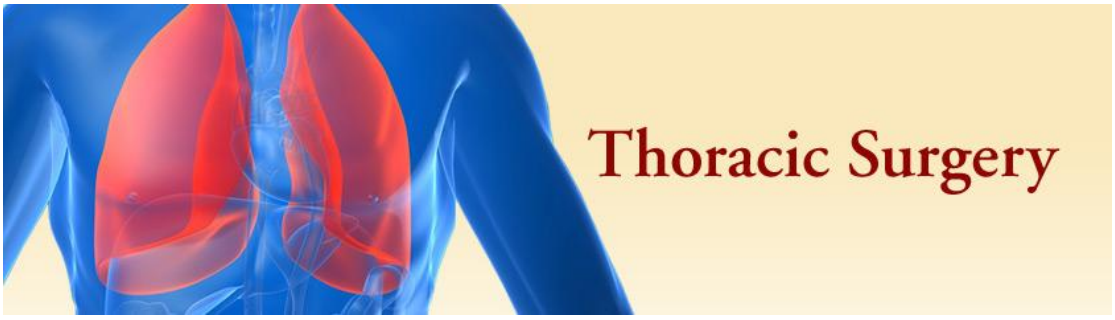

Presentation &Management of Common Thoracic Diseases

Dr. Waseem HAJJAR

Notes, imp

Surgery TEAM

Badra'a Al Muharib

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Nouf Alzendi

Thanks to : Nourhan Alshamma'

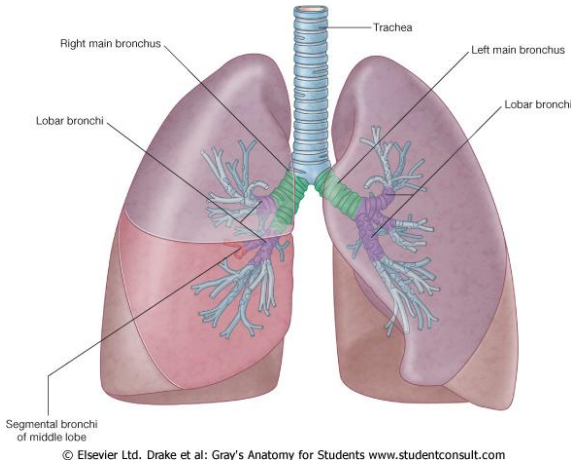
No " MCQ" on anatomy part :)

The Lung:

- ✓ Embryology
  - Bronchial system
  - Alveolar system
- ✓ Anatomy
  - Lobes
  - Fissures
  - Segments
  - Blood supply

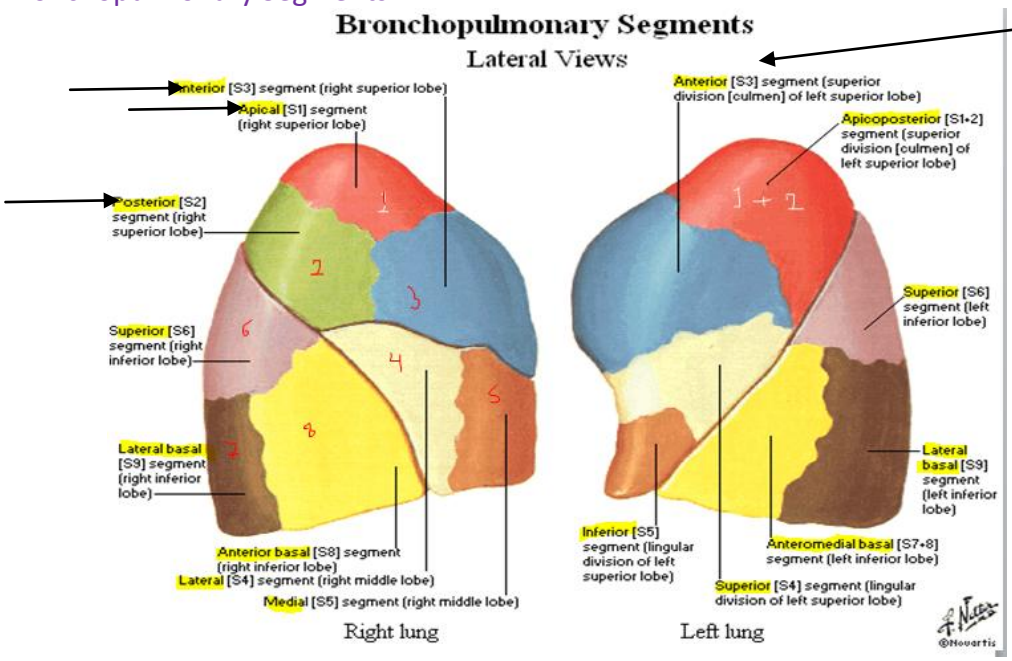
transverse fissure is a fissure separating the superior lobe from the middle lobe.
The left lung has no middle lobe, so there is no horizontal fissure on that lung
oblique fissure:" big one " -In the right lung, it separates the inferior from the superior and middle lobe; in the left lung it separates the inferior and superior lobe

Airways



As we know:
R- lung: 3lobes "upper, middle, lower"
L-lung: 2lobes "upper, lower"

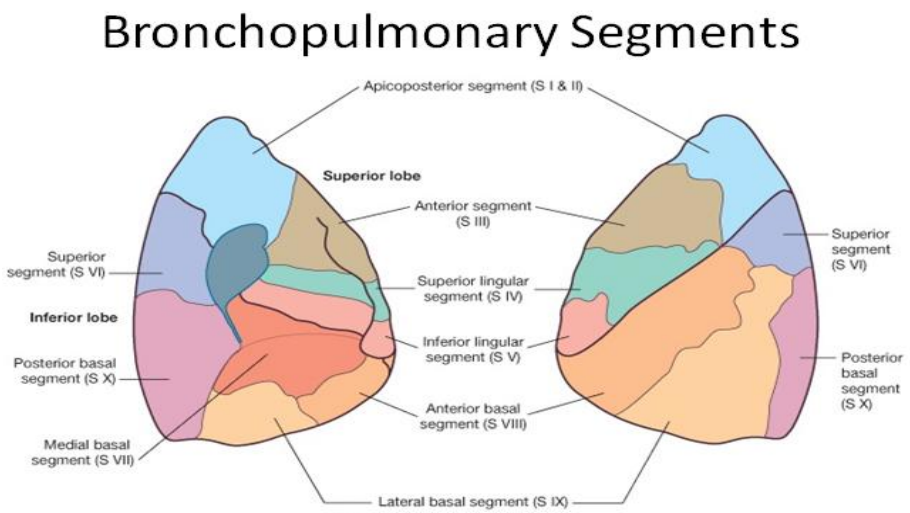
Bronchopulmonary Segments



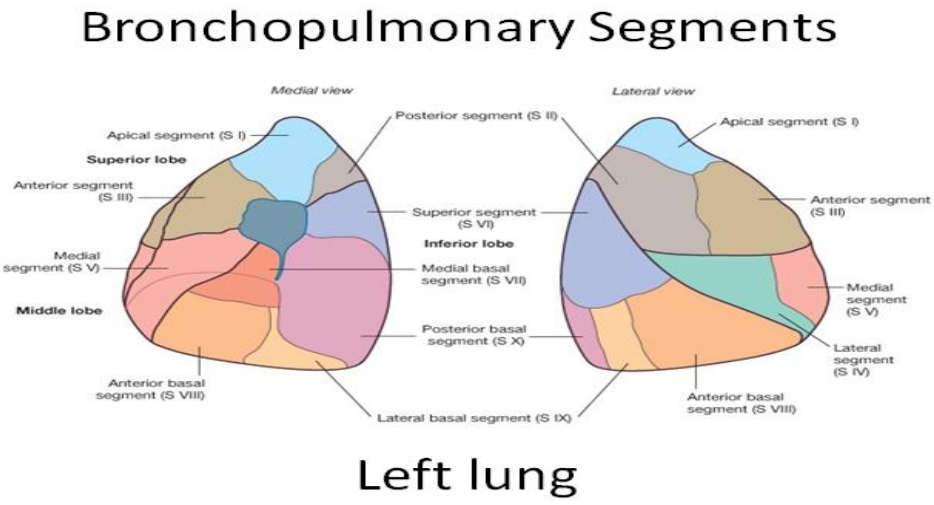
No middlel segment in the L lung to make a space for the "L- ventricle" heart!

-There is an interaction b\w lobes not as each lobe is separated!

- We should know which lobe and segment when we do examination



Right lung



Left lung

Bronchopulmonary Segments

Right lung

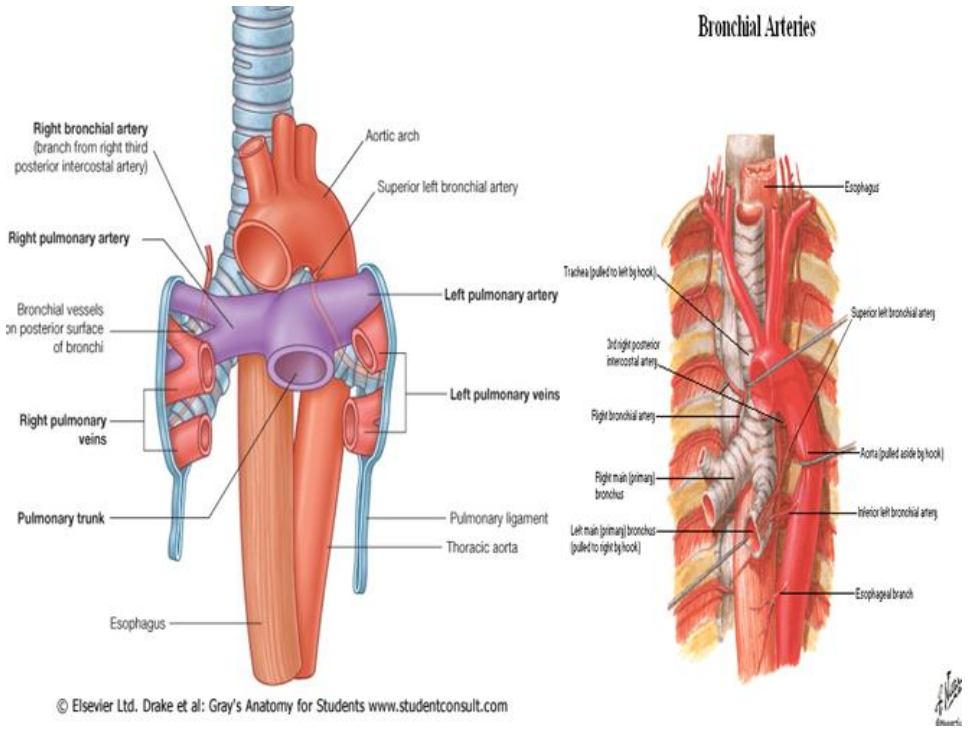
- superior lobe : Apico-posterior *(merger of "apical" and "posterior")* , Anterior , Inferior lingular , Superior lingular
- inferior lobe : superior , anteromedial-basal *(merger of "anterior basal" and "medial basal")* , lateral-basal , posterior-basal

Left Lung

- superior lobe : apical , posterior , anterior
- middle lobe : lateral , medial
- inferior lobe : superior, medial-basal , anterior-basal , lateral-basal , posterior-basal
- ***As you can see the difference, 2 lingular on the right instead of the middle lobe, and 2 of the segments merged together***

Blood Supply:

- Lungs do not receive any vascular supply from the pulmonary vessels (pulmonary aa. or veins) – that for oxygenation
- Blood delivered to lung tissue via the bronchiole arteries
- Vessels evolve **from aortic arch**
- Travel along the bronchial tree



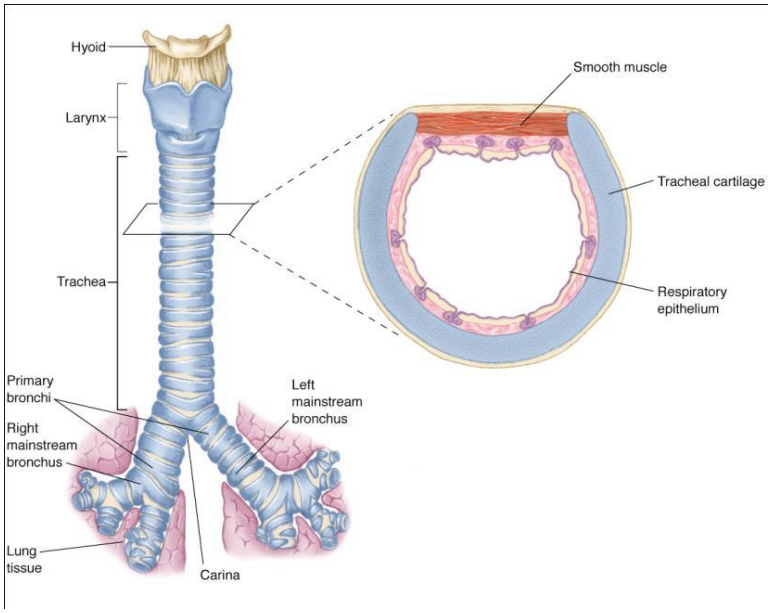
Airways:

- Trachea, primary bronchi, secondary bronchi, tertiary bronchi out to 25 generations
- All comprised of hyaline cartilage
- Trachea:
  - Begins where larynx ends (about C6) and end in Carina.
  - 10 cm long, half in neck, half in mediastinum
  - 20 U-Shaped rings of hyaline cartilage – keeps lumen intact but not as brittle as bone
  - Lined with epithelium and **cilia** which work to keep foreign bodies/irritants away from lungs

The more distal the branches are, the less hyaline cartilage they have, and more smooth muscle they have.

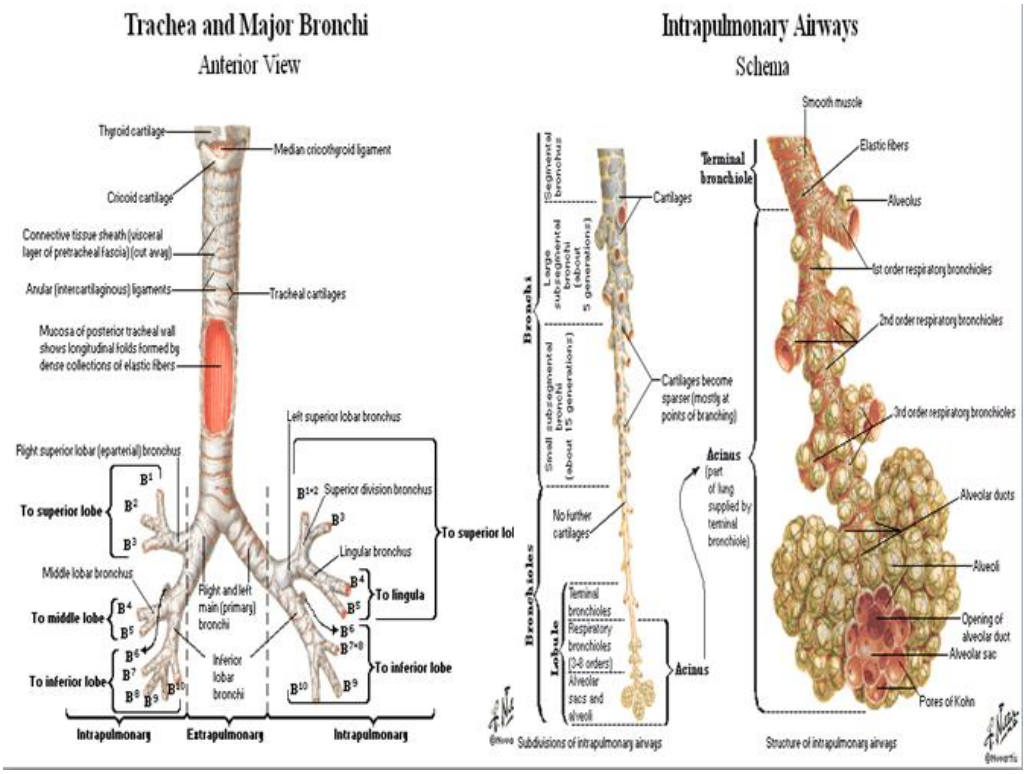
Bronchioles: Bronchioles have smooth muscle, bronchi don't

- First level of airway surrounded by smooth muscle; therefore can change diameter as in broncho-constriction and broncho-dilation
- Terminal
- Respiratory
- 3-8 orders
- Alveoli



Carina and primary bronchi :

- Right Primary Bronchus is shorter, wider, and more steep.- if there is foreign body in children it will enter the R !
- Left Primary Bronchus is longer, more narrow, and less steep.

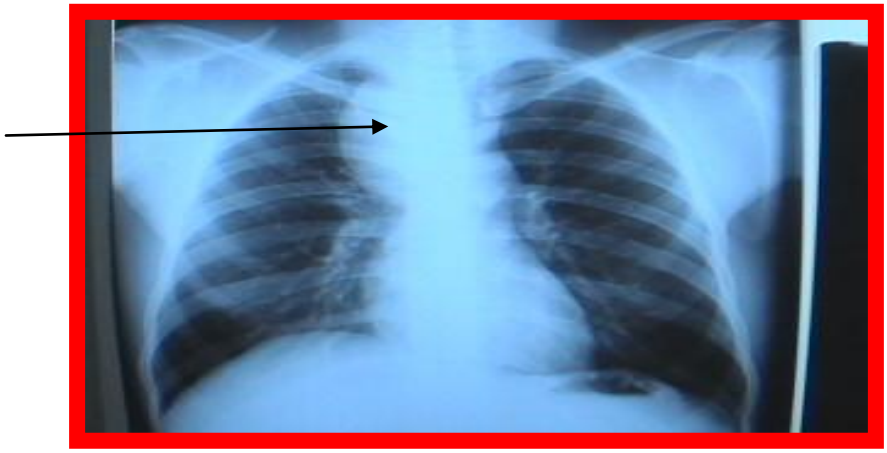


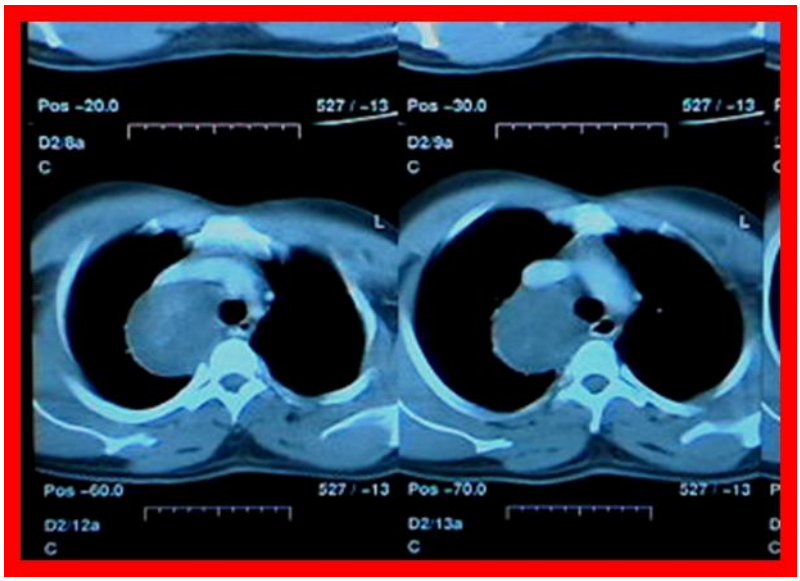
Pulmonary Sequestration: a congenital condition where a piece of lung tissue is not attached to the bronchial tree , Often it gets its own blood supply 1,2or 3 arteries from the thoracic aorta below the diaphragm level, and separated from blood supply of the lung, It could be Intraparenchymal or Extraparenchymal , Repetitive chest infections, also known as a **bronchopulmonary sequestration** or a **cystic lung lesion** – more in the **left** lower lobe "left lower zone opacification " – do surgery to prevent infection

DISEASES OF THE LUNG

1) **Congenital** – in pediatric
   - Agenesis : absent of the lung
   - Hypoplasia: incomplete development
   - Cystic adenomatoid malformation
   - Pulmonary sequestration تشظي الرئة
   - Lobar emphysema : "Replacement of whole lobe by bulla**", in neonate** Emphysematous bulla or emphysematous lobe that pushes and press on other normal lung tissue , Patient on ventilator, Needs surgery to allow normal lung to inflate.
   - Bronchogenic cyst**:** – it's like a big cysts attach to the trachea full of "semi-solid " material "chess like "proposed to infection, hemorrhage, compress on the trachea and my obstruct esophagus. pts complain of – SOB , stridor, hypoxia and sometimes dysphasia.

     Usually paratracheal or subcarinal, they transform in the future to malignant adenocarcinoma , Surgical excision to confirm dx , avoid complications (malignancy, rupture , inflammation , infection), prevent compression on vital organ.





2) Infectious:

In X-ray : black = air
White = soft tissue, solid or mass

A. Lung Abscess

Causes: infection
Clinical Features :

- Copious production of large amount of foul smelling sputum
- cough- SOB, chest pain and sever high temp = very sick pt.

Investigation:

- CXR (air fluid levels) Radio opaque , radio lucent
- CT- scan

Treatment:

- Initially: supporative
- Antibiotics
- **Drainage**:
  - ✓ Internal " catheter and we give antibiotic and IV fluid"
  - ✓ External
- Surgical: **Pulmonary resection** " lung or lobe "
  - Indications: imp!!
    - Failure of medical RX
    - Giant abscess (>6cm)
    - Pressure symptoms (on surrounding tissues)
    - Haemorrhage
    - Inability to R/O carcinoma abscess on top of cancer like in male smoker pt 65y/o very sick!
    - * Rupture with resulting empyema (pus in pleural cavity b/w visceral & parietal pleura)
  - Type of Resection
    - Lobectomy, bilobectomy (2 lobes)
    - Pneumoectomy .

Causes :
-part of sepsis
-lung cancer
-foreign body in children
-pneumonia

R\O=" rule out "

* Or rupture inside bronchial tree with sputum
-It very complicated case

التوسع"التكيس" القصبي

B. Bronchiectasis

Def. : Bronchial dilatation
Cause

- Congenital (cystic fibrosis, immotile cilia syndrome = Kartagener syndrome)
- Infection يسوي أوبستركشن
- Obstruction (benign or semi-benign tumor obstruct main bronchus others: foreign body , infection , diseases Of childhood : measles, whooping cough may complicated by bronchiectasis but not anymore b\c of immunization)

immotile cilia syndrome: immotile or absent of the cilia
- bilateral
-In old age they need lung transplant

More in female ☹

Clinical Features

- Cough (morning with sputum) – b\c it accumulation while pt sleep
- Dyspnea
- Haemoptysis (50%)
- Clubbing>b/c it's chronic disease

Sputum: yellowish or whitish sometimes added infection : pseudomonas , Klebsella that make it greenish with fever ,SOB, septic – give them IV antibiotic

Types :

- Cystic
- Cylindrical (usually widespread through a bronchial tract)

Investigation:

- Bronchogram (invasive ,pt should be in controlled situation oxygenated-sedative, catheter & contrast)
- CT, investigation of choice is C-Xray we will see Cystic formation but CT more accurate.
- Bronchoscopy – but not any more "

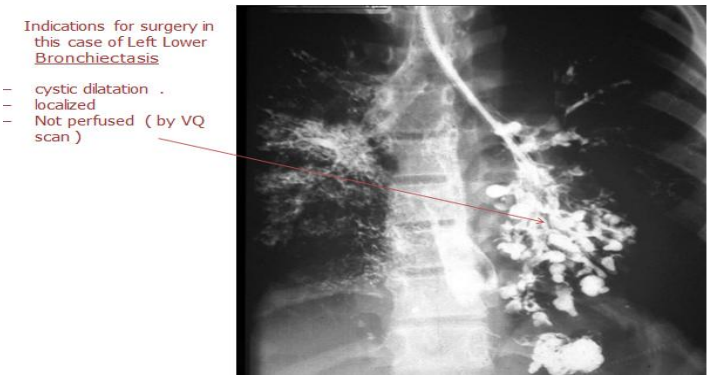
Postural drainage: head down and set flat to loosening of secretions in the lung by tapping on each lobe and ask pt to cough in specific to position to prevent accumulation

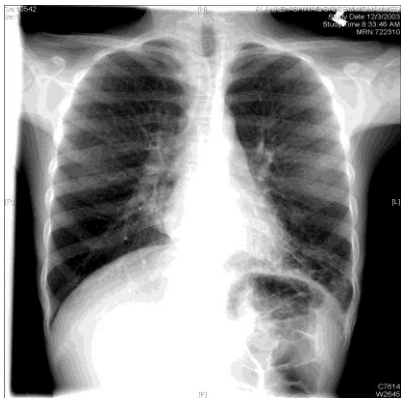
Treatment:

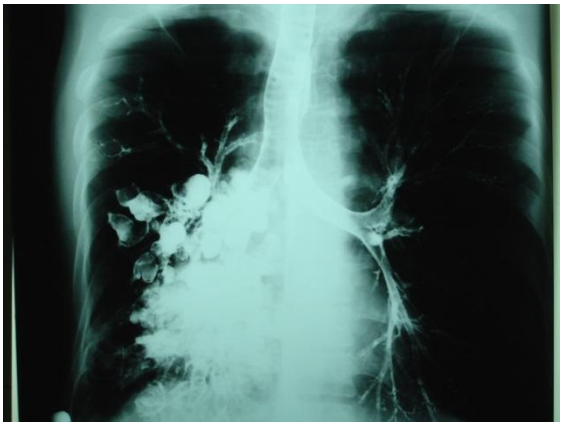
- Medical – bronchodilator- antibiotic
  - ✓ Resolve most cases (perfused , bilateral , cylindrical)
- Surgical (Indications) imp!! Anatomical resection Lobectomy or segmentectomy or Lobectomy with segmentectomy.
  - ✓ Failure of medical Rx
  - ✓ Patient with localized disease (قسم واحد من الرئة)
  - ✓ cystic dilatation *not cylinderical*

Not perfused (doesn't have arteries for perfusion .. How to know ? By : VQ scan)b/c if it perfused رئة فعالة and we take it pt will have SOB, symptomatic.

P.S : most of the cystic are not perfused ;) but cylindrical perfused







C. **Tuberculosis** TB can cause Bronchiectasis

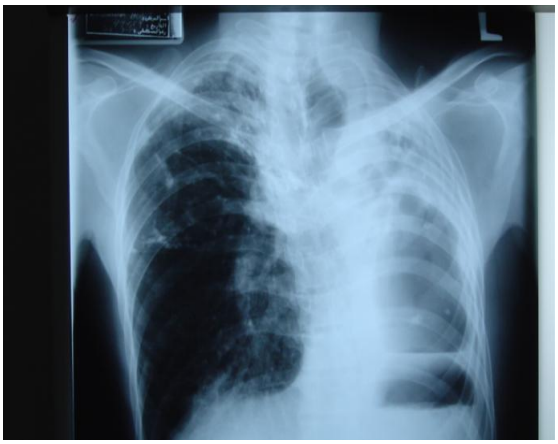
- 30,000 new cases occur annually in U.S.A

Cause:

- Pulmonary
- Extra-pulmonary (pleura , mediastinum)

Investigation:

- C X R " more in the apex "
- CT scan . infiltration ,abcess formation , Lymph node
- AFB sputum Culture . (+ve) Acid-fast bacillus smear and culture
  - Bronchoalveolar lavage
  - Mediastinoscopy (caseating granuloma)



Left bronchus syndrome

-More in the left than right lung for anatomical feature

-Notice , the Trachea is pulled to left side.. WHY ? cuz of fibrosis there is loss of space , loss of ventilation in the left side , the left lung is smaller in size , infective , bronchioectatic , it will pull the trachea toward it .

What is Left bronchus syndrome? Chronic condition , it is the end sequelae النتيجة النهائية of lung destruction due to TB In the pic , notice the bronchioectatic changes all over the lung !

Rt lung : pt still can breath from it , although it has apical scarring , Rt upper zone infiltration . Lt Lung : has Abcess cavity , Air Fluid levels , cystic bronchiectasis.

If we did bronchoscopy , bronchoalveolar lavage , we will see the Fast Bacilli of Mycobacterium TB , which are resistant to 1st , 2nd and 3rd line anti-TB medications ! نتيجة بؤرة التهابية

CT scan : infiltration ,abcess formation , Lymph node

We do not opreate on active TB b\c of complication and infection speread to other – we should mange him before that for 4 weeks until he's sterilize

Treatment:

- Medical
- Surgical:

✓ Failure of medical Rx (Resist. 1st , 2nd , 3rd Line of ttt)
✓ Destroyed lobe or lung (left bronchus syndrome) cuz can lead to (inflammation , infection , abscess formation , septic state .. Pt needs to be admitted continuously due to chest infection or TB !)
✓ Pulmonary haemorrhage
✓ Persistent open cavity with + ve sputum
✓ Persistent broncho pulmonary fistula.

D. Aspergillosis

Cause:

- Aspergillus fumigatus, A. niger

Mode of Transmission:

- immunocompramised , superinfection "e.g. with TB –or complication of it-"

Forms:

- Allergic bronchopulmonary aspergillosis
- Saprophytic مترممه(An organism, especially a fungus or bacterium, that grows on and derives its nourishment from dead or decaying organic matter.)
- Invasive

Saprophytic form: Aspergillus is a saprophytic fungus that may cause allergic pulmonary aspergillosis, aspergilloma, and semi-invasive and invasive aspergillosis. The coexistence of a saprophytic fungus and hydatid cyst is extremely rare

Clinical Features: (indications for surgery)

- Invasive Aspergilloma (mycetoma) (come with warning sign of haemoptysis, at this time you have to react quickly-morbidity & mortality is very high in this pt.-)
- Chronic productive cough
- Haemoptysis (patient with preexisting Disease).
- Accidental findings : with CXR

Investigations:

- Skin test
- Sputum (fungal culture)
- Biopsy (Invasive) (by CT scan)
- C X R

Treatment:

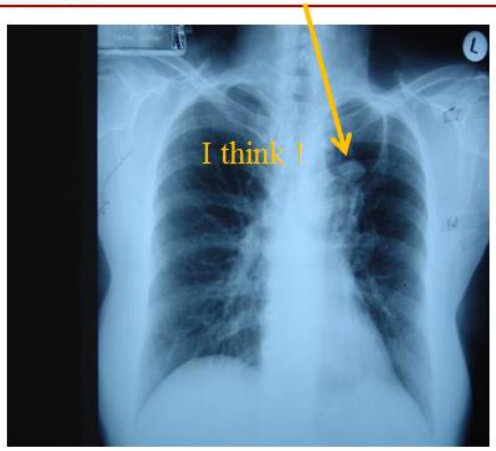
- Medical (anti fungal)
- Surgical:
  - ✓ Indications:
- A significant aspergilloma
- Haemoptysis
- Clinical features such as Chronic productive cough , SOB ,
  - ✓ Type of resection (depend on the affected site)
- Lobectomy (mainly)
- Pneumonectomy (Rarely)
- Segmentectomy (very rarely)

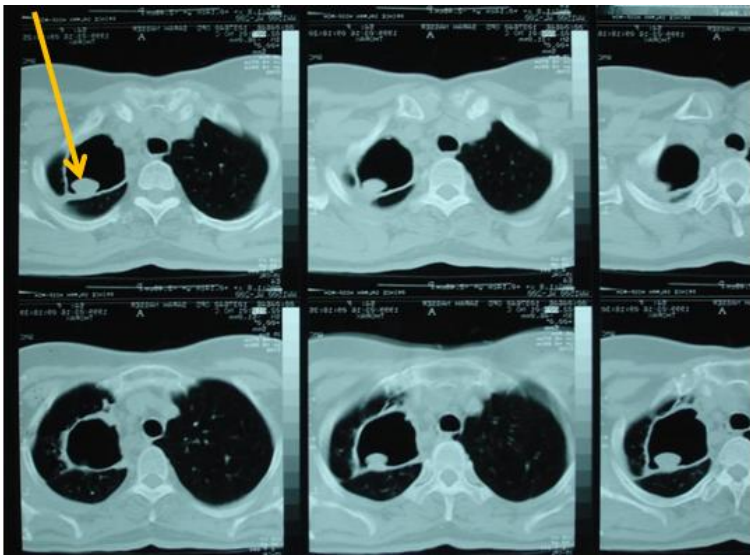
In CT : see Aspergilloma complex inside a cavity " could be TB cavity or not TB cavity"!

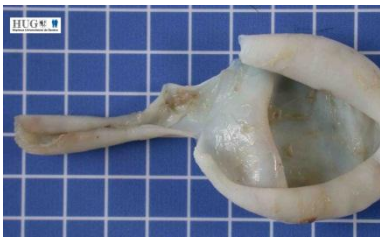
Could be bilateral

Mostly in apex or Rt upper lobe!

CXR shows cavity with aspergilloma (like a ball inside the cavity by CT either able to move or fixed) called : aspergilloma complex or mycetoma .
If it is invasive **(Invasive aspergilloma)**
, it can lead to infecion , affect the Vessels , Lung Tissue, Bronchi . the pt present with severe hemorrhage..







E. Hydatid cyst

Cause:

- Parasite : Echinococcus granulosus
- Host : Dogs , Cats , sheep
  (eating the contaminated grass (e.g. Jarjeer :P) without washing it perfectly)
  (eating raw sheep liver , which is contaminated (the sheep ate the contaminated grass !)

(Discovered accidentally or sometimes there will be symptoms!)

Diagnosis:

- Hydatus cyst titers
- skin test .
- CXR shows cyst (radiopacity)
- CT

*(chronic→it becomes calcified!)

Treatment:

- Surgery : Lobectomy
  (excision : anatomically or Only the cyst itself!)

Surgery : Lobectomy (you have to be very careful when doing surgery)
Injection of concentrated (hypertonic) saline 20% for 2-4 mins (usually the used Saline is 0.9%) , to kill the scolex الأجنة which are able to rupture to the pleural cavity and form new cysts ! (prevent spillage of the scolex which is highly infected)
We cover the whole area with sterile towels , to prevent contamination.
Apendazole is given after or before the surgery
Saline is injected during the surgery
(they used to inject formaline " aminarol ? " but now they don't use it)

Hydatid cyst : الأكياس المائية

consists of three layers and hydatid fluid .

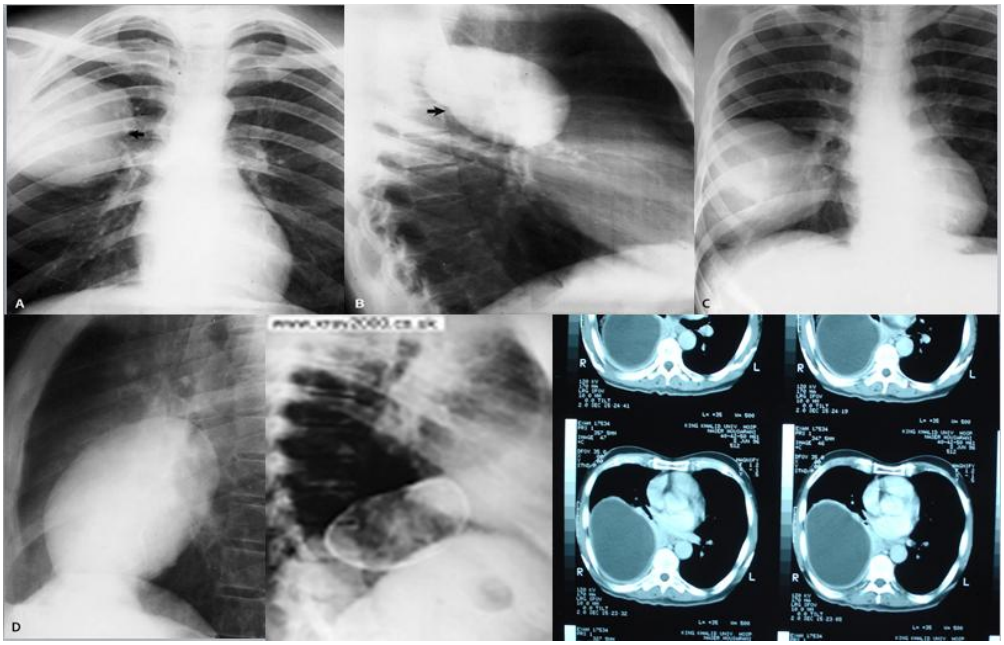
- ✓ The first layer is the **pericyst or adventitia** which is the host tissue formed by the lung as a reaction to the foreign body (parasite). (false layerطبقة ثابتة)
- ✓ The other two layers, the **laminated membrane**(الطبقة الحقيقية) external layer of the cyst and the **germinative layer** (inner layer of the cyst), belong to the parasite and it contain 1-2million scolex
  الطبقة المولدة تعطي الأجنة " الscolex
  و ممكن تنتشر عن طريق الدم إلى أي مكان للجسم "
  hydatid cyst in the brain , parotid , abdomen …. But the commonest sites are liver and lungs.
- ✓ The cyst fluid resembles water in appearance which may contain daughter vesicles .

* (Sometimes we see the cyst ruptured to the pleural cavity)

- ✓ **Why some of the cyst rupture and others do not rupture even if they are big cysts ?**
- It depends on the feeding bronchus , if the feeding bronchus is big , the cyst will rupture even if it is small .
- And if the feeding brochus is small , it will not rupture

*Cyst can be anywhere, but mainly in the liver or lung

(scolex go to portal system→liver→lung – so when we have pt. with hydatid cyst in lung we have to rule out the liver-)



3) Tumor

- Benign
- Malignant
  - ✓ Primary
  - ✓ Secondary (metastasis)

A. Primary lung carcinoma

Incidence:

Worldwide, **lung cancer** is the most common cause of **cancer** death.
The 3rd most common cause of death overall.
The incidence is rising in women as well (after breast ca) ☹ .

Risk Factor:

- Smoking
- Diet
- Genetic factors
- Others - air pollution, radiation and industrial chemicals, radon ,and asbestos

Pathology:

- Adenocarcinoma
- Squamous cell carcinoma
- Large cell carcinoma
- Small cell carcinoma

NSCLC vs. SCLC:

SCLC (Small cell lung cancer): derived from neuroendocrine – nonsurgical (chemotherapy), ex: pt come with small nodules we excite it to establish Dx,and u find it's SCLC but usually pt come with systemic disease , large Mediastinal lymphadenopathy.

- NSCLC (Non small) : derived from epithelial origin - surgical

Clinical Features:

- Asymptomatic (discovered accidentally when doing CXR)
- Symptomatic
- General : loss of appetite , fever , loss of weight , fatigue.
- Lung manifestation: cough is the commonest , occures in half of the pt !, Haemoptysis , sputum production , SOB, pain
- Pressure symptomes on Surrounding structures :
- Rec. L. nerve : paralysis, chocking (تتشردق) on drinking , hoarsness .
- Oesophagus : dysphagia .
- C8, T1 nerve : arm pain or numbness , brachial plexus
- Sympathetic especially injury to satellite ganglion (1st sympathetic ganglion): Horner's syndrome (ptosis , Anhidrosis , enophthalmos … etc)
- Pleural pain
- SVC : superior vena cava obstruction syndrome , Shortness of breath is the most common symptom, followed by face or arm swelling

Distal (para-neoplastic syndrome): Squemous cell carcinoma that produce hormone:

- PTH
- ADH
- ACTH
- Hypertrophic pulmonary osteoathropathy (HPOA) : pain and swelling of joints .not responsive for any ttt. Once the tumor removed , all the symp. Improved
- Hypercalcemia , hyponatremia , fluid retention .(cushing syndrome)

Investigations:

- C X R
- Trans-thoracic needle aspiration
- CT Scan best modality for staging (trans CT scan needle biopsy a.k.a Transthoracic needle aspiration , trocar biopsy)
- Bronchoscopy with biopsy ex of results: Squamous cell ,Adenocarcinoma, alveolar cell cancer
- MRI : Poor modality in Lung cancers staging (MCQs) ! If there is involvement of the major structures in the apex (brachial plexus , vertebral column , spinal canal , apex , spine)

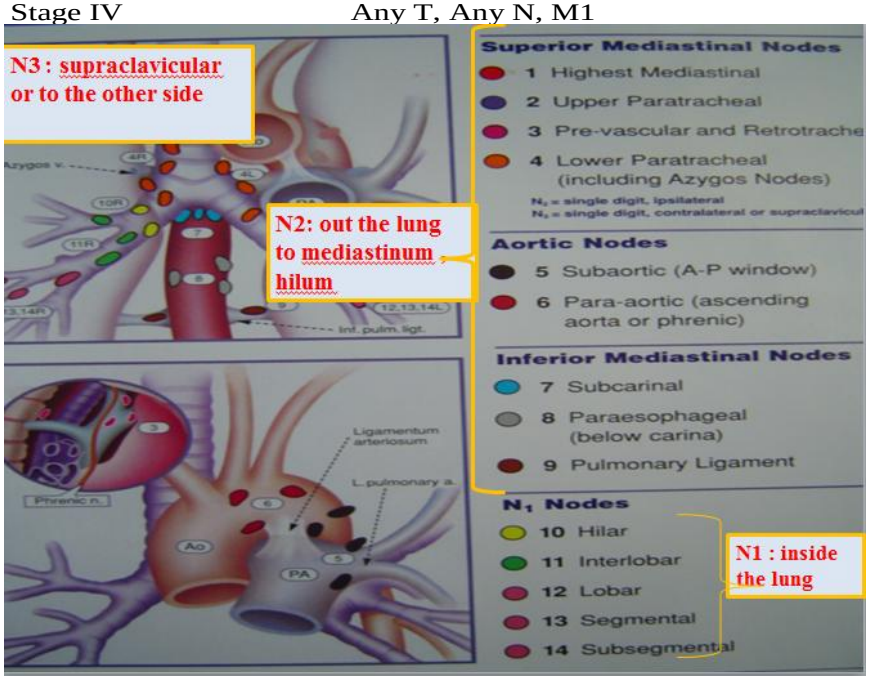
Best modality for staging → CT
MRI → rule only when there is invasion to spinal cord,soft tissue and structure around it BUT not in staging !

Staging

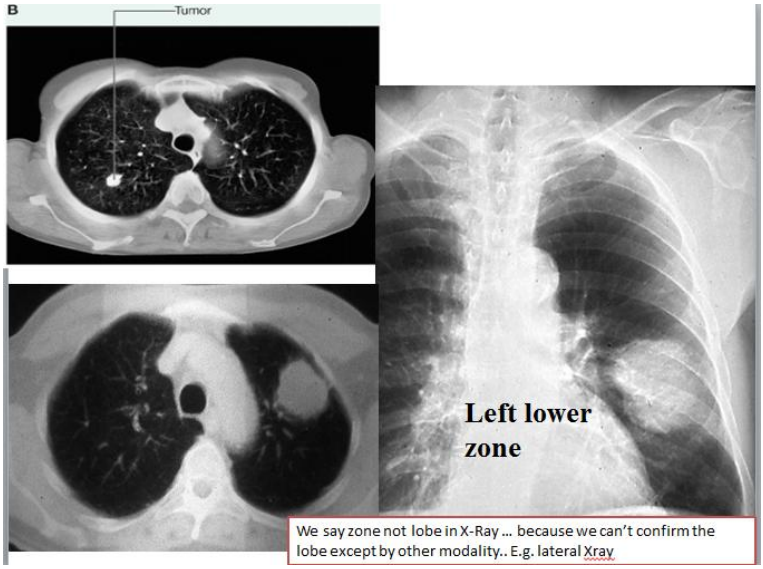
NEW INTERNATIONAL REVISED STAGE GROUPING

الجدول +lymph node للإطلاع :)

Stage 0	TIS
Stage IA	T1, NO, MO
Stage IB	T2, NO, MO
Stage IIA	T1, N1, MO
Stage IIB	T2, N1, MO
	T3, NO, MO
Stage IIIA	T1-3, N2, MO
	T3, N1, MO
Stage IIIB	T4, Any N, MO
	Any T, N3, MO
Stage IV	Any T, Any N, M1

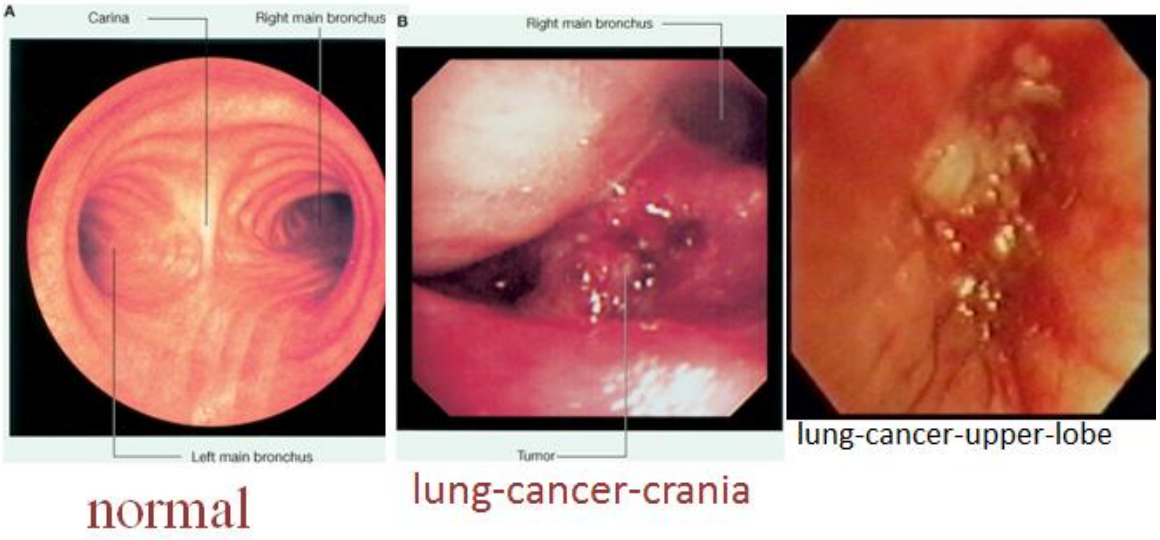


MRI is used in Cancox tumor , or superior sulcus tumor (in the Apex of the Lung) cuz we can see the involvement of the spinal canal and vertebrea



We say zone not lobe in X-Ray ... because we can't confirm the lobe except by other modality.. E.g. lateral Xray

Bronchoscope



normal

lung-cancer-crania

lung-cancer-upper-lobe

Management:

- Depends on:
  - ✓ Stage

-Tumor size ? Is there lymph node involvement or not ? (In the mediastinum & hilum)
-Is there metastasis or not ? By CT (liver,bone, brain)

- ((The TNM staging system is based on the extent of the tumor (T), whether cancer cells have spread to nearby (regional) lymph nodes (N), and whether distant (to other parts of the body) metastasis))

- ✓ Cell Type (small cell, nonsmall cell: squemous , adenocarcinoma, large)
- ✓ Patient Physical fitness (the tumor might be of an early stage , but the pt has many other dieases like IHD ! ما يقدر يتحمل

neoadjuvant chemotherapy : chemotherapy before the surgery

adjuvant chemotherapy : chemotherapy after the surgery

- NSCLC
  - ✓ Surgical (early stage)
  - ✓ Radiotherapy & Chemotherapy (Late stage)

    neoadjuvant chemotherapy : chemotherapy before the surgery , then the surgery is done , after that we give chemo again !
    - WHY ? To down stage the tumor.
- SCLC
  - ✓ Non surgical (cuz tumour is usually discovered late, when metastesis is extensive.. The patient develops symptoms when it's a systemic disease, an very aggressive tumor , very undifferentiated , with massive mediastinal adenopathy
  - ✓ Chemotherapy
  - ✓ Radiotherapy

B. Secondary Lung Carcinoma " metastasis"

- Solitary Lung Nodule DDx :
  - ✓ Primary Carcinoma
  - ✓ Tuberculous Granuloma
  - ✓ Mixed tumor
  - ✓ °2 Carcinoma (metastatic)
  - ✓ Miscellaneous
- Benign Vs. Malignant Hamartoma, Carcinoid
  - ✓ Age
  - ✓ Sex
  - ✓ X-ray
    - – Size
    - – Time
    - – Calcification

4) THE MEDIASTINUM

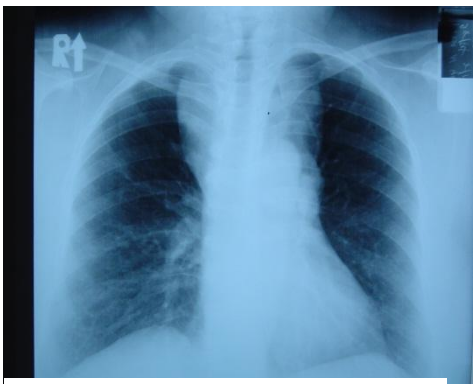
Anatomy:

- Boundaries (superior , inferior " anterior, middle, posterior")
- Divisions
  - ✓ Traditional
  - ✓ Clinical
- Access: Mediastenoscopy, mediastenotomy

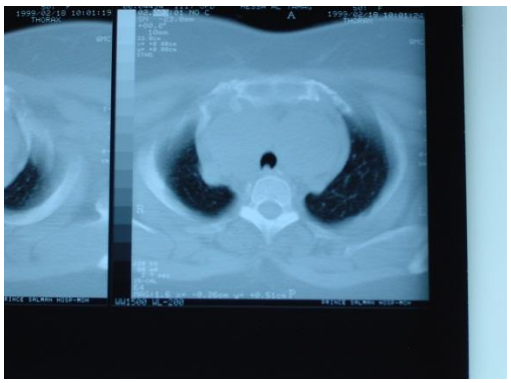
Mediastinal mass lesions:

a. Anterior mediastinum or superior: (5 T's) : Teratoma , Thyroid (retrosternal goiter) , TB lymphadenitis, T cell lymphoma , Thymoma
b. Middle Mediastinum (pericardial or bronchogenic Cyst)
c. Posterior mediastinum (Neurogenic tumor)

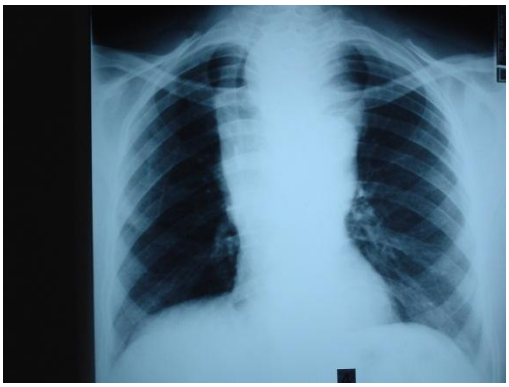
(retrosternal goiter: compress the trachea, narrow it and deviate it to the Rt !)

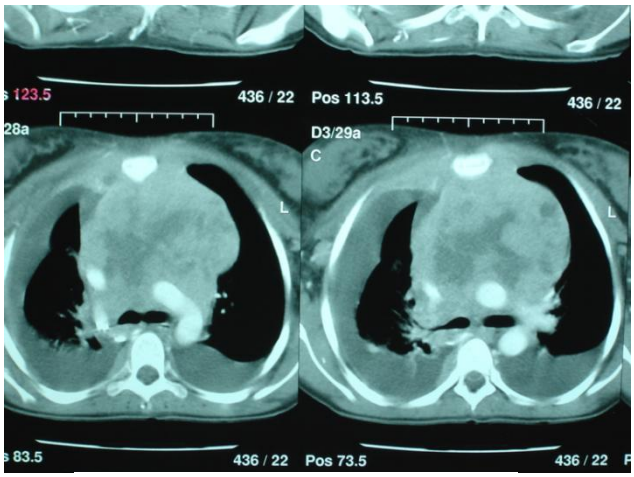


Retrosternal goiter



Trachea is compressed " pressure symptomes"





Mediastinal Lymphoma

5)THYMOMA: للإطلاع !

Incidence:

- The commonest tunmor of A.M.
- Peak 40-60 y.
- M : F (1 : 1)

Pathology:

- Classification
  - ✓ Epithelial
  - ✓ Lymphocystic
  - ✓ Lymphoepithelial
  - ✓ Spindle cell
- Benign vs. malignant
- Stages
  - ✓ I, II, III, IV

Clinical Features:

- Asymptomatic
- Symptomatic
  - ✓ Mass effect
  - ✓ Systemic effect

  M.G. is the commonest 40-50%

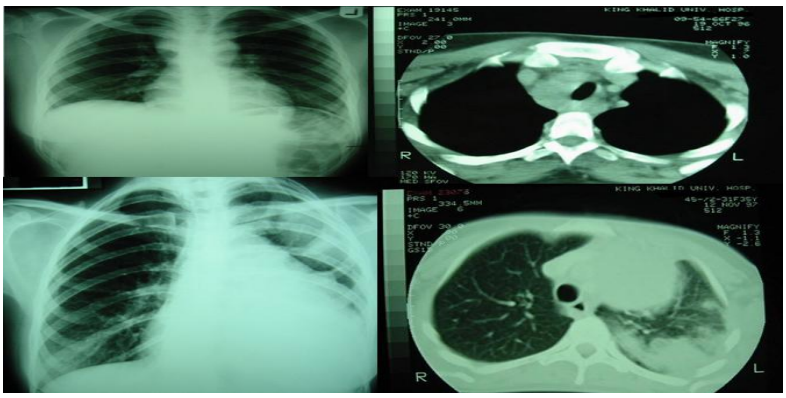
Investigation:

- C X R
- CT Scan
- Biopsy
- Bronchoscopy }
- Esophagoscopy } Selected cases
- Angiogram }

Treatment:

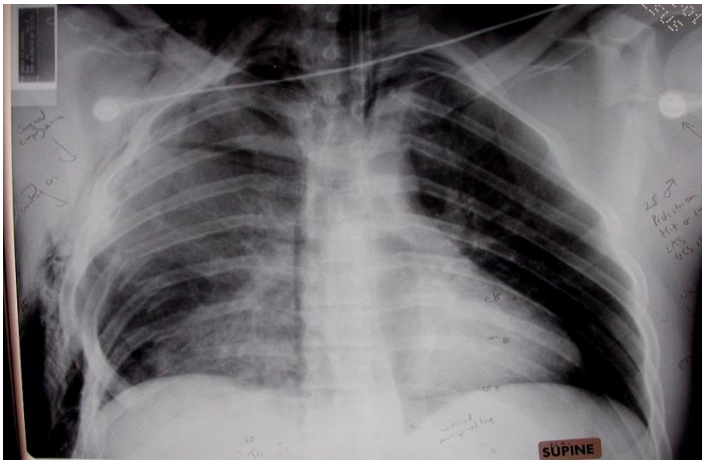
- Benign → complete excision
- Malignant → complete excision if possibal

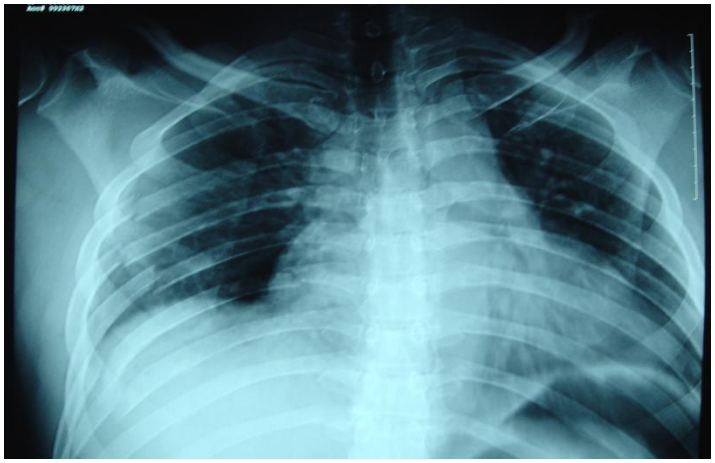
  If non-resectable } post-op
  Or } Radiotherapy
  Resection incomplete }

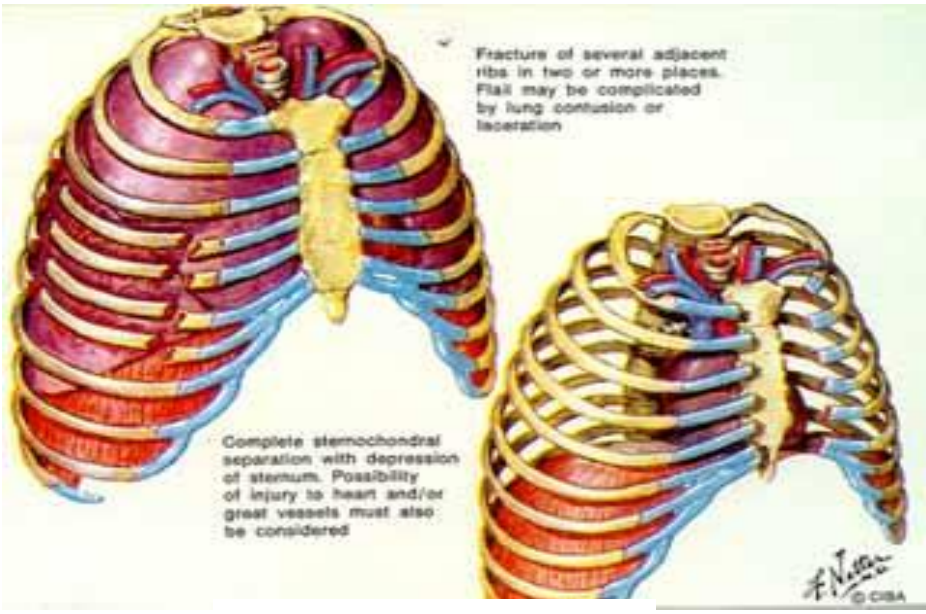


6)Trauma

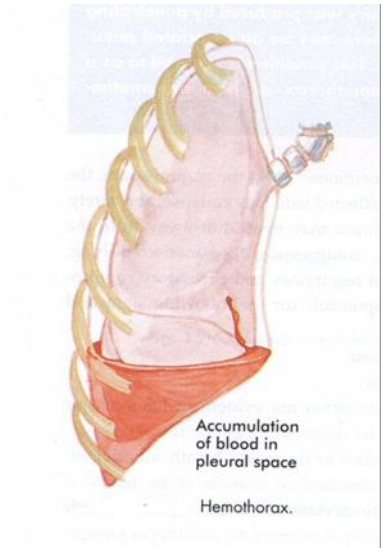
- RTA
- Fracture Ribs Simple – Complicated
- Haemothorax(accumulation of blood in the pleural cavity> in CxR opacity if it's huge can deviate trachea and Carina to other side)
- Pneumothorax(accumulation of air in the pleural cavity)
- Flail chest (fracture of more than 2 ribs each one is damaged in 2 side)
- Lung Contusion ("تجمع دموي داخل الرئة نفسها" تكدم الرئة)and ARDS →no surgery until massive bleed

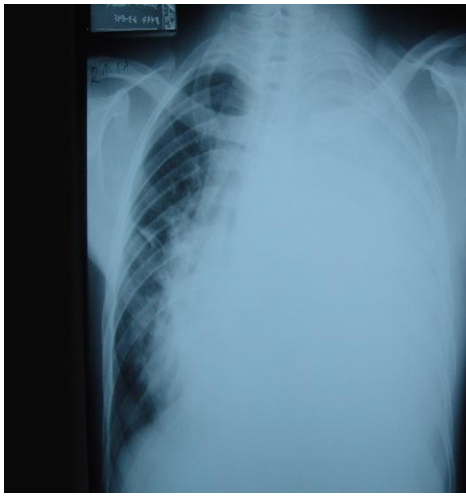


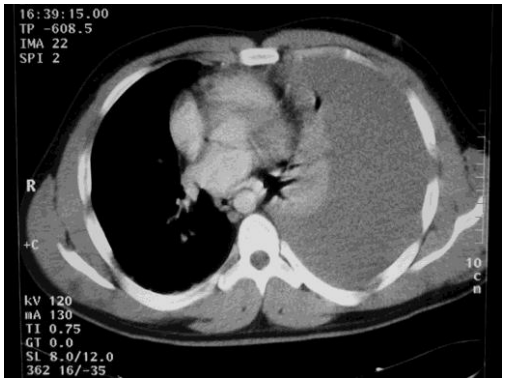


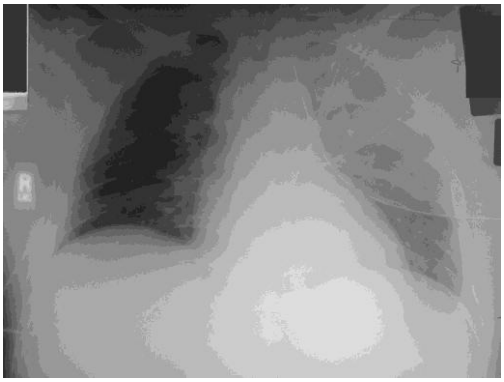


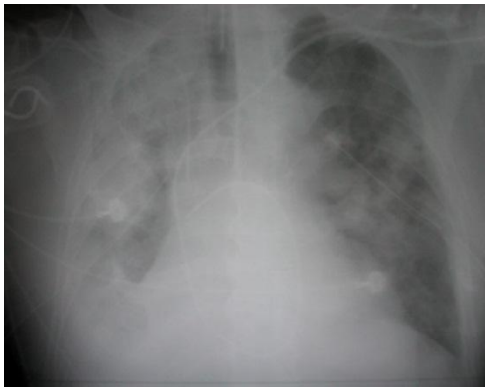
Flial Chest

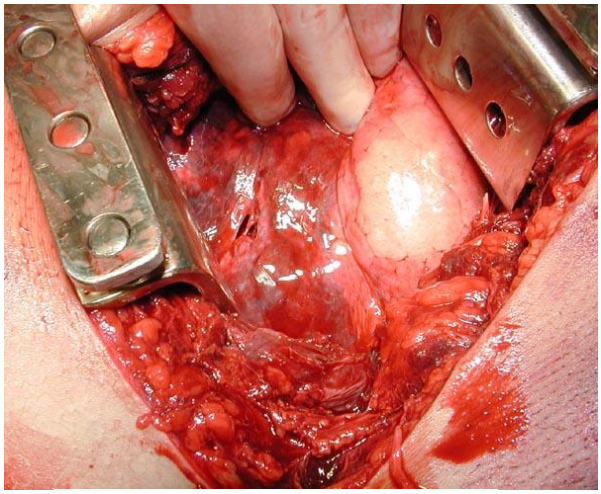








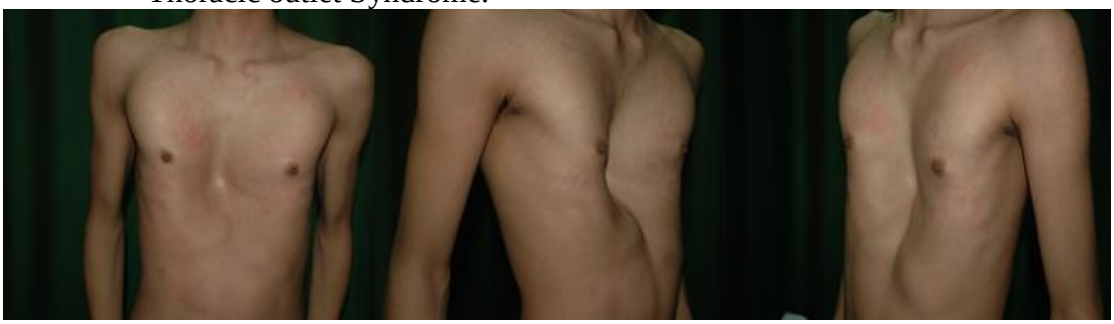




Lung Contusion : blood in parenchyma

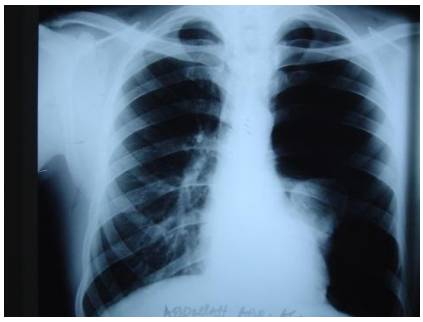
7) Chest Wall! للإطلاع

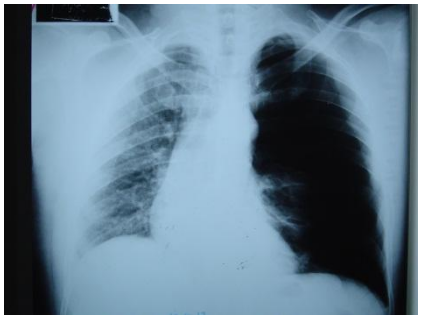
- Deformity:
  - ✓ Pectus excavatum (funnel)
  - ✓ Pectus Carniatum (pigeon)
- Infection
- Chest wall tumor
- Thoracic outlet Syndrome.

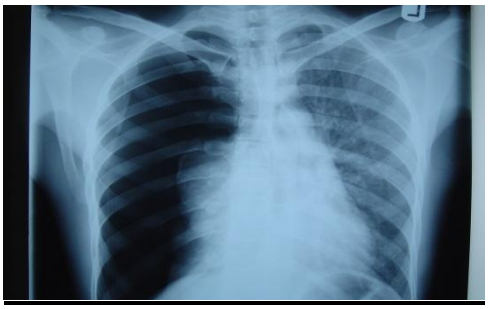


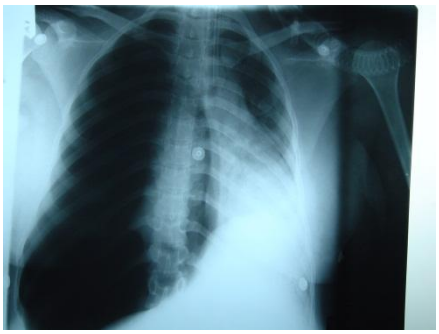
8)Pleura

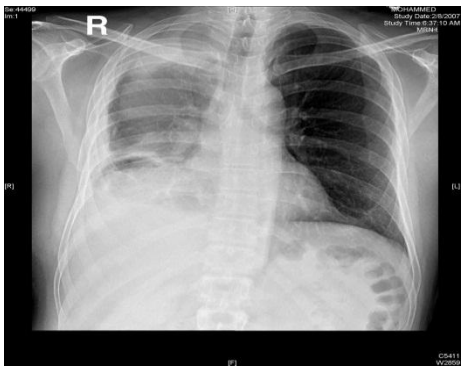
- Spontaneous pneumothorax>can cause pressure on mediastinum.
- Pleural effusion
- Empyema
- Mesothelioma .
- Tension pneumothorax → emergency !

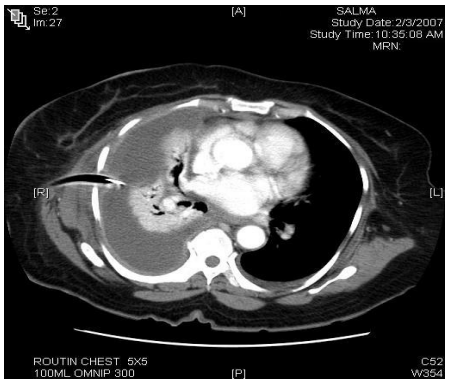








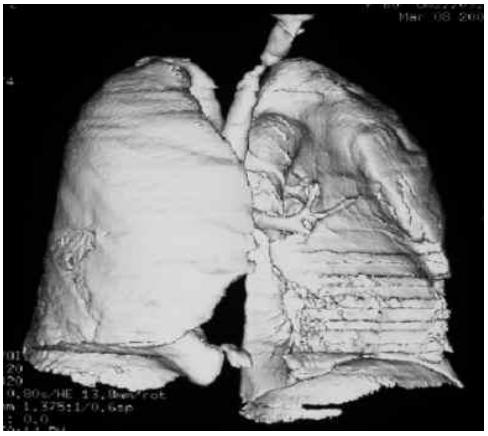




Not explained by doctor

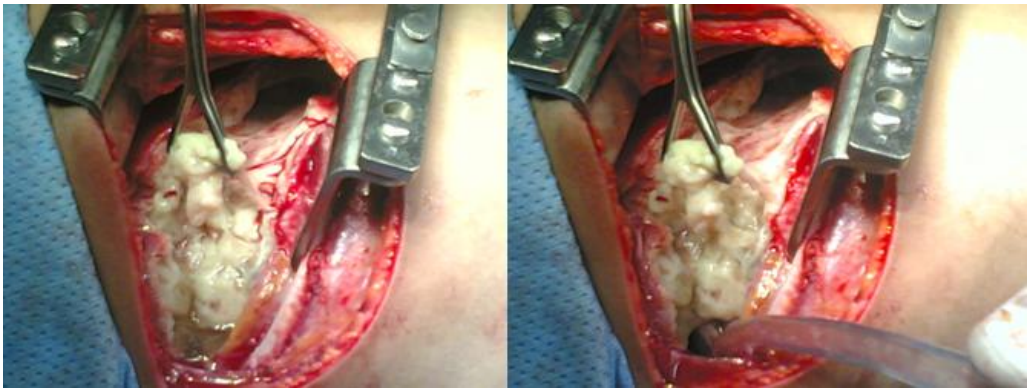
9) Air-way:

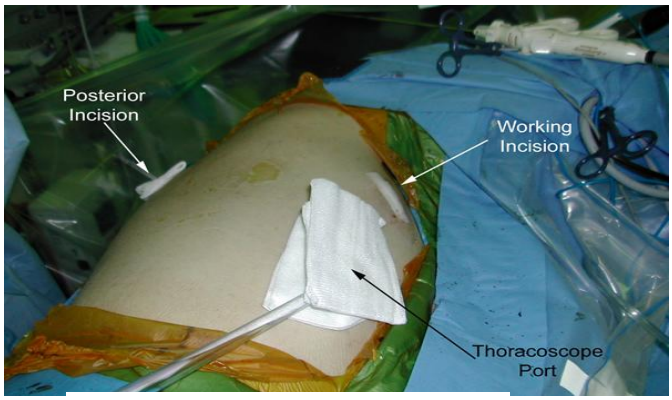
- Congenital tracheal anomalies
- Tracheal Stenosis
- Tracheostomy



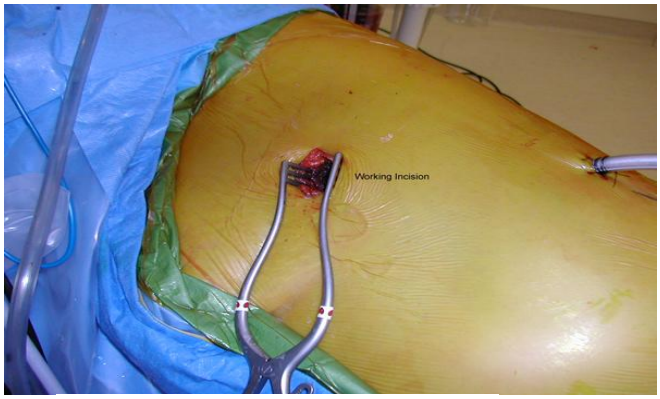
10) Surgery:

- Thoracotomy
- Thoracoscopy
- Sternotomy
- Analgesia





Position of skin incisions, showing camera port and working port anteriorly



Use of a retractor to hold open the working port.