



MED437
KING SAUD UNIVERSITY



Radiological Anatomy of Thorax

Lecture 6

غيداء ال مضمع
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Revised by

Please check our [Editing File](#).

هذا العمل لا يغني عن المصدر الأساسي للمذاكرة

Objectives

- 1- Identify the bones of the thoracic cage.
- 2- Identify superficial soft tissues.
- 3- Identify the trachea and lung fields.
- 4- Describe the mediastinum and the cardiac shadows.
- 5- Describe brief knowledge about Bronchography.
- 6- Describe brief knowledge about Coronary Angiography

- Text in **BLUE** was found only in the boys' slides
- Text in **PINK** was found only in the girls' slides
- **Text in RED is considered important**
- Text in **GREY** is considered extra notes

Radiography

Indications for chest X-ray

•A chest x-ray may be used to **diagnose** and **plan treatment** for various conditions, including:

•1-Disease/Fractures of the bones of the chest

- Ribs
- Sternum
- Vertebrae
- Clavicle
- Scapula

•2-Lung disorders

- pneumonia
- Emphysema
- Atelectasis
- Pleural effusion
- Tuberculosis
- Lung cancer

•3-Heart disorders

- Congestive heart failure, which causes
- cardiomegaly (heart enlargement).

4-Chest radiographs are also used to screen for **job-related lung diseases** in industries such as mining where workers are exposed to dust, example of diseases: Asbestosis, silicosis

5-Chest x-ray is also requested as **pre-employment demand**.

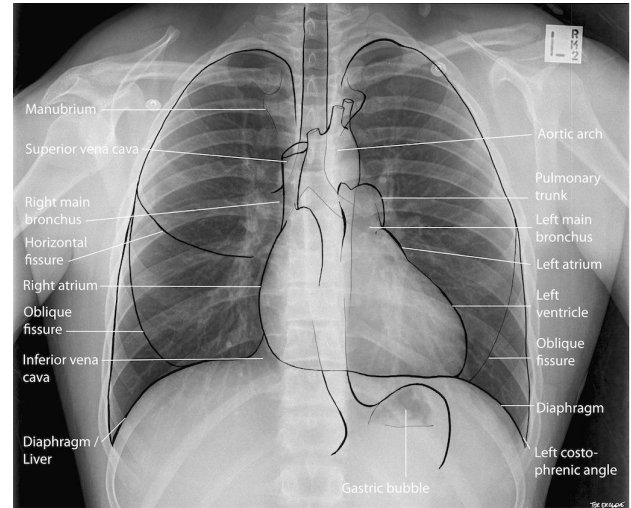
Radiography

Different views of the chest can be obtained by:

- Changing the orientation of the body
- The direction of the x-ray beams.

The most common views are:

- 1- Posteroanterior (PA).
- 2- Anteroposterior (AP).
- 3- Lateral (L).
- 4- Decubitus.



Radiography

- **Anteroposterior (AP) view:**

- The x-rays enter through the anterior aspect and exit through the posterior aspect of the chest.

- AP chest x-rays are done where it is difficult for the patient to obtain a normal chest x-ray, such as when the patient cannot get out of bed.

- **Lateral view** • Indicated only for further interpretation*.
- **Decubitus:** lying at the side

*we only use it if we need more information.



Lateral view



Decubitus

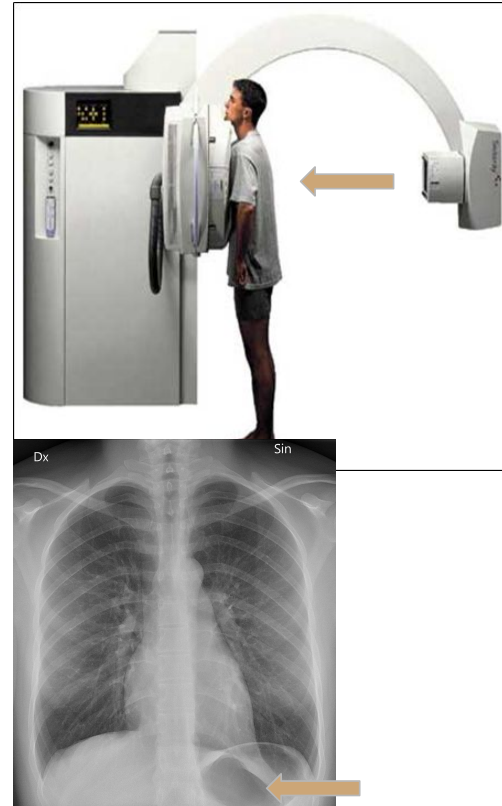
Radiography

- **Posteroanterior (PA) view:**

- The x-rays enter through the posterior aspect of the chest, and exit out of the anterior aspect where they are detected by an x-ray film.
- PA view gives a good assessment of the **Cardiac Size***.
- It avoids magnification of the heart as the film is close to the anterior chest wall.
- It is identified by the presence of the **fundal** gas bubble** and the **absence of the scapulae** in the lung fields.

*the real size of the heart.

** Related to the stomach.



Radiography

Posteroanterior radiograph

the following structures must be examined

- Superficial soft tissues: Nipples in both sexes and the Breast in (females) are seen superimposed on the lung fields.
- Bones of thoracic cage.
- Diaphragm.
- Lungs and Bronchi.
- Heart & Great Vessels.

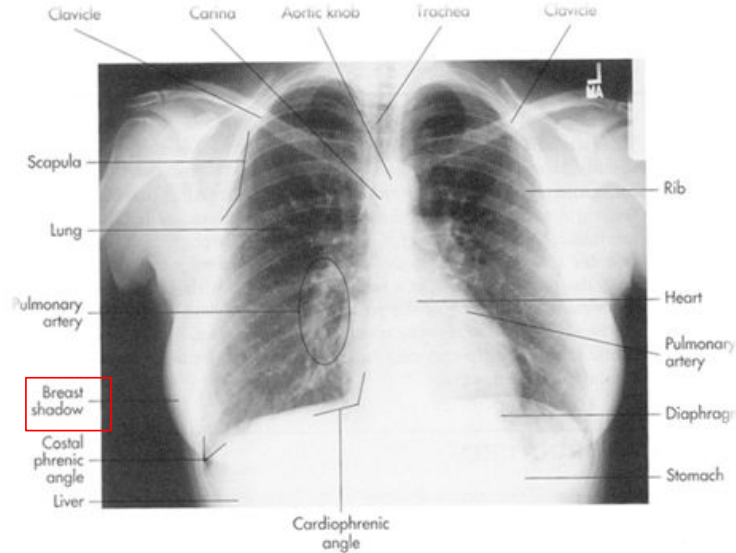


Fig. 3-1 Normal position of anatomical structures on a posterior or anterior chest radiograph.

Posteroanterior radiograph (Bones of thoracic cage)

Thoracic vertebrae:

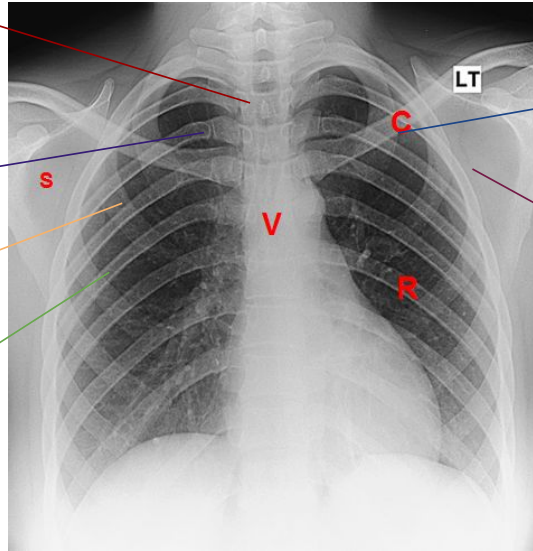
The Thoracic Vertebrae are imperfectly (not clearly) seen.

Costo-transverse joints

Anterior ribs

Posterior ribs

Costo-transverse joints and each **Rib** should be examined in order. from above downward and compared to their fellows of the opposite side .



Clavicles:

Are seen clearly crossing the upper part of each lung field.

Medial border of the scapula:

may overlap the periphery of each lung field.

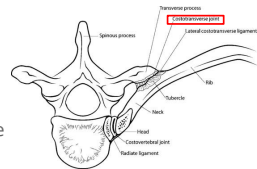
Costal Cartilages:

are not usually seen, but if **calcified**, they will be visible.

The image is from the boy's slides

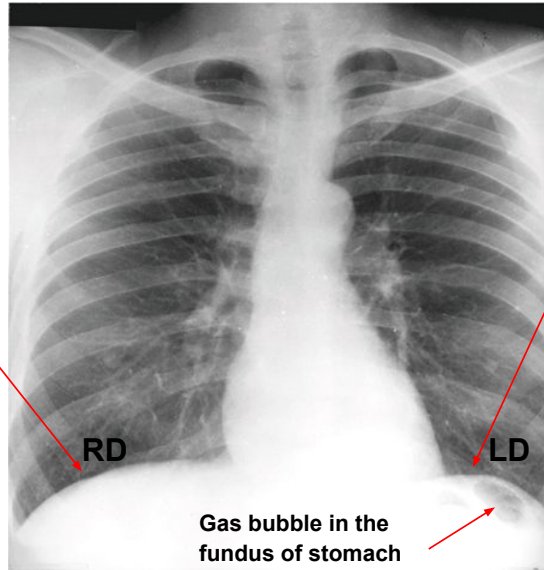
ملاحظة : هذه الشريحة عند الأولاد فقط تعداد

Extra for better understanding :
costotransverse joint : The joint between the transverse process and the head of the ribs (tubercle)



Posteroanterior radiograph (Diaphragm)

The diaphragm appears as a **Dome-shaped** shadows on each side.



The right dome is slightly higher than the left dome. (if they were equal this suggest a pathology)
Beneath the right dome is the homogeneous, dense shadow of the **liver**

Beneath the **left dome** a gas bubble maybe seen in the **fundus of the stomach**.

Gas bubble in the fundus of stomach

Posteroanterior radiograph (Diaphragm)

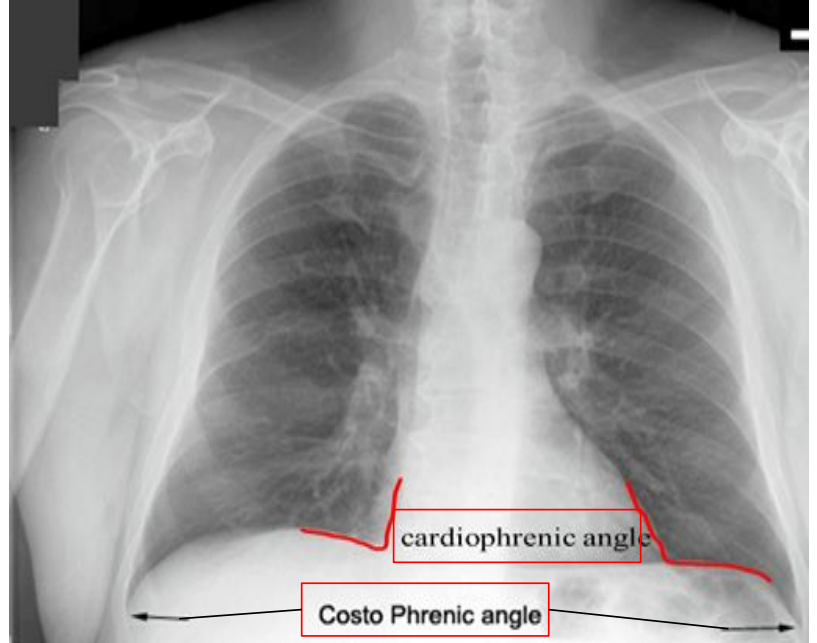
Costo-diaphragmatic (costo-phrenic) Angles

They are at the sites where the diaphragm meets the thoracic wall. Forming an acute angle.

•The angles become blunt (obtuse *زاوية منفرجة* - not sharp) or obscured (unnoticeable) in case of presence of **pleural fluid or fibrosis**

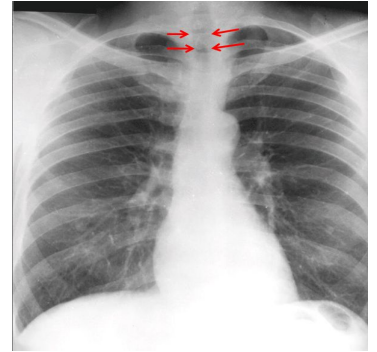
Cardiophrenic Angle

where the diaphragm meet the heart.



Trachea

- The radio-translucent, air-filled shadow of the trachea is seen in the **midline of the neck as a dark area**.
- It is superimposed on the lower cervical and upper thoracic vertebrae.



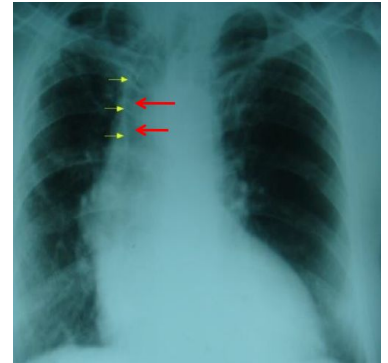
Tracheal shift

Only found on girls slides.

- Tracheal air column is seen shifted to right on X-ray chest PA view.
- **It indicates:**
 - A loss of volume of the right upper lobe of the lung, either due to collapse or fibrosis. (will shift to the right)

OR

- A massive pleural effusion (will shift to the left) on the left side. (But in this x ray, no pleural effusion is seen on the left)

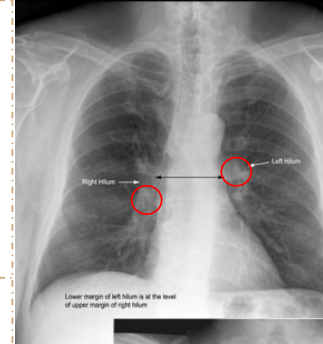


Lung

Lung roots

*Relatively **dense shadows** caused by the **presence of the blood- filled pulmonary and bronchial vessels, the large bronchi, and the lymph nodes.**

*Notice that the lower margin of left hilum lies at the level of the upper margin of right hilum.



Lung fields

by virtue of the air they contain, readily permit the passage of x-rays. For this reason, the **lungs are more translucent on full inspiration than on expiration.**

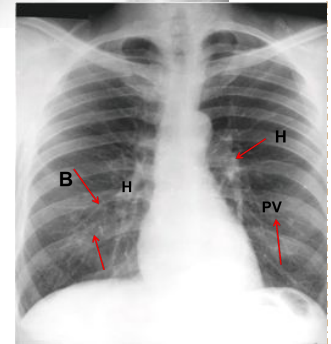
Pulmonary blood vessels

are seen as series of **small, round, white shadows** radiating from the lung root.

Bronchi

*The **large bronchi** also cast similar **round shadows**.

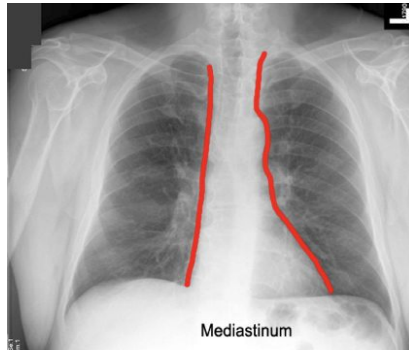
*The **smaller bronchi** are **not seen**.



Posteroanterior radiograph

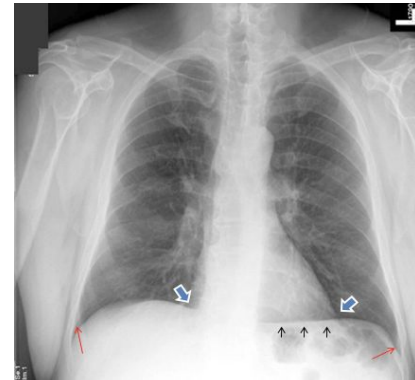
Mediastinum

- ❖ The shadow is produced by the various structures within the mediastinum, superimposed one on the other.
- ❖ Note the outline of the heart and great vessels.



Only found on girls slides.

- ❖ The inferior border (lower border of the heart) blends with the diaphragm and liver shadow.
- ❖ Note the **cardiophrenic angles**.



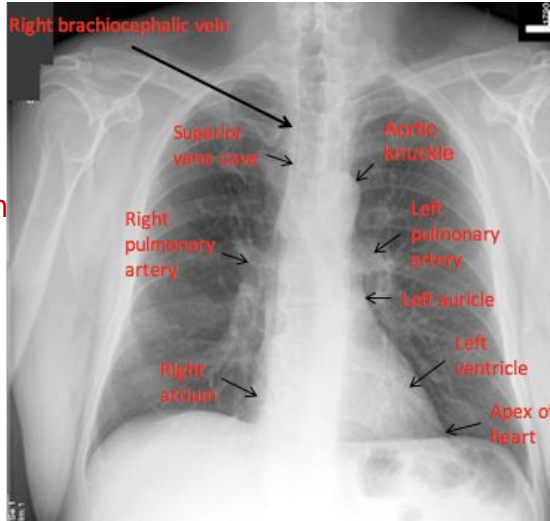
Posteroanterior radiograph

Mediastinum

The **Right Border** from above downward consists of:

(Memorize them in order)

- 1) Right brachiocephalic vein
- 2) Superior vena cava
- 3) Right atrium
- 4) Sometimes the Inferior vena cava.



The **Left Border** consists of:

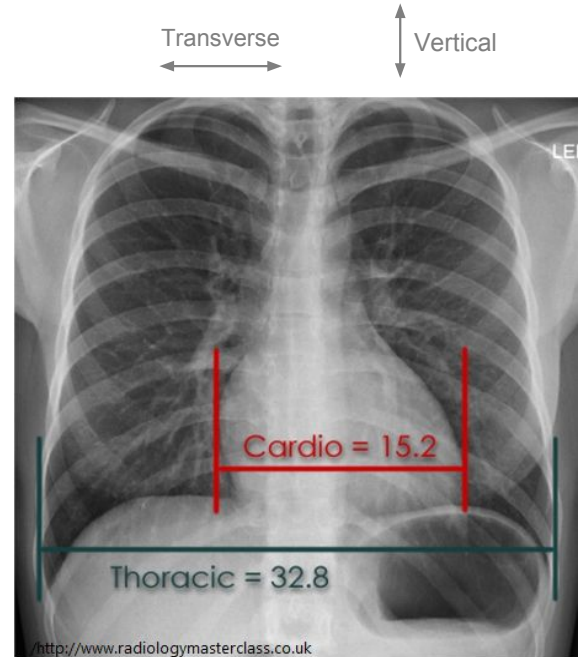
- 1) A prominence, the **Aortic knob (Knob)**, caused by the aortic arch.
- 2) Left margin of the **Pulmonary Trunk**
- 3) The left **Auricle**
- 4) The left **Ventricle & apex of heart**.

- Each atrium has an auricle.

Radiology of the Heart

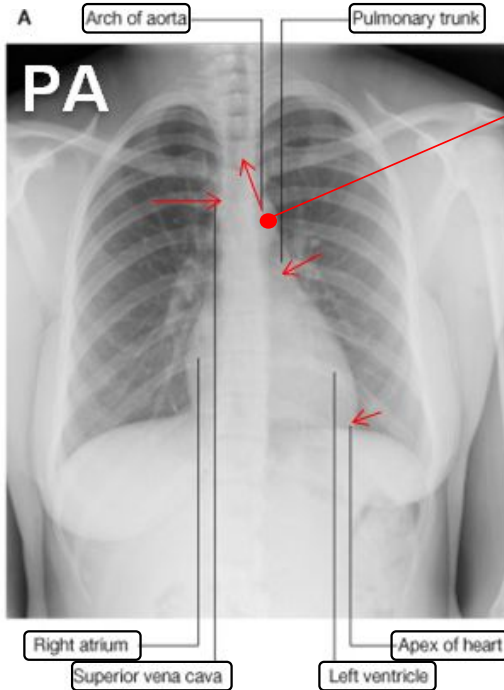
Heart

- The **Transverse Diameter** of the heart should not exceed half the width of the thoracic cage.
Dr. Jamila said: for example if transverse diameter of the thoracic cage is 10 then the transverse diameter of the heart must be less than or equal to 5 **BUT** if it's more than 5 that means there is enlargement in the heart .
- On **deep inspiration**, when the diaphragm descends, the **vertical length** of the heart increases and the **transverse diameter is narrowed**. **Dr. Jamila said:** normally the heart with inspiration descend, so the vertical diameter in inspiration longer than expiration and the transverse diameter in inspiration narrower than expiration. **Team 436:** as if you are pulling down the heart.
- **In infants**, the heart is always wider and more globular "كروي" in shape than in adults.
Dr. Jamila said: the vertical and horizontal diameters are almost equal so that's why the heart appearance would be globular and wider than adult.



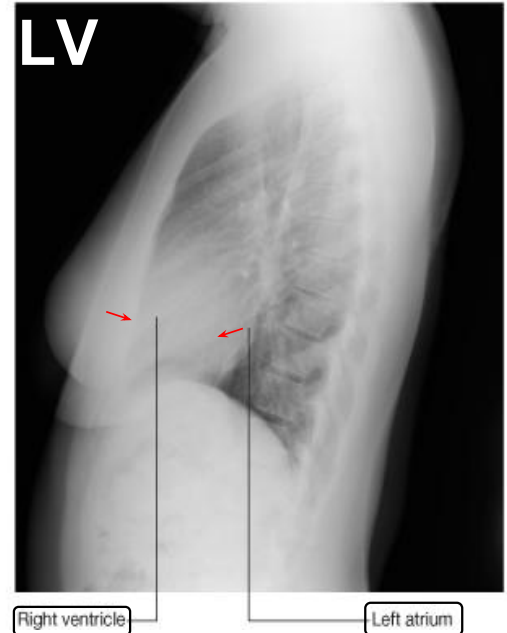
Radiology of the Heart

Only in females' slides



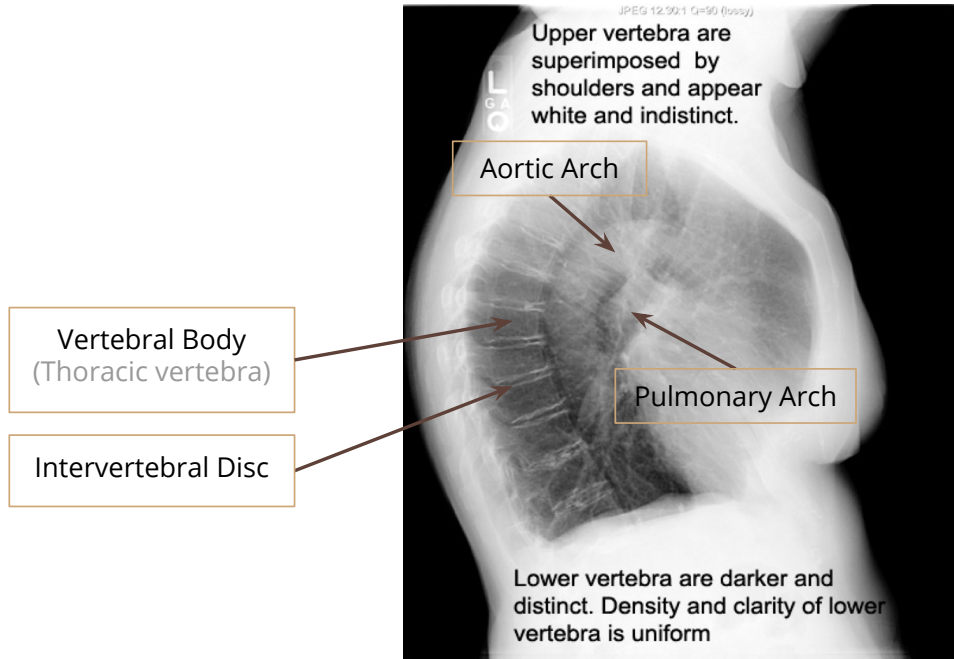
Aortic knuckle

Team 436:
in the PA view you can see the aortic knuckle, apex of the heart, right atrium and left ventricle, **BUT** in order to see the right ventricle and left atrium you have to look at the Lateral View.



Lateral Radiograph of The Chest

Only in females' slides



- We also use the LV to assess the vertebral column

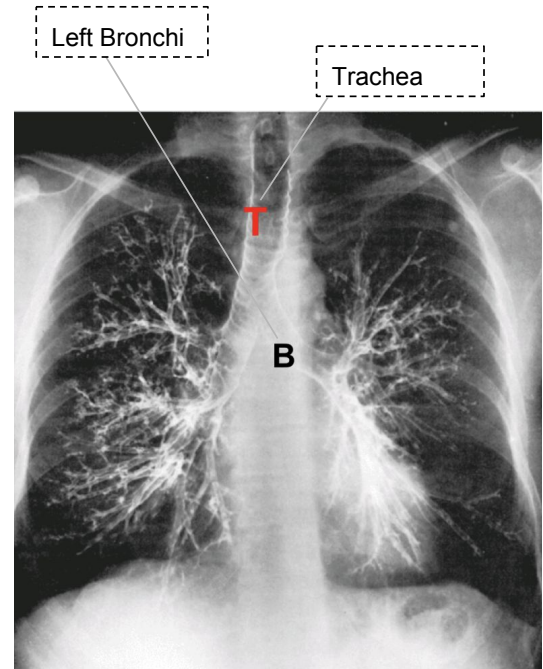
Bronchography

- **Bronchography is a** radiological technique **special study of the bronchial tree by means of the introduction of contrast medium into a particular bronchus or bronchi**, usually under fluoroscopic control. Fluoroscopy is an imaging technique that uses X-rays to obtain real-time moving images of the interior of an object.

The contrast media are no irritating and sufficiently radiopaque to allow good visualization of the bronchi.

Contrast media is a substance used to enhance the contrast of structures or fluids within the body in medical imaging

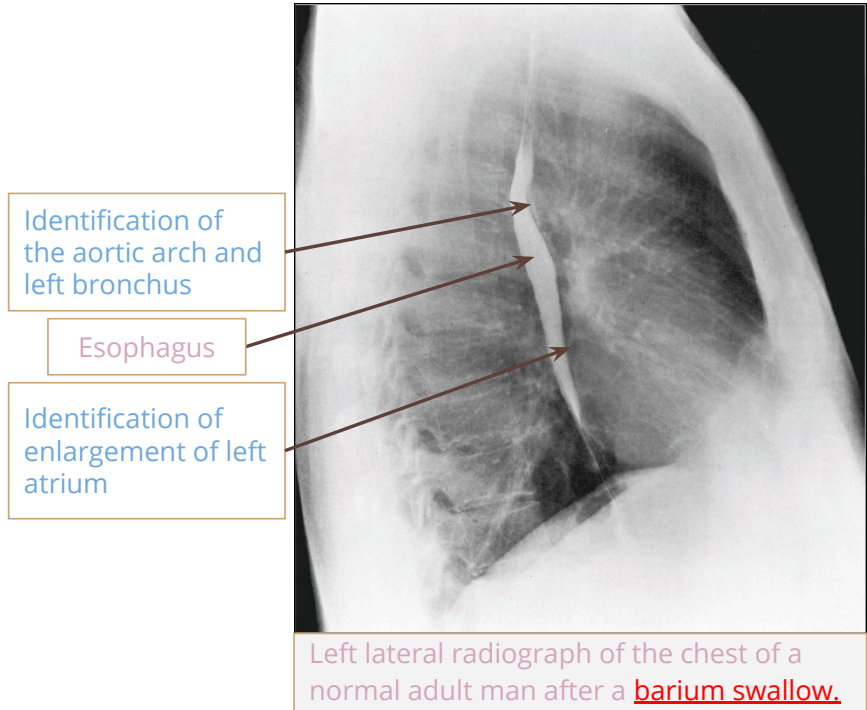
After the radiographic examination is completed, the patient is asked to cough and expectorate -to spit out -the contrast medium.



Posterior Bronchogram

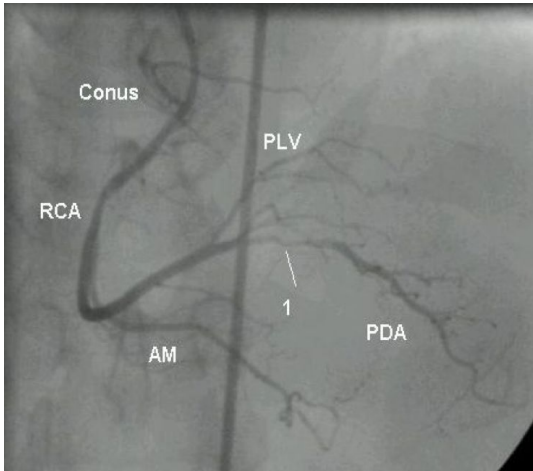
Contrast Visualization of The Esophagus

- Contrast visualization of the esophagus by swallow a contrast media, (**barium swallow**).
- Other barium contrast studies:
 - Barium meal: stomach
 - Barium follow through: small intestine
 - Barium enema: large intestine

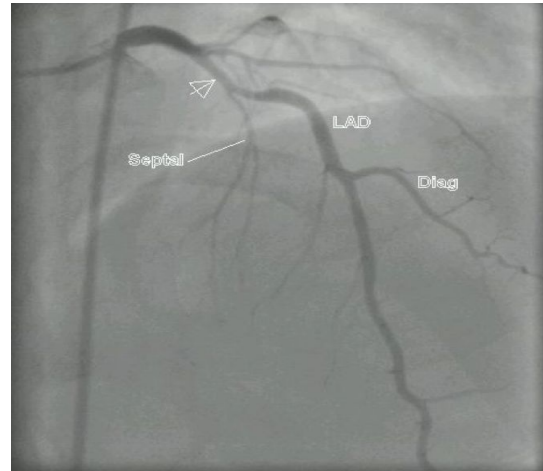


Coronary Angiogram (Angiography)

- An X-ray with radio-opaque contrast in the coronary arteries.
- The coronary arteries are visualized by introduction of radio-opaque material into their lumen.
- Pathological narrowing or blockage of coronary artery can be identified.



Right Coronary



Left Coronary

MCQ's

1- Posteroanterior (PA) view gives a good assessment of:

- A) Cardiac Size.
- B) Lung Size.
- C) Both A+B.

2-The right dome is _____ the left dome.

- A) slightly lower than.
- B) as high as.
- C) slightly higher than.

3-The Aortic knuckle, caused by the aortic arch at the:

- A) Left border.
- B) Right border.
- C) Both A+B.

4-On deep inspiration, when the diaphragm descends, the vertical length of the heart:

- A) Decreases.
- B) Increases.
- C) doesn't affect.

5-In infants, the heart is always _____ in shape than in adults

- A) wider and more globular.
- B) wider and less globular.
- C) narrower and more globular.

6-We use _____ to visualize the esophagus on an x-ray image.

- A) Barium meal
- B) Barium swallow
- C) Barium enema

Team Members

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Rawan Mohammad Alharbi
Abeer Alabduljabbar
Afnan Abdulaziz Almustafa
Ahad Ahmed Algrain
Albandari Alshaye
AlFhadah abdullah alsaleem
Ghaida Alsanad
Lojain Azizalrahman
Maha Barakah
Majd Khalid AlBarrak
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Saud Alghufaily
Hassan Aloraini
Abdullah Alomar
Fahad Alfaiz
Saad Aloqile
Abdulmajeed Alwardi
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Sultan Alfuhaid
Ali Alammari
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Mohammed Alquwayfili
Saleh Almoaiqel
Abdullah Almeaither
Abduljabbar Al-yamane
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Abdulhaziz Alabdulkareem