



# 430 Radiology team

## Lecture 6

### **Radiologic investigation of Chest and CVS diseases**

**Khawlah AlOthman**

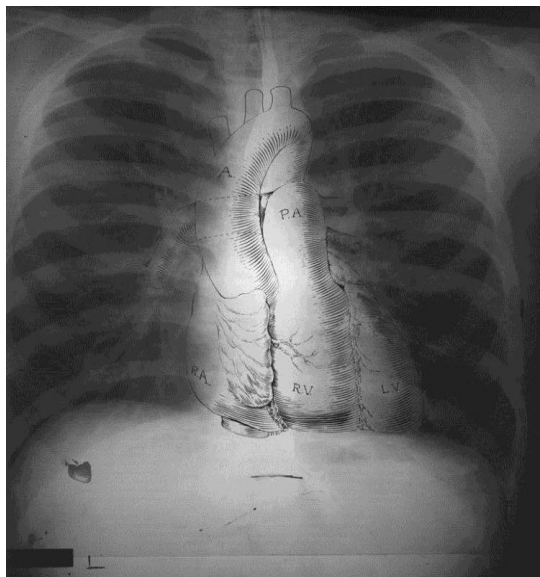
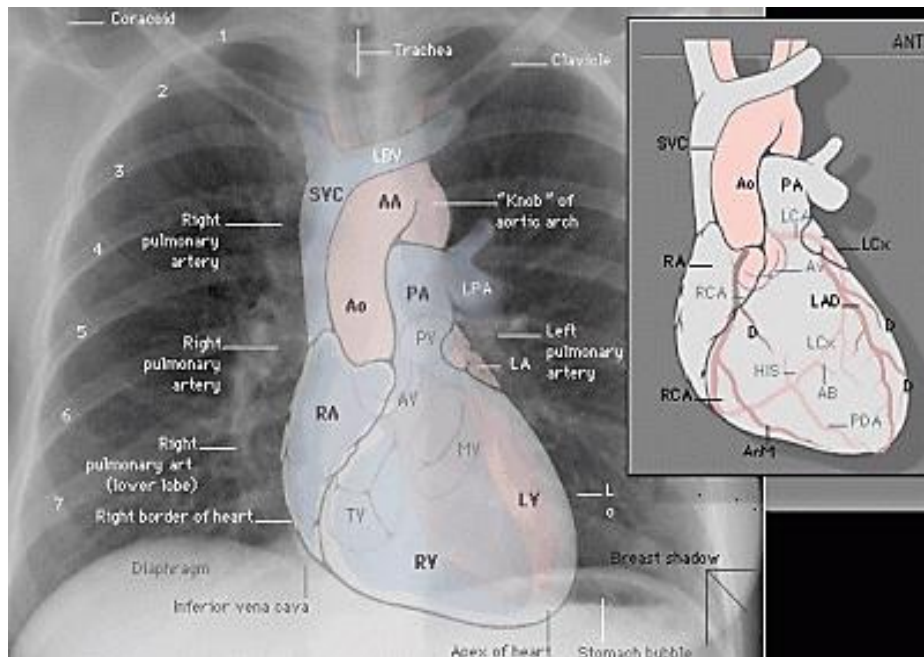
Maha AlKubidan

Hanan Alrabiah

Hanan AlSalman

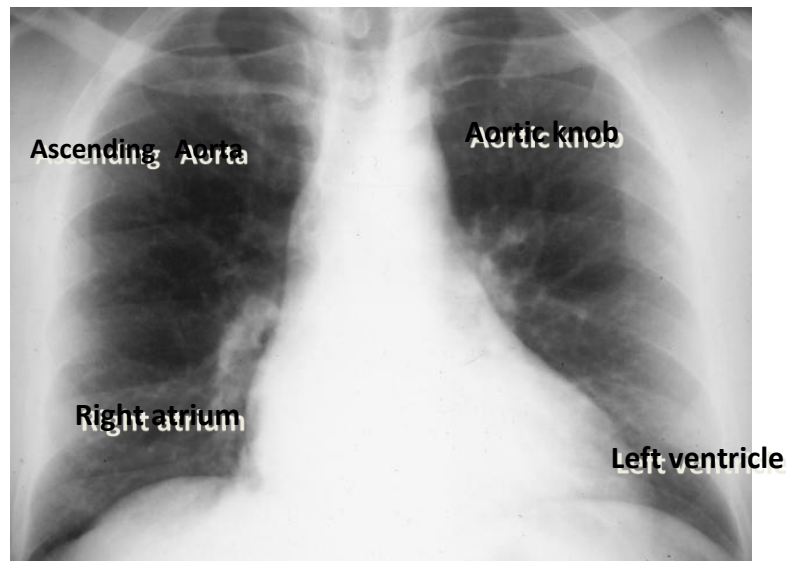
Ghadeer AlWuhayd

## Anatomy on Normal Chest X-Ray:



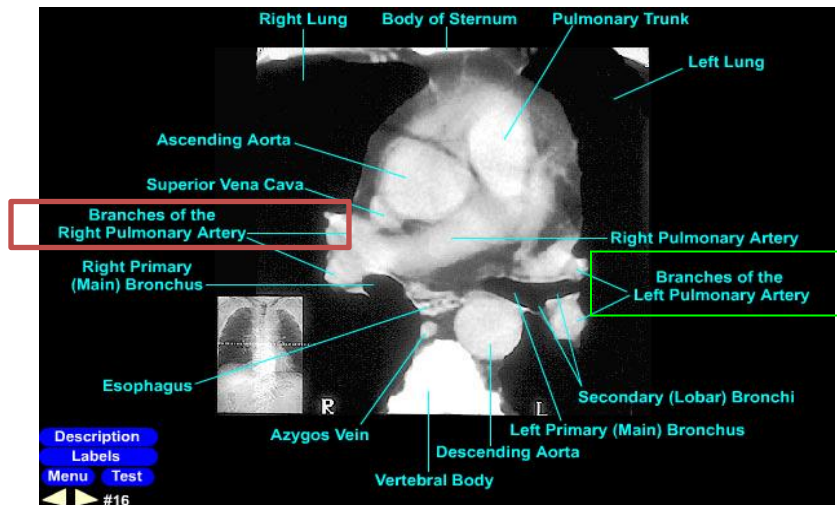
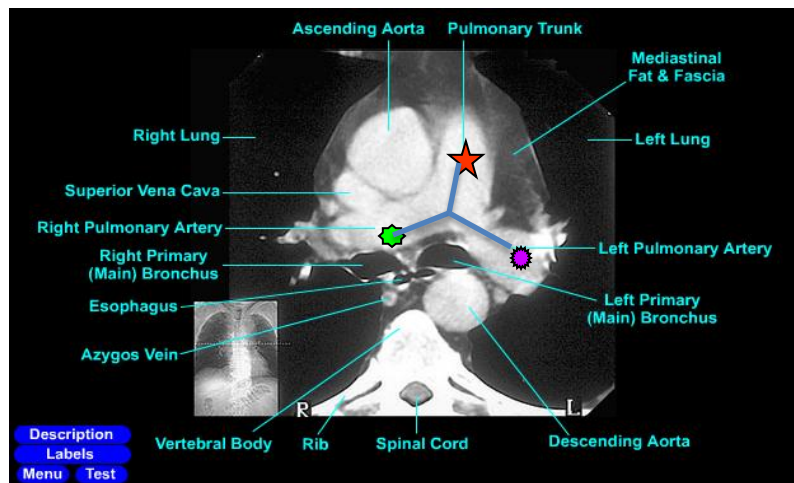
**Heart borders and chambers of the heart on PA and lateral views.**

## The Cardiac Contours



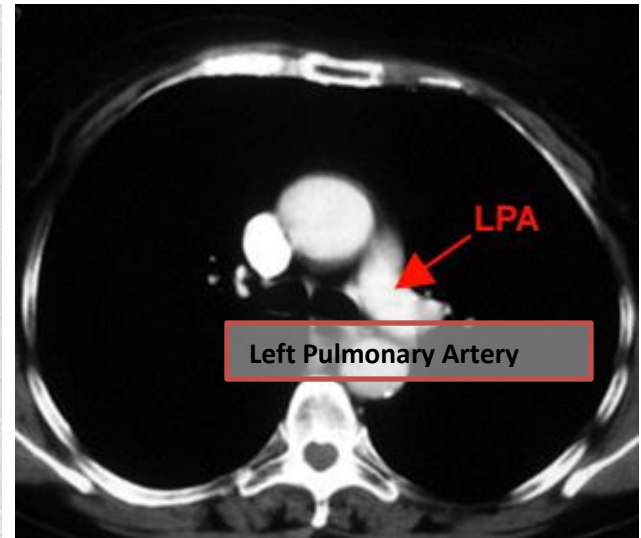
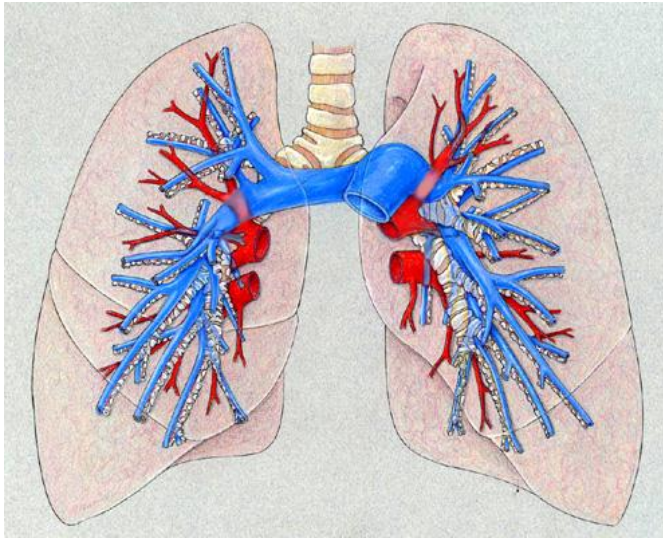
## Vascular anatomy of the chest

Mercedes sign  
"important"





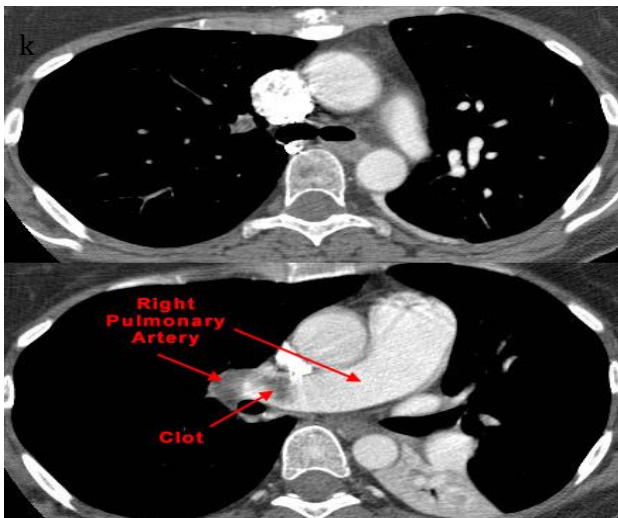
## Pulmonary artery



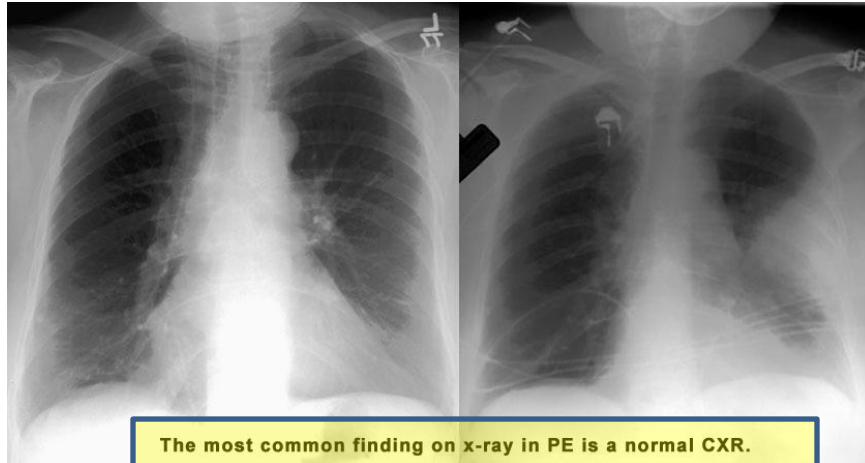
## Pulmonary embolism :

- The majority (79%) of pulmonary emboli arise from the propagation of lower limb DVT (Deep Vein Thrombosis ).
- CT pulmonary angiography , is the most commonly sought first -line diagnostic test . In addition , it has the advantage of visualizing the distribution and extent of the emboli .
- Chest X-ray , usually normal . but in chronic case may there are enlarged pulmonary artery trunk and enlarged heart.
- Presentation varies depending on the number, size and distribution of emboli and underlying cardiorespiratory reverse .

Pulmonary embolism	Acute massive PE	Medium PE	Chronic PE
<b>Symptoms</b>	<ul style="list-style-type: none"> <li>• Faintness or collapse</li> <li>• Crushing central chest pain</li> <li>• Severe dyspnea</li> </ul>	<ul style="list-style-type: none"> <li>• Pleuritic chest pain .</li> <li>• Restricted breathing</li> <li>• Haemoptysis (coughing up of blood )</li> </ul>	<ul style="list-style-type: none"> <li>• Dyspnea</li> <li>• Late symptoms of pulmonary hypertension or right heart failure</li> </ul>



CT Pulmonary angiogram showing small embolus within left pulmonary artery.



### Computed Tomography Angiography CTA , Coronal Reconstruction

A coronal plane through the body is a vertical plane from head to foot and parallel to the shoulders .



Embolus in  
descending right  
pulmonary artery

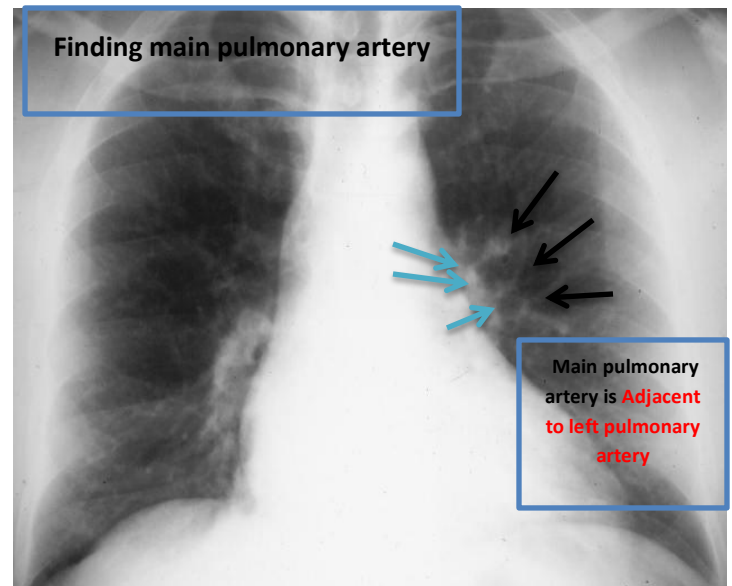
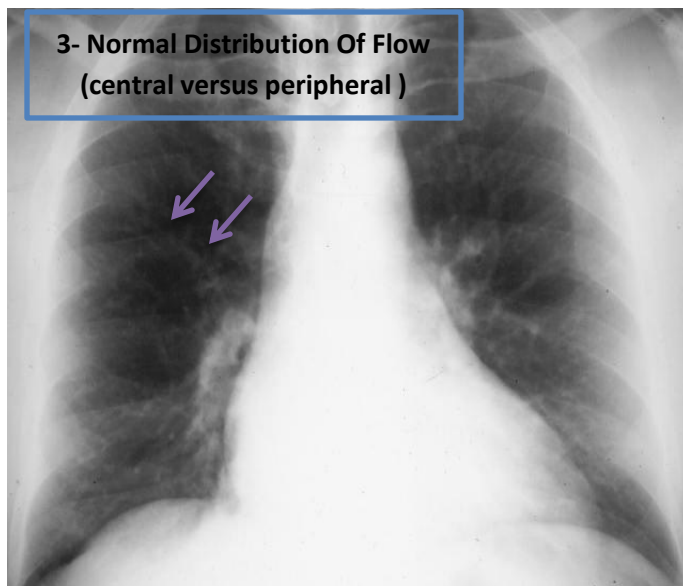
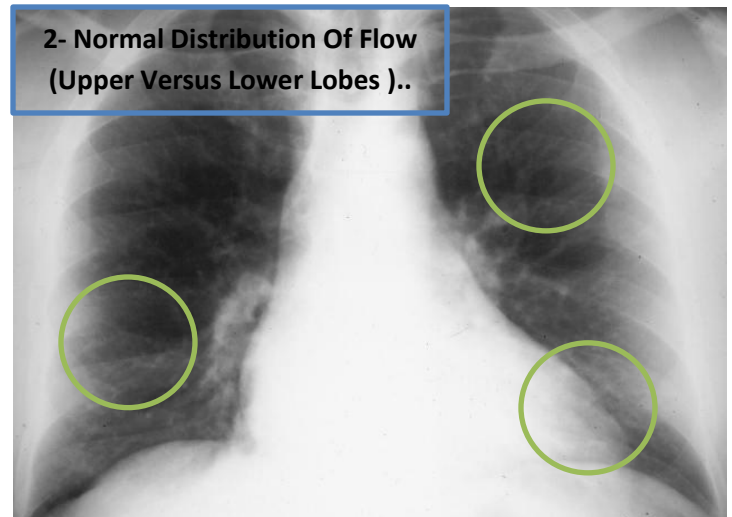
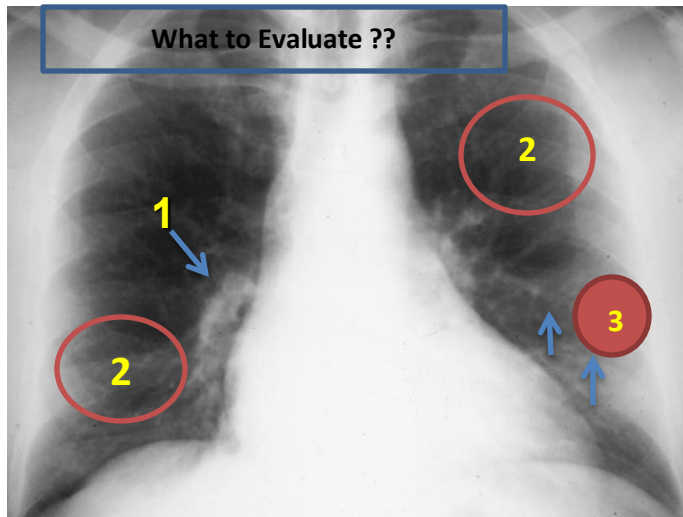
Embolus in left main  
pulmonary artery

Normal Homogenous  
Filling Of Vessels

## The Pulmonary Vasculature :

### Five States of the Pulmonary Vasculature :

- Normal
- Pulmonary venous hypertension
- Pulmonary arterial hypertension
- Increased flow
- Decreased flow

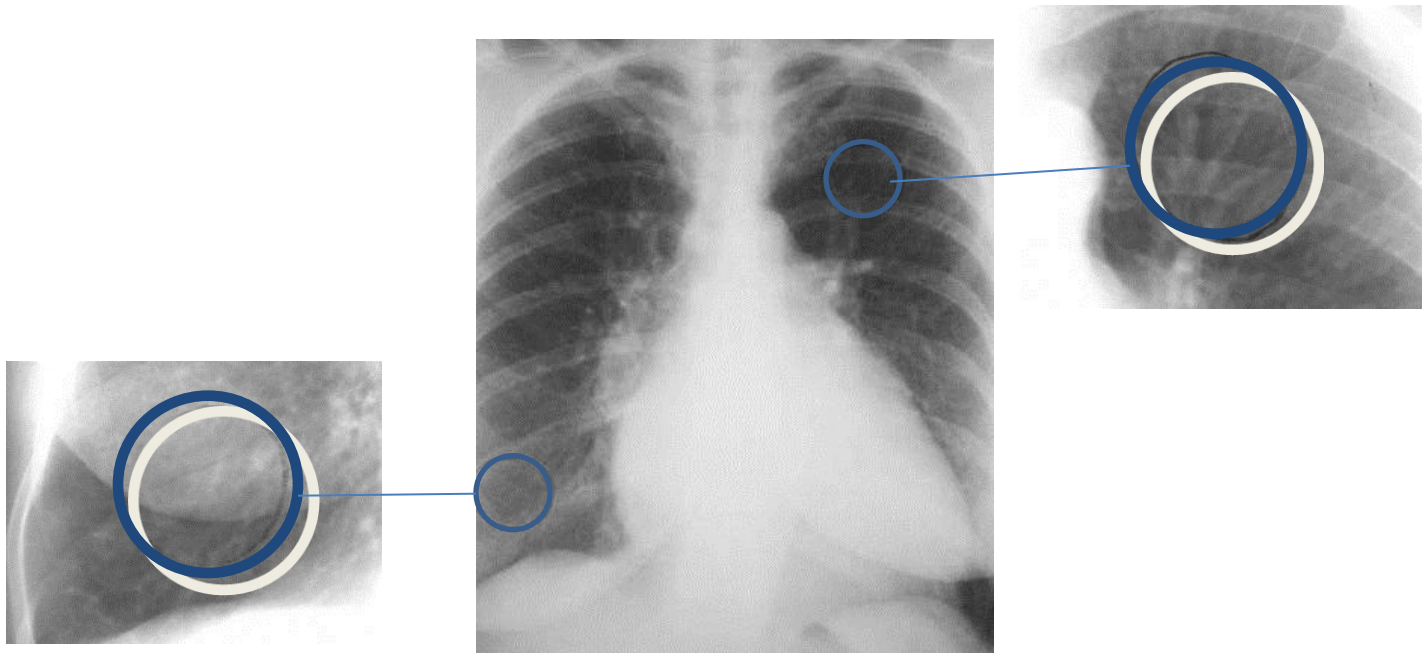


- Image 1: NO (1): RDPA(Right descending pulmonary artery) < 17 mm in diameter.
- Image 2 :
  - In erect position, blood flow to bases > than flow to apices.
  - Size of vessels at bases is normally greater than size of vessels at apex.
  - You can't measure size of vessels at the left base because the heart obscures them.
- Image 3:
  - Central vessels give rise to progressively smaller peripheral branches.
  - Normal tapering of vessels from central to peripheral.

- **Image 4: Main Pulmonary Artery**

### Pulmonary Venous Hypertension:

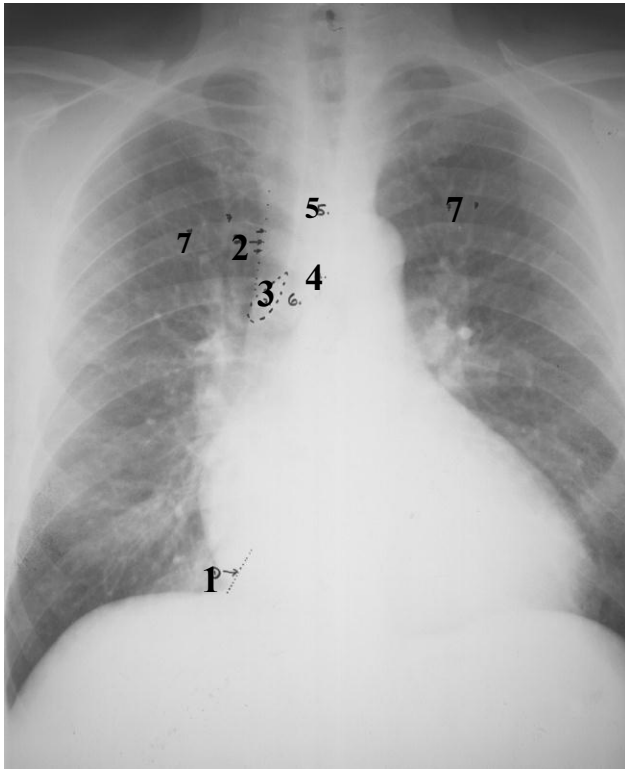
- Pulmonary venous hypertension is high blood pressure results when the heart is unable to efficiently carry blood away from the lungs. The blood tends to collect in the lung tissue. It is usually the result of conditions such as left-sided heart disease, constrictive pericarditis and other heart problems.
- **Clinical Features :**
  - Breathlessness
  - Chest pain
  - Fatigue
  - Palpitation
  - Syncope



- RDPA (**(Right descending pulmonary artery)** usually  $\geq 17$  mm in diameter.)
- Upper lobe vessels equal to or larger than size of lower lobe vessels → Cephalization

## Cardiovascular Imaging :

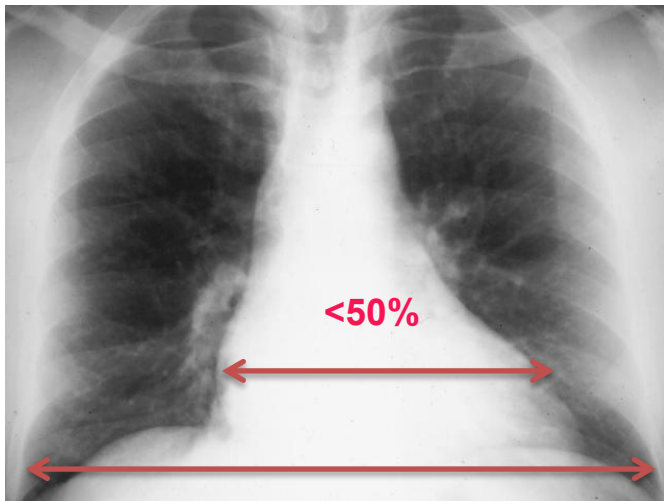
### Heart and Vessels :



Key:

1. Inferior vena cava (IVC)
2. Superior vena cava (SVC)
3. Azygos vein
4. Carina
5. Trachea
6. Right main stem bronchus
7. Prominent pulmonary vessels

- 1- Any and or all heart chambers may enlarge when the heart becomes diseased. **Cardiomegaly = a big heart.**
- 2- A patient's heart enlarges due to a number of diseases e.g. valve disease, high blood pressure, congestive heart failure.
- 3- If the heart fails, the lung often become congested. Early on the pulmonary vessels appear more prominent as in this case. More advanced failure can result in a condition of pulmonary edema which is fluid flooding into the alveoli of the lungs causing the patient marked shortness of breath.



### Cardio -Thoracic Ratio (CTR):

- which is the widest diameter of the heart compared to the widest internal diameter of the rib cage .
- Sometimes, CTR is more than 50% But Heart is Normal

Normal CTR **<50%**



### **Extracardiac causes of cardiac enlargement**

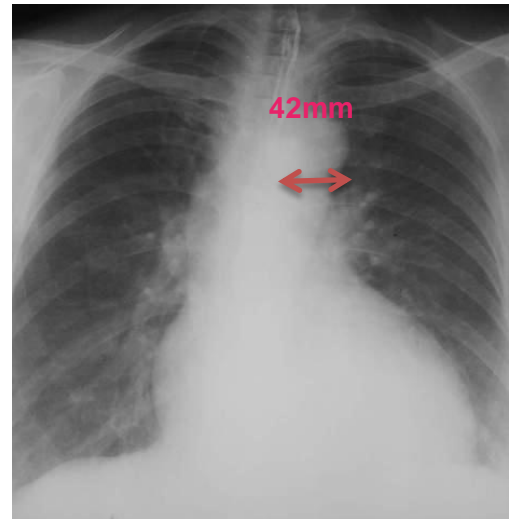
- ✓ Portable AP films
- ✓ Obesity
- ✓ Pregnant
- ✓ Ascites
- ✓ Straight back syndrome.
- ✓ Pectus excavatum.

### **Aortic Knob**

**Normal Aortic Knob diameter: 42 mm**

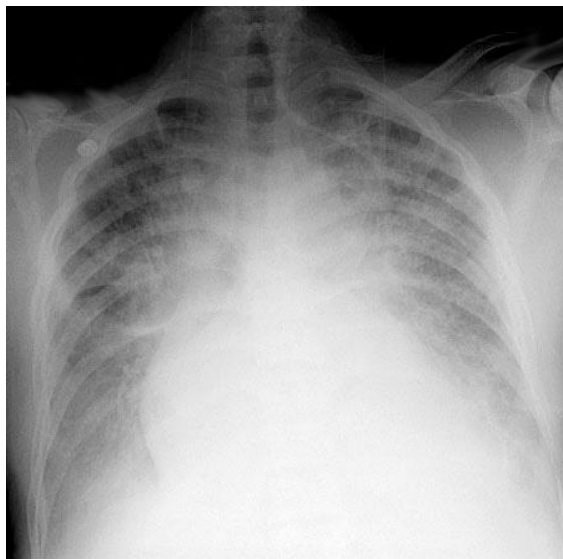
**Enlarged with:**

- Increased pressure
- Increased flow
- Changes in aortic wall



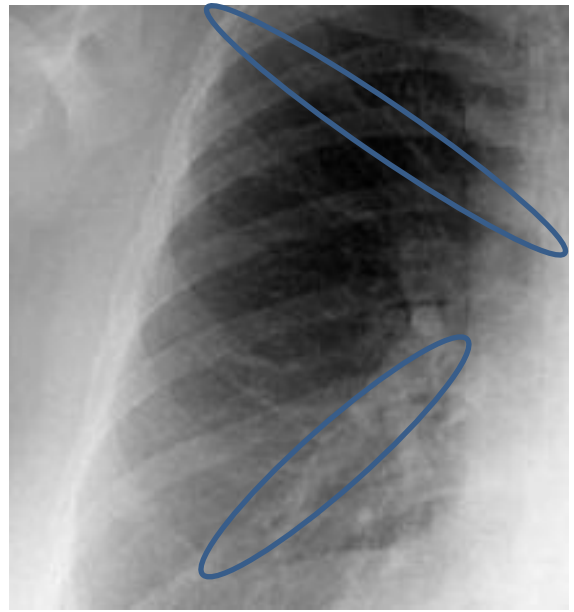
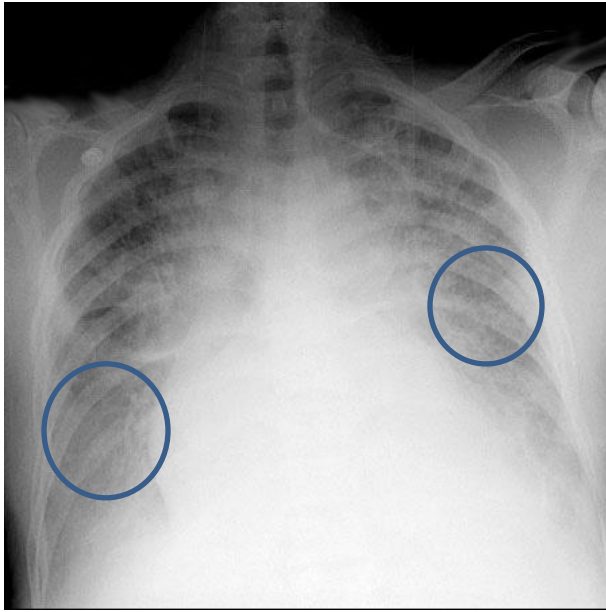
### **Congestive heart failure :**

- occurs when the heart is unable to provide sufficient pump action to distribute blood flow to meet the needs of the body.
- Heart failure can cause a number of symptoms including **shortness of breath , leg swelling , and exercise intolerance .**



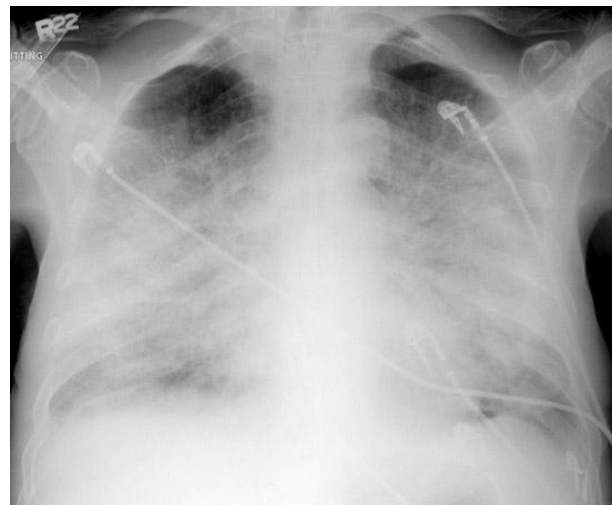
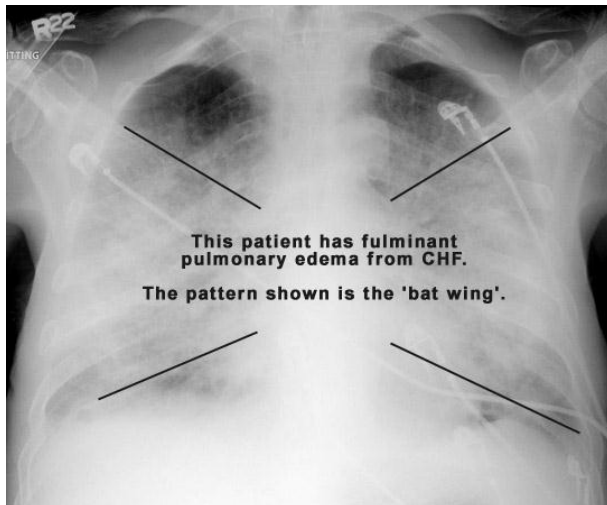
### **Radiological features of heart failure :**

1. **Diffuse Lung Opacities**
2. **Ill-defined Vessels**
3. **Cardiac Enlargement**
4. **Enlarged cardiac silhouette**



### Acute Pulmonary Edema :

- Pulmonary edema occurs when the alveoli fill up with excess fluid seeped out of the blood vessels in the lung instead of air
- can be caused by many different factors. It can be related to heart failure, called cardiogenic pulmonary edema, or related to other causes, referred to as non-cardiogenic pulmonary edema.



**Chest X ray a patient with pulmonary oedema**

- Are a sign seen on chest radiographs **with interstitial pulmonary edema** . They are thin **linear pulmonary opacities** caused by fluid or cellular infiltration into the interstitium of the lungs.
- The most common condition causing Kerley B lines is **cardiac failure**.

