Common thoracic diseases

Objectives:

- Bronchogenic carcinoma
- Assessment for pulmonary resection.
- Mesothelioma
- Mediastinum
- Pneumothorax
- Emphysema

(Management is not required)

Resources:

- Davidson's.
- Slides
- Surgical recall.
- Raslan's notes.

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[Color index | Important | Notes | Extra]
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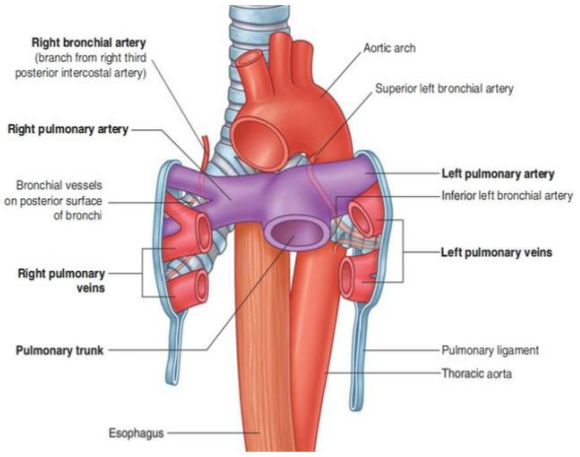
Once you stop learning
you start dying.

Basic review:

ANATOMY of the Lung:



Lobes and fissures:

- RIGHT LUNG: divided into 3 lobes by the oblique and horizontal fissures
- LEFT LUNG: divided into two lobes by the oblique fissure

Blood supply:

- Lungs don't receive any vascular supply from the pulmonary vessels (pulmonary artery or vein)
- Lungs have a dual blood supply, it receives blood via the Bronchial arteries from the Aorta and the Intercostal arteries, supplying oxygenated blood to bronchi, lung tissue & visceral pleura.
    - ***Bronchopulmonary segments:*** each of the tertiary bronchi serves a specific bronchopulmonary segment, each segment has Its own artery and is therefore; these are the anatomical, functional, and surgical units of the lungs, you can remove one w/o affecting the others.

Airways:

- Trachea, primary bronchi, secondary bronchi, tertiary bronchi out to 25 generations of progressive smaller branches.
    - All comprised of hyaline cartilage

- **Trachea:**
    - Begins where larynx ends (about C6), and bifurcates at (T4)[1].
    - 10 cm long, half in neck, half in mediastinum superior & behind the manubrium

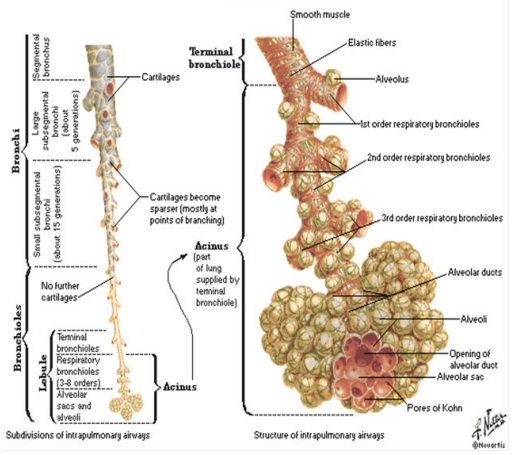
  20 U-shaped rings of hyaline cartilage, keeps lumen intact but not as brittle as bone
- Posteriorly smooth muscle because it's in contact with esophagus

  Tracheoesophageal fistula due to pressure necrosis (emergency)
    - *Causes:*
        - Prolonged intubation (balloon inflation)
        - Pressure of NasoGastric Tube (NGT) and cervical vertebra

  Treatment : tracheotomy

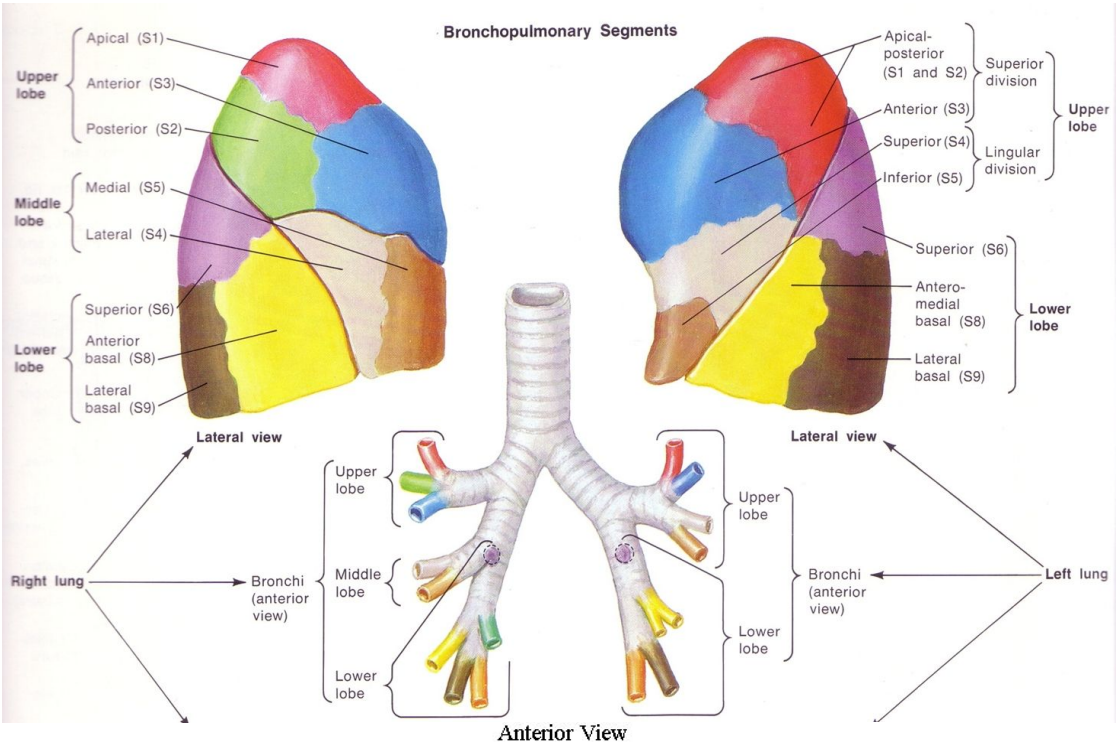
- Lined with epithelium and cilia, which work to keep foreign bodies/irritants away from lungs
    - immotile ciliary syndrome or ***Kartagener syndrome*** (in children) and Mucoviscidosis ***"cystic fibrosis" they have defect in the cilia***

- **Bronchioles:**
    - First level of airway surrounded by smooth muscle; therefore can change diameter as in bronco-constriction and bronco-dilation
        - Right primary bronchus is shorter, wider, and more vertical than the left primary bronchus. Therefore when foreign bodies as they get aspirated, they often lodge the the right main bronchus. (MCQ)
    - Terminal bronchioles
    - Respiratory bronchioles 3-8 orders
    - **Alveoli.**

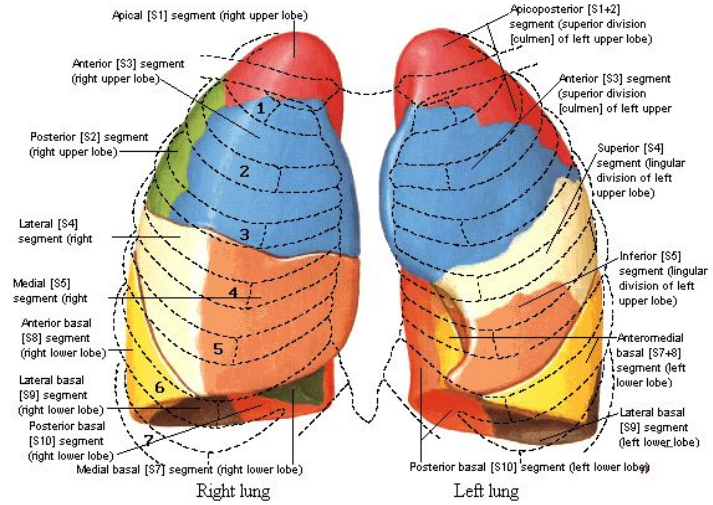


[1] Remember: common carotids bifurcates at **C4**, trachea bifurcates at **T4** and abdominal aorta bifurcates at **L4.**

Bronchopulmonary Segments	
RIGHT	**LEFT**
Upper lobe	**Upper lobe**
Apical (S1), Posterior (S2), Anterior (S3)	Apico-posterior (S1+S2), Anterior (S3)
Middle Lobe	**Lingular division of upper lobe**
Lateral (S4), Medial (S5)	Superior lingular (S4), inferior lingular (S5)
Lower Lobe	**Lower Lobe**
Superior (S6), Medial (S7), Anterior (S8), Lateral (S9) and Posterior (S10) basal	Superior (S6), Anterior-medial basal (S7+8) (no medial segment because of the heart) , Lateral basal (S9) and Posterior basal (S10)
Total of 10 segments	**Total of 8 segments**



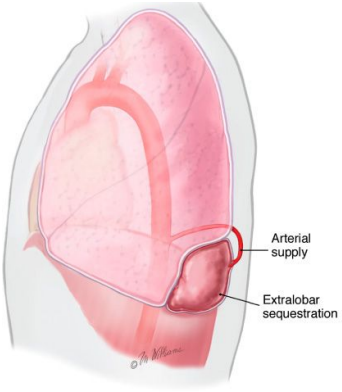
Anterior View



LUNG DISEASES

Congenital:

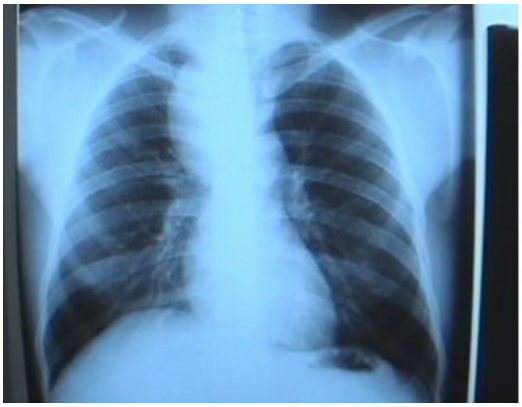
- **Agenesis:** Absence of the lungs
- **Hypoplasia:** Incomplete development of the lungs
- **Cystic adenomatoid malformation** leads to infections.
    - Abnormal embryogenesis. Usually an entire lobe of lung is replaced by non-functioning cystic area.
- **Pulmonary sequestration** also called Accessory lung**:**
    - It consists of a nonfunctional mass of normal lung tissue that lacks normal communication with the airways, and often receives its own arterial blood supply from the systemic circulation (esp, thoracic aorta: above, below, or directly on the diaphragm) surgeon should identify the blood supply in case of resection.
        - Located in the left lower lobe most of the time
        - Caused by repetitive infection

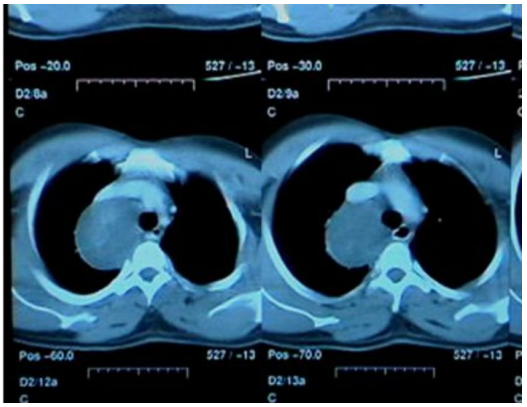


- **Lobar emphysema**[2]
    - **characterized** by progressive **loss of interalveolar septae,** Large air spaces are formed throughout the lungs, which become grossly enlarged with severely affected areas that are neither ventilated nor perfused. This causes progressive loss of respiratory function, culminating in respiratory failure and death.
        - Recurrent infection and pneumothorax are common.
    - This is typically a **smoking-related** disease affecting patients from the **fourth or fifth decade onwards**, with a tendency towards an **upper lobar distribution**.
        - **Treatment:** Lung volume reduction surgery aims to improve lung function by excising parts of the worst-affected areas. This removes the space-occupying effect of these non-functional areas and allows the overall lung volume to return towards normal,
        - The procedure may be performed either as a video thoracoscopic operation or through a median sternotomy.
        - Case selection is important as the operative mortality is high (6–12%), reflecting the generally very poor condition of these patients.
    - In less than 10% of cases, however, it can also result from a deficiency of **α1-antitrypsin**, affecting younger patients from the **third decade** and having a **lower lobar distribution**.
        - **Medical treatment** with bronchodilators and steroids may improve symptoms but transplantation is the only definitive cure. This is only an option for younger patients, and even in these it should be postponed for as long as possible.

- **Bronchogenic cyst:** (benign cysts with malignant position[3])
    - **Location:**
        - Paratracheal (right) most common
        - Subcarinal[4]
    - **Clinical features:**
        - They consist of semisolid cartilaginous material that secretes cheesy like material that is prone to infections, may also result in hemorrhage and compression of the surrounding structures (I.e. trachea, esophagus) presents with: SOB, stridor, cough and dysphagia
        - Symptoms: very severe dyspnea and may differ with position, could be asymptomatic.
    - **Different from Enteric duplication cysts by the presence of cartilage**
    - **Work up:**
        - Full history and examination

[2] Now called congenital lobar overinflation (CLO) or congenital alveolar overdistension
[3] " it has a توضّع effect, like meningeomia its benign but because of its mass effect it causes severe symptoms"
[4] Below the bifurcation of trachea



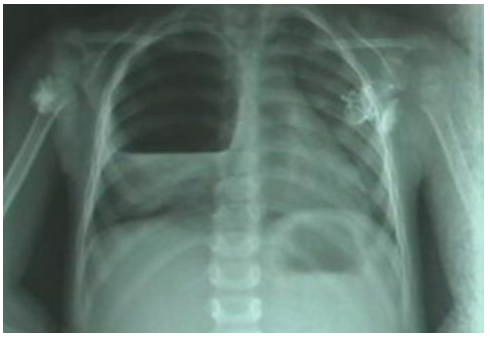


- Investigation: CT or CXR which shows over-inflation of the affected lobe (radiolucency).

- **Treatment:** Excise the cysts to: Establish diagnosis, prevent infection or bleeding, prevents transformation to malignant adenocarcinoma (rare) **mainly, you remove it to relieve the compression on the structure**

Infectious:

- **1/Lung Abscess:** (inside lungs' parenchyma)
  - **Causes:**
    - As a complication of pneumonia, bronchial obstruction (by tumor or inhaled foreign bodies esp. In children) bacteremia, and **septic emboli**. **Could be due:**
      - Renal failure
      - Showring emboli
      - Immunocompromised (Diabetic, HIV, etc)
      - Leukopenic
      - Superinfection
  - **Clinical features:**
    - High fever & chills
    - Severe chest pain
    - Cough and hemoptysis
    - Copious production of foul smelling sputum (pus like)
    - Leukocytosis
  - **Work up:**
    - Full history and examination
    - Investigation: CXR (thick cavitation+air fluid level), CT (to differentiate b/w abscess and empyema)



Air-fluid level appearance in the right upper zone (two-dimensional)

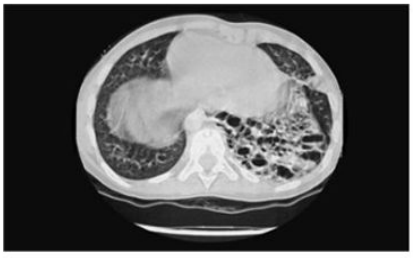
  - **Two rules to establish a diagnosis**
    - Exact anatomical localization of the lesion (by full work up)
    - History, age, gender and habits of the patient would narrow your search for the Dx

- **Treatment:**
- *It's a benign condition so you aim for a conservative approach*
  - Drainage
    - Internal: bronchoscope
    - External: Percutaneous Tube Drainage
  - Antibiotics
  - **Pulmonary resection**
    - **Indications of resection:**
      - Failure of medical RX
      - Giant abscess (>6cm)
      - Hemorrhage
      - Inability to rule out carcinoma by H&Px (eg, old smoker pt, unexplained weight loss,SOB)
      - Rupture with resulting empyema
    - **Types of resection:**
      - Lobectomy (main) or Bi-lobectomy
      - Pneumonectomy

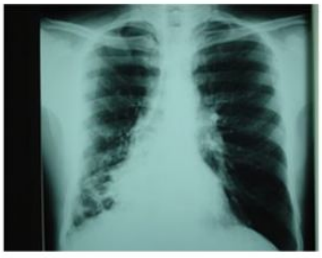
2/Bronchiectasis:

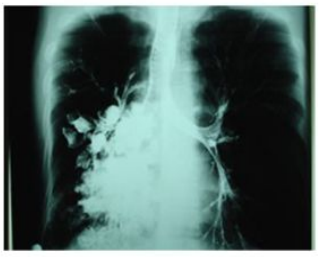
- **Definition:** Bronchial dilatation, usually affecting the lower lobes
- **Causes:**
  - **Congenital:** (bilateral)
    - Mucoviscidosis (Cystic fibrosis)
    - Immotile ciliary syndrome (Kartagener syndrome)
  - **Infections:** (rare now due to the development of vaccination)
    - Childhood infection
    - Repeated pulmonary infection
  - **Obstruction:**
    - Inhaled foreign body (GP must refer the pt to the thoracic surgeon in this case)
    - Tumors
- **Clinical features:**
  - Productive cough (in the morning every day due to collection of secretion during the sleep)
  - Dyspnea
  - Haemoptysis (50%) (usually self-limiting)
  - **Clubbing**
- **Types:**
  - Cystic
  - Cylindrical
- **Investigation:**
  - Bronchogram invasive
  - CT High-resolution > diagnostic study of choice.
  - Bronchoscopy not commonly used nowadays
  - CXR (cystic formation) > initial test.

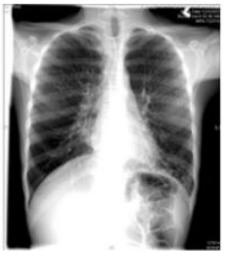
CT scan

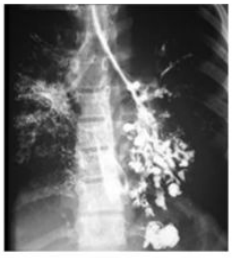


Bronchogram



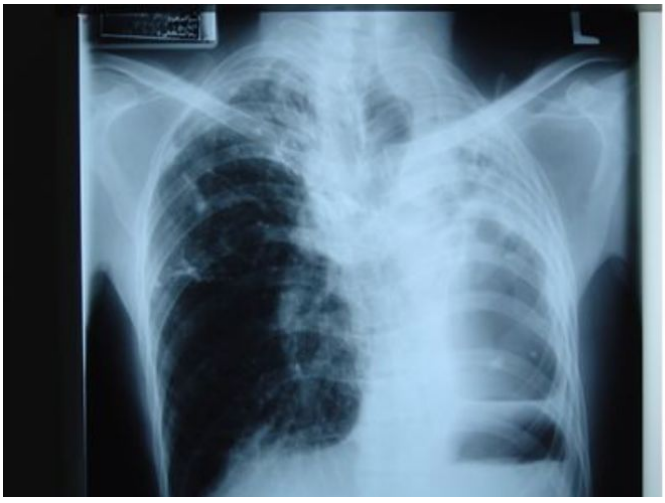


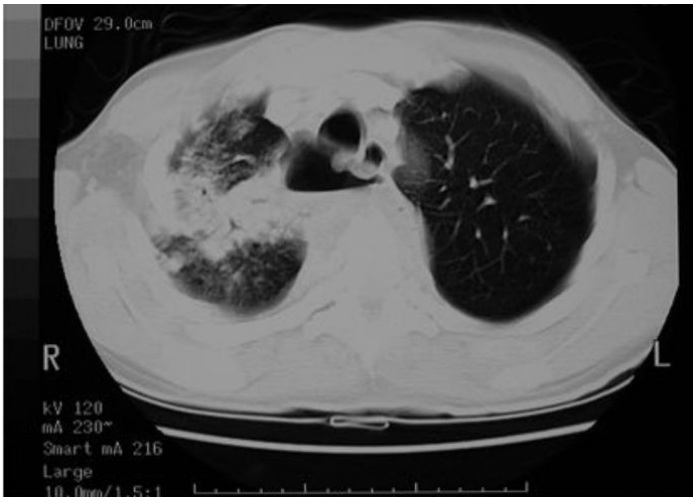




- **Treatment:**
  - **Medical**:(Cylindrical? Yes; Perfused? Yes > Medical)
    - Resolves most cases (Antibiotics, bronchodilator, physiotherapy)
  - **Surgical indications:**
    - Failure of medical Rx
    - Unilateral localized disease
    - If bilateral, lung transplantation is necessary
    - cystic dilation not cylindrical
    - Non-perfused (by V/Q scan)
      - Most cystic types are non prefuse, while most cylindrical are prefused

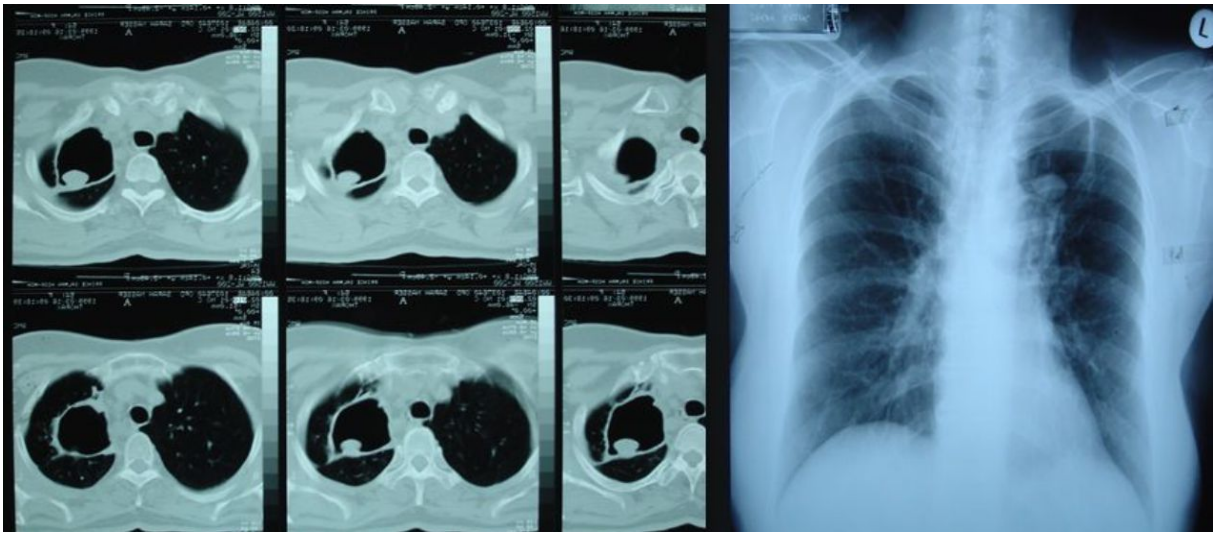
- **3/Tuberculosis:**
  - 30,000 new cases occur annually in U.S.A
  - **Causes:**
    - **Pulmonary:**
      - TB empyema (not pyogenic)
    - **Extra-pulmonary:**
      - TB lymphadenitis
      - Pott's disease (in vertebra)
      - Tuberculoma (in meningitis)
  - **Investigation:**
    - **CXR (more in apex)**
    - AFB (acid-fast bacillus) sputum culture (if positive confirms TB)
    - Tuberculin skin test (latent TB)
    - Bronchoscopy
    - **Chest CT scan (infiltration, abscess formation, lymph nodes)**
    - Mediastinoscopy (caseating granuloma)





  - **Treatment:**
    - Medical : effective in most cases (isoniazid (INH), rifampin, pyrazinamide, and ethambutol)
    - Surgical: ***Indications:***
      - Failure of medical Rx **(Multidrug resistant)**
      - Destroyed lobe or lung
      - Pulmonary haemorrhage **(emergency)**
      - **Supperinfection** (inf. Occurring on top of earlier one)
      - Persistent open cavity with + ve sputum
      - Persistent bronchopleural fistula (persistent pneumothorax)
      - Empyema

- **4/Aspergillosis:** Affects mainly immunocompromised pt > upper lobe
  - **Causes:**
    - Aspergillus fumigatus, Aspergillus niger
  - **Mode of transmission:**
    - Inhalation of airborne conidia
    - Contaminated water (while showering)
    - Nosocomial infections
    - Esp. in immunocompromised patients (HIV, TB,hepatitis, etc…)
  - **Forms:**
    - Allergic
    - Saprophytic (aspergilloma/mycetoma)
      - Characterized by Asp infection with no tissue invasion, usually with underlying TB and/or sarcoidosis
    - **Invasive**
  - **Clinical findings:**
    - Aspergilloma/mycetoma cavity ball-like in CT
    - Comes with a warning sign of **hemoptysis** >very high mortality and morbidity
    - Chronic productive cough
  - **Investigations:**
    - Skin test
    - Sputum fungal culture
    - Biopsy (Invasive)
    - CXR (radiolucent) or CT (if there are air crescent sign + aspergilloma> diagnosis will be TB)

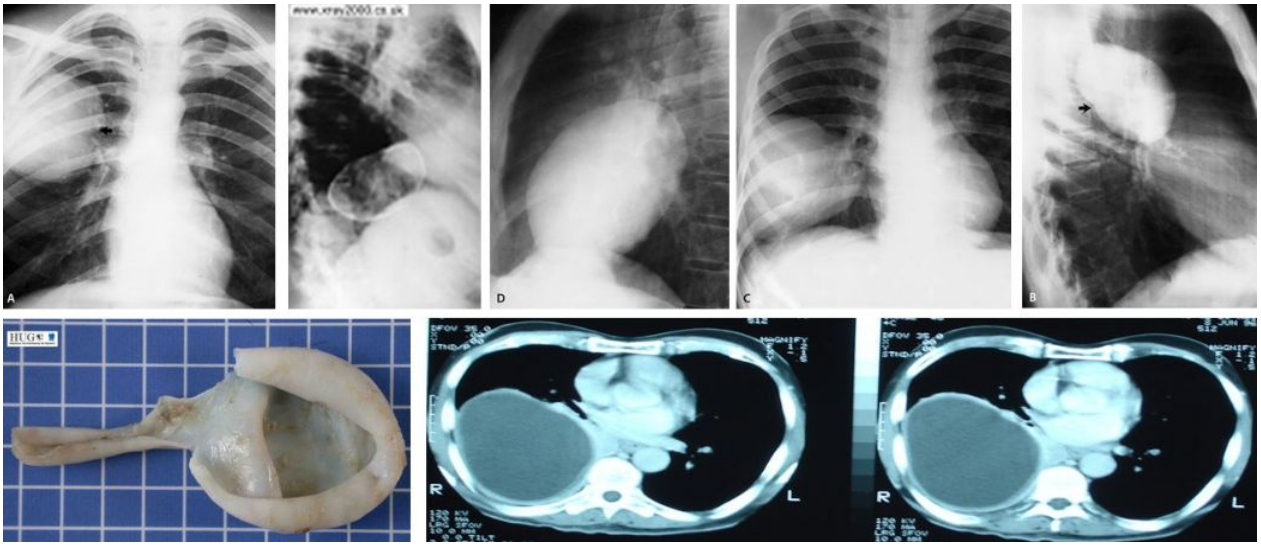


Cavity and fungal ball (mycetoma) composed of aspergilloma complex, movable when you change the pt position.

  - **Treatment:**
    - Medical IV antifungal (amphotericin B)
    - Surgical: ***Indications:***
      - A significant aspergilloma
      - Haemoptysis
        - ***Type of resection***
          - Lobectomy mainly (surgical operation where a single lobe is removed)
          - Segmentectomy (surgical removal of a segment of a lung lobe).
          - Pneumonectomy (If associated with TB destroying the whole lung)

- **5/Hydatid cyst**
  - Parasitic infestation by Echinococcus granulosus (tapeworm)
  - Asymptomatic or symptomatic (compression by cyst will cause dyspnea)
  - The liver is the most common organ involved, followed by the lungs.
  - **Cause:**
    - Echinococcus granulosus
  - **Transmission:**
    - Definitive host Dog (feces) to intermediate host sheep (grass) to poor human (those who eat raw liver)
  - **Hydatid cyst Layers:**
    - The outer pericyst composed of host cells that are formed as a reaction to the parasite (false layer)
    - The middle Laminated membrane (external layer of cyst)
    - The inner Germinal layer (that gives eggs)
  - **Investigation:**
    - Skin test (Casoni's reaction)
    - CXR
    - CT scan (a chronic cyst appears calcified on CT)
    - High echinococcus titers and other serologic tests
    - Routine blood work (nonspecific)
      - Any pt with hydatid cysts anywhere must be routinely screened for cysts in the liver

One of the Serious complication of hydatid cyst is the risk of anaphylactic shock, following rupture of the cyst
The cyst contain water and can press on the organ على حسب المكان فاذا جات بالرئه تضغط عليها فيصير المريض ما يقدر يتنفس



  - *Large opacity in:*
    - upper right zone and right upper lobe (lateral view)
    - Lower right zone and right lower lobe (lateral view)
    - capsules are filled with embryo, you fill it with hypertonic saline to kill the embryo.
  - **Treatment:**
    - **Aspiration by needle is contraindicated**.
    - Surgical : Excise the cyst (surgeon must be careful when doing this procedure, b/c if it's ruptured it will spill millions of scolex into surrounding cavities which leads to the formation of new cysts! That's why we use hypertonic saline before excision. but if there are multiple cysts in multiple organs > chemo is indicated.

Recall:

What is it Hemoptysis? Bleeding into the bronchial tree
What are the causes?
1. Bronchitis (50%)
2. Tumor mass (20%)
3. TB (8%)
4. Other: bronchiectasis, pulmonary catheters, trauma

What is the usual cause of death?
Asphyxia (choking due to a lack of oxygen not hemorrhagic shock)
Which arterial system is most often the source of massive hemoptysis?
Bronchial (not pulmonary) arteries
What are the signs/symptoms of lung abscess?
Fever, productive cough, sepsis, fatigue
What are the associated diagnostic studies?
CXR: air-fluid level
CT scan to define position and to differentiate from an empyema
Bronchoscopy (looking for cancer/culture)
What is the treatment?
1. Antibiotics and bronchoscopy or culture and drainage
2. Percutaneous drainage
3. Surgical resection if nonoperative management fails or underlying cancer

Lung tumors:

- Benign
- Malignant:
  - Primary
  - Secondary

Primary lung carcinoma

➢ **Incidence:** Worldwide, lung cancer is the **most common cause of cancer death.**
➢ **Risk factor**: Smoking (most important).
others: radiation, industrial chemicals, diet, genetic factors, radon. The combination of asbestos exposure and cigarette smoking produces a many-fold increase in risk.
➢ **Pathology:**
With the exception of alveolar cell carcinomas, which arise from cells lining the alveoli, Primary lung cancers arise within the bronchial epithelium and are hence termed bronchogenic carcinoma.

➢ **Classification:** 1- Non-Small Cell Carcinoma. 2- Small Cell Carcinoma.
- (Different in the management).

NSCLC	SCLC
• Epithelial origin • 75-80% 1. Adenocarcinoma (40%) peripherally located 2. Squamous cell carcinoma: (30%) centrally located. 3. Large cell carcinoma.(9%) peripherally located.	• Neuroendocrine origin • 20-25% • centrally located • Poor prognosis • patient usually presents with systemic disease.

➢ **Management:**
- Depends on:
  - Stage
  - Cell type (small cell or non small cell)
  - Patient physical fitness (no comorbidity no MI)

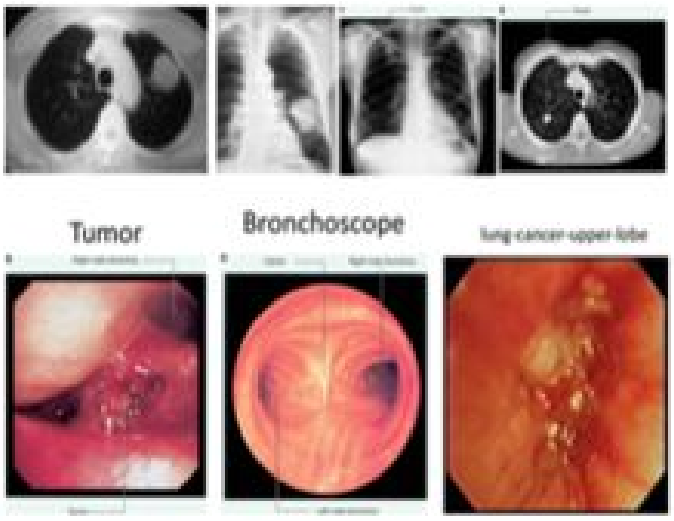
• Treatment of NSCLC: - Surgical (always preferred in early stage and if limited to the lung) - Neoadjuvant chemotherapy (intermediate stage) > means before surgery - Radiotherapy \ chemotherapy (late stage after operation)	• Treatment of SCLC: ○ **Non surgical** (because tumor is usually discovered late when metastasis has already happened) ○ (**chemotherapy** only +\- radiotherapy).

➢ **Clinical features:** according to the tumor location (peripheral or central). Peripheral lesions may grow to 8 cm or more before causing local symptoms such as chest wall pain. Central lesions tend to occlude the airways, causing varying degrees of pulmonary collapse and consolidation
- Asymptomatic: accidentally on CXR
- Symptomatic:
  - ➔ Lung: (mostly cough, hemoptysis..)
  - ➔ General manifestations: (loss of appetite, fever, weight loss, fatigue)
  - ➔ Surrounding structures (by compression)
    - ◆ Recurrent Laryngeal nerve (hoarseness)
    - ◆ Oesophagus (dysphagia)
    - ◆ C8, T1 nerve (brachial plexus pain like pancoast tumor “superior sulcus tumor”)
    - ◆ Sympathetic chain (horner’s syndrome): Characterized by the classic triad of miosis partial ptosis and loss of hemifacial sweating(i.e., anhidrosis).
    - ◆ Pleura (severe pleuritic chest pain)
    - ◆ SVC (SVC obstruction syndrome)
  - ➔ Distal (paraneoplastic syndrome)
    - ◆ PTH (hypercalcemia)
    - ◆ ADH (hyponatremia by increasing plasma vol.)
    - ◆ ACTH (cushing’s syndrome)
    - ◆ Hypertrophic pulmonary osteoarthropathy (HPOA) (pain and swelling of joints that doesn't respond to medications and improves once tumor is resected).

➢ **Investigations:**
- CXR
- Bronchoscopy
- Transthoracic needle aspiration
- CT Scan
- MRI (very poor modality for the purpose of staging , we only order MRI if we suspected an invasion of the soft tissue major structure of apex, like pancoast tumor if there is invasion of vertebra, spinal canal and root brachial plexus)

➢ **Staging:** very important because it tell you about the appropriate management (surgical or not) , early stage or not.
➢ (Dr mentioned that you do not have to memorize it but the most common is stage IA)
➢ N0: no lymph, N1: in the hilum, N2: outside the lung towards mediastinum , N3: supraclavicular “advance”.

NEW INTERNATIONAL REVISED STAGE GROUPING - Tissue Node Metastases	
Stage 0	TIS (carcinoma in situ)
Stage IA	T1, NO (no node), MO (no distant metastasis)
Stage IB	T2, NO, MO
Stage IIA	T1, N1(hilar), MO
Stage IIB	T2, N1, MO
	T3, NO, MO
Stage IIIA	T1-3, N2 (mediastinal), MO
	T3, N1, MO
Stage IIIB	T4, Any N, MO
	Any T, N3 (other side or supraclavicular), MO
Stage IV	Any T, Any N, M1 (metastasis to distant organs)



Secondary lung carcinoma

- Neoplasm that have spread from a primary lesion in another organ.
- secondary lung tumors appear as multiple solitary lung nodules (well marginated, single, mass< 3 cm, intraparenchymal opacity)

➢ **Solitary lung Nodule DDX:**
- Primary carcinoma
- Tuberculous Granuloma
- Mixed tumor
- Secondary carcinoma (metastasis)
- Miscellaneous

➢ **Hamartoma - carcinoid** (benign Vs malignant):we differentiate between them by history, examination and biopsy.
- Carcinoid is potentially malignant (semi benign). the treatment in early stage is surgical, it has two types typical and nontypical
- Age: hamartomas occur primarily in adult > 50 y\o
- Sex: males 3 times more likely than females
- X- rays (usually peripherally located)
  - Size (usually small <4 cm in diameter, rounded
  - Time: grows slowly
  - Calcification: sometimes with varying patterns

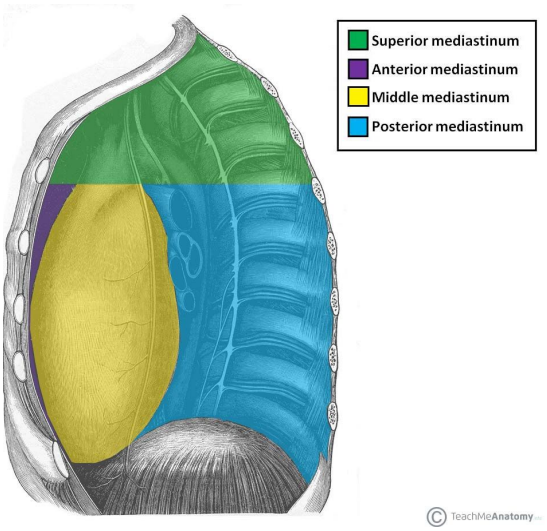
Recall

What is the #1 risk factor for Lung Cancer?
Smoking
What is Pancoast (superior sulcus) tumor?
Tumor at the apex of the lung or superior sulcus that may involve the brachial plexus, sympathetic ganglia, and vertebral bodies, leading to pain, upper extremity weakness, and Horner's syndrome
What is Horner's syndrome?
Injury to the cervical sympathetic chain; think: "**MAP**"
1. Miosis (small pupil)
2. Anhidrosis of ipsilateral face
3. Ptosis
What are the five most common sites of extrathoracic metastases?
1. Brain 2. Bone 3. Adrenals 4. Liver 5. Kidney

Mediastinum: المنصّف

Is the space in the thoracic cavity between the lungs

- ➢ **Boundaries:**
  - Superior: thoracic inlet
  - Inferior: diaphragm
  - Anterior: sternum and costal cartilages
  - Posterior: thoracic spine
  - Lateral: mediastinal pleura
- ➢ **Divisions**:
  - Traditional
  - Clinical
- ➢ **Access:**
  - Mediastinoscopy endoscope for a biopsy.
  - Mediastinotomy surgical opening called Chamberlain procedure to access the aortopulmonary lymph nodes.
- ➢ **Mediastinal mass lesions:**



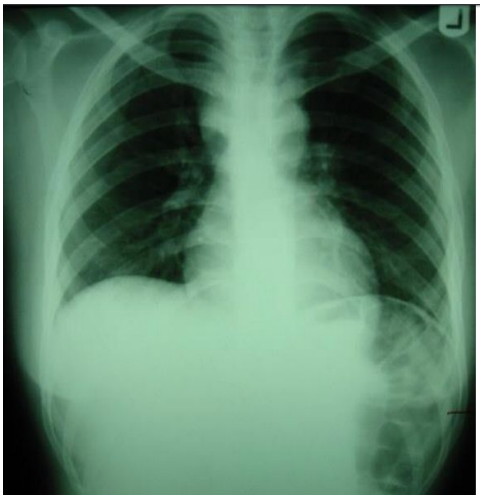
Superior Anterior mediastinum	Middle mediastinal	Posterior mediastinal
5 T's: - Teratoma - Thyroid "retrosternal goiter" - TB lymphadenitis - T cell lymphoma - Thymoma	Cyst: - pericardial cyst - bronchogenic cyst - Esophegeal cyct	Neurogenic tumor: dumbbell tumor of neurofibroma and paravertebral mass.

Recall:

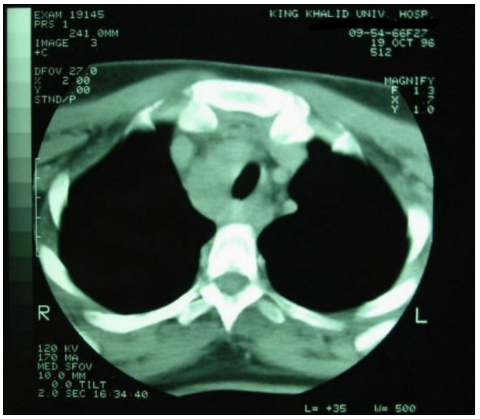
What structures lie in the following three mediastinal Compartments:
1- Anterosuperior mediastinum?
Ascending and arch aorta, great vessels, thymus, upper trachea, esophagus, lymph nodes.
2- Middle mediastinum?
Heart, lower trachea and bifurcation, lung hila, phrenic nerves, lymph nodes
3- Posterior mediastinum?
Esophagus, descending aorta, thoracic duct, vagus and intercostal nerves,sympathetic trunks, azygous and hemiazygous veins, lymph nodes
What is Superior Vena Cava Syndrome?
Obstruction of the superior vena cava, usually by extrinsic compression
What are the clinical Manifestations of SVC syndrome?
1. Blue discoloration and puffiness of the face, arms, and shoulders
2. CNS manifestations may include headache, nausea, vomiting, visual distortion, stupor, and convulsions.
3. Cough, hoarseness, and dyspnea

Thymoma

- **Incidence:**
  - The most common tumor of the anterior mediastinum. Potentially malignant (start as benign end as malignant)
  - Peak 40-90y
  - M:F(1:1)
  - If we take 100 patients with Myasthenia Gravis, 15% of them will have thymoma.
  - If we take 100 patients with thymoma, 40% of them will have Myasthenia Gravis.
- **Pathology**
  - **Classification**
    - Epithelial
    - Lymphocytic
    - Lymphoepithelial
    - Spindle cell
- **Benign OR Malignant**
- **Stages** Masaoka classification
  - I (well capsulated), II (invade capsule but not invade surrounding structure) , III (invade surrounding structures (phrenic nerve, pericardium and lung), IV (metastasis)
- **Clinical features:**
  - Asymptomatic
  - Symptomatic (MG)
    - Mass effect: SVC syndrome, dysphagia, and cough.
    - Systemic effect: associated autoimmune disorders, most commonly **myasthenia gravis** 40-50%.
- **Investigation:**
  - All cases:
    - CXR
    - CT Scan
    - BIOPSY: important
  - Selected cases:
    - Bronchoscopy
    - Esophagoscopy
    - angiogram



- **Treatment:**
  - Need surgery
  - Benign: complete excision
  - Malignant: complete excision if possible
  - Post-op radiotherapy
    - If non-resectable
    - Resection incomplete



Stage 1 & 2 definitely surgery, then according to the cell type do chemotherapy, while stage 3 & 4 NEED adjuvant chemotherapy.

Trauma

Trauma is injury is either **blunt** or **penetrating**

❖ **Road Traffic Accident (RTA).**

❖ **Fracture ribs (simple - complicated):** very common in ksa

➢ (most common blunt thoracic injuries)

❖ **Haemothorax**:

➢ Accumulation of blood in pleural cavity

- Appears as radio-opacity on CXR.
- Cause is mostly traumatic

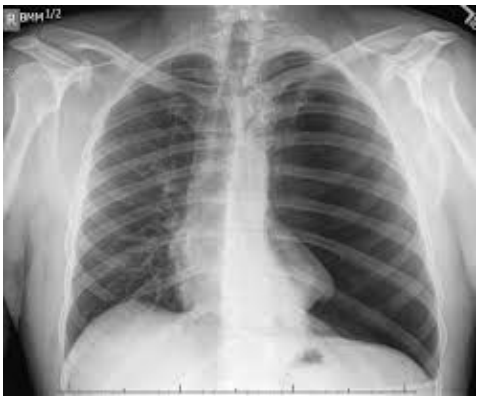
➢ **Traumatic Pneumothorax:**

- occurs when air enters the potential space between the visceral and parietal pleura through either an external chest wound or an internal air leak.
- External air entry: occurs with a traumatic chest wall defect, and the resulting open pneumothorax is often associated with a 'sucking wound', where air moves in and out of a chest wound with respiration.
- Internal air leakage: may follow oesophageal perforation or anastomotic breakdown, as air can enter the pleural cavity via the mouth.However, the most common cause of pneumothorax is leakage of air from the lung, due either to a traumatic puncture wound or to spontaneous leakage from a large (bulla) or small (< 1 cm, 'bleb') air sac on the lung surface.

- **Tension pneumothorax:**
  - The pulmonary leak point may have a flap valve mechanism that allows air out of but not back into the lung, causing a rapid buildup of pressure within the pleural cavity,This can be fatal, as the high intrapleural pressure completely flattens the ipsilateral lung while deviating the mediastinum to the opposite side, impeding venous return.

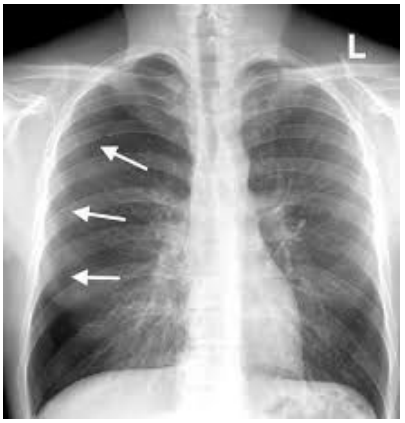
The DX of tension pneumothorax is clinical base not radiological, by assigning respiration and hemodynamic state (it causes obstruction of IVC >> SVC >> aorta >> low cardiac output

  - Causes:
    - Mechanical ventilation with associated barotrauma.
    - CPR:
    - Trauma
  - Clinical features:
    - Hypotension and tachycardia
    - Distended neck veins
    - Shift of trachea away
    - Decreased breath sounds on affected side
    - Hyperresonance
  - Diagnosis: clinically (no time for CXR!)
  - Treatment: (Medical emergency!)
    - If tension isn't relieved patient is likely to die from hemodynamic compromise.
    - Immediately decompress the pleural space via large-bore needle or chest tube.



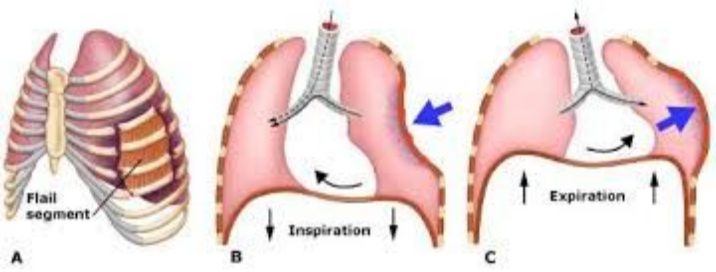
- **Spontaneous pneumothorax:**
  - is described as primary or secondary.
    - Primary pneumothorax typically occurs in young (15–35 years) individuals with essentially normal lungs apart from a few apical bullae or blebs.
    - Secondary pneumothorax develops in elderly patients (55–75 years) with a background of emphysema and chronic obstructive pulmonary disease. It is caused by rupture of a bulla.

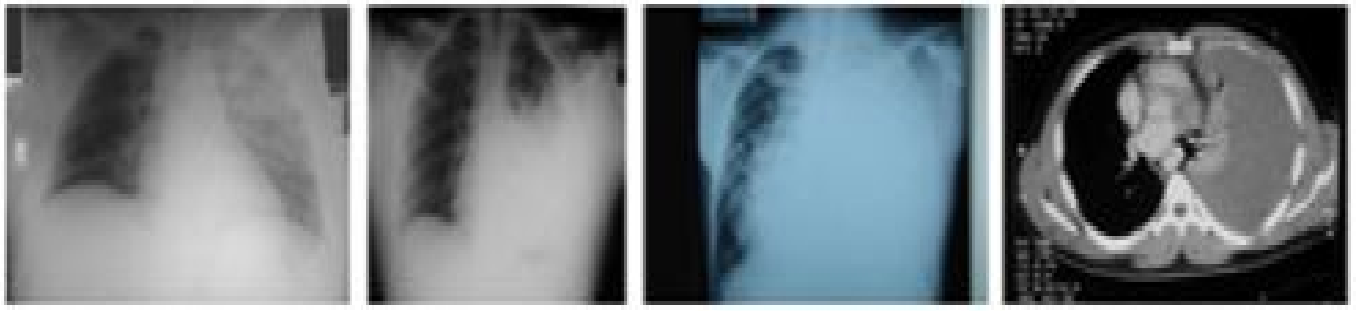
- Clinical features:
    - Sudden ipsilateral chest pain
    - Dyspnea and cough
    - Decreased breath sounds over affected side
    - Hyperresonance over the chest
    - Decreased tactile fremitus
    - Mediastinal shift towards side of pneumothorax
- Diagnosis: CXR
- Treatment:
    - Primary spontaneous pneumothorax:
        - If small and patient is asymptomatic:
            - Observation (should resolve spontaneously in 10 days) reassess with CXR.
            - Small chest tube may benefit some patients.
        - If larger and/or patient is symptomatic:
            - Administration of supplemental oxygen
            - Chest tube insertion to allow air to be released.
    - Secondary spontaneous pneumothorax:
    - Chest tube drainage.



- **Flail chest:**

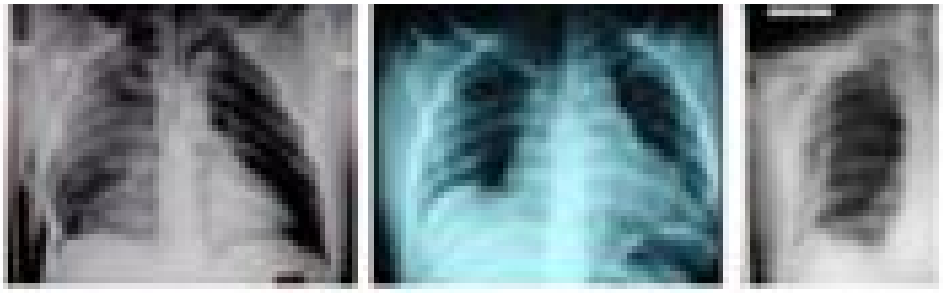
Both ends Fractures of several adjacent ribs (two or more) producing a free unstable segment of chest wall that results in paradoxical movement (you only see it when self ventilated not on machine) should be on. There is usually associated lung contusion[5] (usually the lung is affected too due the trauma).





- **Lung contusion and ARDS:**

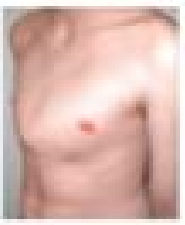
no surgery needed unless massive bleeding.



[5] تكدم الرئة

Chest wall

- Deformities:
  - Pectus excavatum funnel chest (caved-in)
  - Pectus carinatum “protrusion of sternum” (pigeon chest).
  - They are Congenital defect that are usually associated with marfan syndrome and congenital heart problems (VSD, ASD)
  - When mild it’s usually asymptomatic, but when severe it may push the heart and other structure.



- Infection: (e.g. abscess, empyema, costochondritis..)
- Chest wall tumor mostly benign
- Thoracic outlet syndrome.
- Treatment: surgery (open surgery or nuss[6] procedure)

Pleura

- Spontaneous pneumothorax
- Pleural effusion
- Empyema collection of pus in the pleural cavity.
  - Management depends on stages: according to the weeks
    - Week 1 (stage 1): chest tube, aspiration, drainage of pus.
    - Week 2 (stage 2): chest tube, thoracoscopy ”تنظيف”
    - Week 3 (stage 3): fibrosis formation, thoracotomy.
- ***Mesothelioma:*** rare cancer***: “in objectives”***
  - This causes progressive thickening of the parietal and visceral pleura, with subsequent encasement of the lung and the formation of a large pleural, causing pain and SOB,It is strongly related to a history of asbestos. The patient commonly presents with shortness of breath, owing to a large pleural effusion. In many cases, the diagnosis is made by a percutaneous pleural biopsy but, if this is not successful, thoracoscopy or open pleural biopsy is useful.

Air-way:

- Congenital tracheal anomalies
- Tracheal stenosis
- trecheostomy

Surgery:

- Thoracotomy
- Thoracoscopy
- Sternotomy
- Analgesia

[6] The Nuss procedure is a minimally-invasive procedure for treating pectus excavatum.