

# Presentation & Management Of Common Thoracic Diseases

● **Important**

● Notes (Doctors'/students')

**431**

**SURGERY TEAM**

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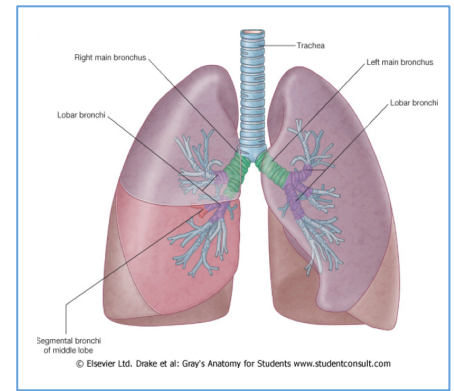
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# Introduction to the Lung

- Embryology: Bronchial system and alveolar system
- Anatomy: Lobes, Fissures, Segments, and blood supply



## Bronchopulmonary segments:

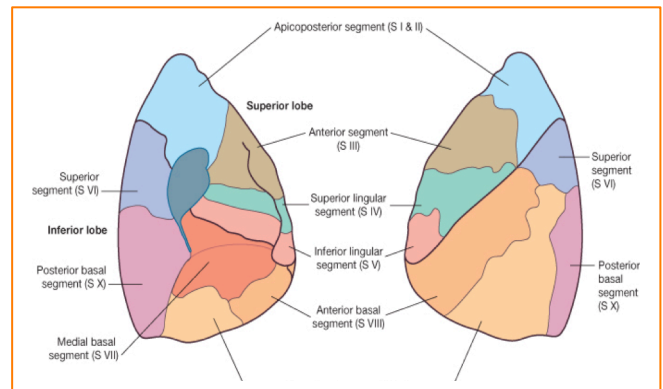
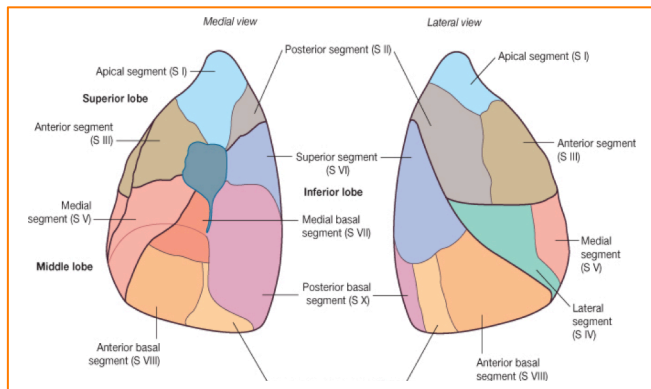
### Right lung:

(Right upper & lower lobe is like left upper & lower lobe)

- Right upper lobe: has apical, anterior and posterior segments
- Right Middle Lobe: has medial and lateral segments
- Right Lower lobe: has superior segment (also called apical lower) and basal segment which has all sides (anterior, posterior, medial and lateral segments)

### Left Lung:

- Left upper lobe: Apicoposterior and anterior segment
- Ligular part (which acts as the middle lobe in the left lung): superior and inferior segment
- Left lower lobe: has superior segment (also called apical lower) and basal segment which has all sides (anterior, posterior, medial and lateral segments)
  - Medial segment usually is not there in the left lower basilar lobe to give space to the left ventricle

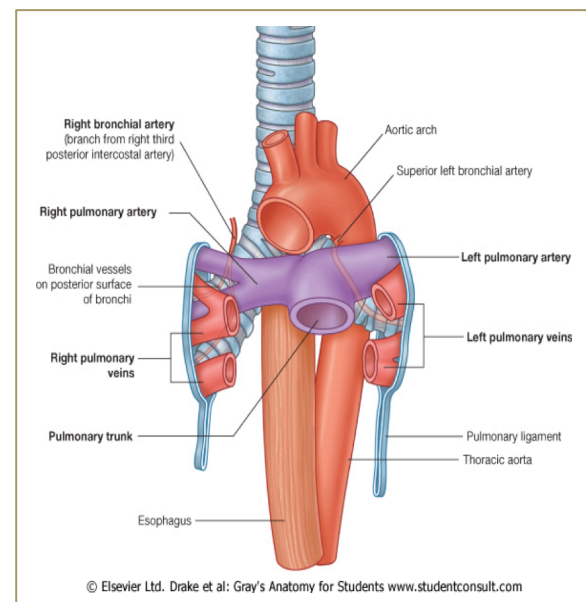


## Blood Supply:

- Lungs don't receive any vascular supply from the pulmonary vessels (pulmonary artery or veins) pulmonary vessels function is oxygenation (which is getting O<sub>2</sub> from the alveoli and excreting the CO<sub>2</sub>)
- Blood delivered to the lung tissue via the bronchial arteries comes from the systemic blood supply
- Vessels evolve from the aortic arch and travel along the bronchial trees
  - Right bronchial artery and superior left bronchial artery come from the aortic arch (from the systemic circulation) they supply the lungs
  - The blood supply to the lung is not strong but what helps with that is that the lung is filled with air and little tissue so it doesn't need lots of arterial supply

## Airways:

- Trachea, primary bronchi, secondary bronchi, tertiary bronchi (till it reaches 25 generations)
- All compromised of hyaline cartilage
- Trachea:
  - Begins where larynx ends (about C6), just below the cricoid cartilage

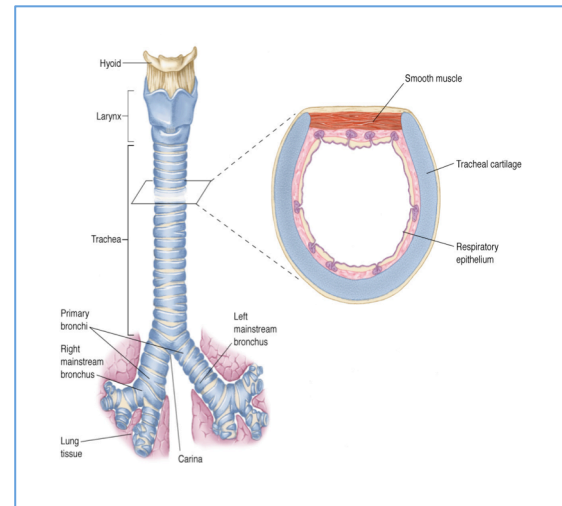


- 10 cm long, half in the neck, half in the mediastinum
- 20 U-Shaped rings of hyaline cartilage – keeps lumen intact but not as brittle as bone.  
**Anterior cartilaginous material and posteriorly is the membranous part**
- Lined with epithelium and cilia, which work to keep foreign bodies/irritants away from lungs. **Same lining as the bronchial tree**

### Bronchioles:

- 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
  - **Left main bronchus is more angulated, thinner and longer 4.5, divides into left lower and upper lobe**
  - **Right main bronchus is wider, more of a continuation to the trachea and is shorter about 1.5, immediately after that it divides into the upper lobe, then later the middle lobe and lower lobe.**

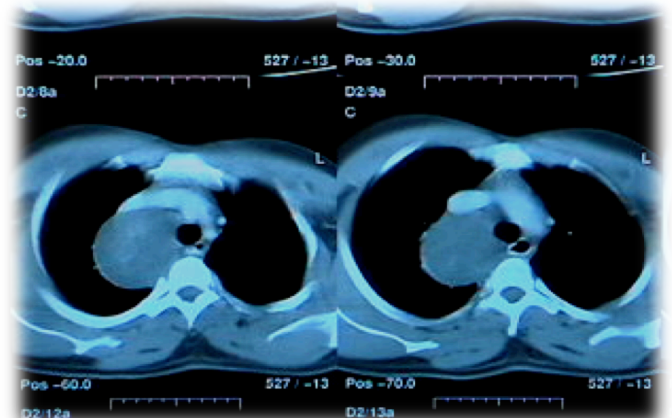
(In children if a foreign bodies enters the respiratory tract they are more likely to get into the right lung than the left one)



## Disease of The Lung

### Congenital: (not that important mostly seen when we take pediatrics)

- Agenesis (failure to Form)
- Hypoplasia (Smaller Lung Size)
- Cystic Adenomatoid malformation (mostly seen by pediatrics not surgeons)
- Lobar emphysema (seen in neonates, the whole lobe is replaced by emphysematous bolus)
- Bronchogenic cyst



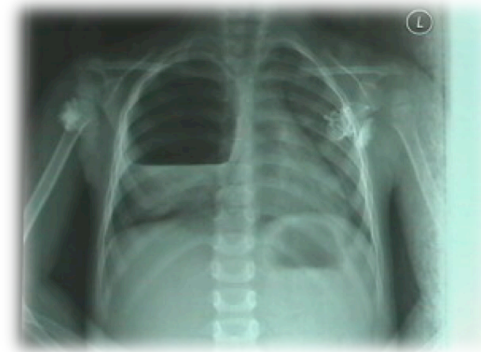
**Bronchogenic cyst:** Opacity in the right which compresses the trachea to the left side (it is a midline organ, when it is deviated it means there is a pathology. Either pushed or pulled, Pushed by space occupying lesion such as thyroid, cyst, pneumothorax, hemothorax, pleural effusion. Pulling if there is loss of space, lung collapse, post lobectomy, and postpneumonectomy)

**CT scan chest:**  
Cyst is on the right paratracheal filled with fluid or cheesy material (bronchogenic cyst)  
Has to be excised to establish diagnosis and prevent any complications because it causes compression (to the main arteries (aorta and vena cava → causing superior vena cava obstruction), esophagus (causes dysphagia) and trachea (causes stridor), hemorrhage, infection, in rare cases malignancy such as adenocarcinoma.

## Infectious:

### • **Lung Abscess:**

- Causes: bacterial, **pyogenic**, fungal
- Clinical features: Copious production of foul smelling sputum (**cough**)
- Investigation: Chest X-Ray
- Treatment:
  - Antibiotics
  - Drainage: internal or external
  - Pulmonary resection:
- ⇒ Indications:
  1. Failure of medical treatment
  2. Giant abscess (>6cm) → **won't heal via conservative management**
  3. Hemorrhage (if hemoptysis occurs and hypoxia)
  4. Inability to rule out carcinoma (If the abscess has a thick wall on x-ray and the patient is a smoker and presented with hemoptysis and weight loss)
  5. Rupture with resulting empyema (empyema → of puss in the pleural cavity)
- ⇒ Type of resection: Lobectomy



Cyst composed of Air fluid level (composed of air and fluid)

- Radiolucent → black
- Radiopacity → white

### • **Bronchiectasis:**

- Definition: abnormal dilatation of the bronchial tree
  - **Is of two types cylindrical (seen in medicine) and cystic (seen in surgery)**
- Causes:
  - Congenital (Could be due to some kind of syndrome like cystic fibrosis or acilia syndrome (no cilia, so secretions stay in the lung, occurs bilaterally))
  - Infection (Not seen much because of immunizations, (occurs due to whooping cough and measles which have a complication of pneumonia then chronic infection in the lobe which late on results in bronchiectasis))
  - Obstruction (Such as foreign body (if it stayed for more than 6 months) it begins to ruin the lung and the lobe will be destroyed. Obstruction due to tumors is very rare because if it a malignant tumor it will kill the patient before bronchiectasis manifests)
- Clinical features:
  - Cough (More In the morning due to accumulation of sputum)
  - Dyspnea
  - Hemoptysis (50%)
  - Clubbing (One of the reasons of clubbing is respiratory disease (lung abscess, chronic infection, bronchiectasis, hepatic pulmonary fibrosis))

Tumors will present as: cough, hemoptysis, anemia, and weight loss. Benign tumors such as adenoma can cause bronchiectasis but are very slow growing (rarely).

- Investigations:
  - Bronchogram (rarely used)
  - CT mode
  - Bronchoscopy
- **Treatment:**
  - Medical: (for cylindrical bronchiectasis) → resolves most cases
  - Surgical:
    - ⇒ Failure of medical treatment
    - ⇒ Patient with localized disease

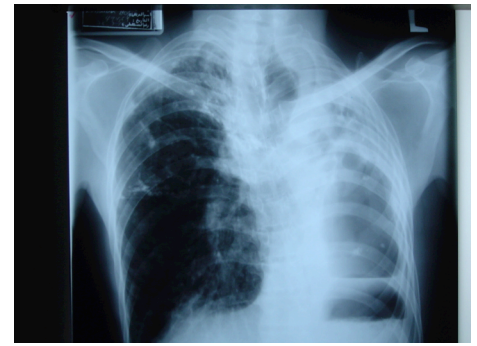


#### **Rules for treatment with surgery:**

- Bronchiectasis has to be localized
- Cystic
- Nonperfused (detected by ventilation perfusion VQ scan). Most cystic are nonperfused while cylindrical are perfused

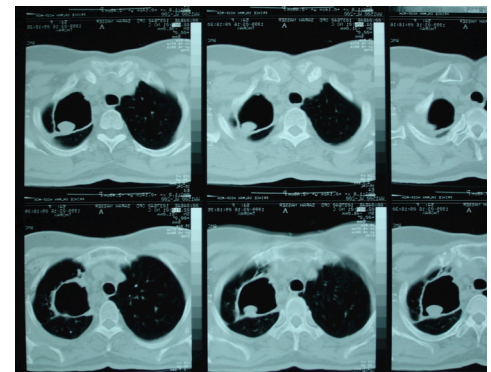


- **Tuberculosis:** (diagnosed by history and investigations)
  - 30,000 new cases occur annually in USA
  - Cause: pulmonary and extrapulmonary (lymph nodes and pleural cavity)
  - Investigations: Chest X-ray
  - Treatment:
    - Medical
    - Surgical
      - ⇒ Failure of medical treatment
      - ⇒ Destroyed lobe or lung
      - ⇒ Pulmonary hemorrhage
      - ⇒ Persistent open cavity with +ve sputum
      - ⇒ Persistent bronchopulmonary fistula



Left lung is completely destroyed; trachea is pulled because there is loss of space, volume, and fibrosis. Lung is fully diseased, this is called end sequel of TB (occurs mostly in left lung than right because bronchiole is longer, more lymph nodes and it blocks the trachea causing bronchiectasis, it is called left bronchus syndrome). The TB is virulent and resistant to antibiotics.

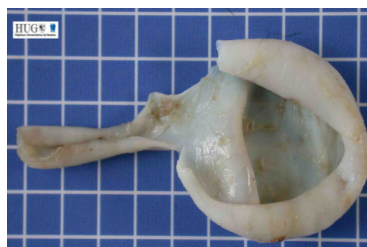
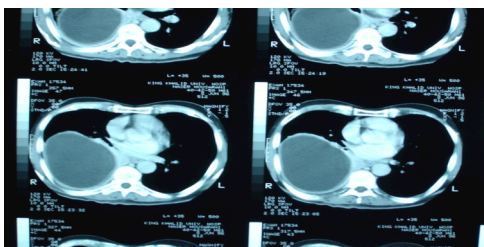
- **Aspergillosis:** doctor said pass through it fast
  - Cause: aspergillus fumigatus, A. niger
    - In surgery the invasive type is seen
    - Affects the immunocompromised patients and causes aspergilloma
  - Mode of transmission
  - Forms: allergic, saprophytic, invasive
  - Cystic fibrosis:
    - Aspergilloma
    - Chronic productive cough
    - Hemoptysis (patients with preexisting disease, such as renal failure, liver failure & TB)
  - Investigations: Skin test, Sputum, Biopsy (invasive), Chest X-ray
  - Treatment:
    - Medical (antifungal)
    - Surgical
      - ⇒ Indications
        - A significant Aspergilloma
        - Hemoptysis (indicating hemorrhage)
      - ⇒ Type of resection
        - Segmentectomy (rarely done)
        - Lobectomy (mostly)
        - Pneumonectomy



Chest x-ray characteristic: Radiolucency with a ball inside (aspergilloma or mycotoma), the ball is usually movable when the patient is situated in prone or supine position

- **Hydatid Cyst:**
  - Cause: Echinococcus granulosus (Comes from raw meat or liver (when diseased))
  - Diagnosis (Can sometimes be asymptomatic, just give pressure symptoms or shortness of breath)
  - Treatment
    - Medication: Albendazole, Mebendazole
    - **Has to be killed:**
      - ⇒ Previously diluted formalin used to be used but it had many side effects to the lungs and liver
      - ⇒ Hypertonic saline is poured into the cyst before opening (protection of surrounding areas before doing anything) → then open and excise

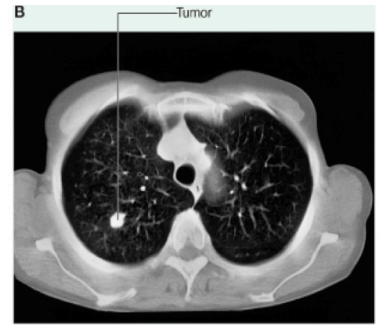
The egg has six hooks called scolex, it lowers the egg → goes into the intestines via scolex → enters lymphatics then the portal system → into the vena cava → into the lung → pulmonary veins → left side of the heart → enters into the systemic circulation  
That's why if found in the liver, lung should be checked



Made up of layers:  
- First one is adventitia → a false layer that occurs due to pressure of the cyst on the tissue  
- Second is germinal layer → true layer that has a laminated membrane and inside is the actual germinal producing layer

## Tumors:

- **Benign**
- **Malignant:**
  - Primary lung carcinoma
    - ⇒ Incidence
    - ⇒ Risk factor: Smoking, Radiation, diet, radon, and asbestos
    - Pathology:
      - ⇒ Adenocarcinoma
      - ⇒ Squamous cell carcinoma
      - ⇒ Large cell carcinoma
      - ⇒ Small cell carcinoma
        - **NSCLC vs. SCLC**
          - ✓ Small cell lung cancer: Treated nonsurgically (a systemic disease when diagnosed there is mediastinal lymphadenopathy and distal metastasis treat by chemotherapy)
          - ✓ Nonsmall cell lung cancer: Treated in early stage surgically while advance stage chemotherapy & radiotherapy then surgically
      - Clinical features:
        - ⇒ Asymptomatic (the patient may discover it upon taking an X-ray)
        - ⇒ Symptomatic
          - Lung (Shortness of breath, cough, hemoptysis or chest pain)
          - Surrounding structures
            - Rec. L. nerve (hoarseness of voice)
            - Oesophagus (dysphagia)
            - C8, T1 nerve (severe pain in the brachial plexus)
            - Sympathetic (Horner's syndrome if pressure on the satellite ganglia which is ptosis, miosis, and anhidrosis, enophthalmosis, and lacking hydration on the affected side)
            - Pleura (severe chest pain, the pleura has many nerve endings → sensitive layer)
            - SVC (causes obstruction syndrome)
            - Distal (paraneoplastic syndrome)
            - PTH, ADH, ACTH, and hypertrophic pulmonary osteoarthropathy (HPOA is of Unknown cause, seen in lung cancer (oat cell cancer, SC and NSC) patients will have severe joint pain. Once the tumor is removed the pain goes)
        - Investigations: Chest X-ray, Bronchoscopy, Transthoracic needle aspiration, CT scan, MRI
        - Staging (not important)
        - Management
          - ⇒ Depends on: Stage, Cell Type, Patient Physical fitness
          - ⇒ **NSCLC**
            - Surgical
            - Radiotherapy
            - Chemotherapy
          - ⇒ **SCLC**
            - Chemotherapy
            - Radiotherapy
  - Secondary (ovarian, breast, and colonic) **doctor didn't mention it**
    - Solitary Lung Nodule: could be Primary Carcinoma Tuberculous Granuloma, Mixed tumor,
      - 2 Carcinoma, Miscellaneous
    - Benign Vs. Malignant
    - Hamartoma-Carcinoid: Age, Sex, and X-ray (Size, Time, and Calcification)



- Early stage of NSCLC: preferably surgery while in late stages chemotherapy or radiotherapy  
- SCLC: chemotherapy +- radiotherapy:  
\* Chemotherapy before surgery is called newadjuvant (given to downgrade the tumor stage).  
\* Chemotherapy after surgery is called adjuvant

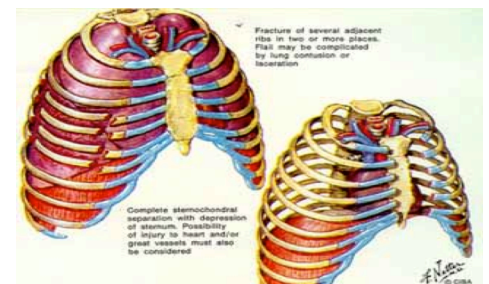
# The Mediastinum

## Anatomy:

- Boundaries:
    - Superior and inferior, what divides them is an imaginary line from the sternal angle to T4-T5 in the back
    - Inferior has three parts: anterior → behind the sternum, middle → around the heart, posterior → in front of the vertebrae
  - Divisions: traditional and clinical
  - Access: Mediastinoscopy (used to take a sample) and mediastenotomy
  - Mediastinal mass lesion
    1. Anterior mediastinum (5 T's) (thymoma, T-cell lymphoma, thyroid, teratoma, TB lymphadenitis)
    2. Middle mediastinum (cyst)
    3. Posterior mediastinum (neurogenic)
- Thymoma: doctor said we don't need to know or study, no questions in the exam

## Trauma:

- RTA (road traffic accidents)
- Fracture ribs (simple or complicated)
- Hemothorax: accumulation of blood in the pleural space (considered as opacity on X-ray)
- Pneumothorax
- Flail chest
  - More than one broken rib, and each rib is broken from both sides. The ribs cause something called paradoxical movement, which is upon inspiration the ribs go in and upon expiration the ribs go out
- Lung contusion and ARDS (acute respiratory distress syndrome)



## Chest Wall

### Deformity: treatment via surgery

- Pectus excavatum (funnel chest)
- Pectus craniatum (pigeon chest)

### Infection

### Chest wall tumor

### Thoracic outlet syndrome



## Pleura

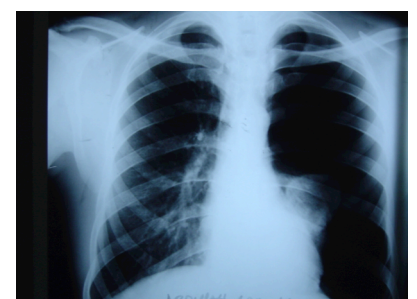
- Spontaneous pneumothorax (accumulation of air inside the pleural cavity)
- Pleural effusion
- Empyema
- Mesothelioma.

### Airway doctor didn't mention it

- Congenital tracheal anomalies
- Tracheal Stenosis
- Tracheostomy

### Surgery doctor didn't mention it

Thoracotomy, Thoracoscopy, Sternotomy, Analgesia



## Summery

**Lung Abscess** causes are bacterial, **pyogenic** or fungal. Associated with **cough** and foul smelling **sputum**. **CXR** for investigation. Abscess is treated by Antibiotic, Drainage or Pulmonary Resection.

**Bronchiectasis** is the abnormal dilatation of the bronchial tree. It has two types (**Cylindrical** or **Cystic**)

could be due to **Infection**, **Congenital** or **Obstruction**. Cough, Dyspnea, hemoptysis and clubbing are features of the disease. Treated **medically for cylindrical** cases and **surgically for cystic** cases.

**Tuberculosis** diagnosed by history and investigation. Causes include **pulmonary and extra-pulmonary**. **CXR** for investigation. Medical and Surgical intervention are the treatment of tuberculosis.

**Hydatid Cyst** is caused by **Echinococcus granulosus "From raw meat or liver"**. Asymptomatic with pressure and shortness of breath only. Treated with **Albendazole, Mebendazole**.

### **Primary Tumors**

**NSCLC vs. SCLC**

**Small cell lung cancer**: Treated **nonsurgically** (a systemic disease when diagnosed there is mediastinal lymphadenopathy and distal metastasis treat by chemotherapy)

**Nonsmall cell lung cancer**: Treated in **early stage surgically** while **advance stage chemotherapy & radiotherapy then surgically**.

Could present with Lung problem symptoms such as **dyspnea, cough, hemoptysis or chest pain**. Or symptoms regarding the surrounding structures.

Investigation done by **CXR, Bronchoscopy, Transthoracic needle aspiration, CT or MRI** the management depends on the stage, cell type and the fitness of the patient.

### **Mediastinal mass lesion**

Anterior mediastinum (**5 T's**) (**thymoma, T-cell lymphoma, thyroid, teratoma, TB lymphadenitis**)

Middle mediastinum (**cyst**)

Posterior mediastinum (**neurogenic**)

### **Trauma**

**RTA, Fracture ribs, Hemothorax, Pneumothorax, Flail chest or lung contusion**

### **Chest Wall**

**Deformity (treated by surgery), Infection, Chest wall tumor or thoracic outlet syndrome**

### **Pleura**

**Spontaneous pneumothorax, pleural effusion, empyema or mesothelioma**