



Anatomy team  
med 438



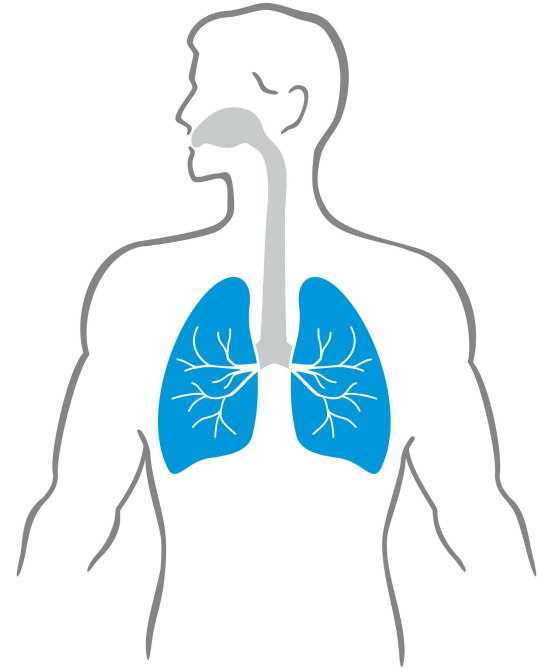
MED438  
KING SAUD UNIVERSITY



# Radiological anatomy of the chest

Respiratory block-Anatomy-Lecture 7

Editing file



# Objectives

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

- 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**

**Color guide :**

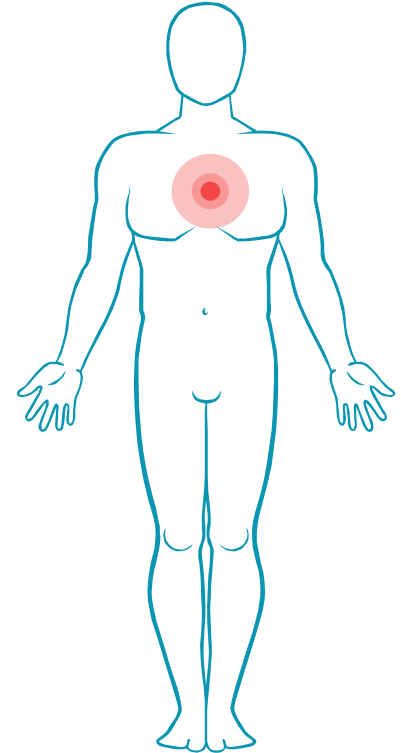
Only in boys slides in **Green**

Only in girls slides in **Purple**

important in **Red**

Doctor note in **Blue**

Extra information in **Grey**



# Radiography

- Different views of the chest can be obtained by changing the orientation of the body and the direction of the x-ray beams.
- The most common views are:
  - ❑ **Posteroanterior (PA):** 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.\*
    - It avoids magnification of the heart as the film is close to the anterior chest wall. Thus Gives a good assessment of the **Cardiac Size\***.
    - It is identified by the presence of the **fundal gas bubble** and the **absence of the scapulae in the lung fields.**\* (The scapulae are at the margins)
  - ❑ **Anteroposterior (AP):** The x-rays enter through the anterior aspect and exit through the posterior aspect of the chest\*.
    - 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:** Indicated **only** for further interpretation\* (to confirm the diagnosis)
  - ❑ **Decubitus\***: lying at the side\*

\*Explanations are found only in the girls slide

Posteroanterior



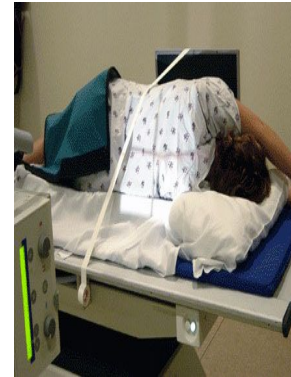
Anteroposterior



Lateral.



Decubitus



# Radiography

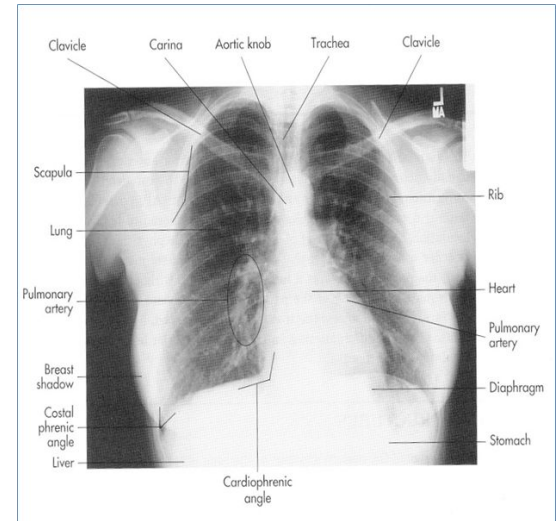
- A chest x-ray may be used to **diagnose, plan treatment** and **follow up** for various conditions, including:
1. **Fractures of the chest bones**, including ribs, sternum, clavicle, vertebrae, and scapula.
  2. **Lung disorders** such as pneumonia, emphysema, pleural effusion, tuberculosis and lung cancer.\*
  3. **Heart disorders** such as congestive heart failure, which causes cardiomegaly (heart enlargement)\*
  4. **Screen for job-related lung diseases in industries** such as mining where workers are exposed to dust, (**asbestosis, silicosis**).
  5. **Sometime its Requested as pre-employment demand.\***

\*Examples are found only in boys slides

## Posteroanterior Radiograph

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

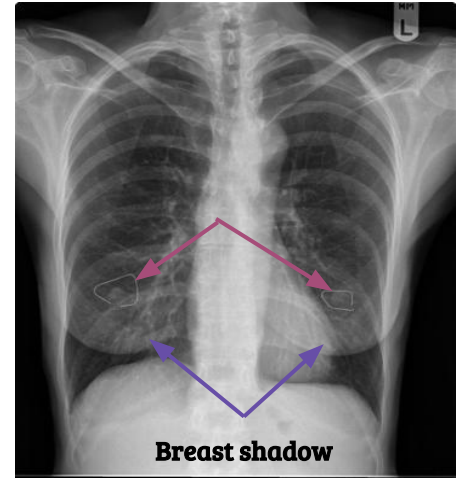
1. **Superficial soft tissues**
2. **Bones**
3. **Diaphragm**
4. **Trachea**
5. **Lungs**
6. **Mediastinum**



# 1- Superficial soft tissues

The **superficial soft tissues** that can be seen are:

- The **nipples** in both sexes
- The **breast in female** are seen superimposed on the lung fields



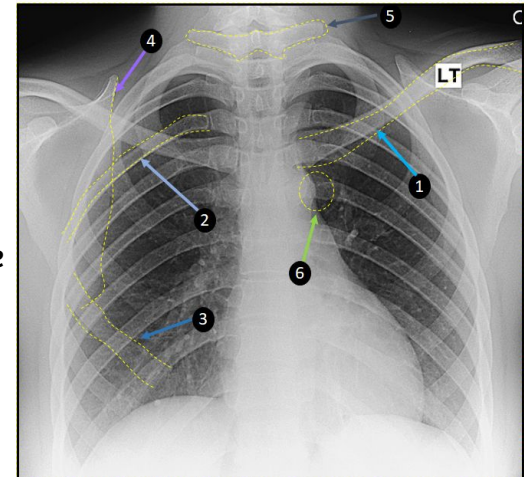
# 2- Bones

Bones of the thoracic cage, e.g:

1. **Clavicle**: are seen clearly crossing the upper part of each lung field.\*
2. **Posterior rib**\*
3. **Anterior rib**\*
4. **Medial border of scapula**: may overlap the periphery of each lung field\*
5. **Thoracic vertebrae**: are **imperfectly** seen\*
6. **Costovertebral joints** and each Rib should be examined in order from above downward and compared to their fellows of the opposite side, The **Costal Cartilages** are not usually seen, but if calcified (abnormal), they will be visible\*.

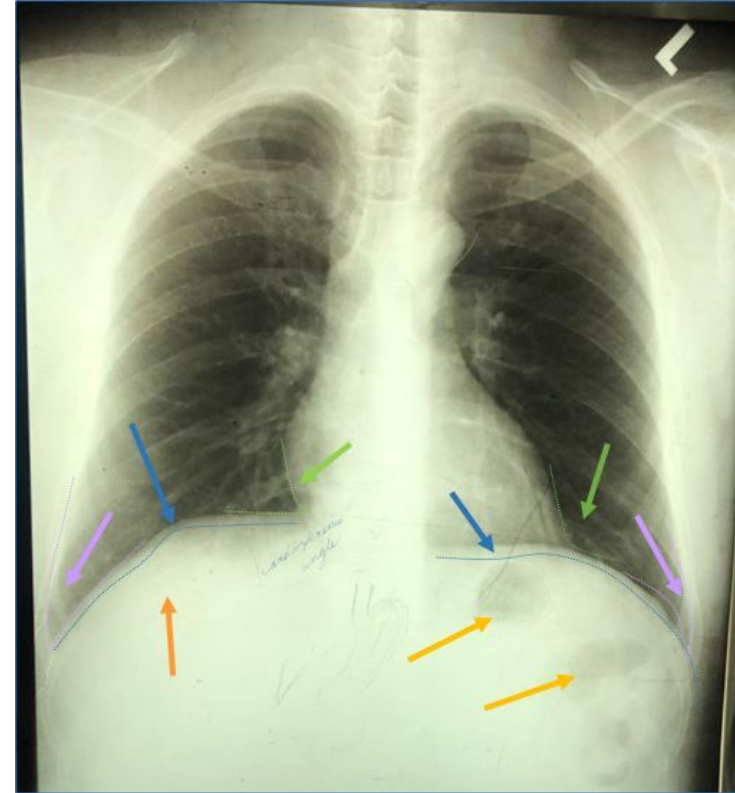
\*Found only in the boys slides.

\*Explanations are found only in the girls slides.



### 3- Diaphragm

- **The diaphragm** appears as a **dome-shaped** shadow on each side.
- The *right side* is slightly **higher** than the left.
- 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.
- Notice the **Costophrenic or Costodiaphragmatic** 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.



## 4- Trachea

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

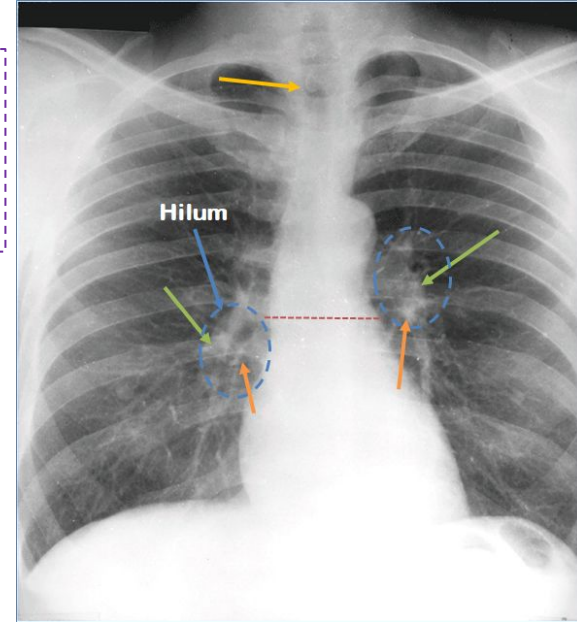
**Tracheal shift** : Tracheal air column is seen shifted to right on X-ray chest PA view.

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 (girls slide)

## 5- Lungs

- **Lung roots**: 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 lies at the level of the upper margin of right hilum.
- The **lung fields**, by the air so they are more translucent on full inspiration than on expiration.
- **The pulmonary blood vessels** are seen as a series of small, rounded, white shadows radiating from the lung root.
- **The large bronchi**, are seen as similar round shadows.
- The smaller bronchi are not seen.





# 6- 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\*

## □ The right border of mediastinum; consists of:

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

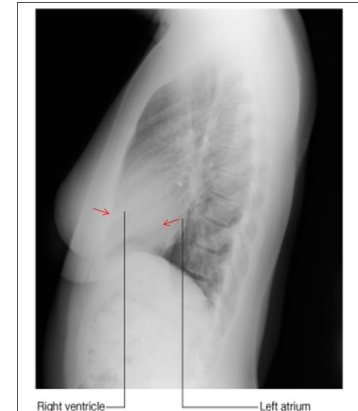
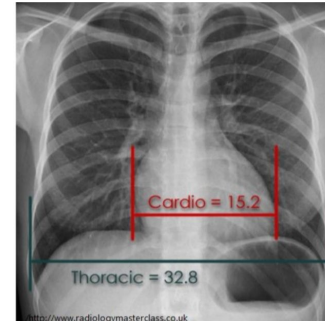
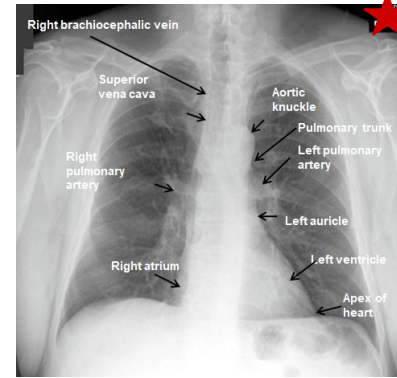
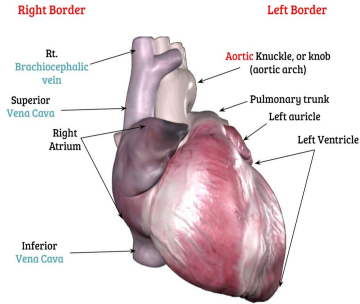
## □ The left border of mediastinum consists of:

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

## □ The inferior border\* (lower border of the heart) blends with the diaphragm and liver shadow.

- Normally the transverse diameter of the heart **should not** exceed **half** of the width of thoracic cage.
- On **deep inspiration**, when the diaphragm **descends**, the vertical length of the heart increases and the transverse diameter is narrowed.
- In infants, the heart is always wider and more globular in shape than in adults.\*

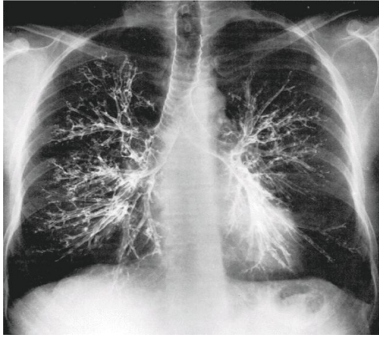
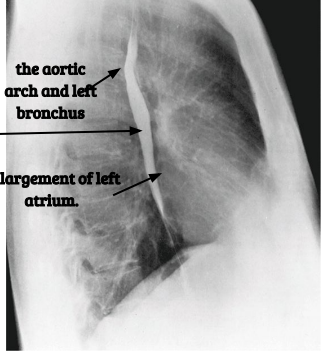
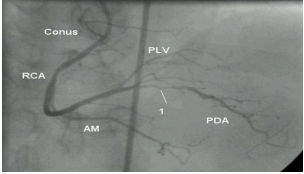
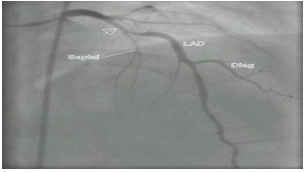
\*found only in the girls slides



**Right ventricle & left atrium**  
**Appear only in lateral view\***  
 Aortic knuckle, pulmonary trunk, and the thoracic vertebrae can be seen also in lateral view



# Other uses of chest X-ray

Bronchography	Contrast visualization of Esophagus	Coronary Angiography
<ul style="list-style-type: none"> <li>Bronchography is special study of the bronchial tree by introduction of contrast medium (by inhalation) into a particular bronchus.</li> <li>usually under fluoroscopic control. The contrast media are non irritating and sufficiently radiopaque to allow good visualization of the bronchi. After the radiographic examination is completed, the patient is asked to cough and expectorate the contrast medium.</li> </ul>	<ul style="list-style-type: none"> <li>Contrast visualization of the esophagus by swallowing a contrast media, (barium swallow).</li> <li>Other barium contrast studies:               <ol style="list-style-type: none"> <li>Barium meal: stomach</li> <li>Barium follow through: small intestine</li> <li>Barium enema: large intestine</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>(an X-ray with radio-opaque contrast in the coronary arteries)</li> <li>The coronary arteries are visualized by introduction of radio-opaque material into their lumen</li> <li>Pathological narrowing or blockage of coronary artery can be identified.</li> </ul>
	<div style="border: 1px dashed black; padding: 5px; width: fit-content;"> <p>Left lateral radiograph of the chest of a normal adult man after a barium swallow.</p> </div> 	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 20px;"> <p><b>Right</b></p>  </div> <div> <p><b>Left</b></p>  </div> </div>

# MCQs

**Question 1:** The right dome of diaphragm is \_\_\_\_\_ ?

- A. slightly lower than the left dome
- B. as high as the left dome
- C. slightly higher than the left dome
- D. does not appear in x-ray

**Question 2:** Which structures forms the aortic knuckle ?

- A. Ascending aorta
- B. Descending aorta
- C. Aortic arch
- D. pulmonary trunk

**Question 3:** -Beneath the right dome is the homogeneous dense shadow of?

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

**Question 4:** - Which of the following cannot be seen in the PA view ?

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

**Question 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
- D. narrower and less globular

**Question 6:** The left border of mediastinum consists of all of the following except ?

- A. Aortic knuckle
- B. Left atrium
- C. Left auricle
- D. Left ventricle.

# SAQs

**Question 1:** List the structures found on the right border of the shadow of the heart in an X-ray. ★

Right atrium, superior vena cava, inferior vena cava, and right brachiocephalic vein

**Question 2:** What causes the cardiophrenic angle to be blunt or obscured ?

The angle becomes blunt or obscured due to minimal pleural fluid (effusion) or fibrosis.

# Best wishes



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**Don't forget to leave  
your feedback:**



# Team members

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- Rawan Al Zayed
- Renad Al Haqbani
- Nouf Al Humaidhi
- Jude Al Khalifah
- Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- Danah Al Halees
- Rema Al Mutawa
- Amirah Al Dakhilallah
- Maha Al Nahdi
- Ghaida Al Braithen