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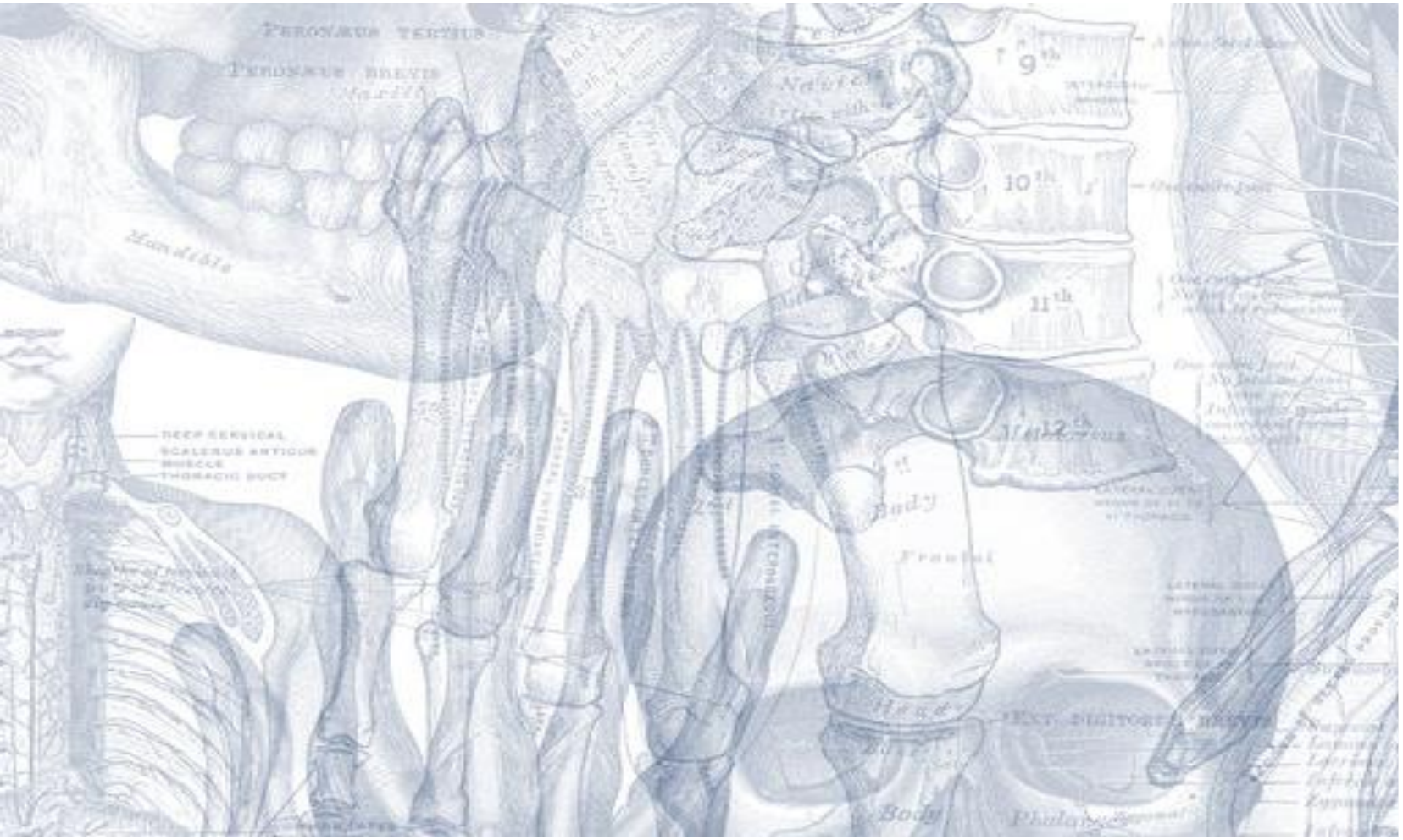


ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

Revised by
شوق الأحمري & طراد الوكيل

Radiological Anatomy Of The Chest

Color Code

- **Important**
- **Doctors Notes**
- **Notes/Extra explanation**

Please view our Editing File before studying this lecture to check for any changes.

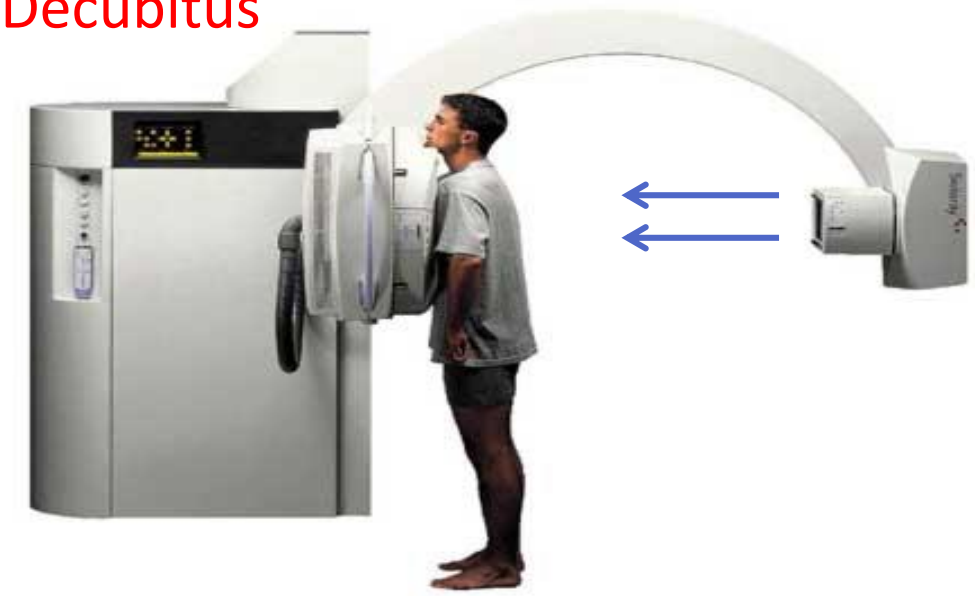
Objectives

By the end of the lecture you should be able to:

- ✓ Identify the bones of the thoracic cage.
- ✓ Identify superficial soft tissues.
- ✓ Identify the trachea and lunge fields.
- ✓ Describe the mediastinum and the cardiac shadows.
- ✓ Describe brief knowledge about Bronchography.
- ✓ Describe brief knowledge about Coronary Angiography

Radiography

- Different views of the chest can be obtained by changing the orientation/relative position of the body and the direction of the x-ray beams.
- The most common views are:
  1. Posteroanterior (PA)
  2. Anteroposterior (AP)
  3. Lateral (L).
  4. Decubitus



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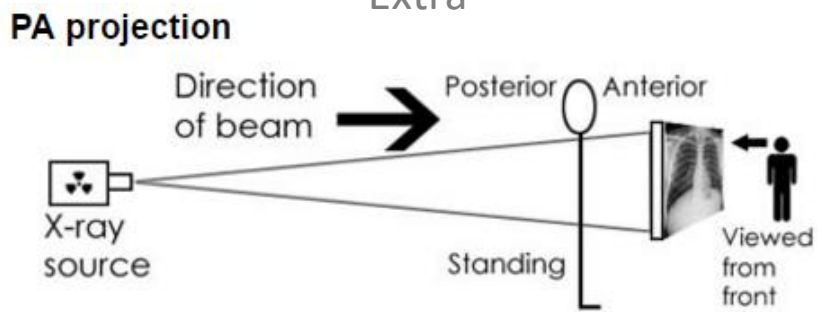

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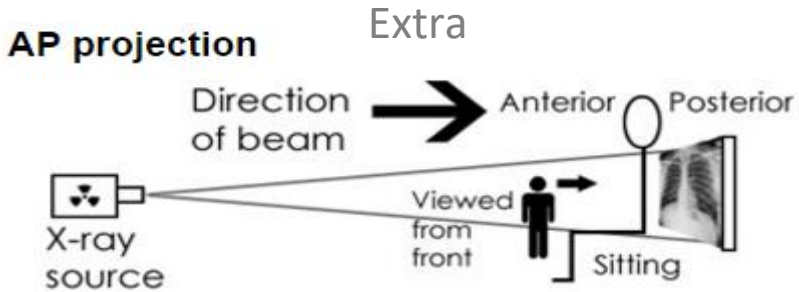

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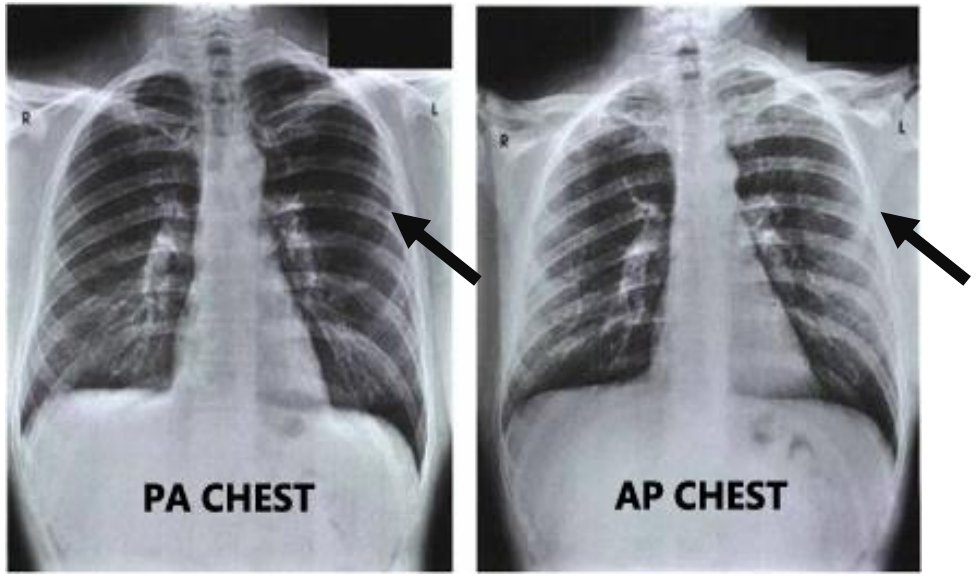
Radiography

1. Posteroanterior (PA) view:

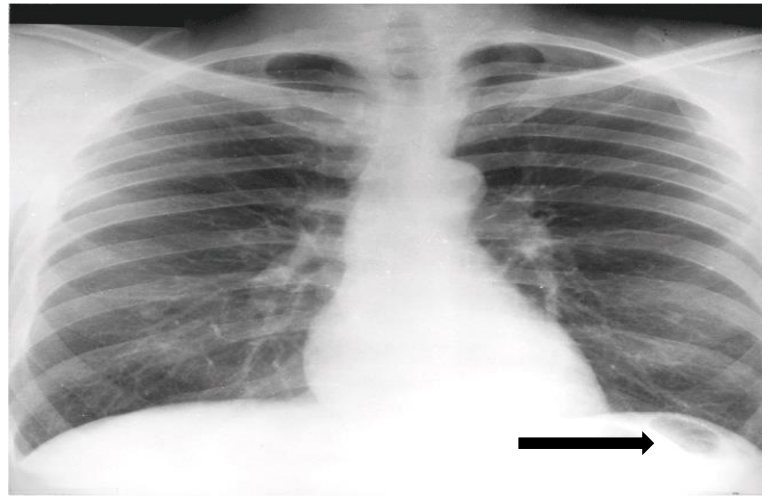
- Most commonly used.
- The x-rays enter through the posterior aspect of the chest, and exit out of the anterior aspect where they are detected by an x-ray film.
- PA view gives a good assessment of the **Cardiac Size.**
- It avoids magnification of the heart as the film is close to the anterior chest wall. (the patient stands directly in front of the sheet so that the beams fall directly without spreading and amplifying the picture)
- How can we differentiate if the x-ray is PA or AP?
- **The PA is identified** by the presence of the **fundal gas bubble*** and the **absence of the scapulae in the lung fields**.**

* The fundus is the only part of the stomach containing air instead of food.

** The scapulae are not completely absent. The medial borders are partially visible.



Extra:
Notice how the scapulae are unclear in PA as opposed to the AP.



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Radiography

2. Anteroposterior (AP) view:

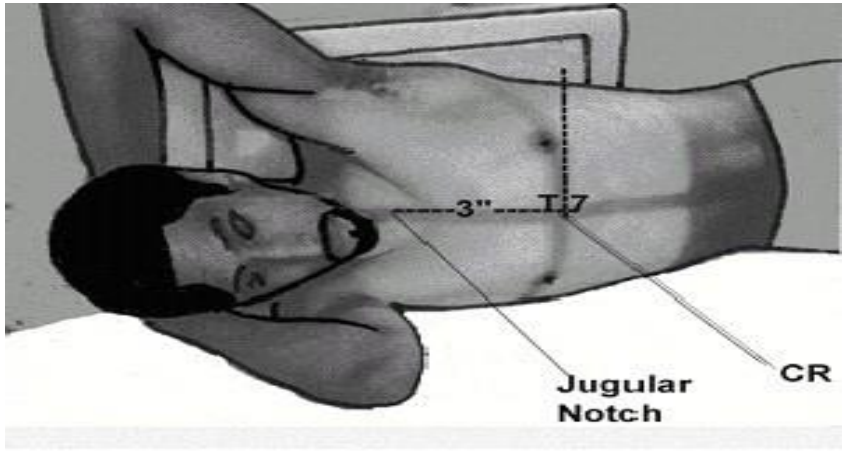
- The x-rays enter through the anterior aspect and exit through the posterior aspect of the chest.
- AP chest x-rays are done where it is difficult for the patient to obtain a normal chest x-ray, such as when the patient **cannot get out of bed** (we call these patients bed ridden)**.**

3. Lateral view

- Taken from the side.
- Indicated only **for further interpretation.** (to see structures we can't see in the PA/AP, for example: the right ventricle and left atrium).

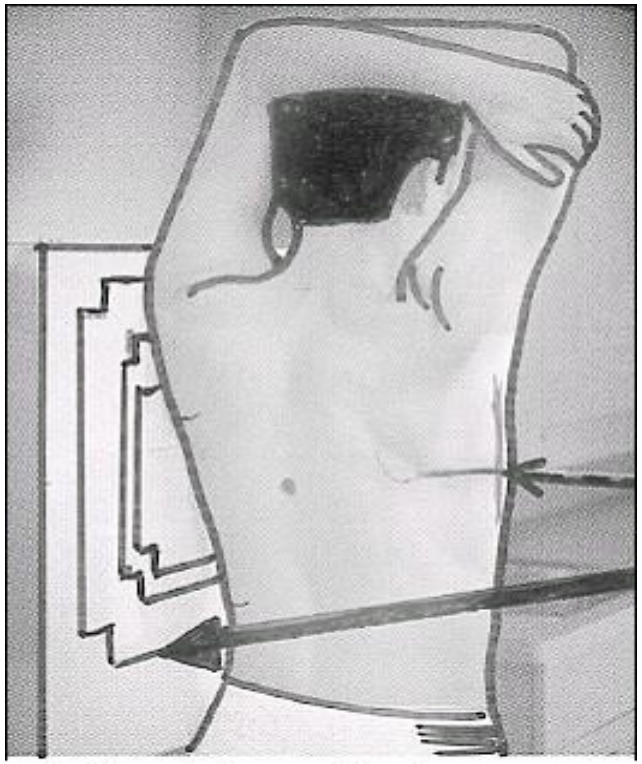
4. Decubitus:

- The patient is lying at the side.



AP projection lateral decubitus position. Image courtesy of Dr. Naveed Ahmad.

Extra



Left lateral chest position. Image courtesy of Dr. Naveed Ahmad.

Extra

This slide is different in the girls' and boys' lectures

Radiography

Indications for chest X-ray

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

1- Disease/Fractures of chest bones including:	2-Lung disorders	3-Heart disorders
• Ribs • Sternum • Vertebrae • Clavicle • Scapula	pneumonia • Emphysema • Atelectasis • Pleural effusion • Tuberculosis • Lung cancer	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. (boys slide)

- **Indication:** reasons or signs we should use a chest x-ray.
- **Follow up**:لمتابعة المريض هل تحسن أم لا
- **Pneumonia**: infection of the lung usually by a bacteria or a virus.
- **Emphysema**: enlargement of air spaces with destruction of their walls.
- **Atelectasis**: (known as collapse), it is loss of lung volume because of inadequate expansion of air spaces.
- **Pleural effusion**: accumulation of fluid in the pleural cavity.
- **Asbestos**: a mineral that was used as an insulator.
- **Silica**: a compound found in sand.

Posteroanterior Radiograph

Posteroanterior Radiograph

For ***Posteroanterior*** radiograph (**PA**), the following systems must be examined in order.

1. Superficial soft tissues;
   - The nipples in both sexes.
   - The breast shadow in female are seen superimposed on the lung fields.
2. Bones of thoracic cage.
3. Diaphragm.
4. Lungs and bronchi.
5. Heart and great vessels.

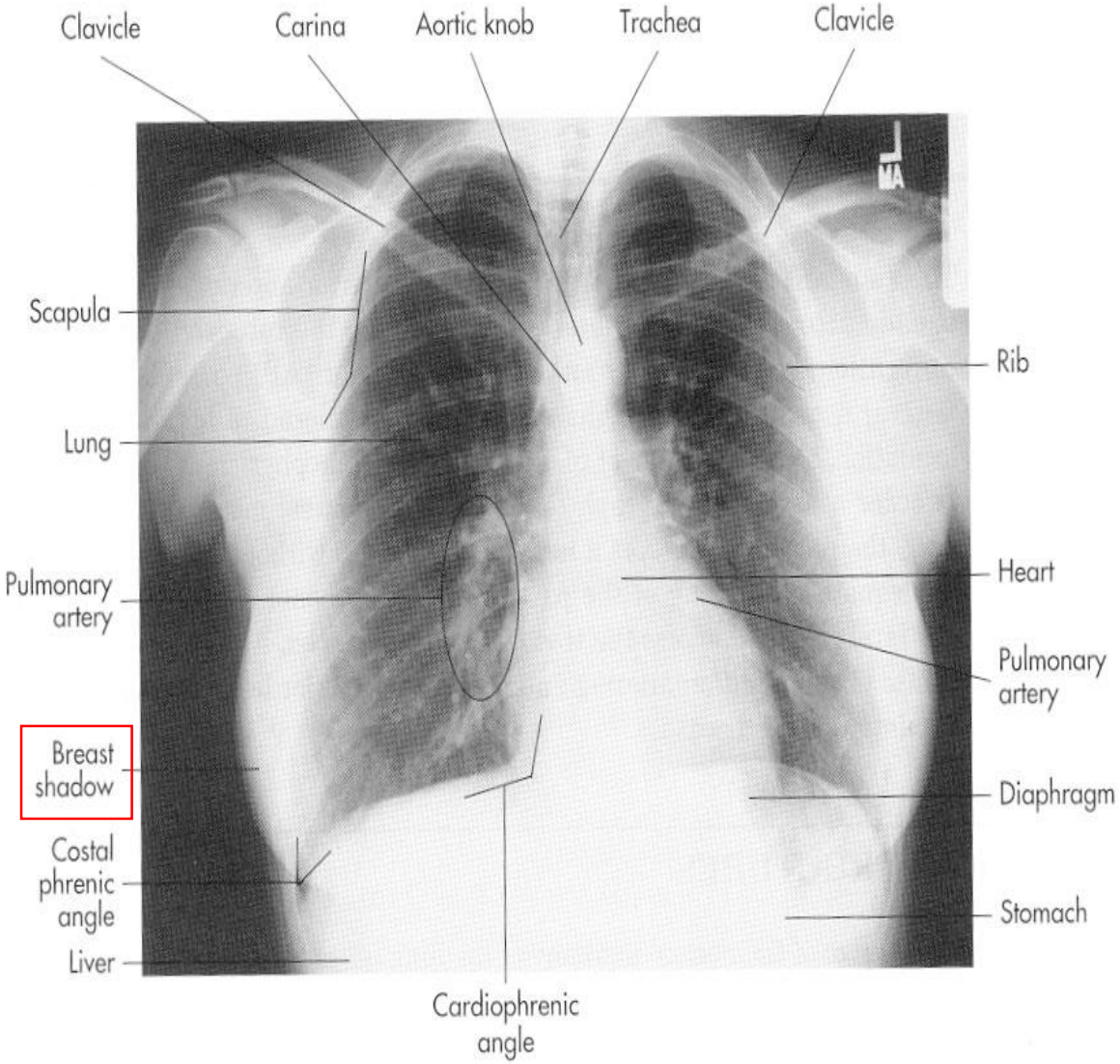


Fig. 3-1 Normal position of anatomical structures on a posterior or anterior chest radiograph.

Posteroanterior Radiograph

Bones of the thoracic cage:

This slide is different in the girls' and boys' lectures

Thoracic vertebrae:

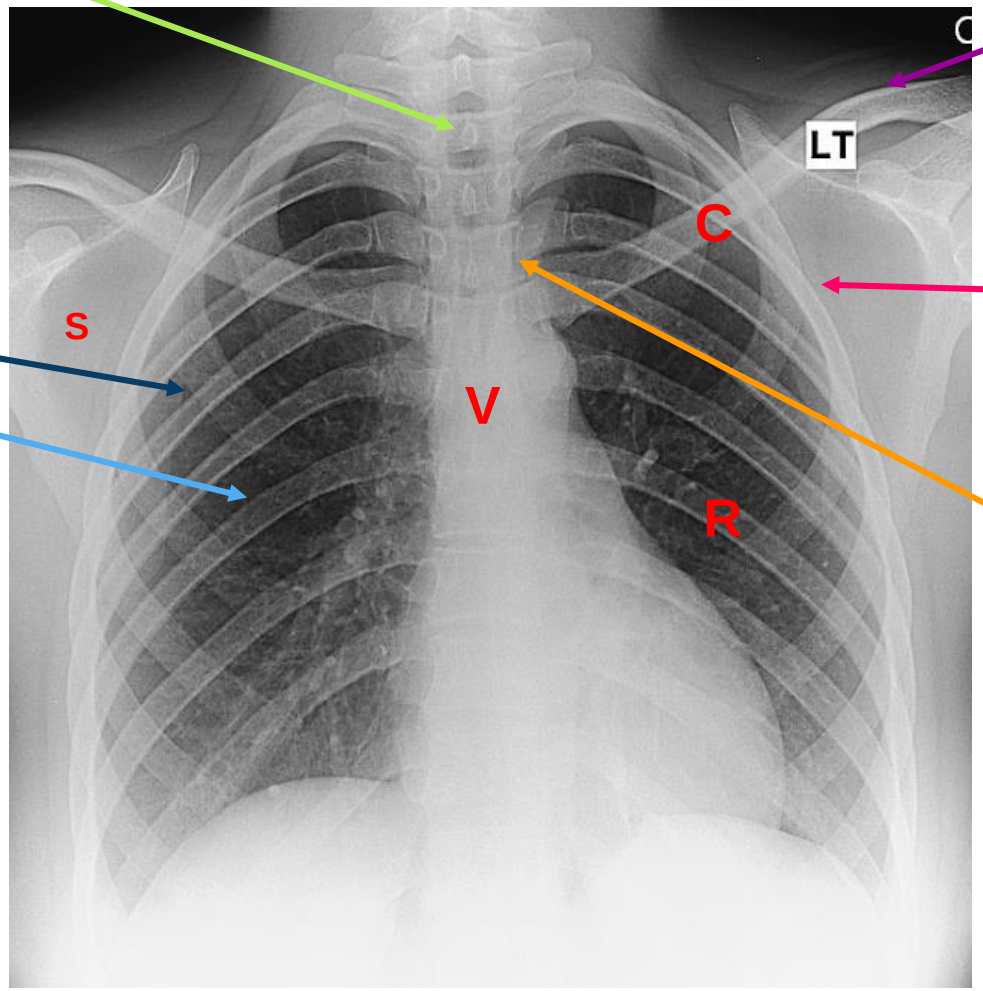
The Thoracic Vertebrae are imperfectly seen.
The black parts resemble the trachea.

- Anterior Ribs
- Posterior Ribs

each Rib should be examined in order from above downward and compared to their fellows of the opposite side to check for any abnormality or fracture .

Costal Cartilages:

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



Clavicles:

seen clearly crossing the upper part of each lung field.

Medial border of the scapula:

may overlap the periphery of each lung field.

Costo-transverse joints

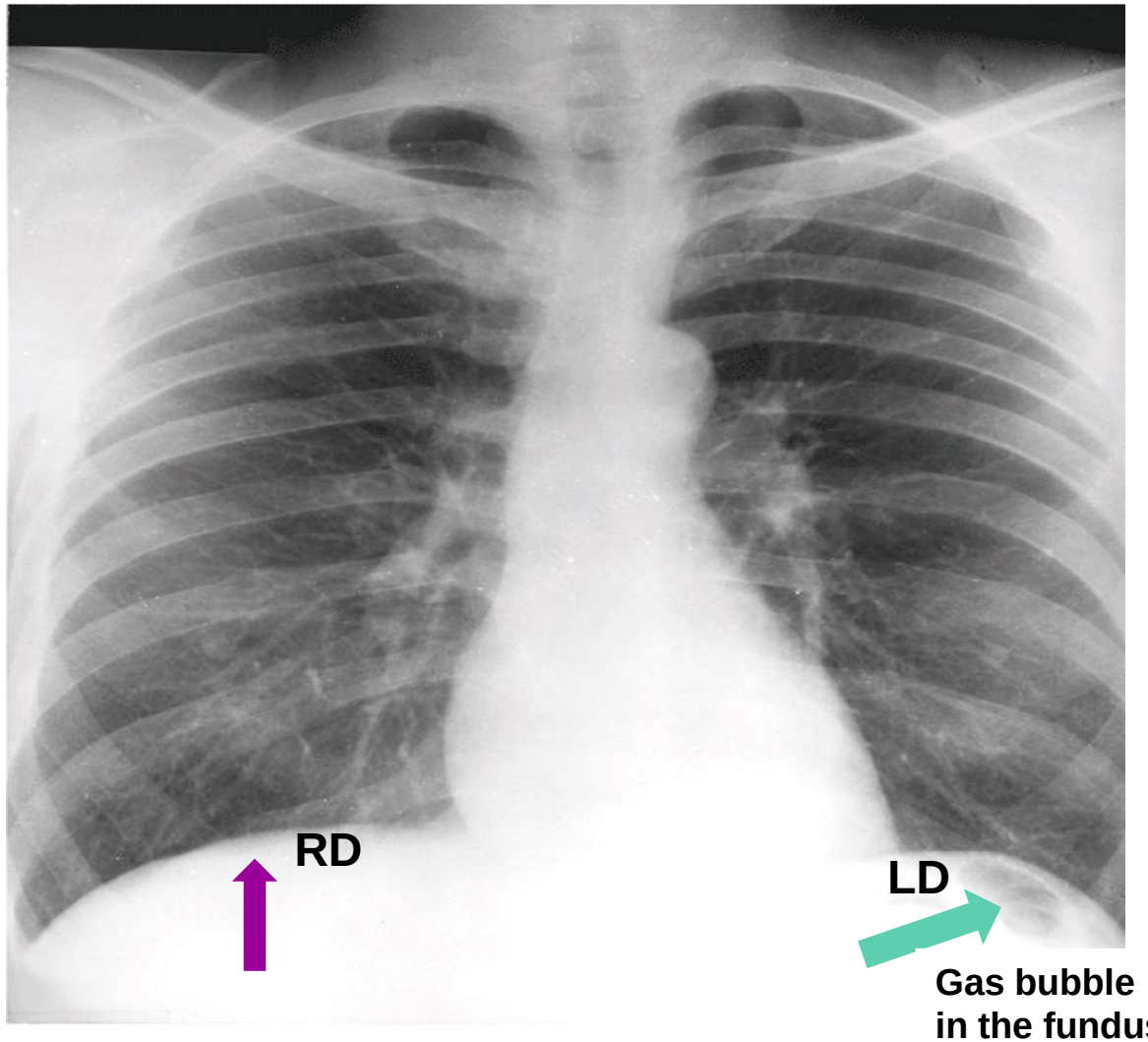
The joint between the transverse process and the head of the ribs.

Note: *LT* is the left side of the patient

Posteroanterior Radiograph

Diaphragm

- **The diaphragm** appears as a dome (or cupola) shaped shadow on each side.
- The **right dome** is slightly *higher* than the left. If the left dome is at the same level or higher than the right dome that means there is fluid in the peritoneal or pleural cavity.
- Beneath the right dome is the homogeneous, dense shadow of the **liver.**
- Beneath the left dome a **gas bubble** mostly seen in the *fundus of the stomach*.



LD: Left Dome
RD: Right Dome

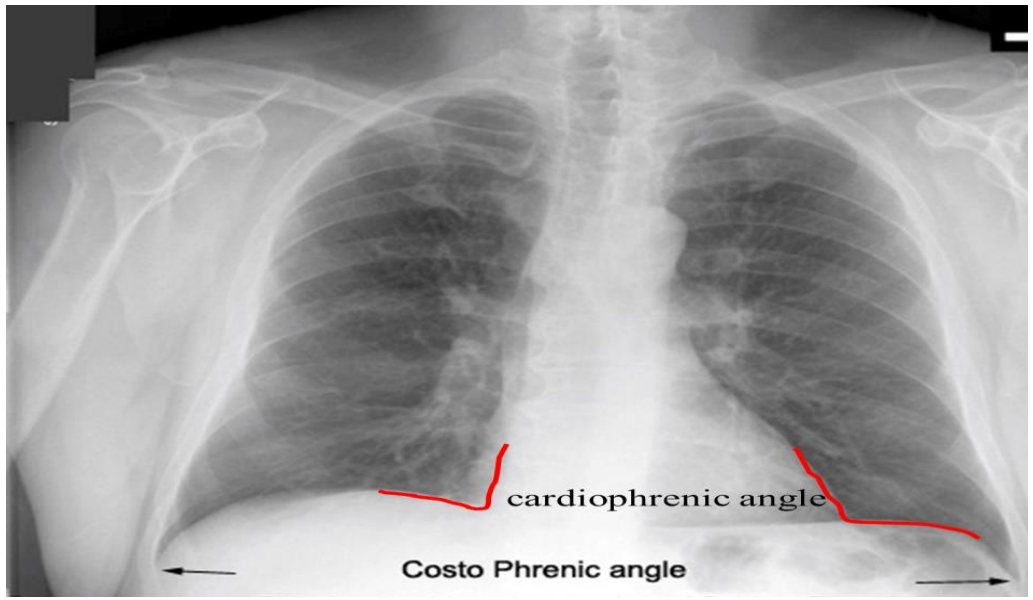
Posteroanterior Radiograph

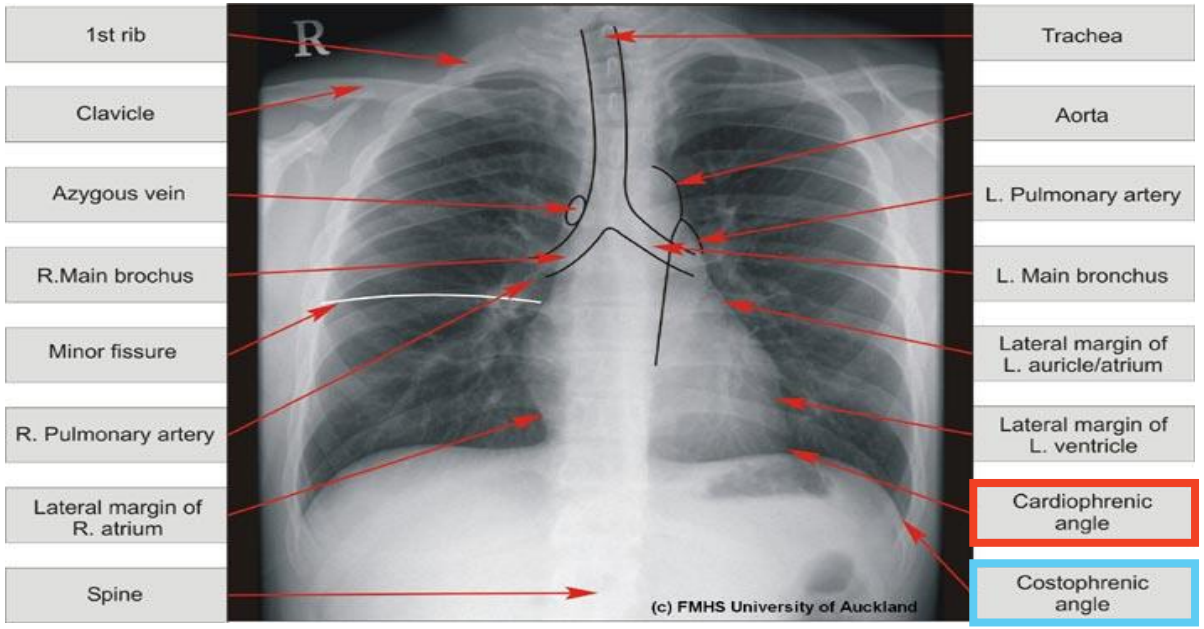
This slide is different in the girls' and boys' lectures

Diaphragm

Costo-diaphragmatic (costo-phrenic) Angles:

- They are at the sites where the diaphragm meets the thoracic/lateral wall.
- The angles become blunt or obscured in case of presence of ***pleural fluid or fibrosis.*** (normally they are acute.)
- Notice the **costophrenic angle**, where the diaphragm meets the thoracic wall, the angle becomes blunt or obscured due to minimal **pleural** fluid (**effusion)** or fibrosis.
- Also note the **cardiophrenic angle** where the diaphragm meet the heart.

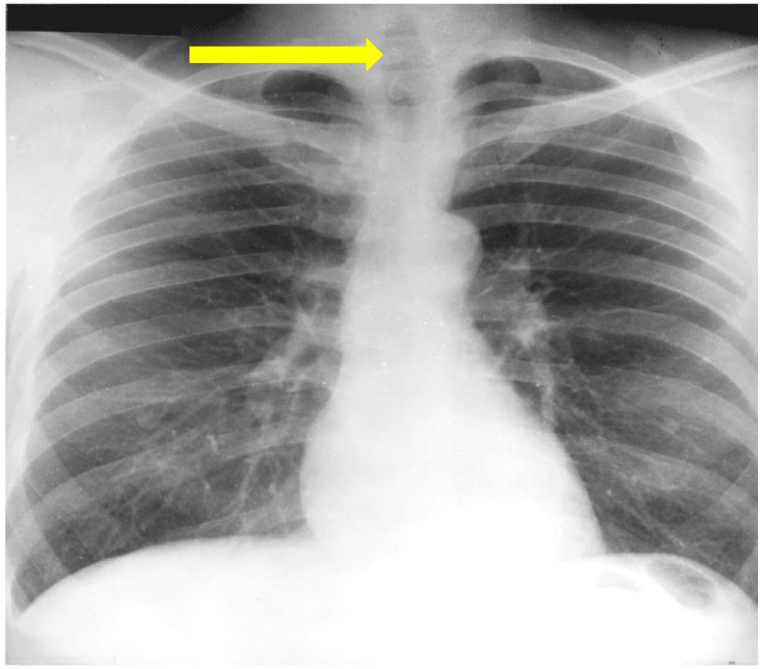




Posterior-Anterior View

Posteroanterior radiograph
Trachea

- The radio-translucent, air-filled shadow of the **trachea** is seen in the midline of the neck as a dark area (because the trachea is a tube filled with air and air is black in x-rays).
- This is superimposed by the lower cervical and upper thoracic vertebrae.



Tracheal Shift

Only on the girls' slides

- Tracheal air column is seen shifted to right on X-ray chest **PA view**.
- *It indicates:*

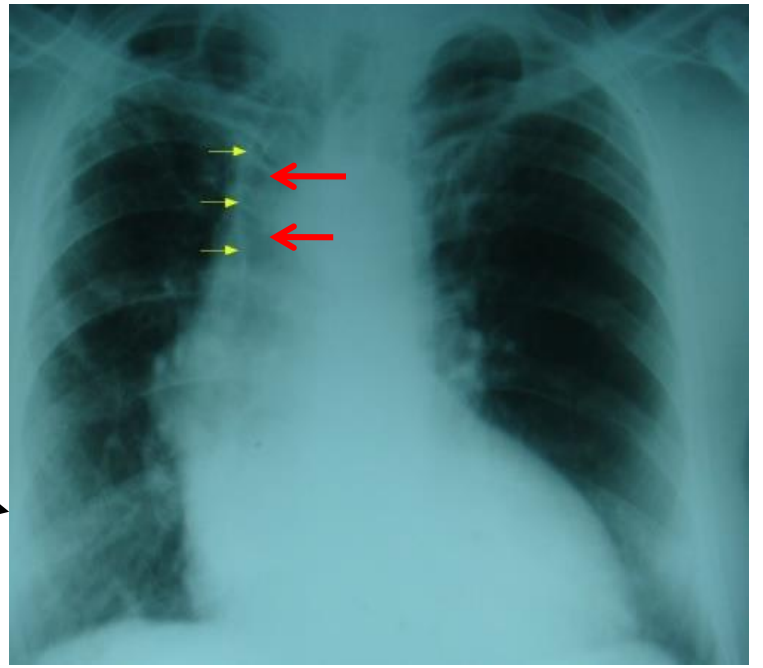
  A loss of volume of the right upper lobe of the lung, either due to **collapse** or **fibrosis**.

  OR

  A massive pleural effusion on the left side.

  (But in this x ray, no pleural effusion is seen on the left)

  Meaning the diagnosis is more likely loss of volume due to collapse or fibrosis.



Posteroanterior radiograph

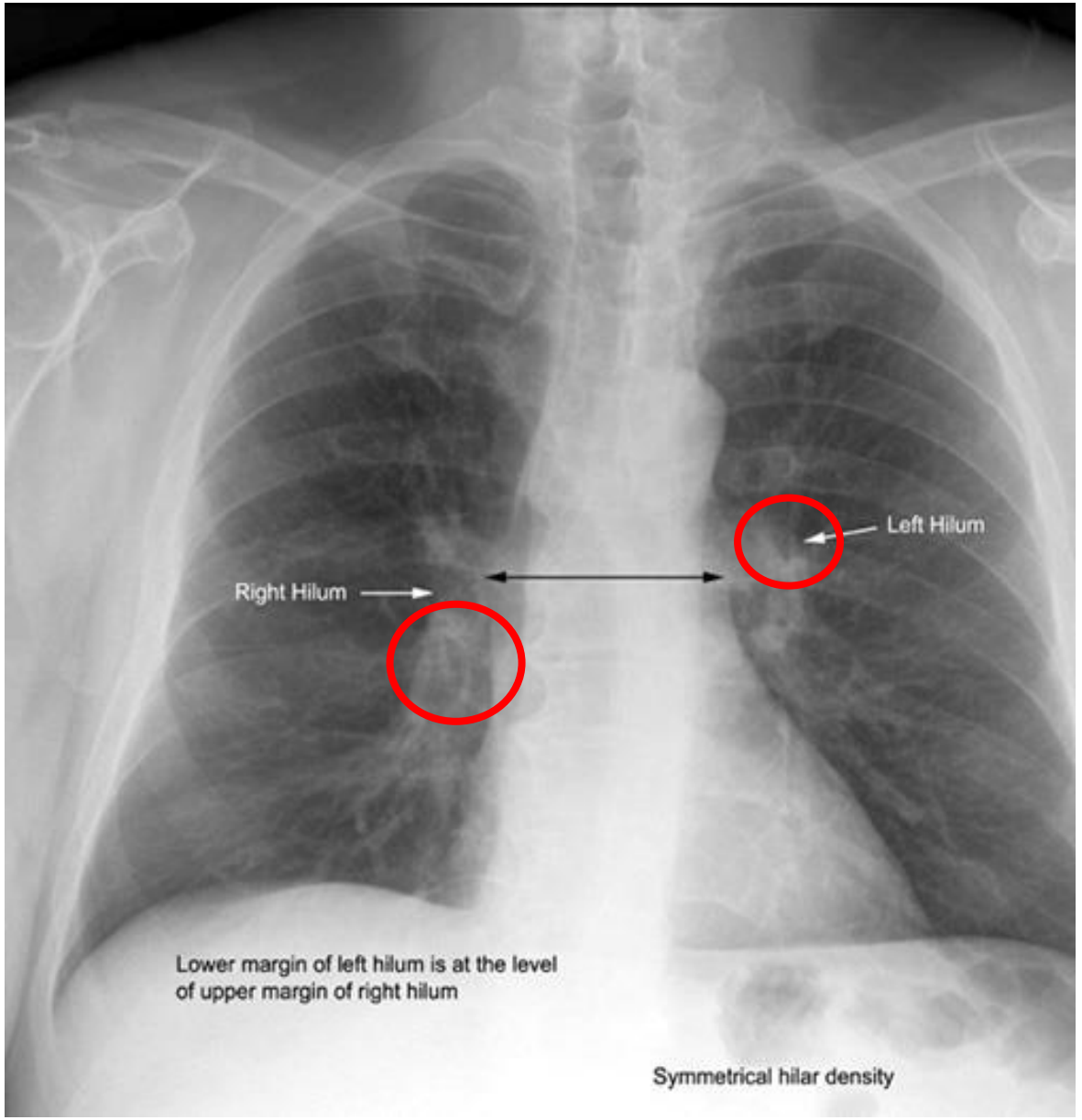
Lungs

Lung roots/hilum:

Relatively dense shadows caused by the presence of:

1. Blood-filled pulmonary and bronchial vessels.
2. Large bronchi.
3. Lymph nodes.

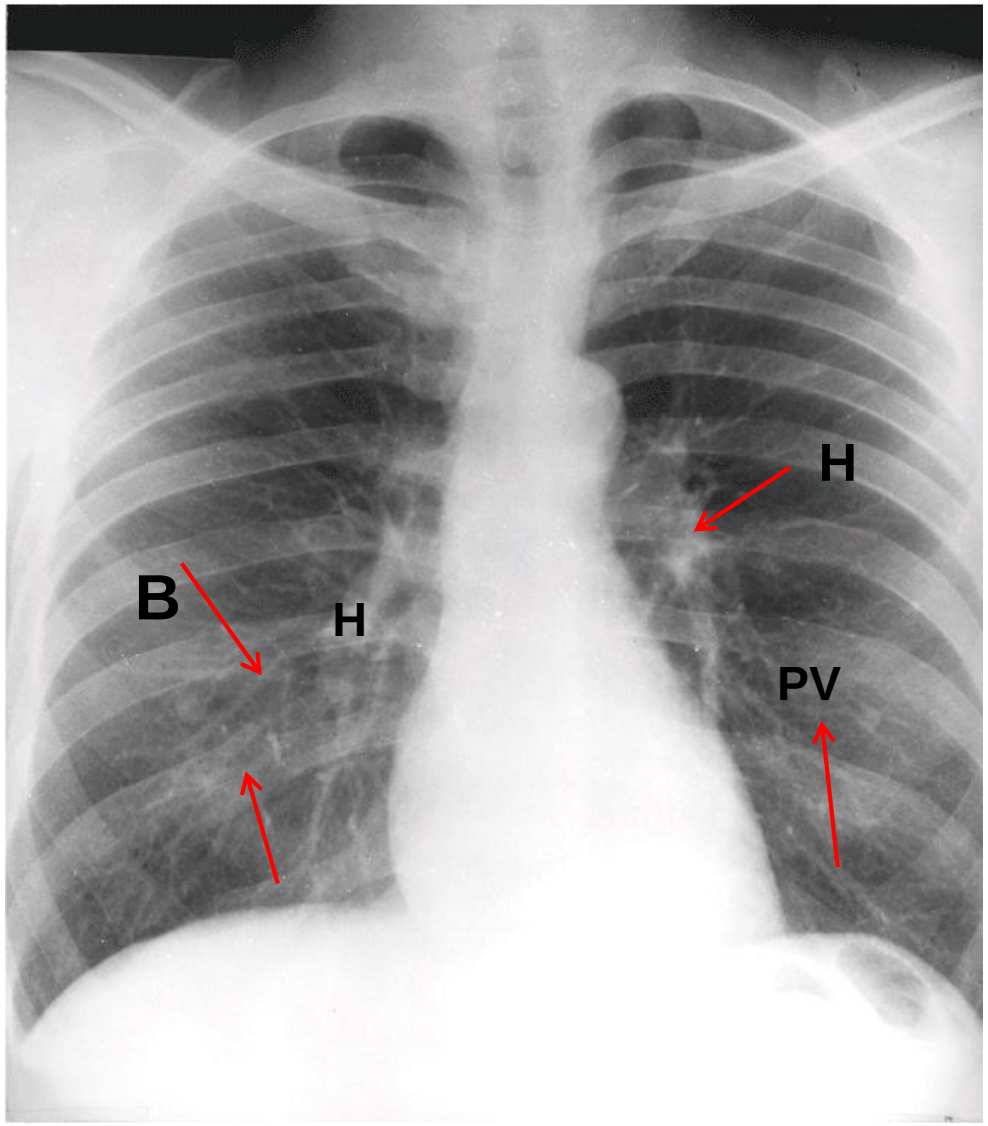
Notice that the lower margin of left hilum is at the level of upper margin of right hilum.



Posteroanterior radiograph

Lungs

- The **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. (when the lung contains more air, like in deep inspiration, it appears more clear on the x-ray)
- The ***pulmonary blood vessels*** are seen as a series of small, round, white shadows radiating from the lung root.
- The ***large bronchi***, also cast similar round shadows.
- The smaller bronchi are not seen.



Posteroanterior Radiograph

Mediastinum

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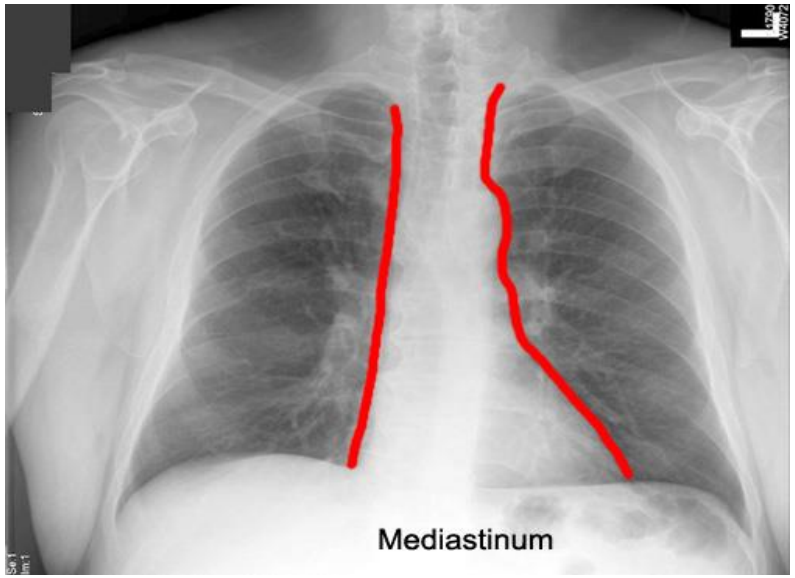
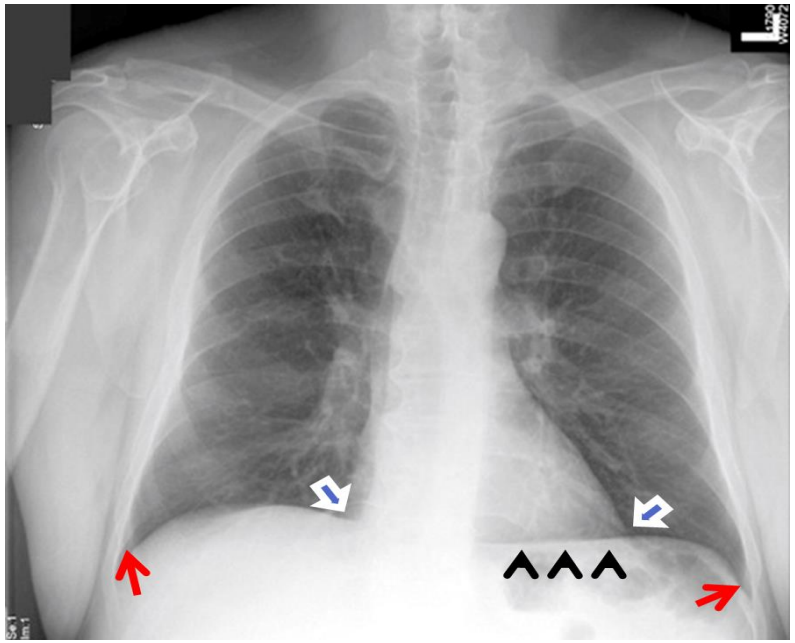
- ***The shadow is produced by the various structures within the mediastinum, superimposed one on the other***
- Note the outline of the heart and great vessels.



The inferior border of the mediastinum: (lower border of the heart) blends with the diaphragm and liver shadow.

Note the cardiophrenic angles.



Posteroanterior Radiograph

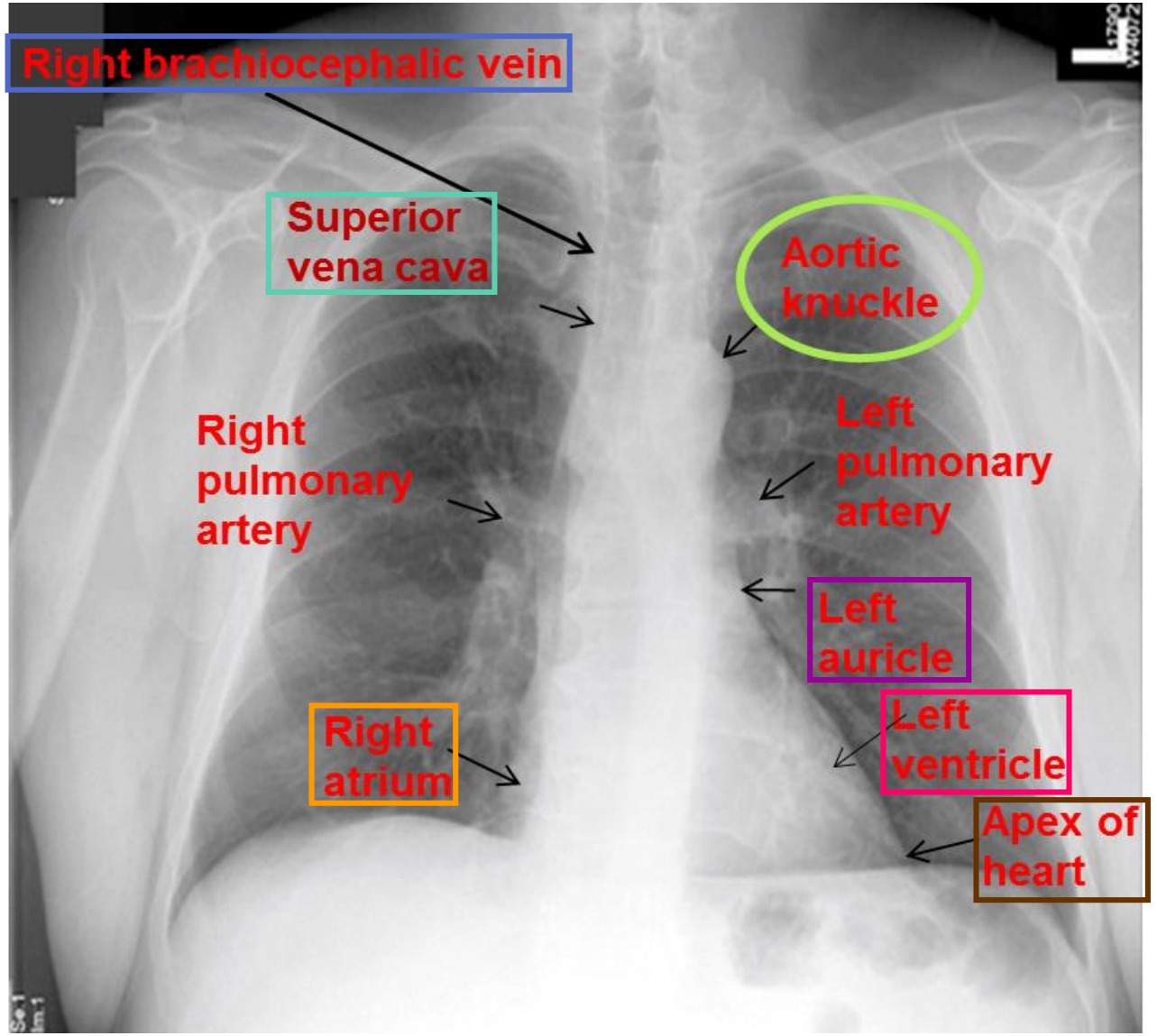
Mediastinum

The right border of the mediastinum from above downward consists of:

1. Right brachiocephalic vein
2. Superior vena cava
3. Right atrium
4. Inferior vena cava (sometimes)

The left border of mediastinum consists of:

1. Aortic knuckle, or knob (a prominence caused by the aortic arch).
2. Left margin of the Pulmonary trunk.
3. Left auricle.
4. Left ventricle.
5. Apex of heart.



Posteroanterior Radiograph

Mediastinum

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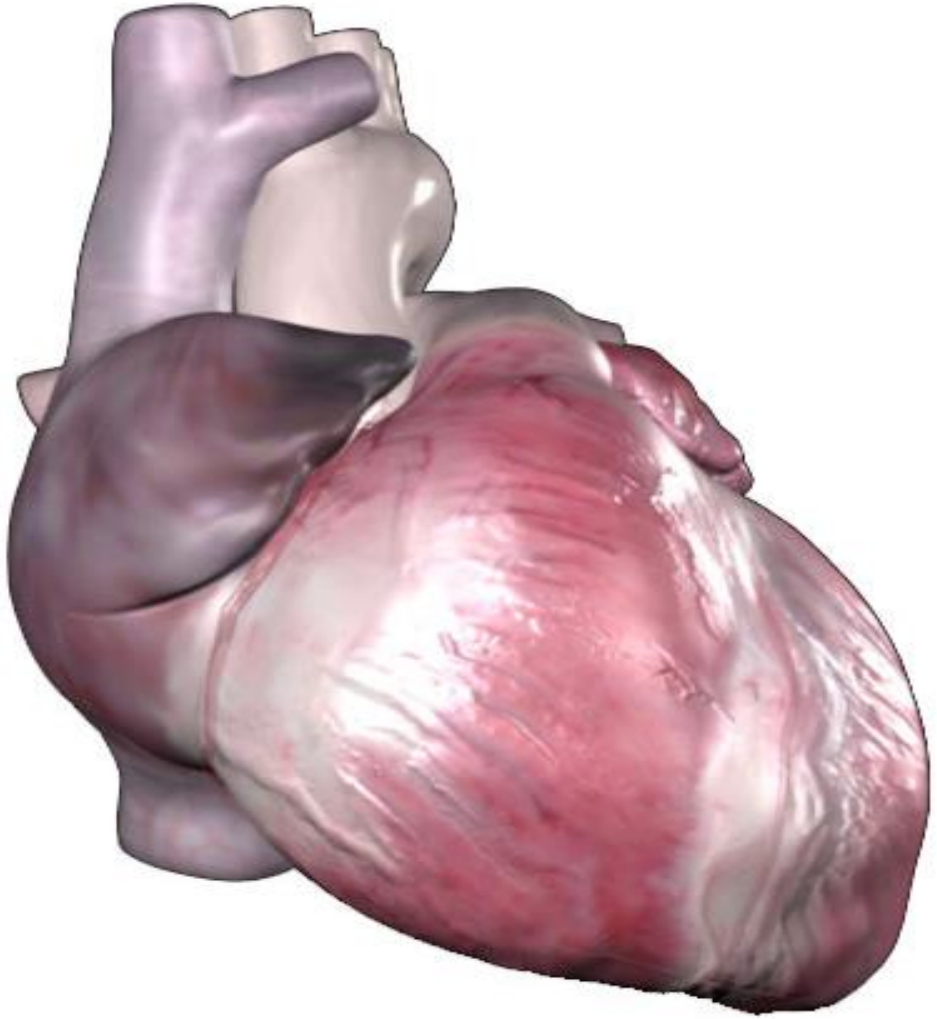
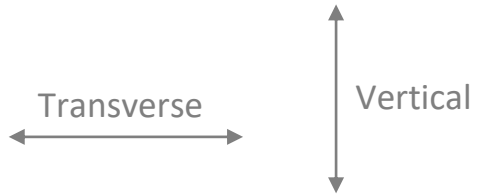
1. ***Right Brachiocephalic Vein***
2. ***Superior vena cava***
3. ***Right atrium.***
4. ***Inferior vena cava.***



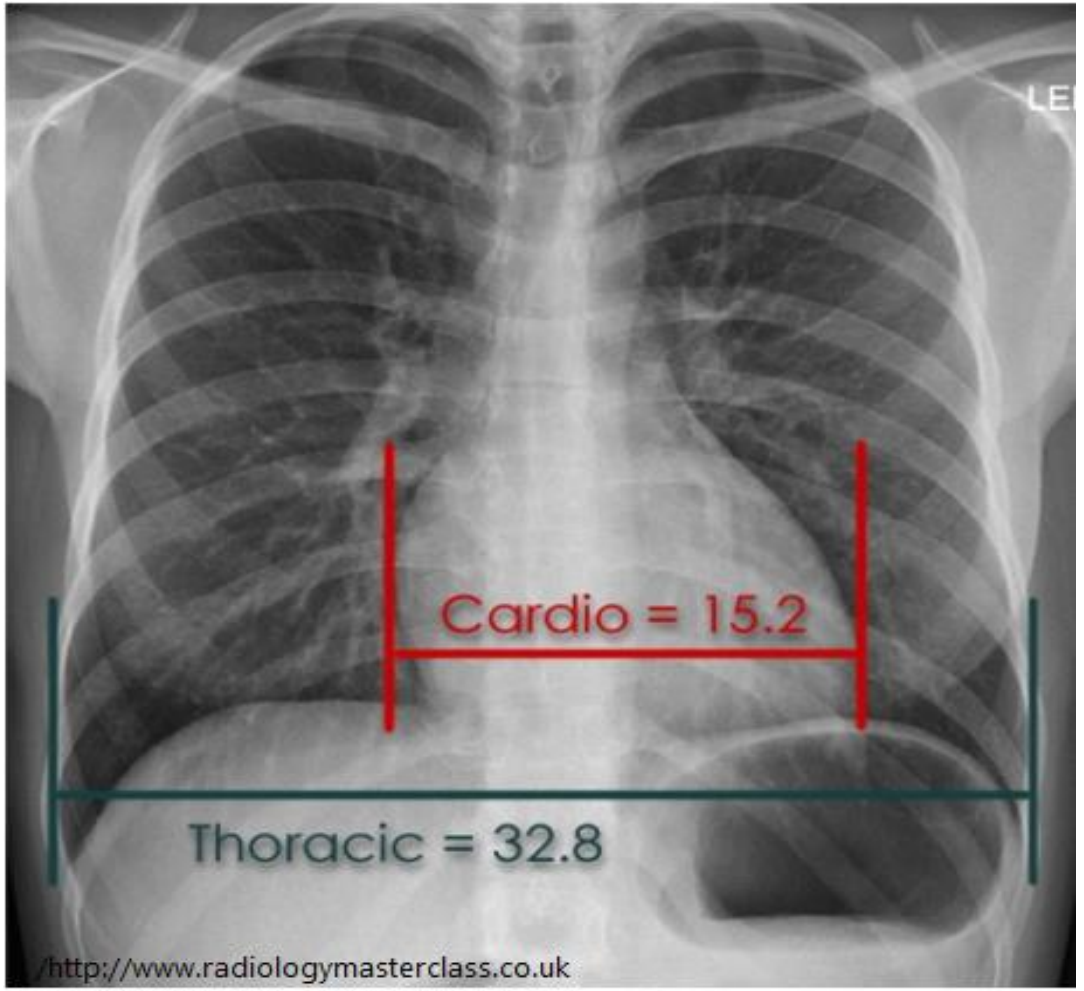
1. ***Aortic knuckle, or***
2. ***knob (aortic arch).***
3. ***Pulmonary trunk.***
4. ***Left auricle.***
5. ***Left ventricle.***

Posteroanterior Radiograph

The heart



- The **Transverse Diameter** of the heart should not exceed half the width of the thoracic cage.
  For example if the width of the thoracic cage is 32 inches, the transverse diameter of the heart should be less than 16.
- On deep inspiration, when the diaphragm descends, the vertical length of the heart increases and the transverse diameter is narrowed. As if you are pulling down the heart.
- In infants, the heart is always wider and more globular in shape than in adults.
  The vertical and horizontal diameters are almost equal so the heart appears globular.



Posteroanterior radiograph

The heart

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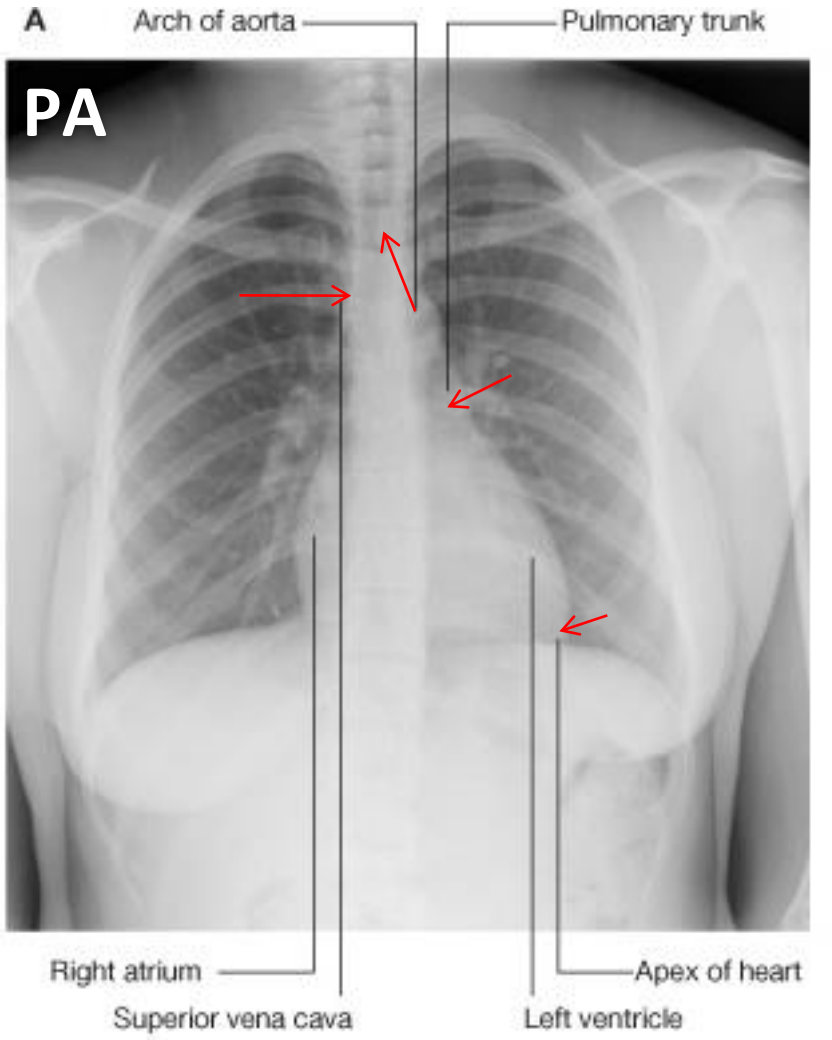
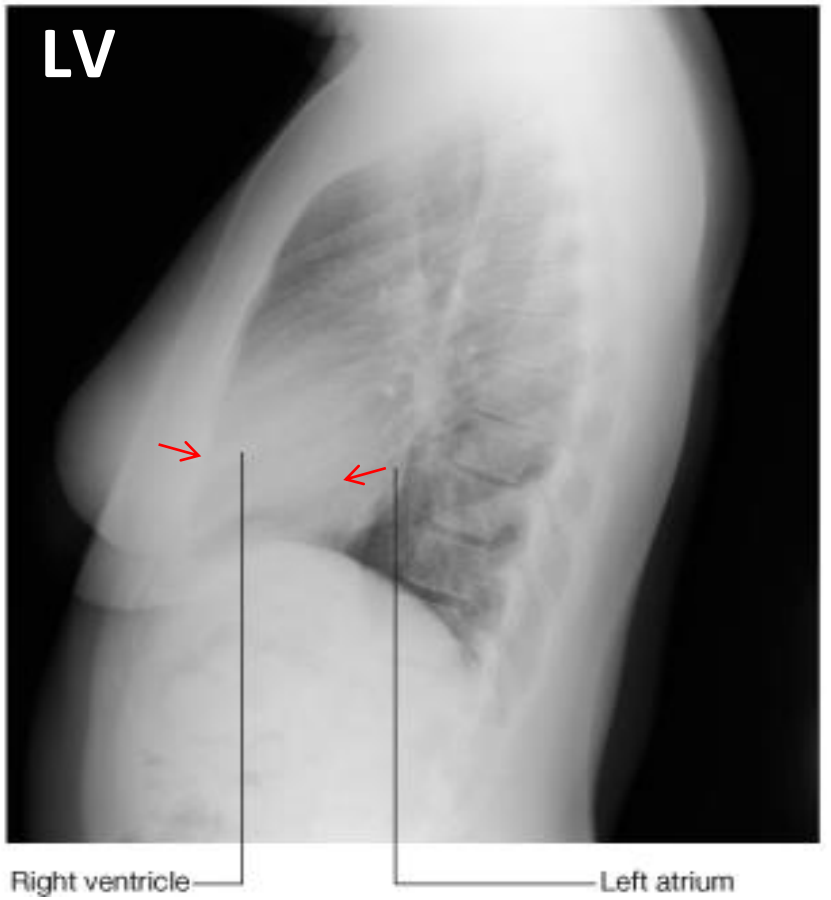


In the PA view you can see the aortic knuckle, apex of the heart, right atrium and left ventricle, but in order to see the right ventricle and left atrium you have to look at the LV.



Lateral radiograph of the chest

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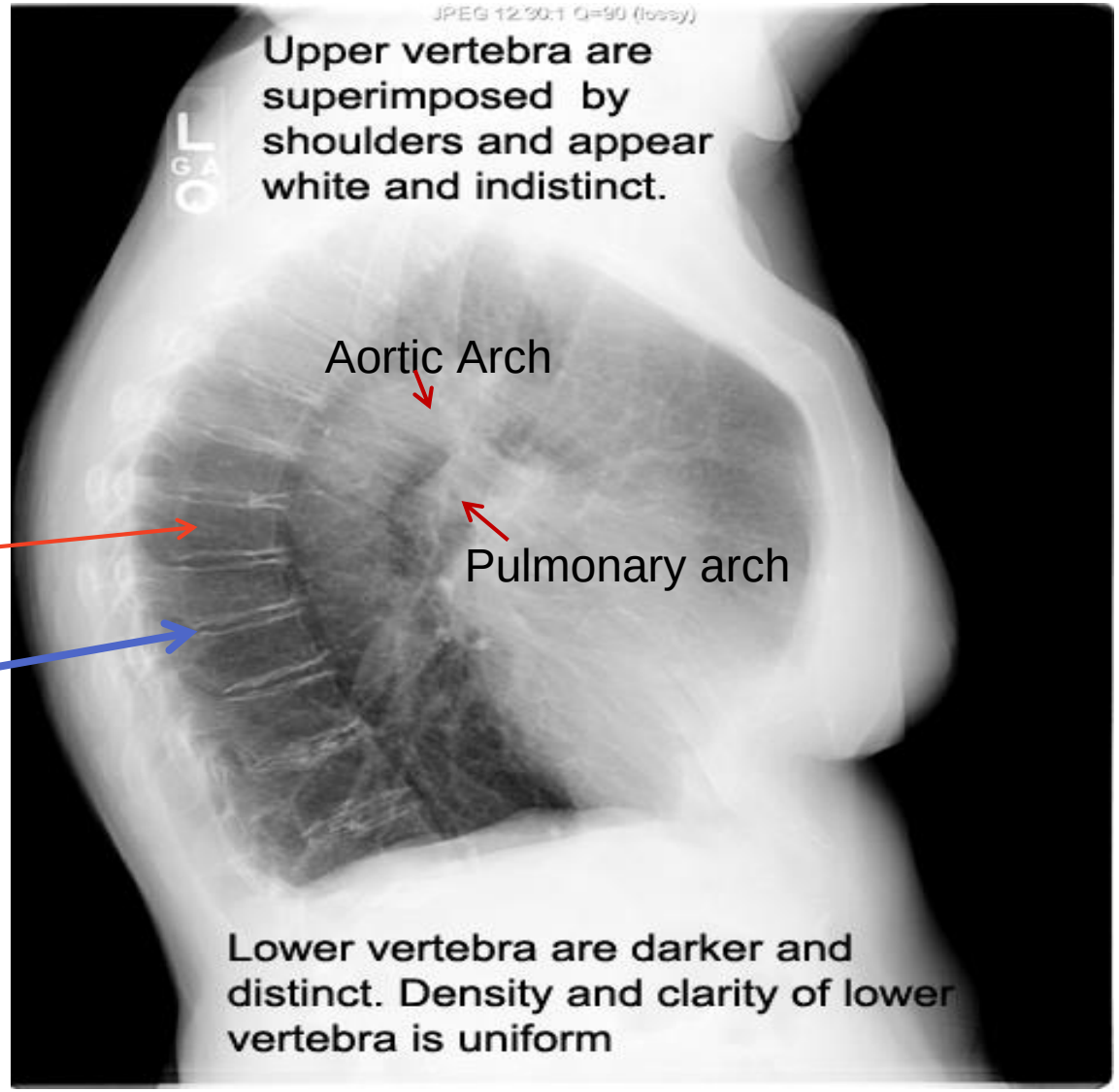


Vertebral body

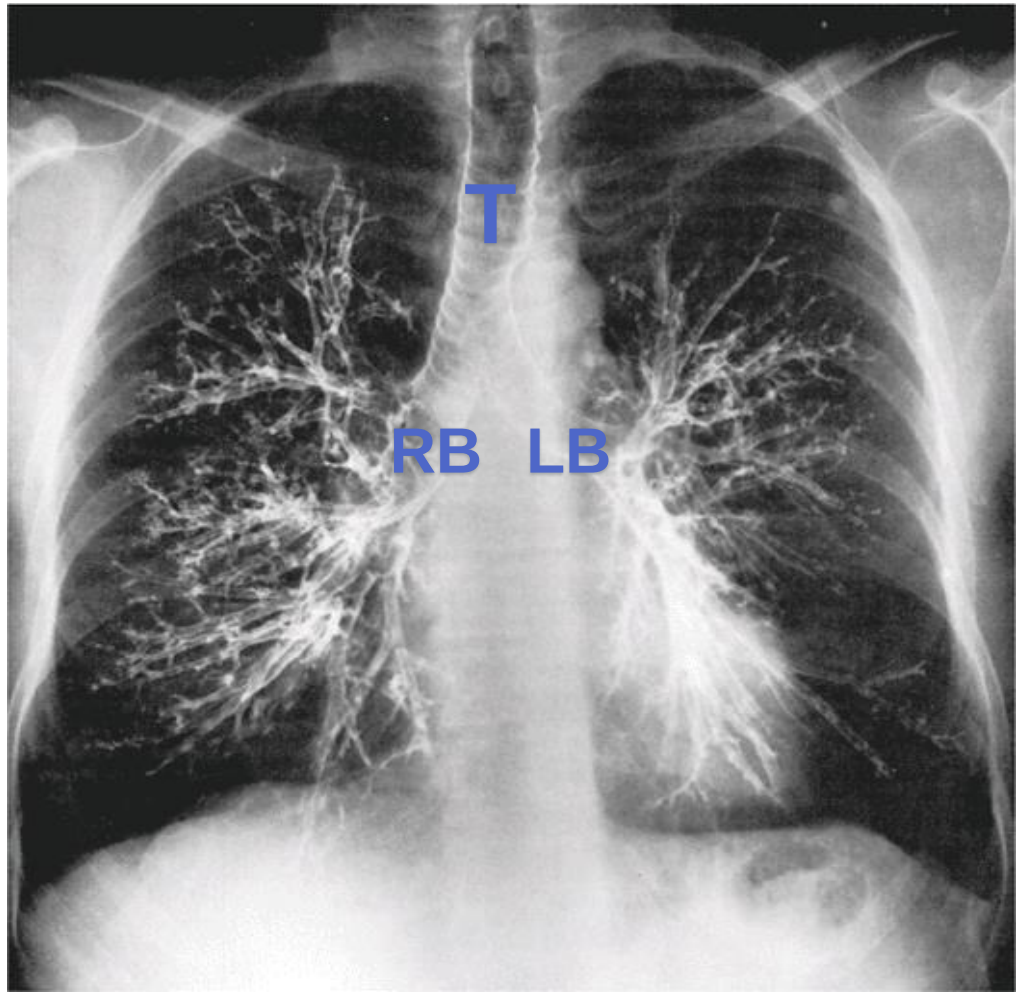
Intervertebral disc

We also use the LV to asses the vertebral column.

This slide is different in the girls' and boys' lectures

Bronchography

- is a special study of the bronchial tree by means of the introduction of contrast media into a particular bronchus or bronchi, usually under fluoroscopic control.
- The contrast media are nonirritating and sufficiently radio opaque to allow good visualization of the bronchi.
- After the radiographic examination is completed, the patient is asked to cough and expectorate the contrast medium.



T: Trachea
RB: Right Bronchus
LB: Left Bronchus

Extra

Fluoroscopy: A continuous X-ray beam is passed through the body part being examined. The beam is transmitted to a TV-like monitor so that the body part and its motion can be seen in detail.

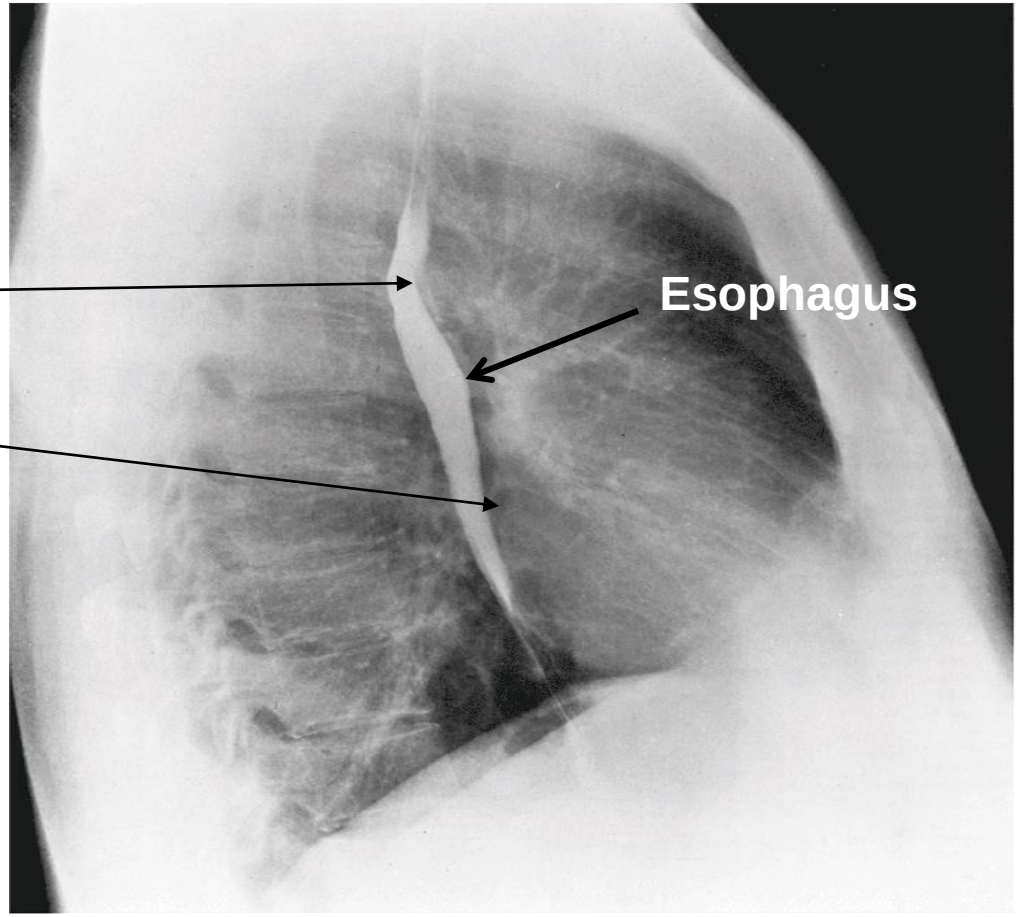
Radio opaque:
obstructing the passage of radiant energy, such as x-rays, the representative areas appearing light or white on the film.

Expectorate: to spit

This slide is different in the girls' and boys' lectures

Contrast visualization of the esophagus

- Contrast visualization of the esophagus by swallowing a contrast media, (barium swallow).
- Identification of the aortic arch and left bronchus.
- Identification of enlargement of left atrium. (When it enlarges it will press on the esophagus)
- Other barium contrast studies for GIT:
  - Barium meal: stomach
  - Barium follow through: small intestine
  - Barium enema: large intestine



Left lateral radiograph of the chest of a normal adult man after a barium swallow.

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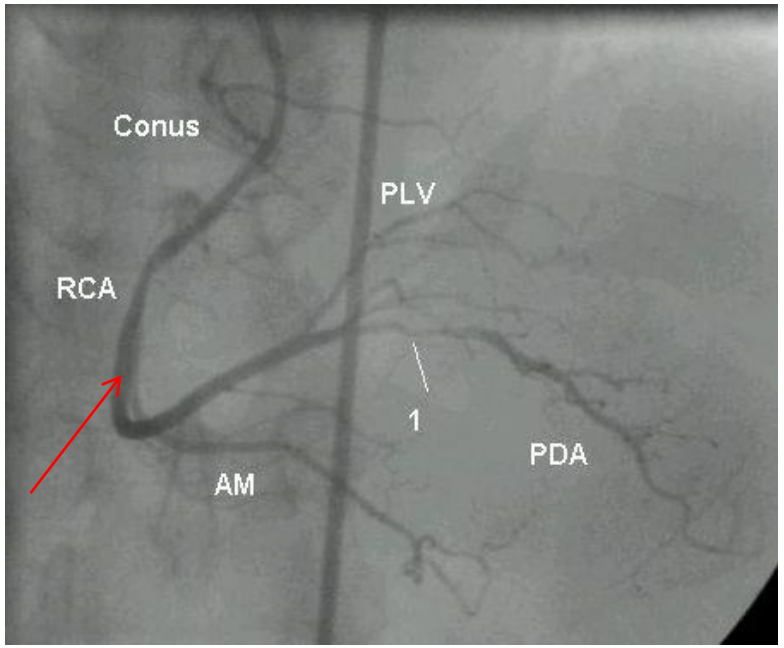
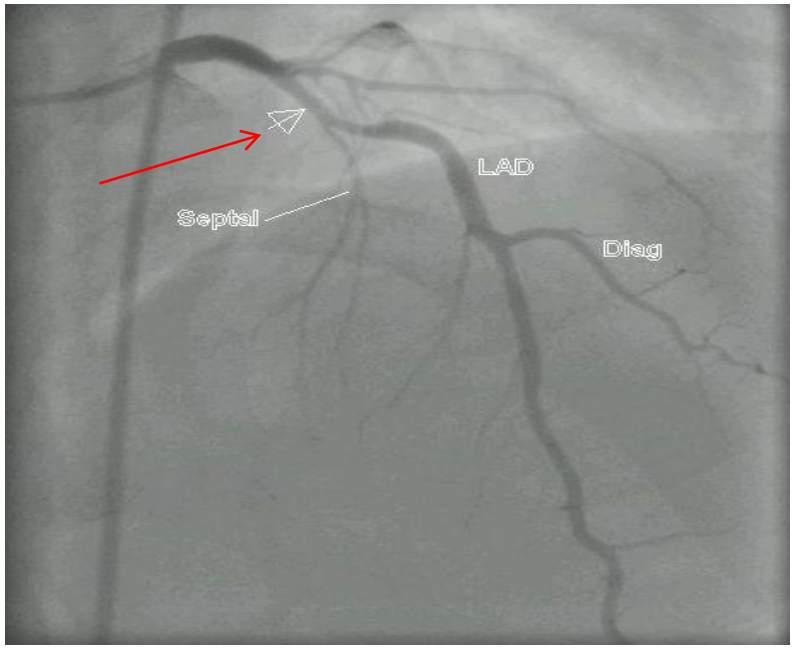
Coronary Angiography (or Coronary Angiogram)

- is an X-ray with radio-opaque material 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.

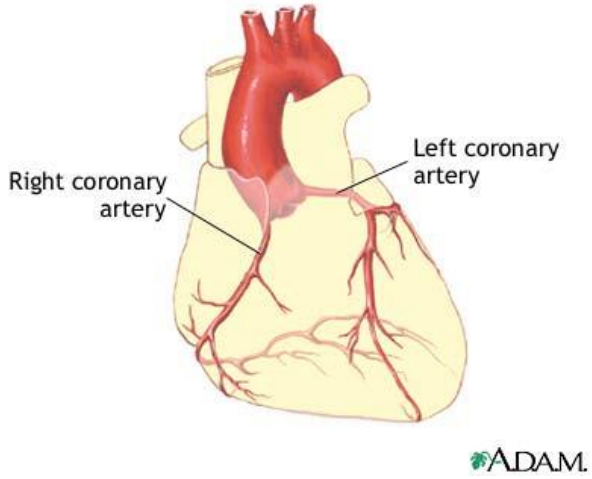


Right coronary



Left coronary

Extra picture for understanding



Note: the coronary arteries supply the heart.

MCQs

Q1- A chest X-ray can be used to diagnose:

A. Fractures of the ribs
B. Pneumonia
C. Tuberculosis
D. All of the above

Answer: D

Q2- Which one of these bones is NOT seen in the Posteroanterior radiograph ?

A. Thoracic vertebrae
B. Clavicles
C. Posterior Ribs
D. Cervical vertebrae

Answer: D

Q3-Beneath the right dome is the homogeneous dense shadow of……?

A. The stomach
B. The liver
C. The kidney
D. The lungs

Answer: B

Q4-The most anterior structure of the left border of the mediastinum is?

A. Apex of the heart.
B. Left pulmonary artery.
C. Aortic knob.
D. Left ventricle.

Answer: C

Q5- Which structures forms the aortic knuckle?

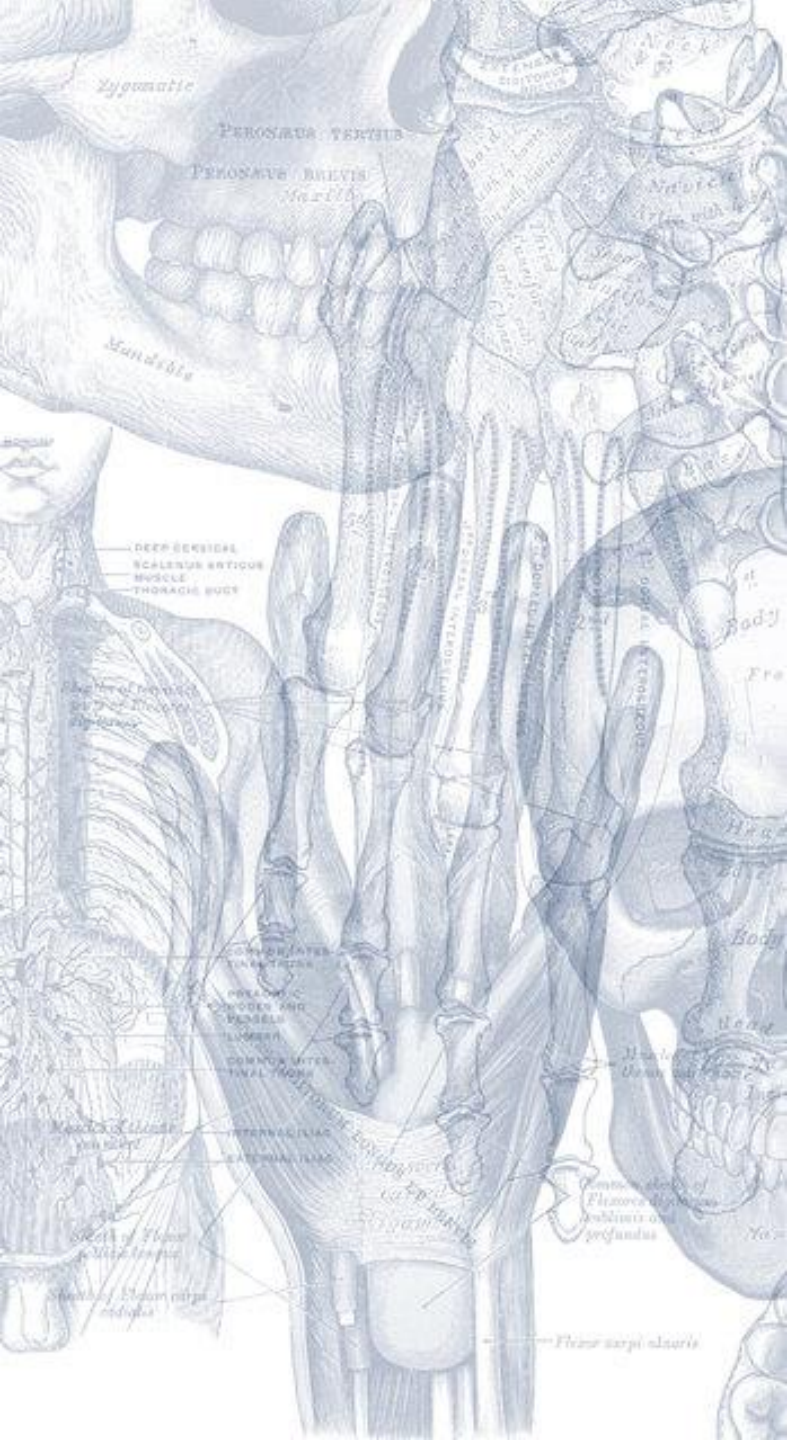
A. Ascending aorta
B. Descending aorta
C. Aortic arch
D. Apex of the heart

Answer: C

Q6- Which of the following cannot be viewed in the PA view?

A. Left Ventricle
B. Right Ventricle
C. Superior Vena Cava
D. Inferior Vena Cava

Answer: B



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Abdulaziz almohammed

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