

**CARDIOVASCULAR SYSTEM**  
**ORIENTATION & SURFACE ANATOMY**  
**OF THE HEART**

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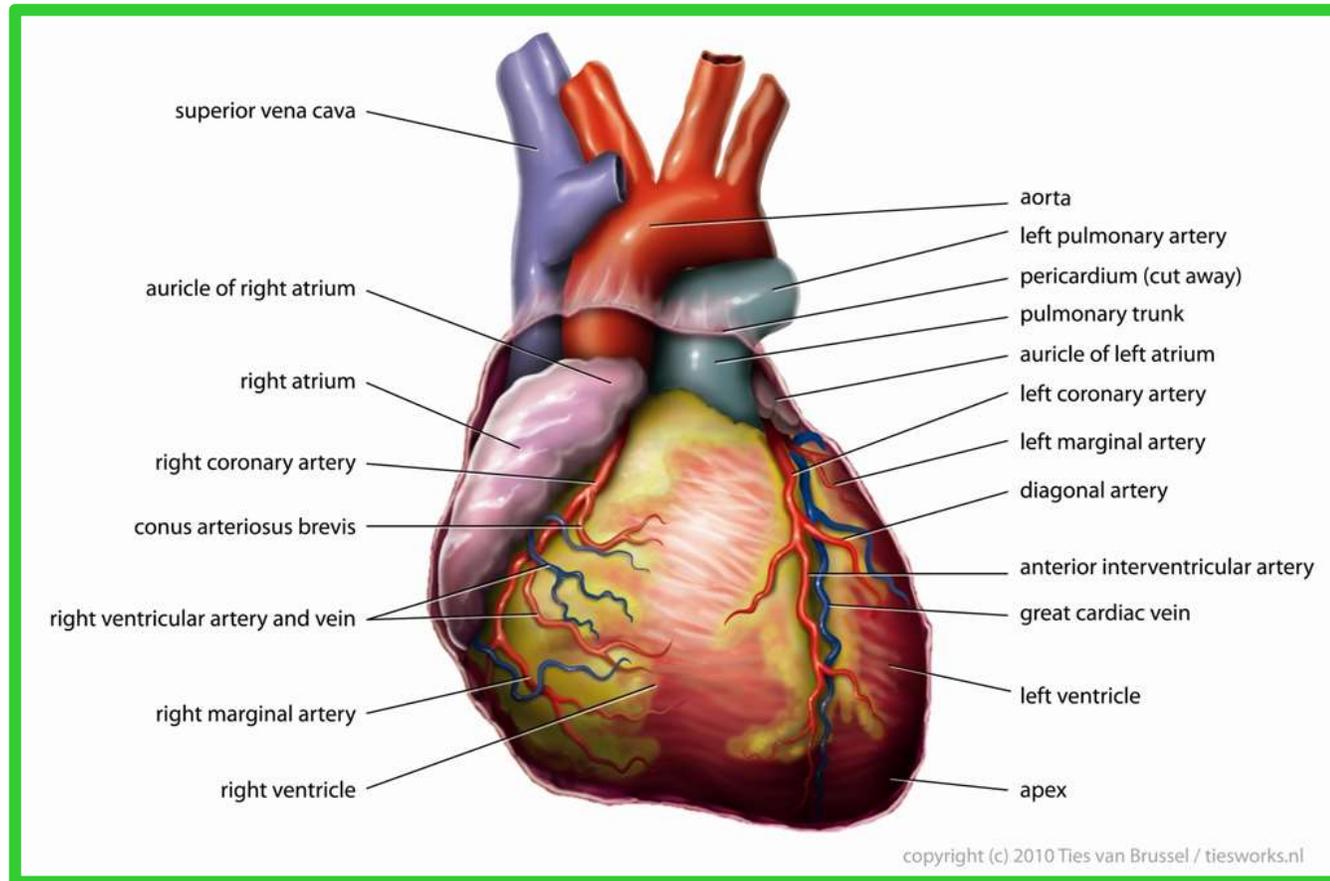
**Monday 5 November 2023**



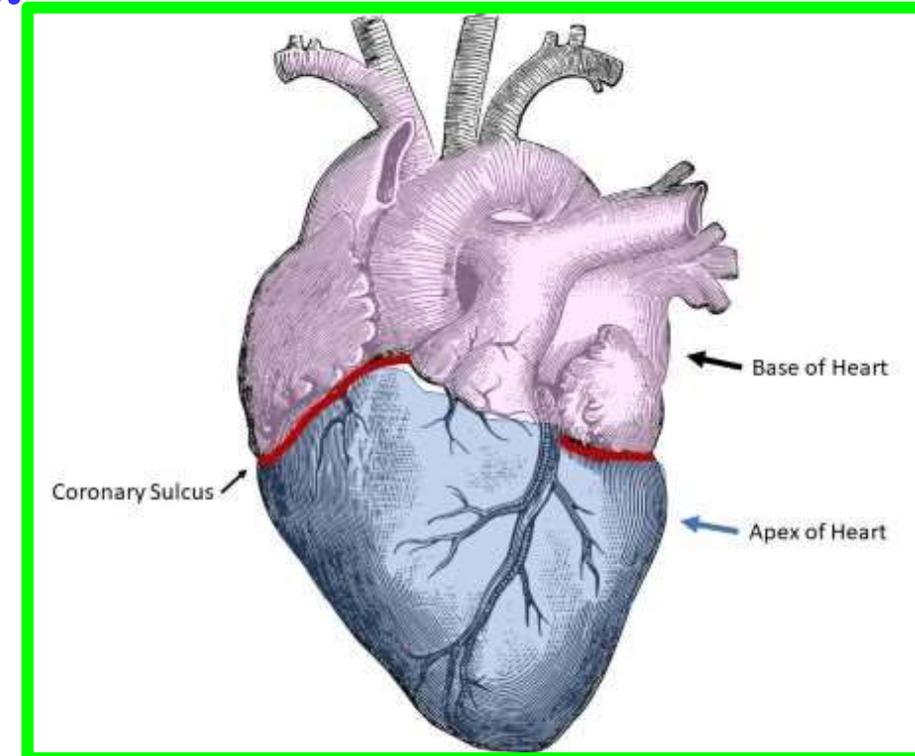
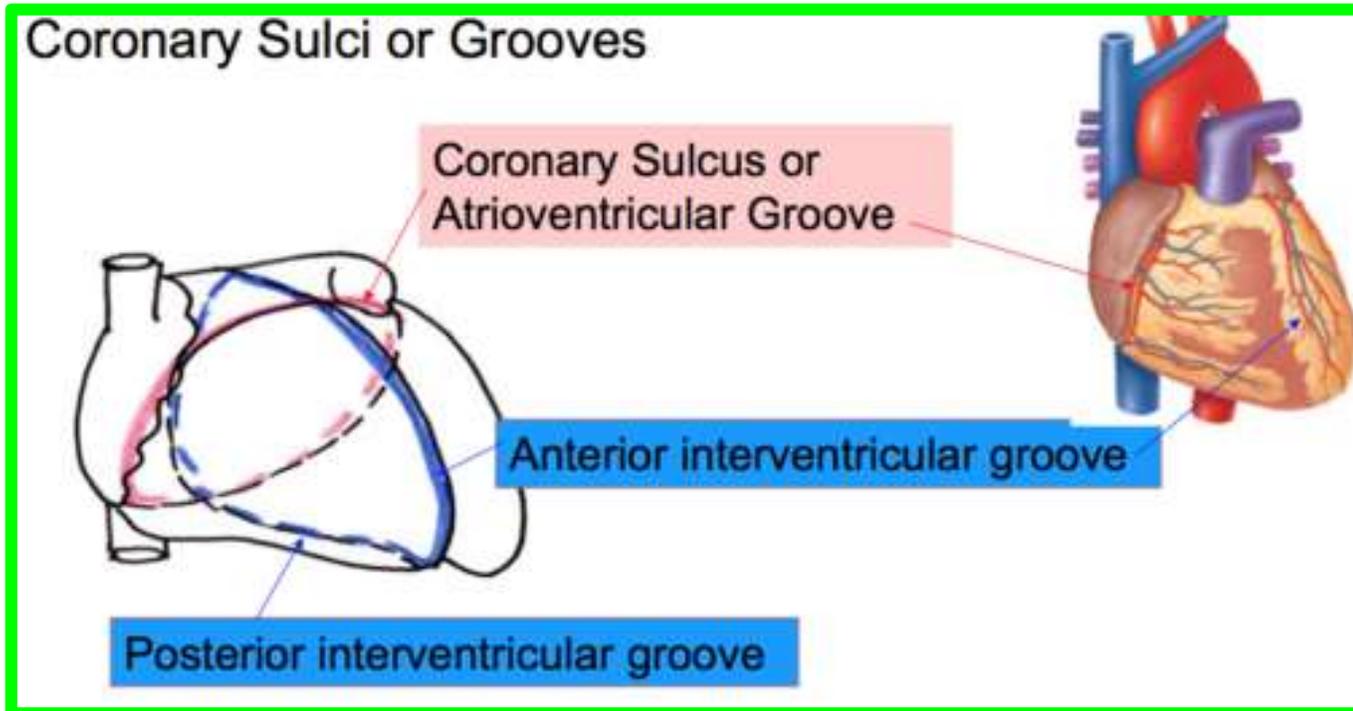
# Heart

## \*\* Position:

- ✓ It lies **obliquely in the middle mediastinum** inside the pericardium.
- ✓ Its **long axis** (the line drawn from the center of the base to the apex) is **directed downwards, forwards and to the left.**



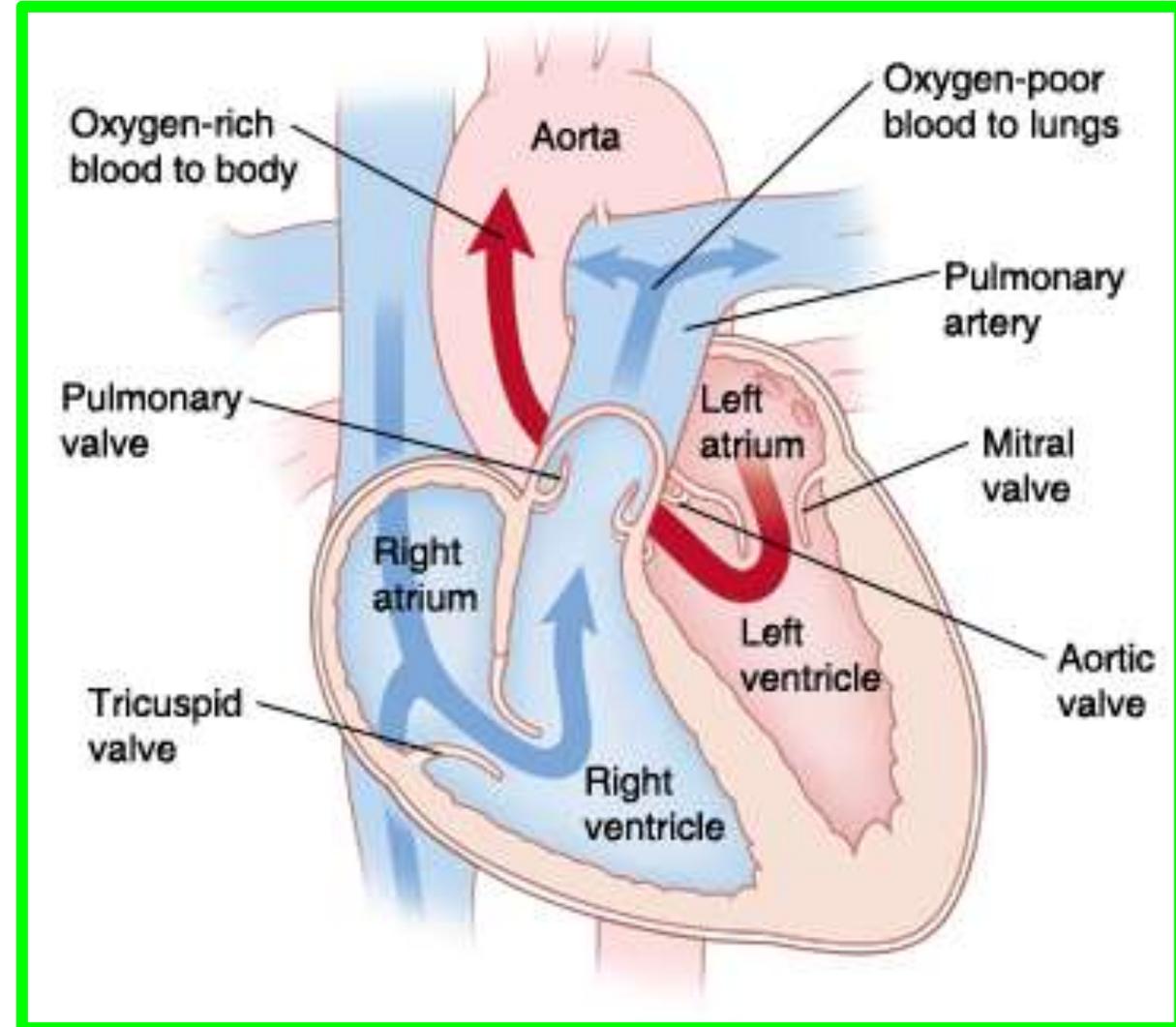
- \*\* Shape: It is a conical muscular organ somewhat larger than a closed fist.
- \*\* It consists of four chambers, two atria and two ventricles.
- ✓ The 2 atria are separated from the 2 ventricles (on the surface) by the atrio-ventricular (coronary) groove.
- ✓ The 2 ventricles are separated from each other (on the surface) by the anterior and posterior interventricular grooves.



# Heart

❖ The left side of the heart receives **well-oxygenated blood** from the lungs through **the pulmonary veins** and pumps it into **the aorta** for distribution to the body.

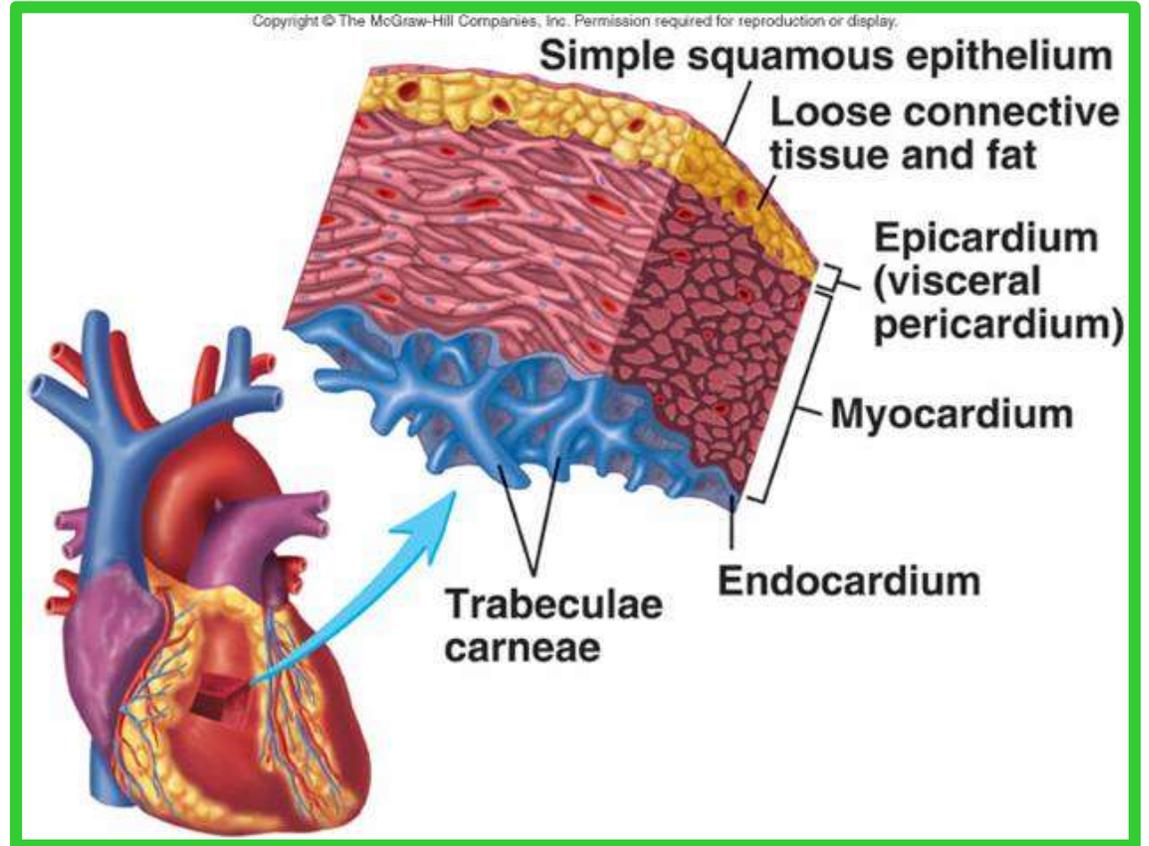
❖ The right side of the heart receives **poorly oxygenated blood** from the body through **the SVC and IVC** and pumps it through **the pulmonary trunk** to the lungs for oxygenation.



# Heart

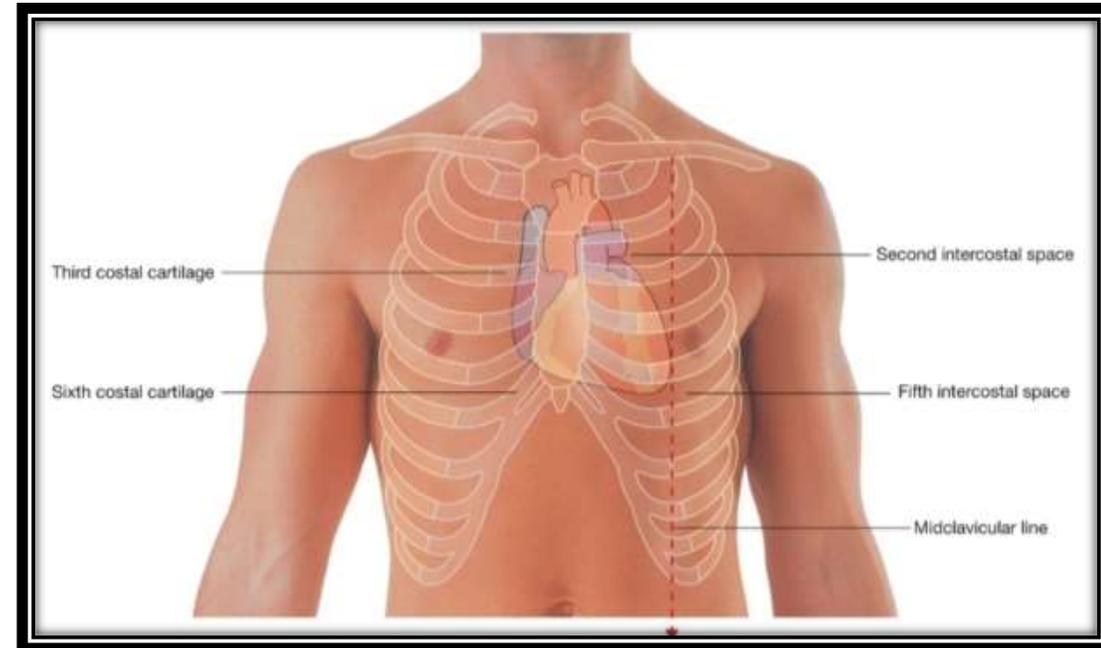
The wall of the heart consists of three layers; from superficial to deep, they are:

- **Epicardium**, a thin external layer (mesothelium) formed by the visceral layer of serous pericardium
- **Myocardium**, a thick middle layer composed of cardiac muscle
- **Endocardium**, a thin internal layer (endothelium and subendothelial connective tissue) or lining membrane of the heart that also covers its valves.



# ORIENTATION OF HEART

- ✓ The heart and roots of the great vessels within **the pericardial sac** are related anteriorly to the sternum, costal cartilages, and the medial ends of **the 3rd to 5th ribs on the left side.**
- ✓ **The heart and pericardial sac** are situated obliquely, lying about **two thirds** to the left and **one third** to the right of the median plane.



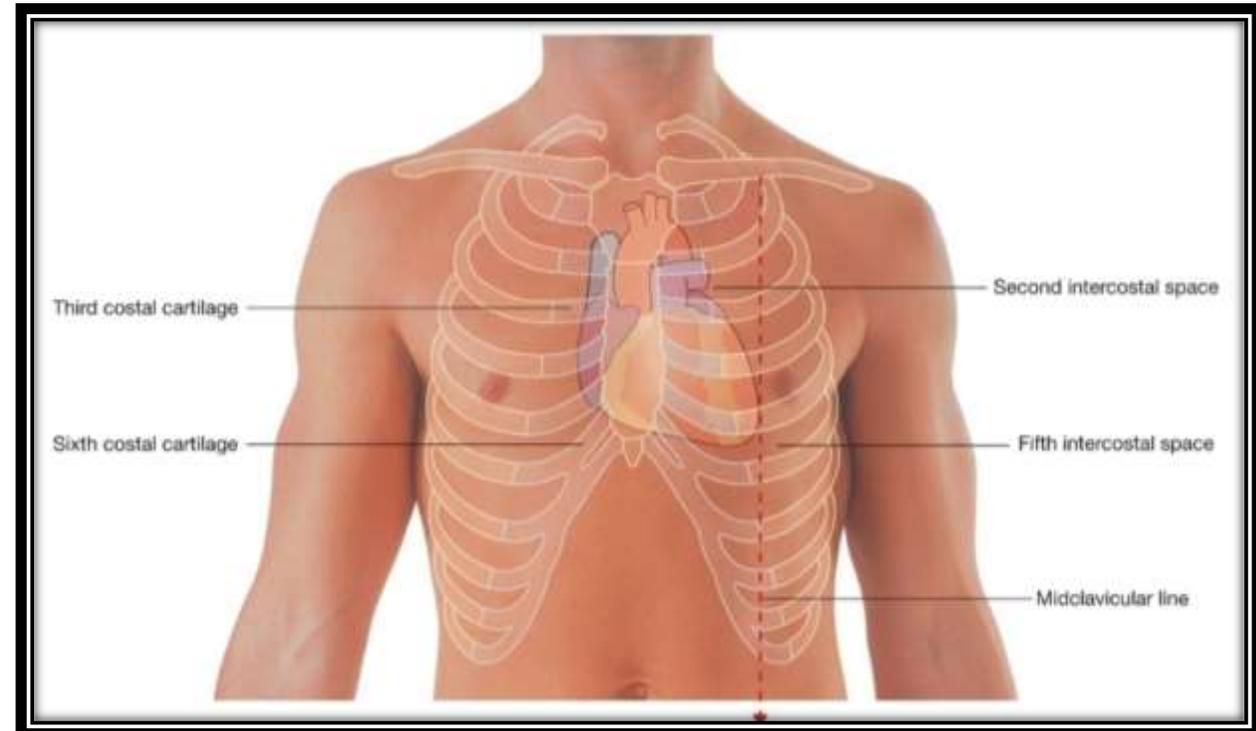
- ✓ The heart is shaped like a **tipped-over, three-sided pyramid** with an apex, base, and four surfaces.

# ORIENTATION OF HEART

## The apex of the heart

- Is directed anteriorly and to the left and is formed by **the inferolateral part of the left ventricle**
- Is located posterior to **the left 5th intercostal space** in adults, **usually 9 cm from the median plane.**

Is where the sounds of **mitral valve** closure are maximal (**apex beat**); the apex underlies the site where the **heartbeat** may be auscultated on the thoracic wall.

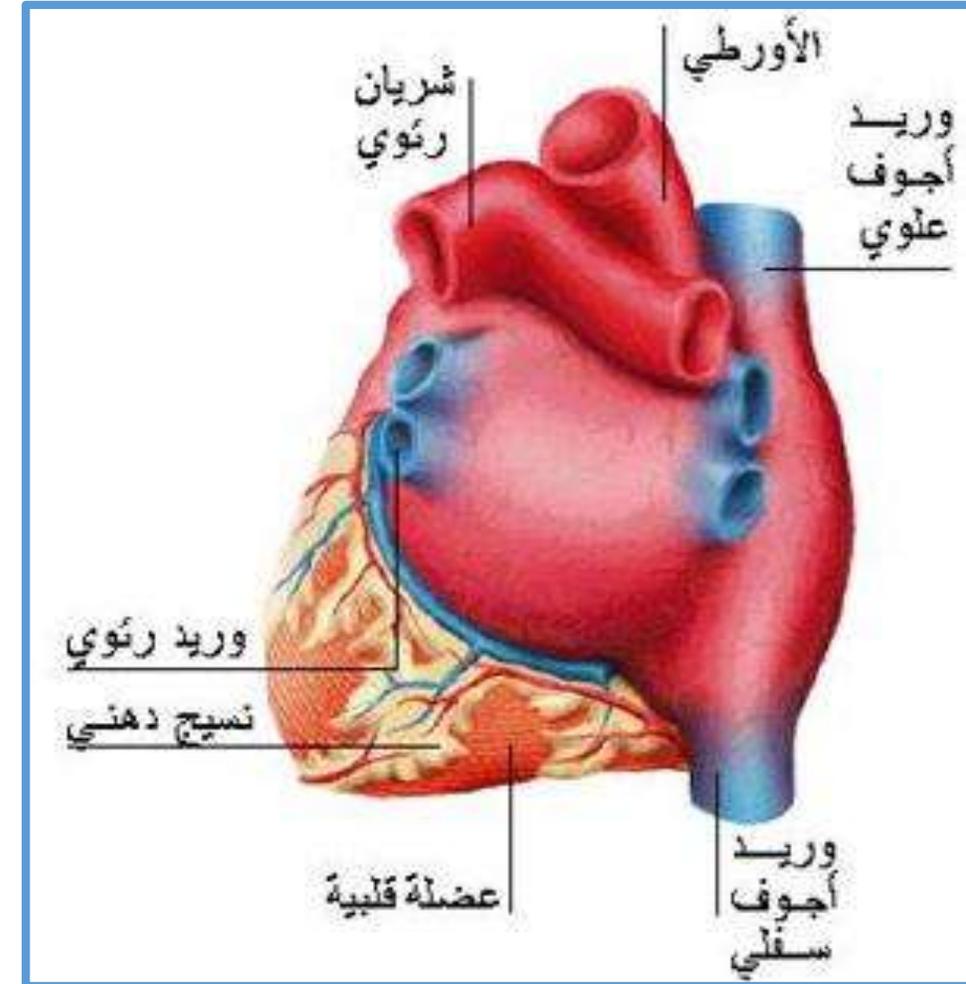


# ORIENTATION OF HEART

## The base of the heart

Is the heart's posterior aspect

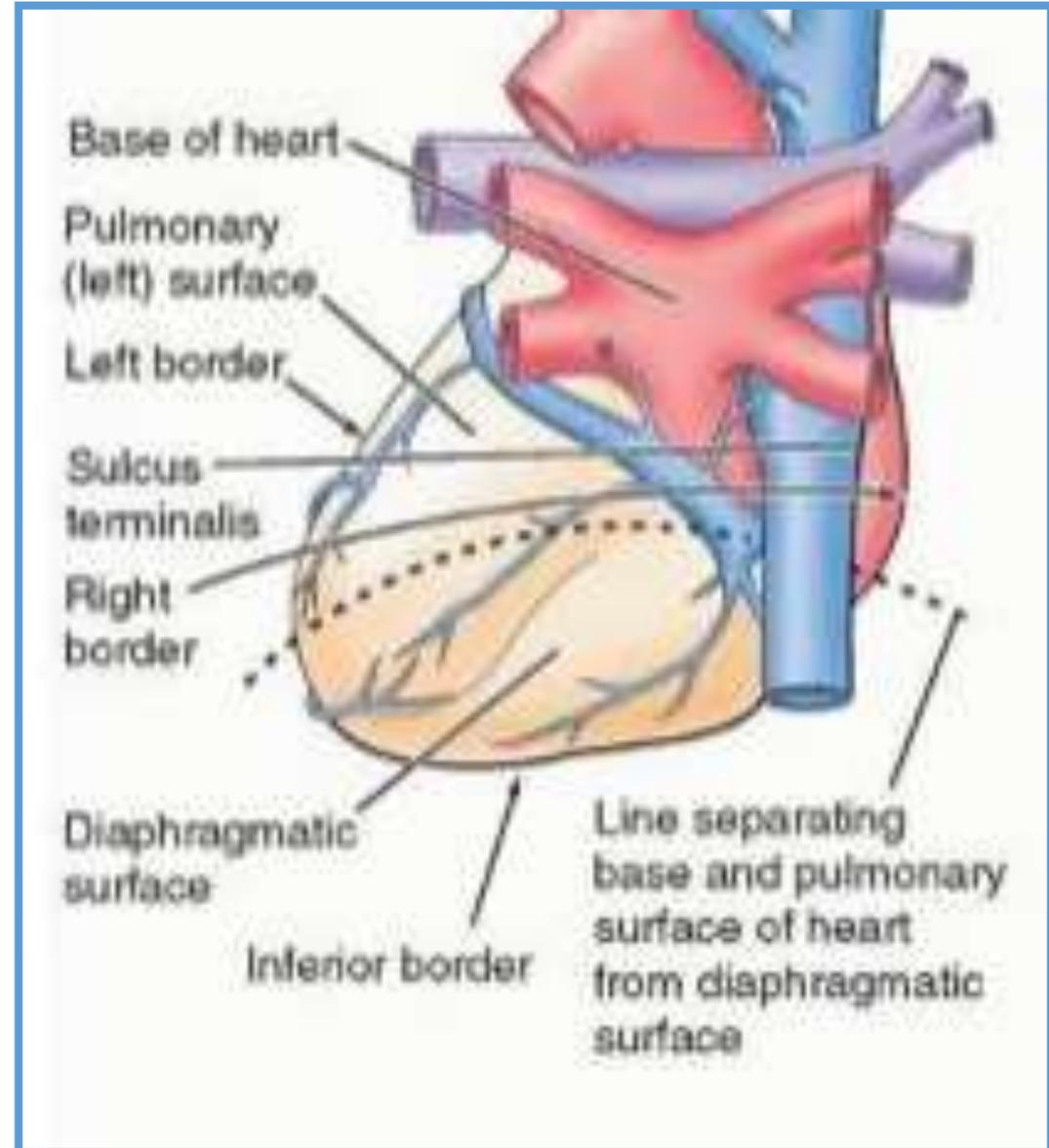
- Is formed mainly by the **left atrium**, with a lesser contribution by **the right atrium**
- Faces posteriorly toward the bodies of vertebrae **T6–T9** and is separated from them by:
  - ✓ **the pericardium,**
  - ✓ **oblique pericardial sinus,**
  - ✓ **esophagus,**
  - ✓ **and aorta.**



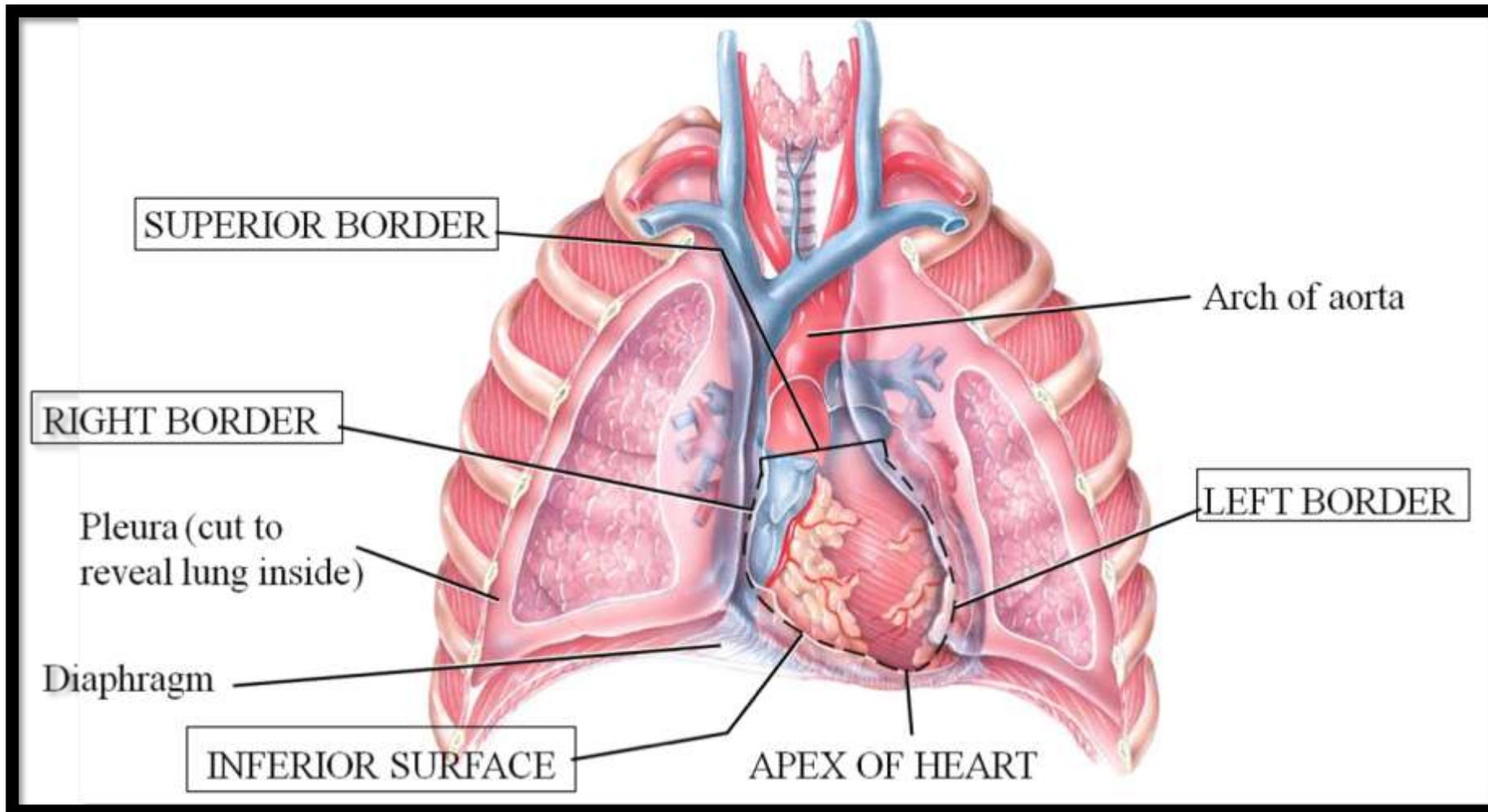
# ORIENTATION OF HEART

## The base of the heart

- Extends superiorly to the bifurcation of the pulmonary trunk and inferiorly to the coronary sulcus (groove)
- Receives the pulmonary veins on the right and left sides of the left atrium and the superior and inferior venae cavae at the superior and inferior ends of the right atrium.



Note that the base of the heart is called the base because the heart is pyramid shaped; the base lies opposite the apex.  
The heart does not rest on its base; it rests on its diaphragmatic (inferior) surface.



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# ORIENTATION OF HEART

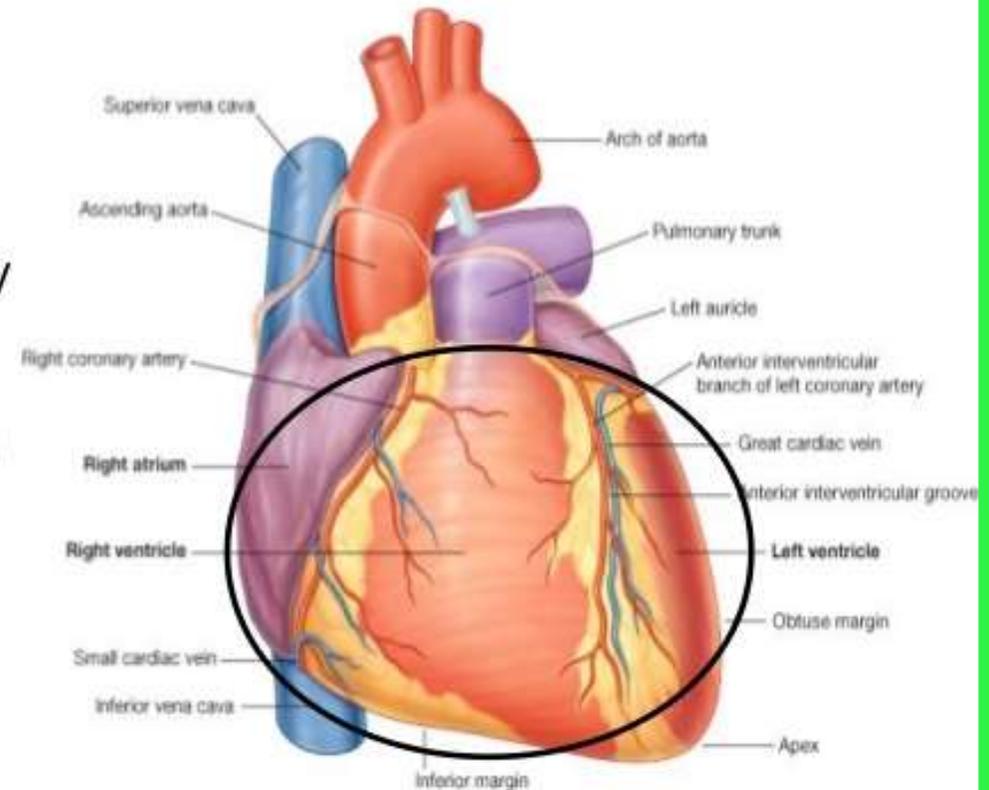
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The four surfaces of the heart are the:::

- Anterior (sternocostal) surface, formed mainly by the right ventricle(2/3) and by the left ventricle(1/3).

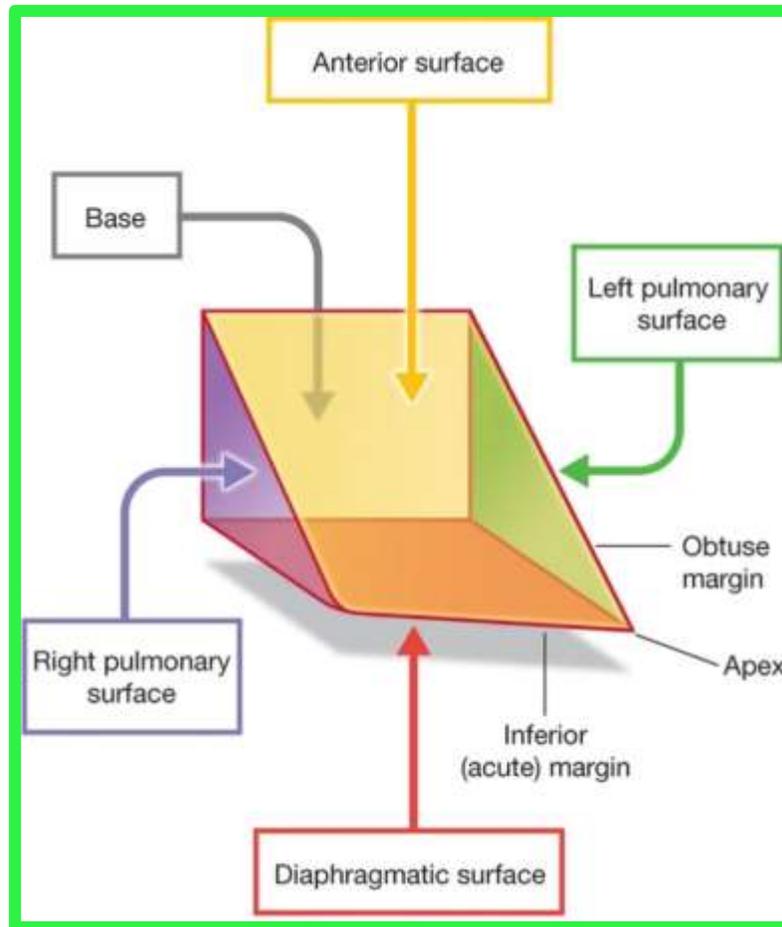
## Anterior/Sternocostal surface

- Faces anteriorly and consists chiefly of "Rt Ventricle" with some Rt Atrium on right and some of Lt Ventricle on Lt



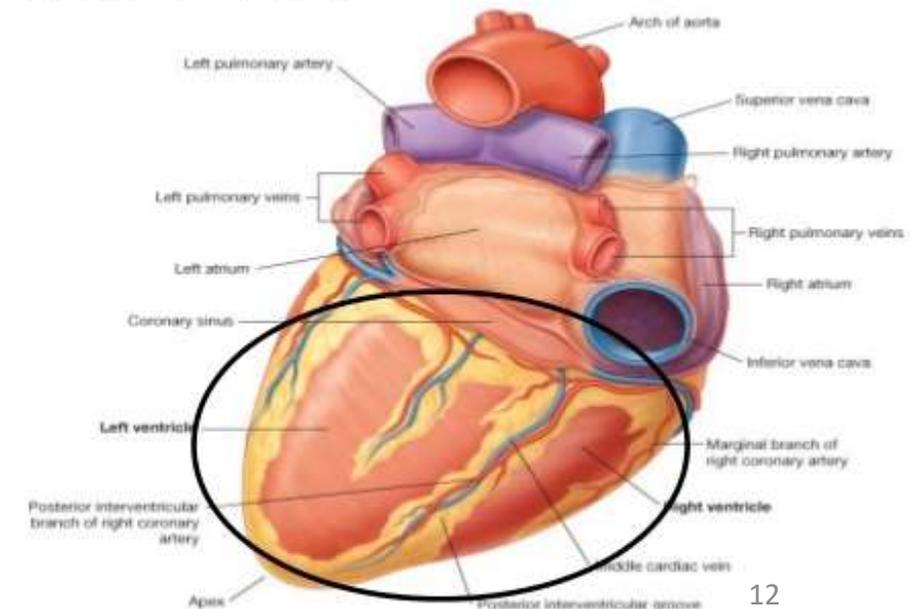
# The four surfaces of the heart are the:::

- **Diaphragmatic (inferior) surface**, formed mainly by the **left ventricle (2/3)** and partly by **the right ventricle(1/3)**; it is related to the central tendon of the diaphragm.



## Inf/Diaphragmatic surface

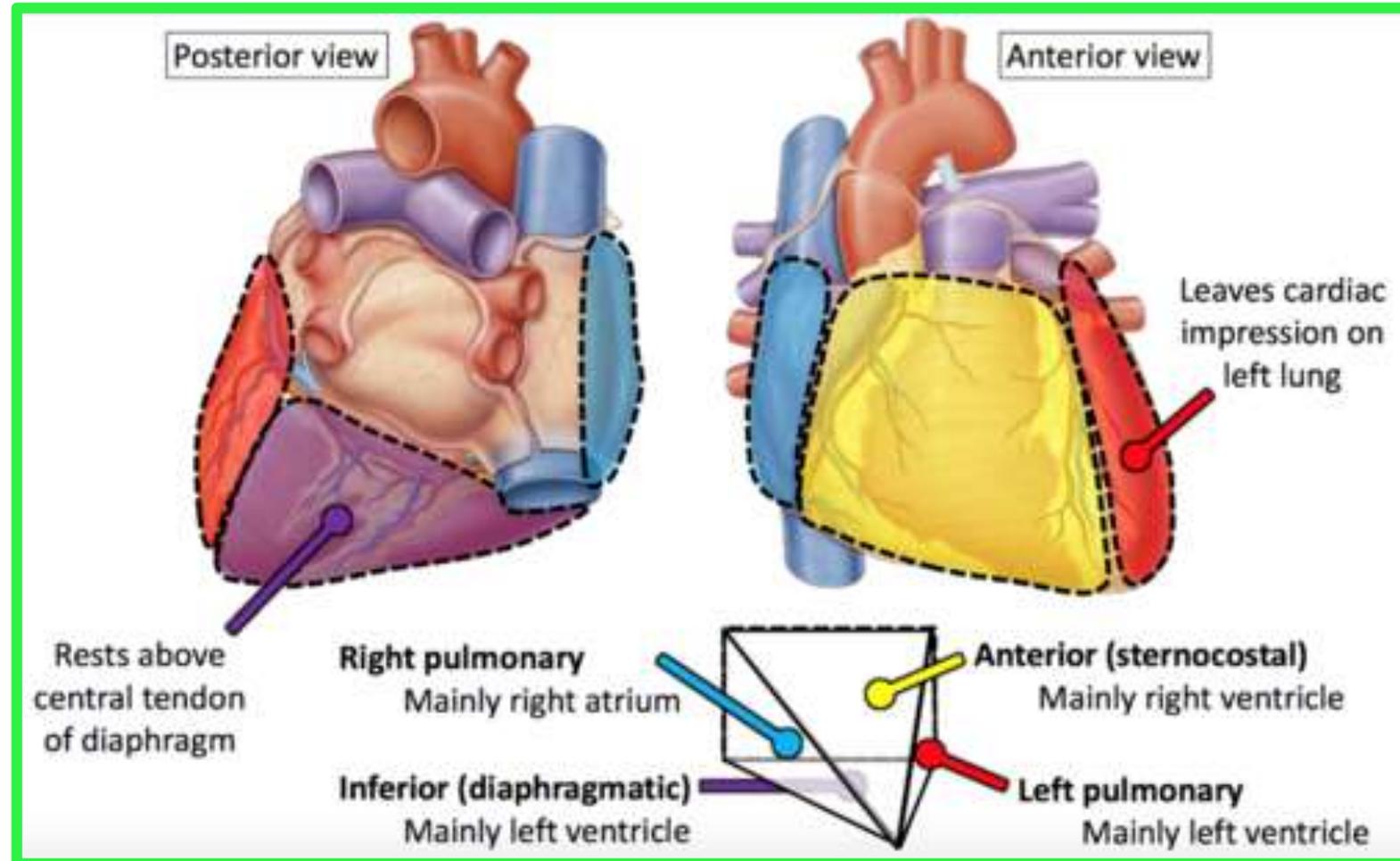
- In Anatomical position rests on this surface
- Consists chiefly of Lt ventricle and a small portion of Rt ventricle



# The four surfaces of the heart are the:::

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- **Left pulmonary surface**, consists mainly of **the left ventricle**; it forms the **cardiac impression of the left lung**.
- **Right pulmonary surface**, formed mainly by **the right atrium**

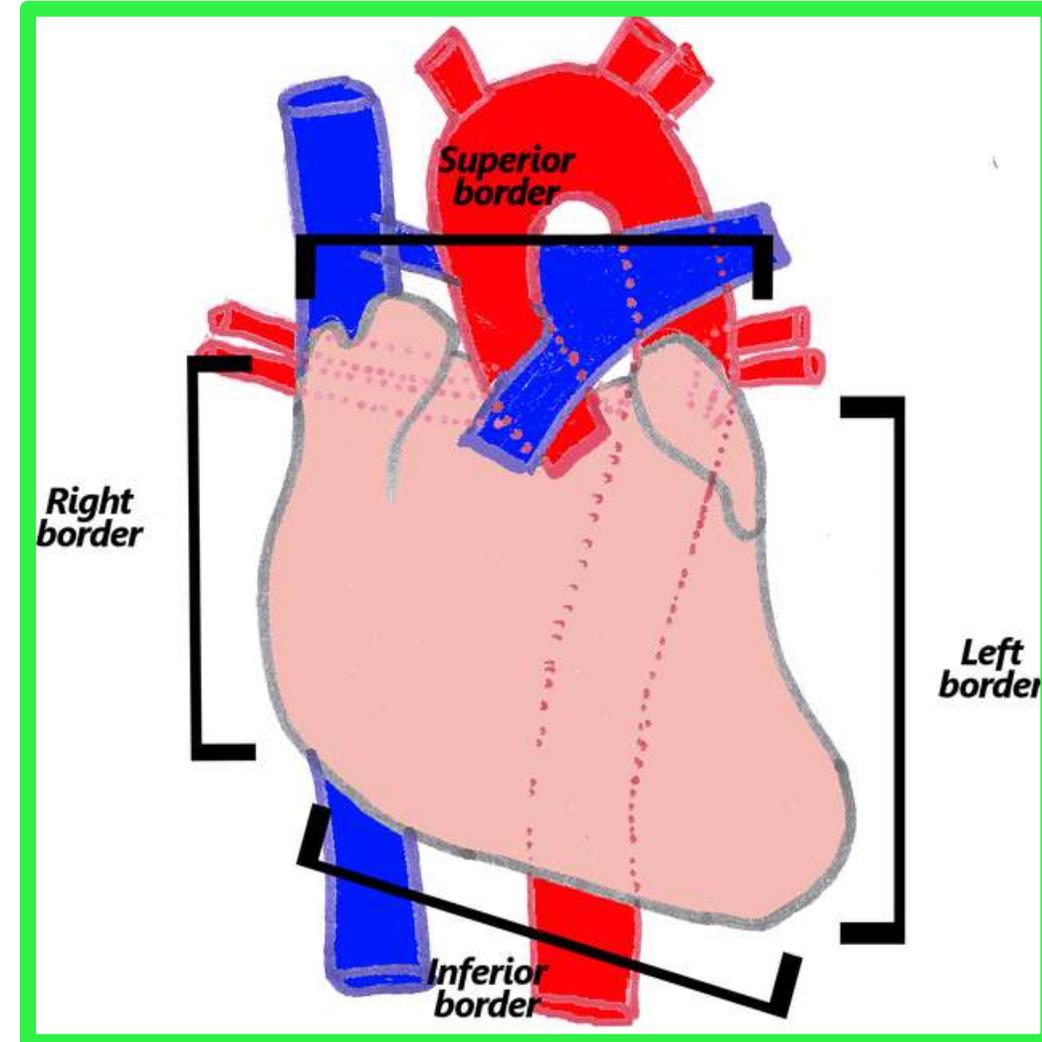


# ORIENTATION OF HEART

The heart appears trapezoidal in both anterior and posterior views.

## The four borders of the heart are the :

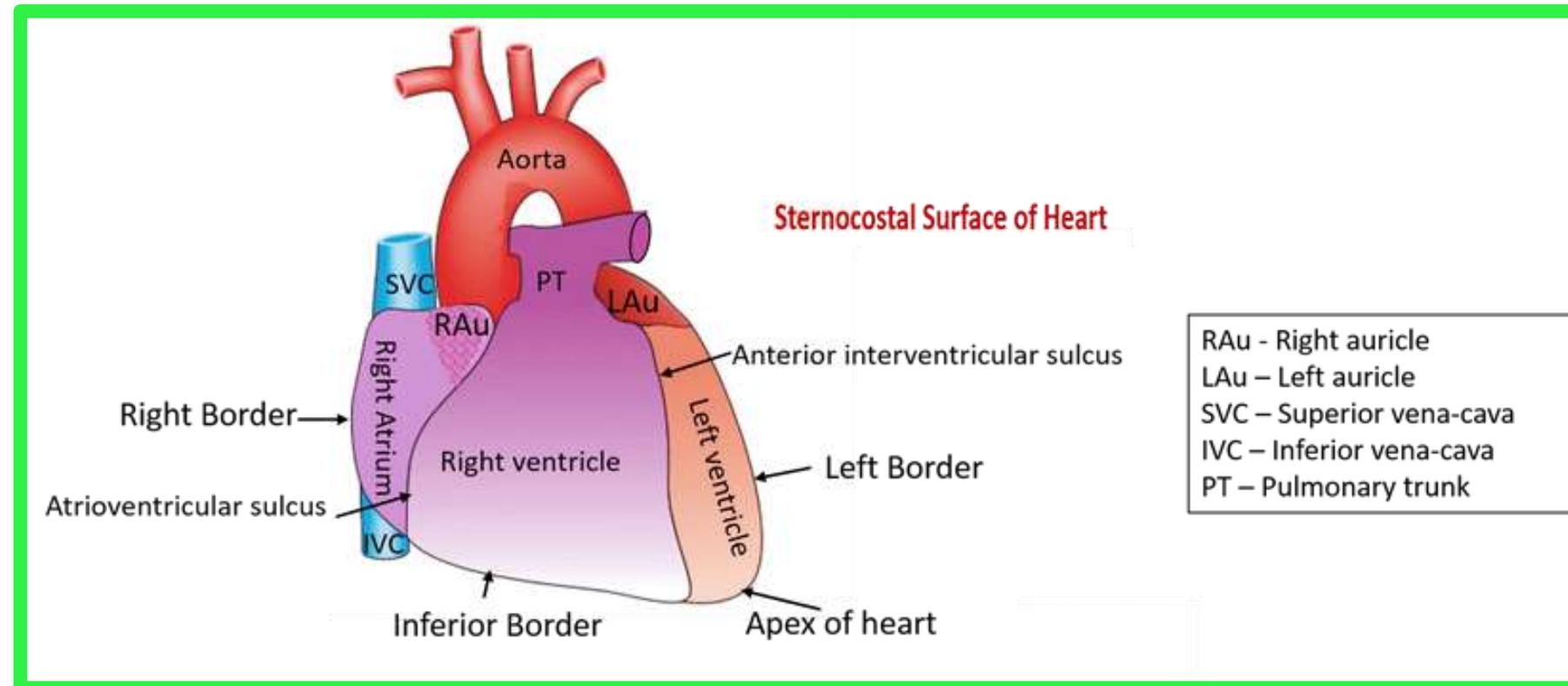
- Right border (slightly convex), formed by **the right atrium** and extending between the **SVC** and the **IVC**
- Inferior border (nearly horizontal), formed mainly by **the right ventricle** and only slightly by **the left ventricle**



# ORIENTATION OF HEART

## The four borders of the heart are the :

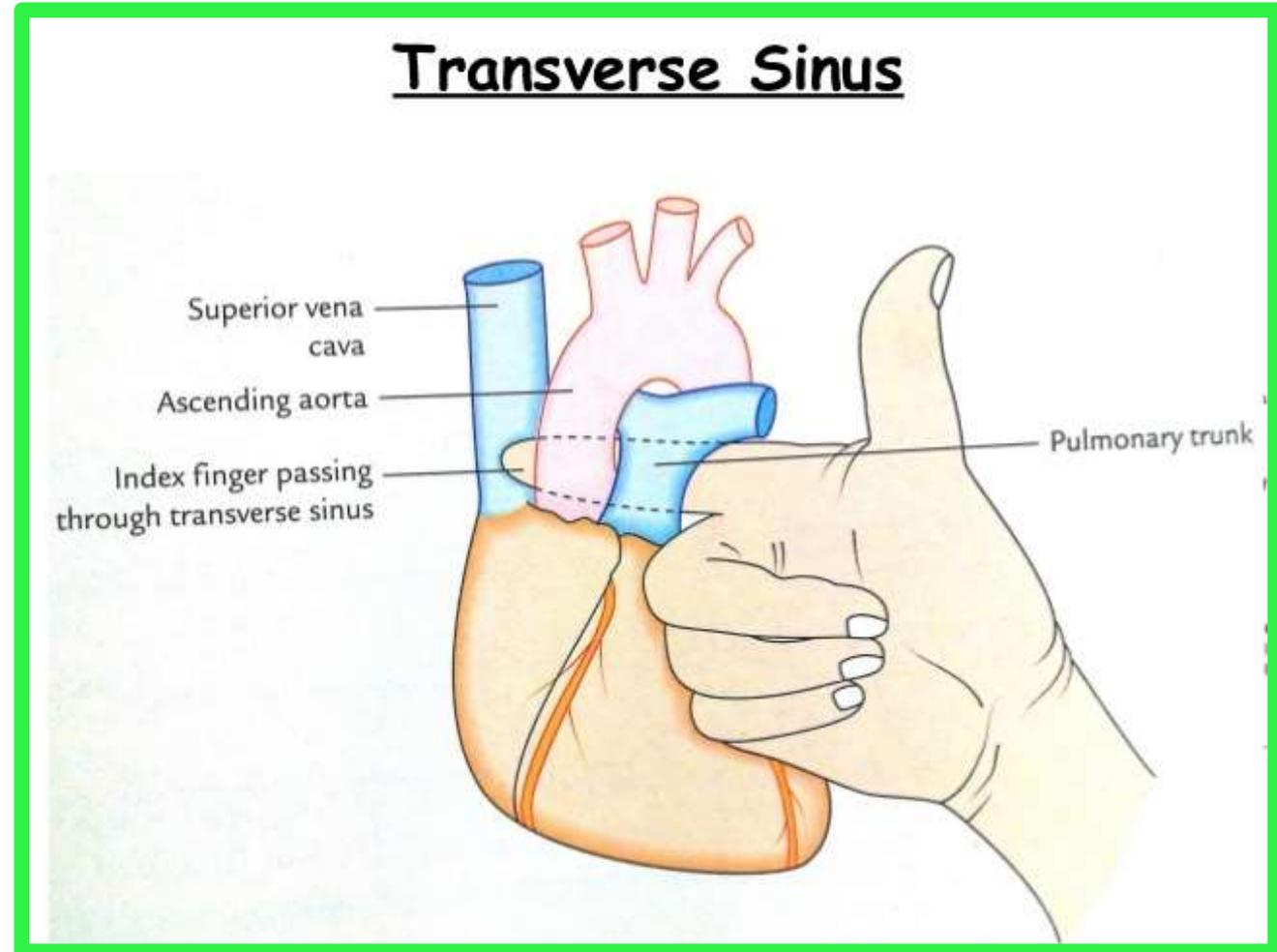
- Left border (oblique), formed mainly by the **left ventricle** and slightly by the **left auricle**
- Superior border, formed by the **right and left atria and auricles** in an anterior view;



# ORIENTATION OF HEART

the **ascending aorta** and **pulmonary trunk** emerge from the superior border, and **the SVC** enters its right side.

Posterior to the **aorta** and **pulmonary trunk** and anterior to the **SVC**, the **superior border forms** the inferior boundary of **the transverse pericardial sinus**

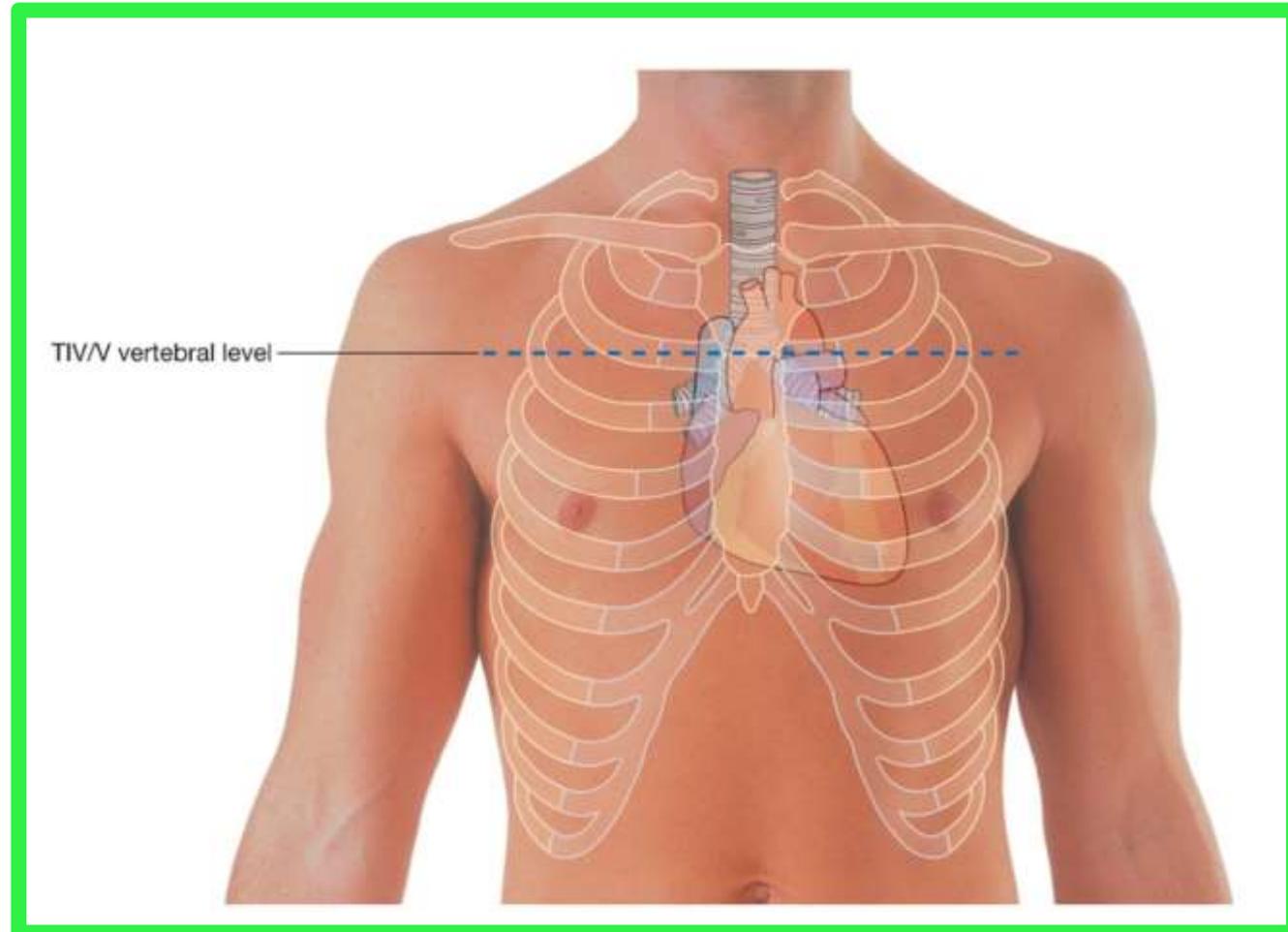


# Surface Anatomy

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**The heart and great vessels** are approximately in the middle of the thorax, surrounded laterally and posteriorly by the lungs and bounded anteriorly by the sternum and the central part of the thoracic cage

The outline of the heart can be traced on the anterior surface of the thorax by using these guidelines:

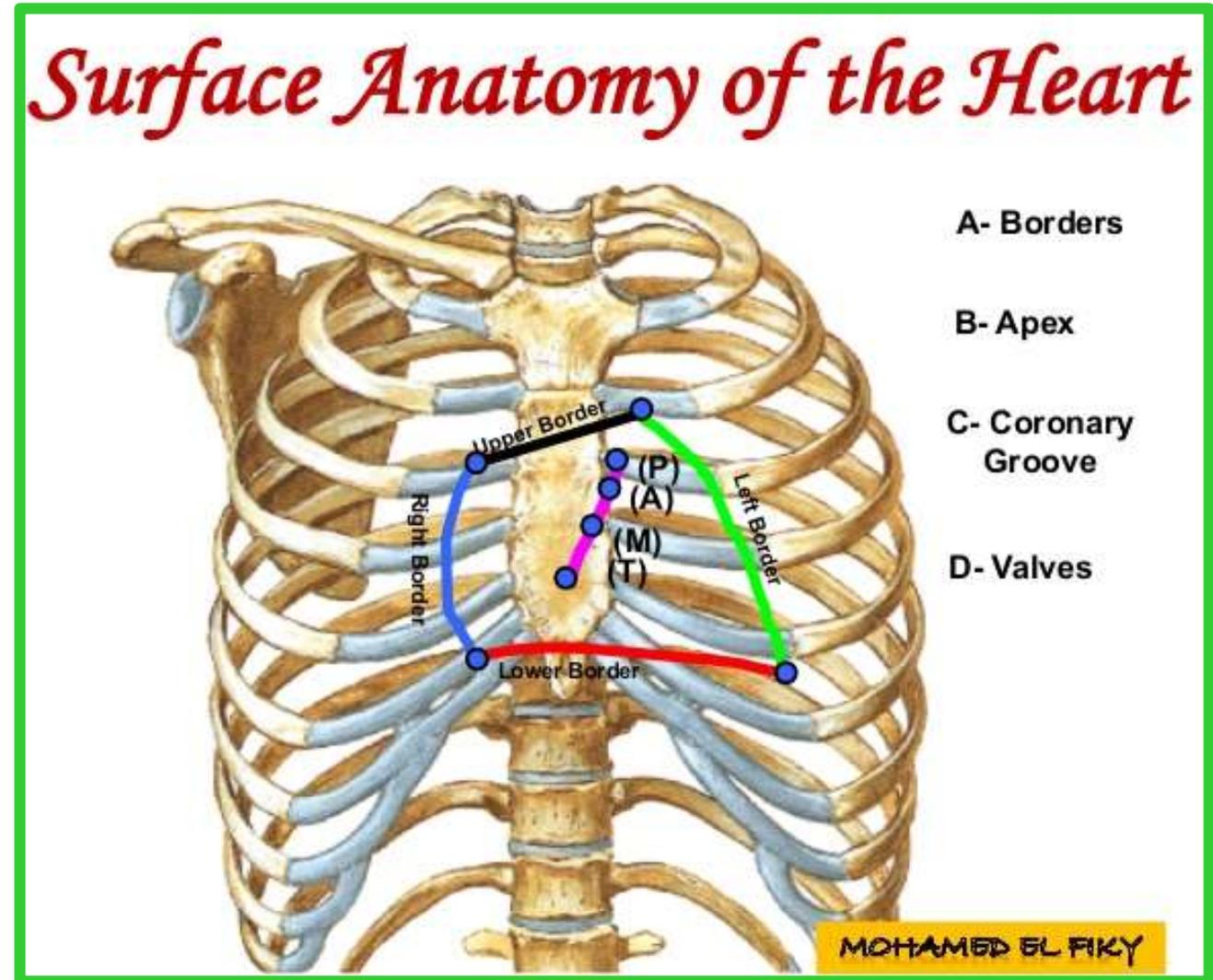


# Surface Anatomy

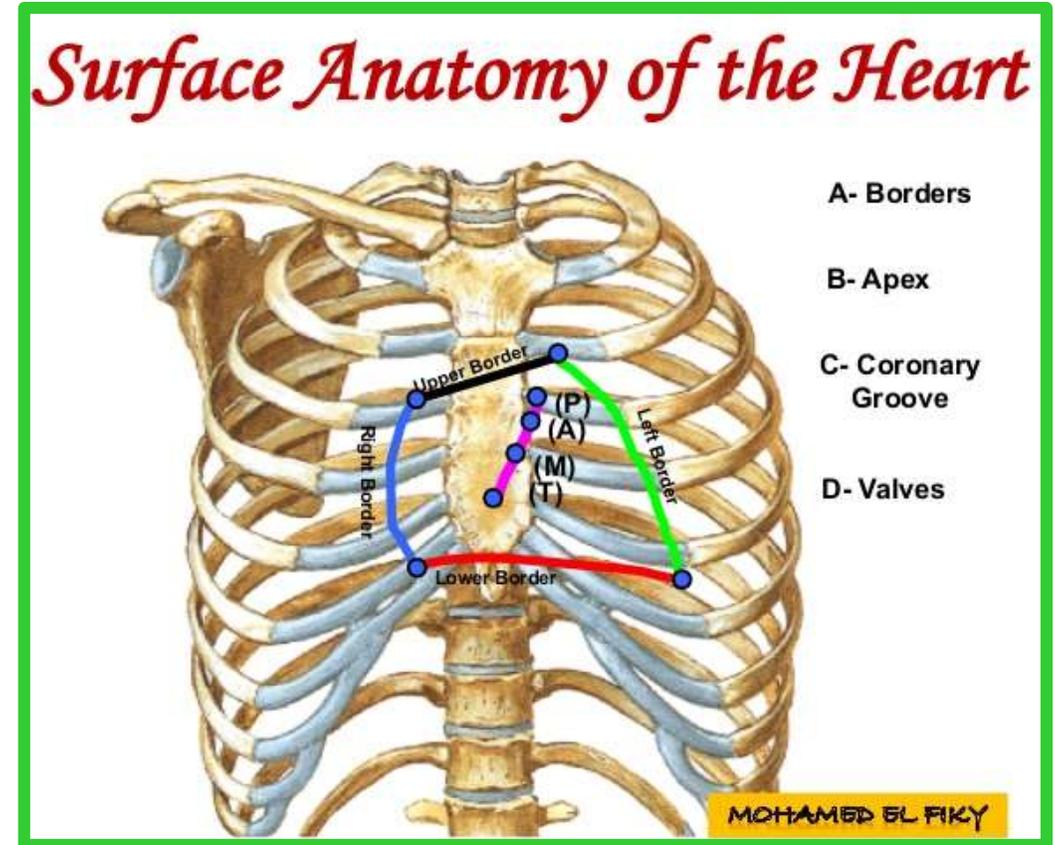
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- The **superior border** corresponds to a line connecting the **inferior border of the 2nd left costal cartilage** to the **superior border of the 3rd right costal cartilage**.
- The **right border** corresponds to a line drawn from the **3<sup>rd</sup> right costal cartilage** to the **6th right costal cartilage**; this border is slightly convex to the right.



- The inferior border corresponds to a line drawn from the inferior end of the right border to a point in the 5th intercostal space close to the left midclavicular line; the left end of this line corresponds to the location of the apex of the heart and the apex beat.

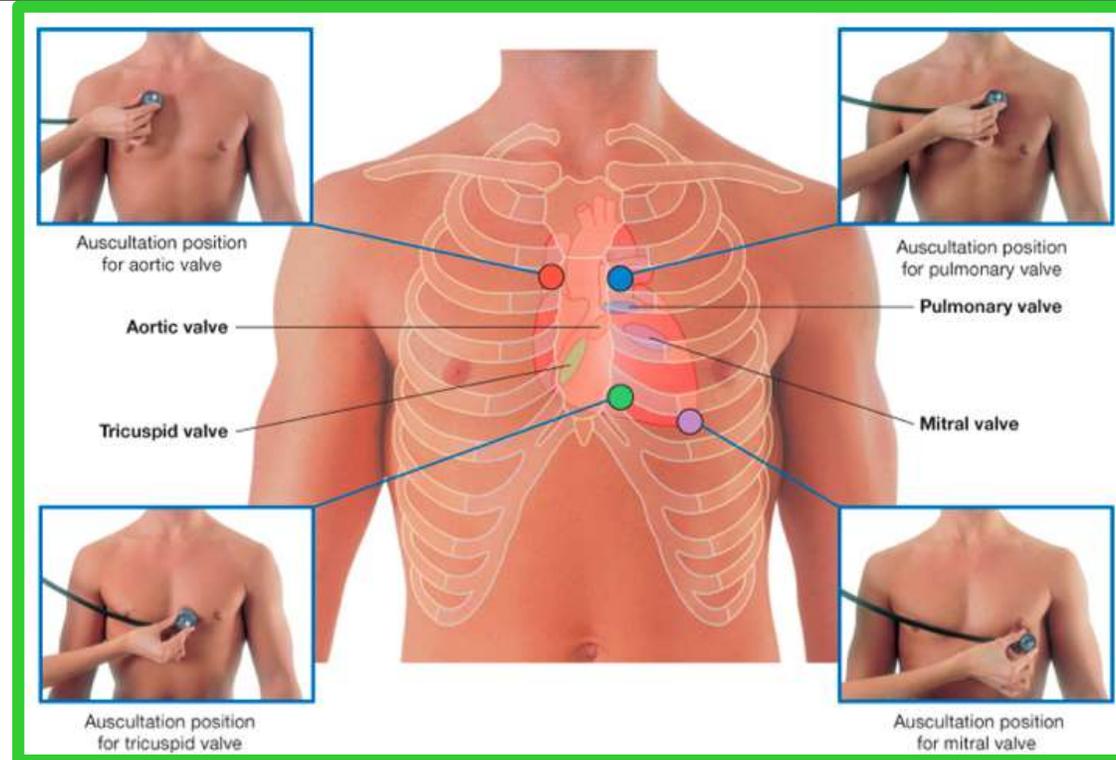


- The left border corresponds to a line connecting the left ends of the lines representing the superior and inferior borders.

*These borders are important to recognize when examining a radiograph of the heart*

# Surface Anatomy

The **apex beat** is an impulse that results from the apex being forced against the anterior thoracic wall when the left ventricle contracts.



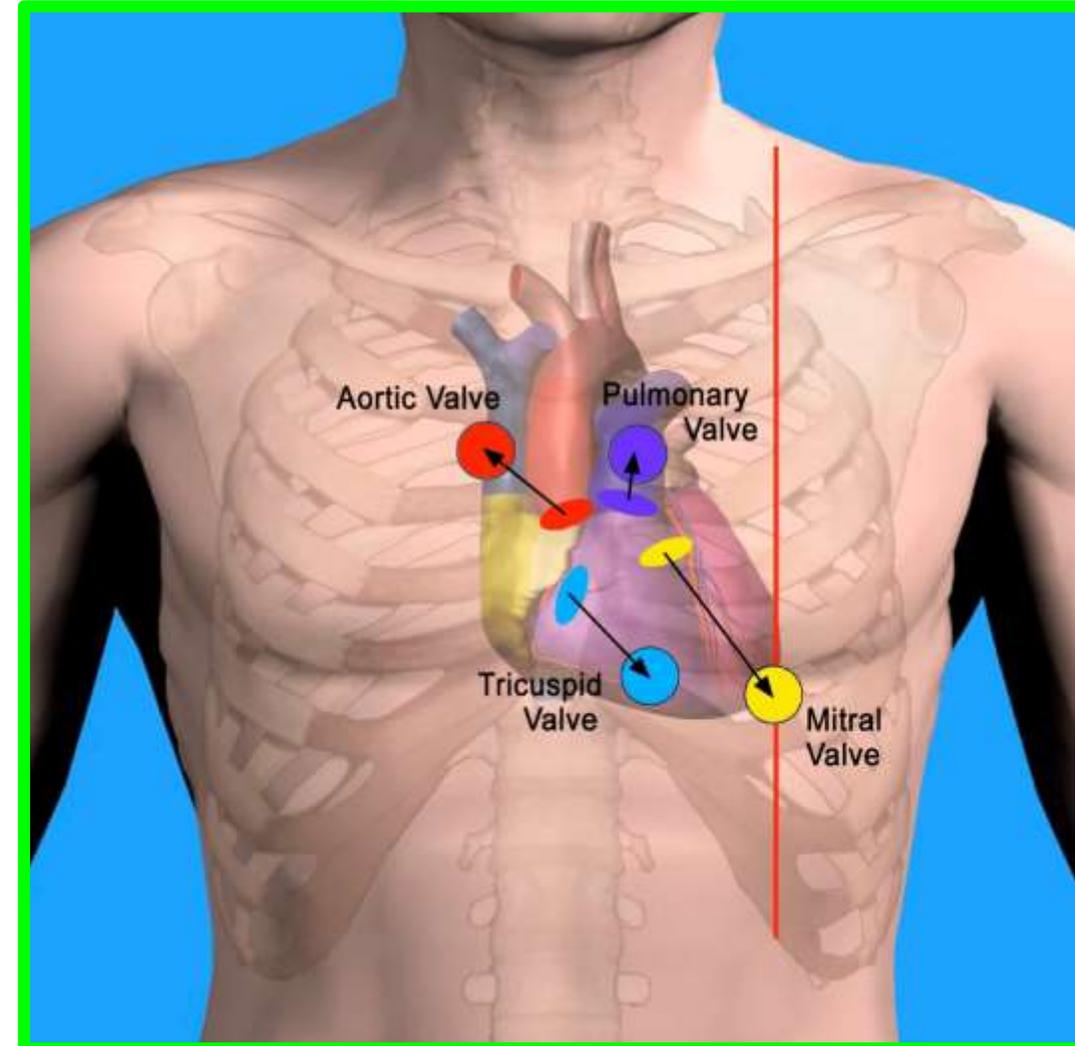
The location of the apex beat (**mitral area**) varies in position; it may be located in the **4th** or **5th** intercostal spaces, **6–10 cm** from the midline of the thorax. **Below and medial to the left nipple**

# Surface Anatomy

**Clinicians' interest** in the surface anatomy of the heart and cardiac valves results from their need to listen to **individual valve sounds**.

Because the **auscultatory areas are wide apart as possible**, the sounds produced at any given valve may be distinguished from those produced at other valves.

Blood tends to carry the sound in the **direction of its flow**. **Each area** is situated superficial to the chamber or vessel into which **the blood has passed and in a direct line with the valve orifice**

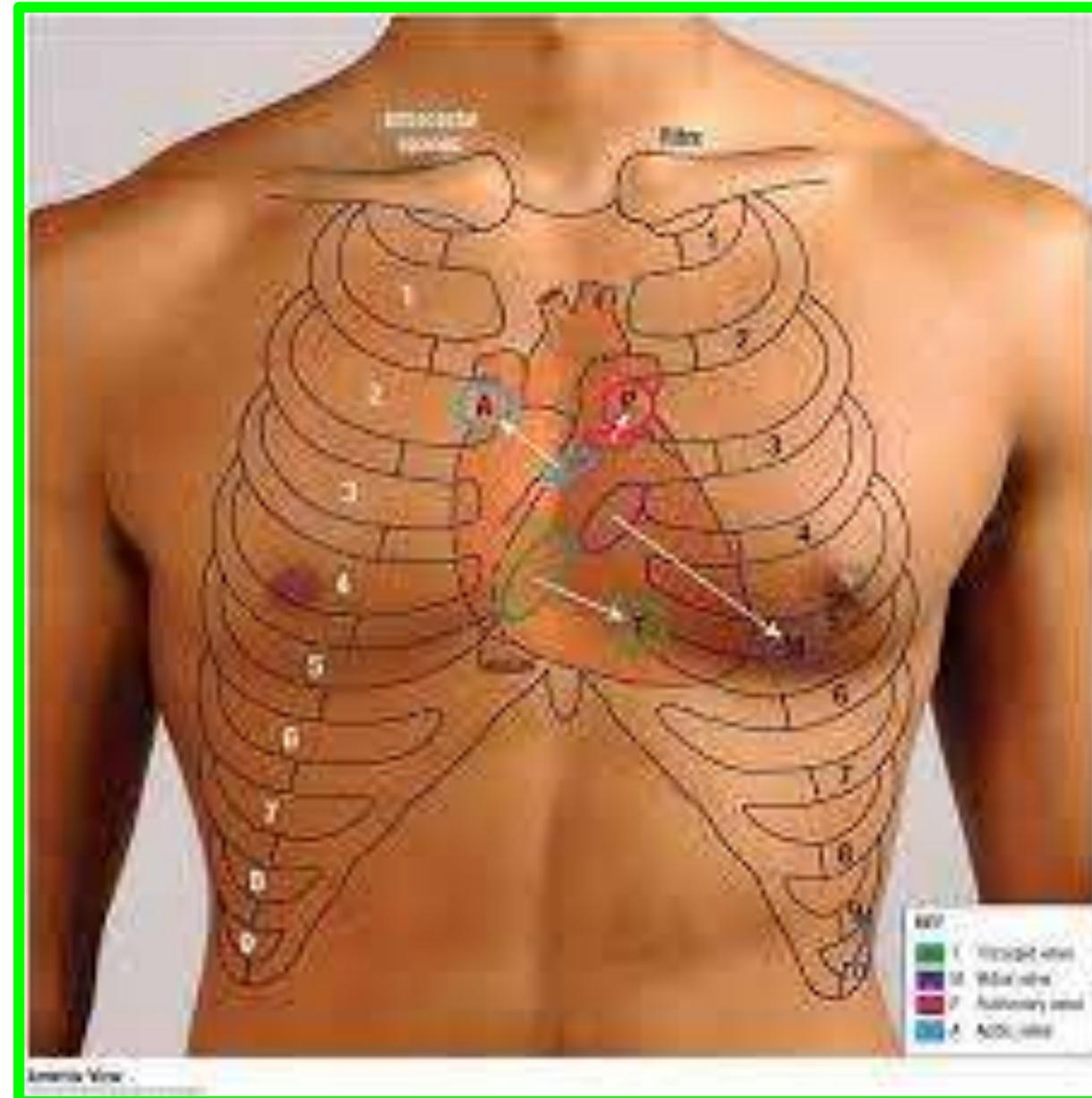


# Auscultation of the Heart Valves

On listening to the heart with a stethoscope, one can hear two sounds: **lub-dup**.

✓ **The first sound** is produced by the contraction of the ventricles and the closure of the **tricuspid** and **mitral valves**.

✓ **The second sound** is produced by the sharp closure of the **aortic** and **pulmonary valves**.

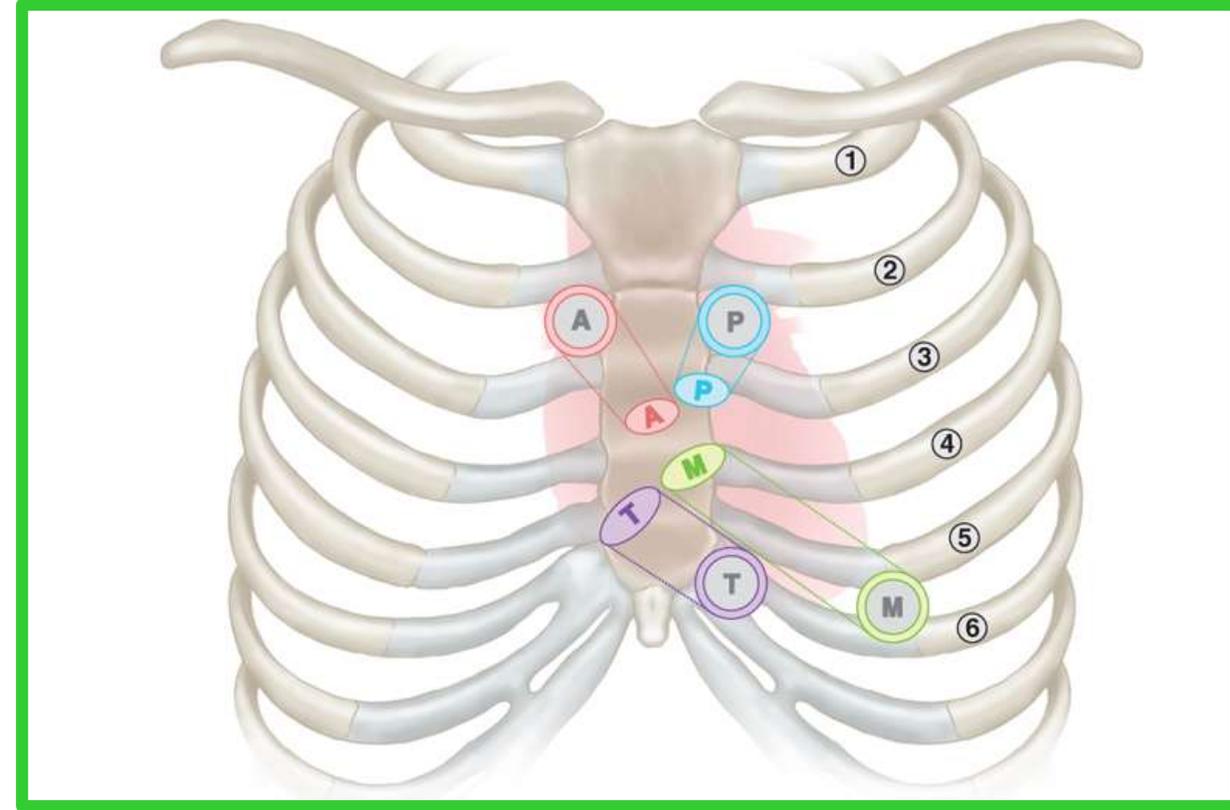
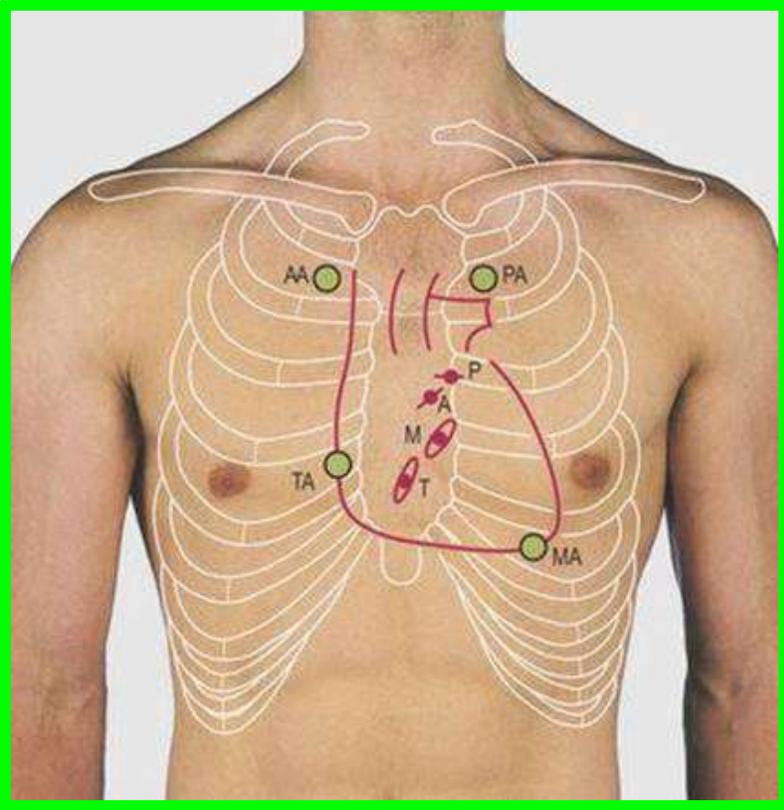


# Surface anatomy of the valves :

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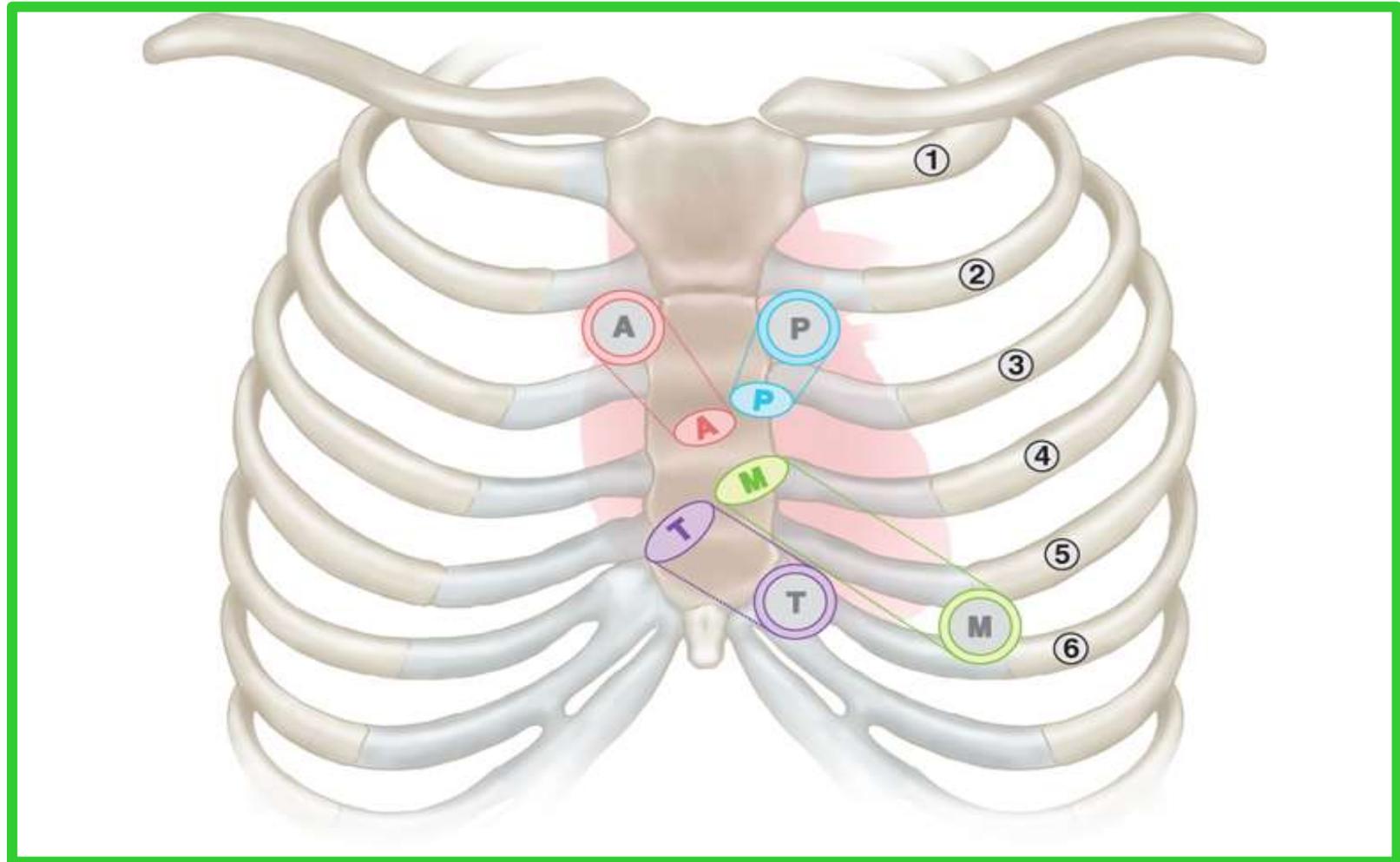
- All the valve of the heart behind the left border of the sternum except **the tricuspid valve** behind the center of the sternum.



- ❖ **Pulmonary valve:** opposite the level of **the left 3rd sterno-costal junction.**
- ❖ **Aortic valve:** opposite the level of **the left 3rd intercostal space.**

## Surface anatomy of the valves :

- ❖ **Mitral valve:** opposite the level of the **left 4th sterno-costal junction.**
- ❖ **Tricuspid valve:** opposite the level of the **left 4th intercostal space.**

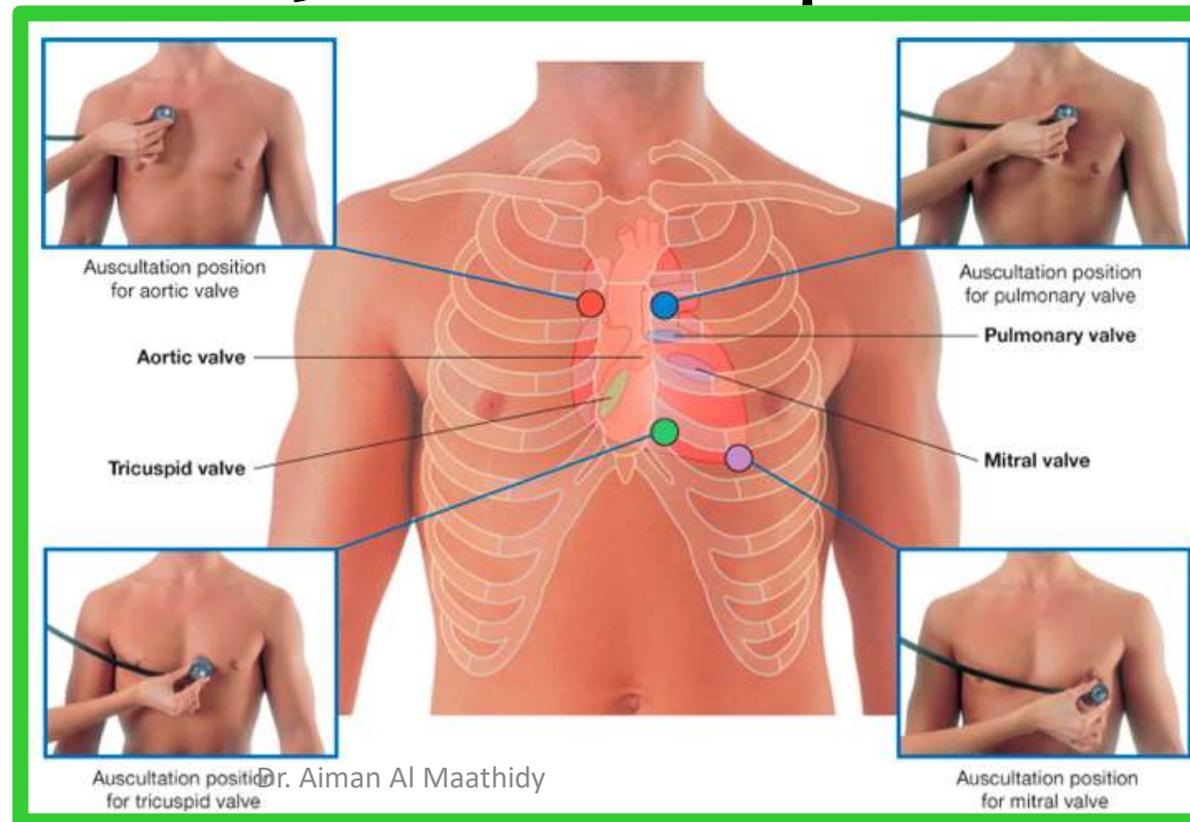


# Auscultation of the Heart Valves

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The areas (sites) of auscultation are

- **Aortic valve (A):** 2nd intercostal space to right of sternal border
- **Pulmonary valve (P):** 2nd intercostal space to left of sternal border
- **Tricuspid valve (T):** near left sternal border in 5th or 6<sup>th</sup> intercostal space
- **Mitral valve (M):** apex of heart in 5th intercostal space in midclavicular line



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*Monday 5 November 2023*

