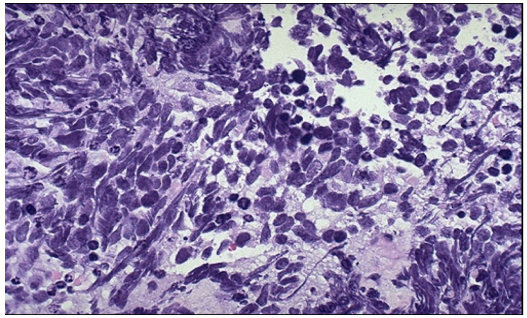
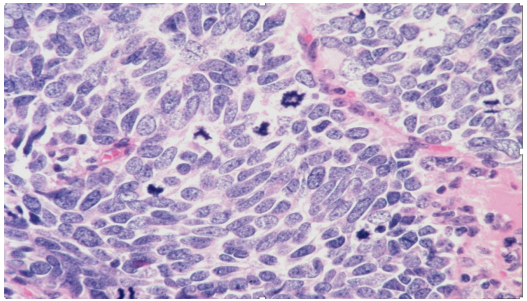
e- Coagulation abnormalities.

Small Cell Carcinoma of the Lung "Oat cell" – Gross

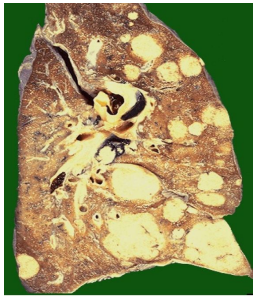
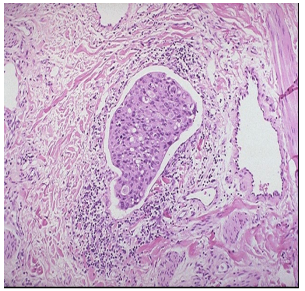
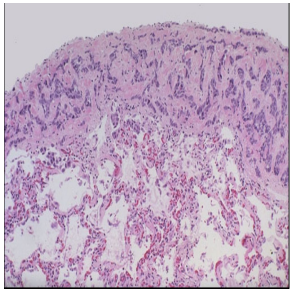


Arising centrally in this lung and spreading extensively.
The cut surface of this tumor has a soft, lobulated, white to tan appearance.
The tumor seen here has caused obstruction of the main bronchus to left lung so that the distal lung is collapsed

SMALL CELL CARCINOMA

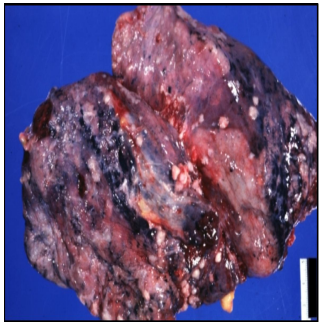
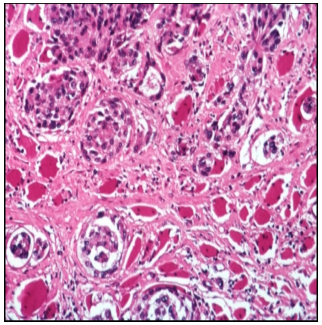
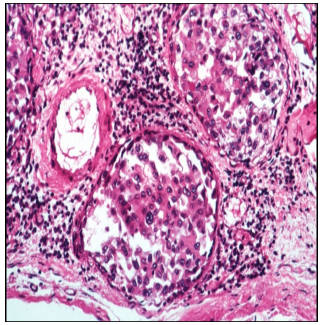
Small Cell Carcinoma of the Lung "Oat cell" – HPF	*Small Cell Carcinoma of the Lung "Oat cell" – LPF*	*Small Cell Carcinoma of the Lung "Oat cell" – Gross*
		
- Increased mitosis - Crushing cells - Hyperchromatic cells -small round blue cells	- Small round, oval and spindle –shaped tumour cells. - Granular nuclear chromatin (salt and pepper pattern) - With prominent nuclear molding - High mitotic count. - Focal necrosis.	Small cell carcinoma which is Pale tumour tissue spreading along the bronchi Metastatic tumour involving hilar lymph nodes.

Metastatic Tumors of lungs

Gross	*X-ray*	*Gross*	*CT scan*	LPF	HPF
					
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.	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	A nest of metastatic infiltrating ductal carcinoma from [breast] is seen in a dilated lymphatic channel in the lung. Carcinomas often metastasize via lymphatics.	A focus of metastatic carcinoma from breast is 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

- **LUNG is the MOST COMMON site for all metastatic tumors, regardless of the site of origin and is sadly very dangerous**
- **It is the site of FIRST CHOICE for metastatic sarcomas for purely anatomic reasons**

Mesothelioma of the lung

Mesothelioma of the Lung – Gross	*Mesothelioma of the Lung – Gross*	*Mesothelioma of the Lung – MPF*	*mesothelioma of the Lung – HPF*
			
Large brown irregular mass in the visceral pleura.	RESPIRATORY: Pleura: Mesothelioma: Gross natural color external view of lung with nodules of tumor in pleura	Mesotheliomas have either spindle cells or plump rounded cells forming gland-like configurations, They are very difficult to diagnose cytologically.	Mesothelioma: Micro epithelial pattern spindle cells or plump rounded cells forming gland-like configurations - Spindle cells - Epithelioid cells - Glandular cells - Mostly malignant cell

- note:

4 cases, Images might be gross or x-ray imag + one histopathological picture

This work was done by:

- Munerah alOmari
- Wadha alOtaibi
- Noura alKharraz
- Monira alSalouli
- Wael alOud