

# The Heart

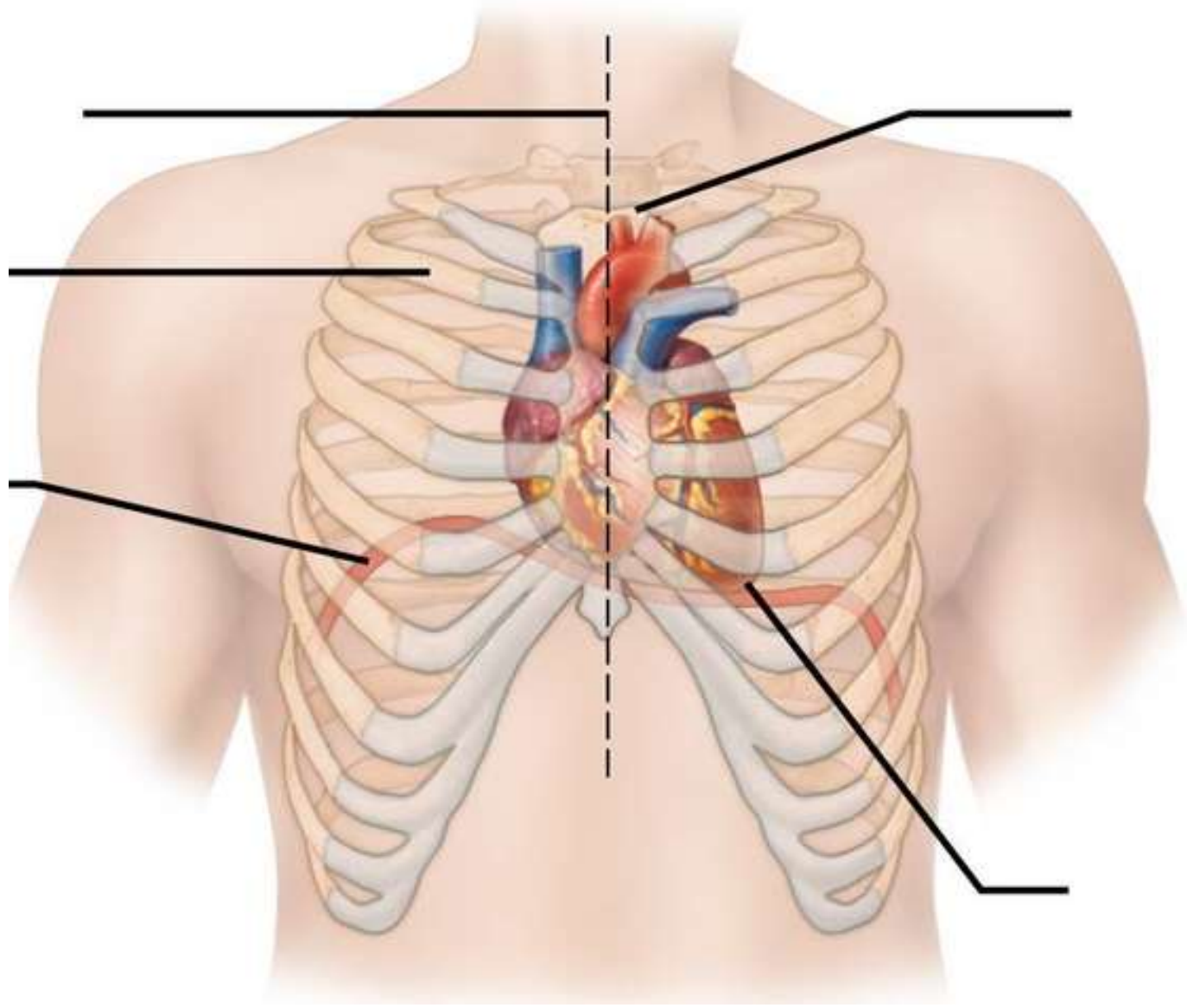
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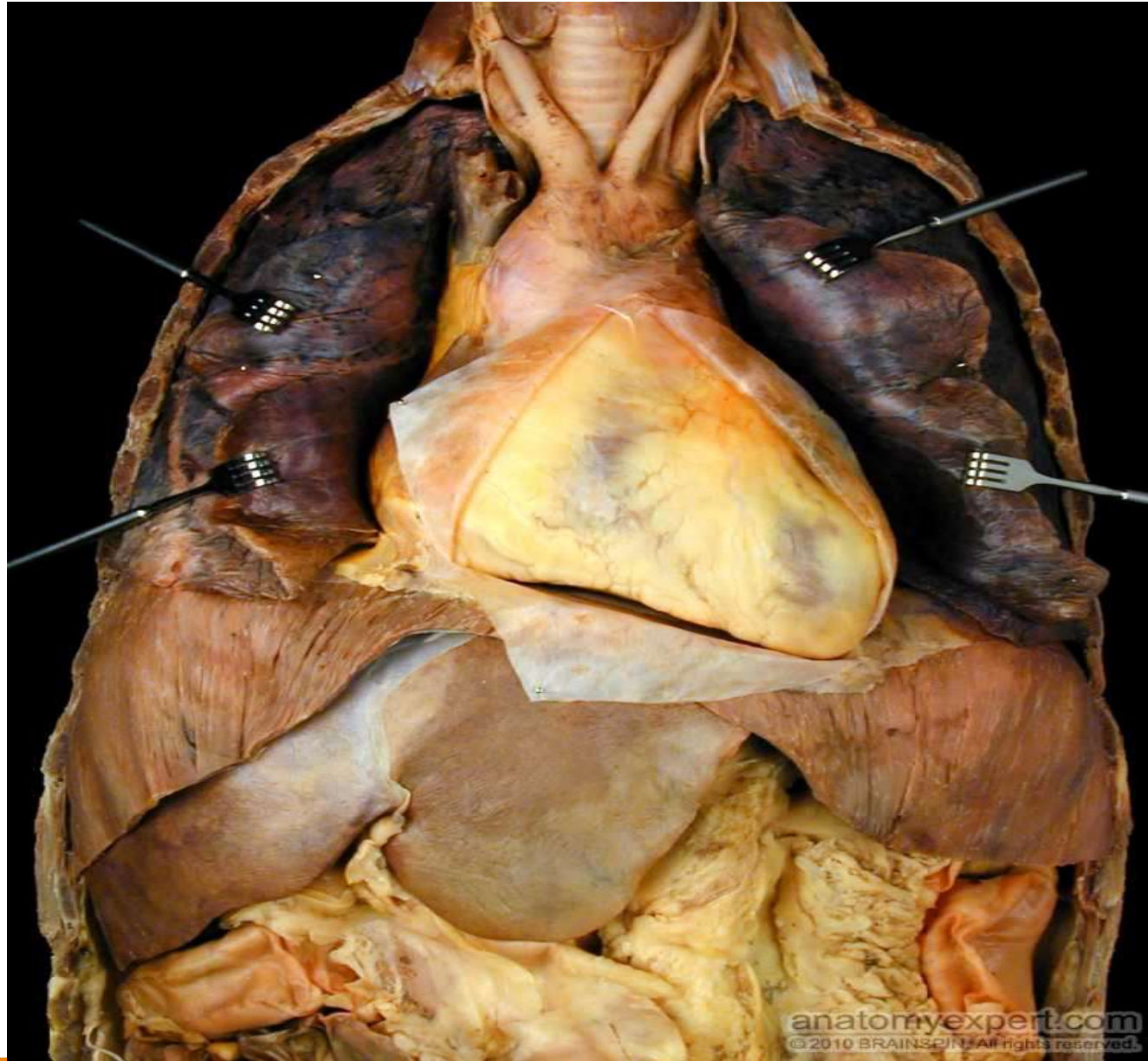
**DR. AHMED SALMAN**

Associate professor of anatomy & embryology



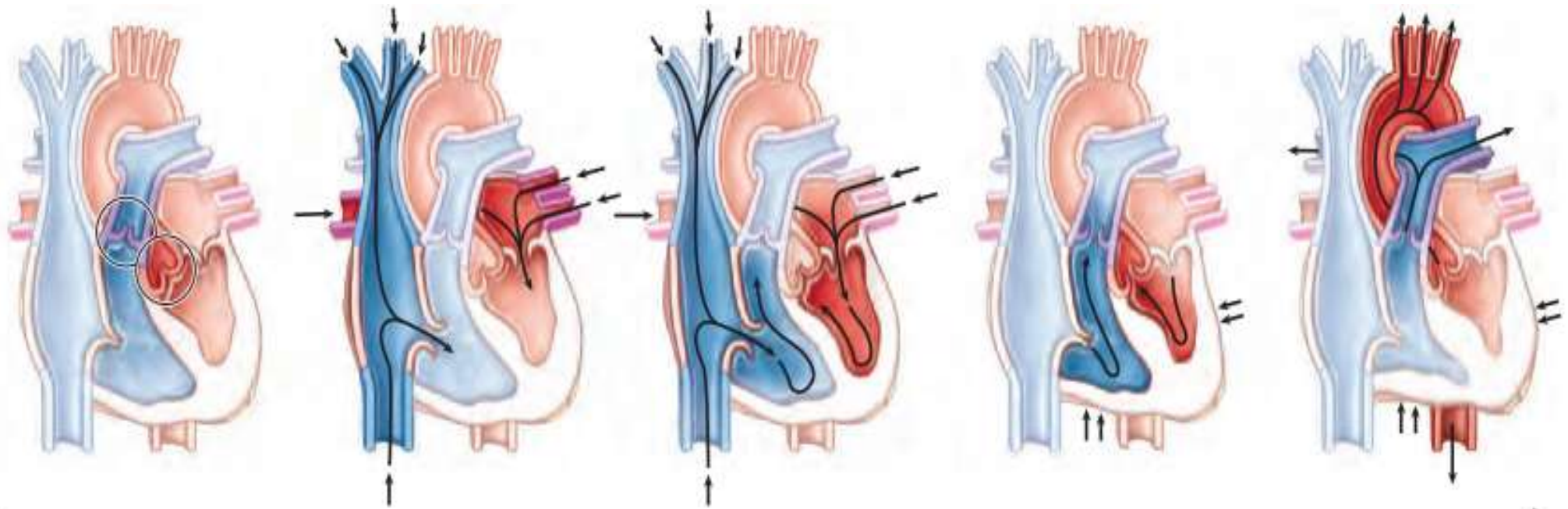
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- ❖ It is a muscular pump that propels blood to various parts of the body.
  - ❖ Lies within the pericardium in the middle mediastinum.
  - ❖ 1/3 of the heart lies to the right & 2/3 to the left of the median plane.
  - ❖ The walls of the heart are composed of three layers from outside :
    - 1- Epicardium
    - 2- Myocardium which is the cardiac muscle
    - 3- Endocardium





## The cardiac cycle

- ❖ The cycle begins with a period of ventricular elongation and filling (**diastole**)
- ❖ And ends with a period of ventricular shortening and emptying (**systole**).
- ❖ Two heart sounds are heard with a stethoscope: a **lub (1st) sound** as the blood is transferred from the atria into the ventricles
- ❖ And a **dub (2nd)** sound as the ventricles expel blood from the heart.
- ❖ The heart sounds are produced by the snapping shut of the one way valves that normally keep blood from flowing backward during contractions of the heart.



(B) Beginning of diastole upon closure of aortic and pulmonary valves

(C) Opening of atrio-ventricular valves during early moments of diastole

(D) Atrial contraction during final moments of diastole

(E) Closure of atrioventricular valves (tricuspid and mitral) very soon after systole begins

(F) Opening of aortic and pulmonary valves during systole

### Anterior views

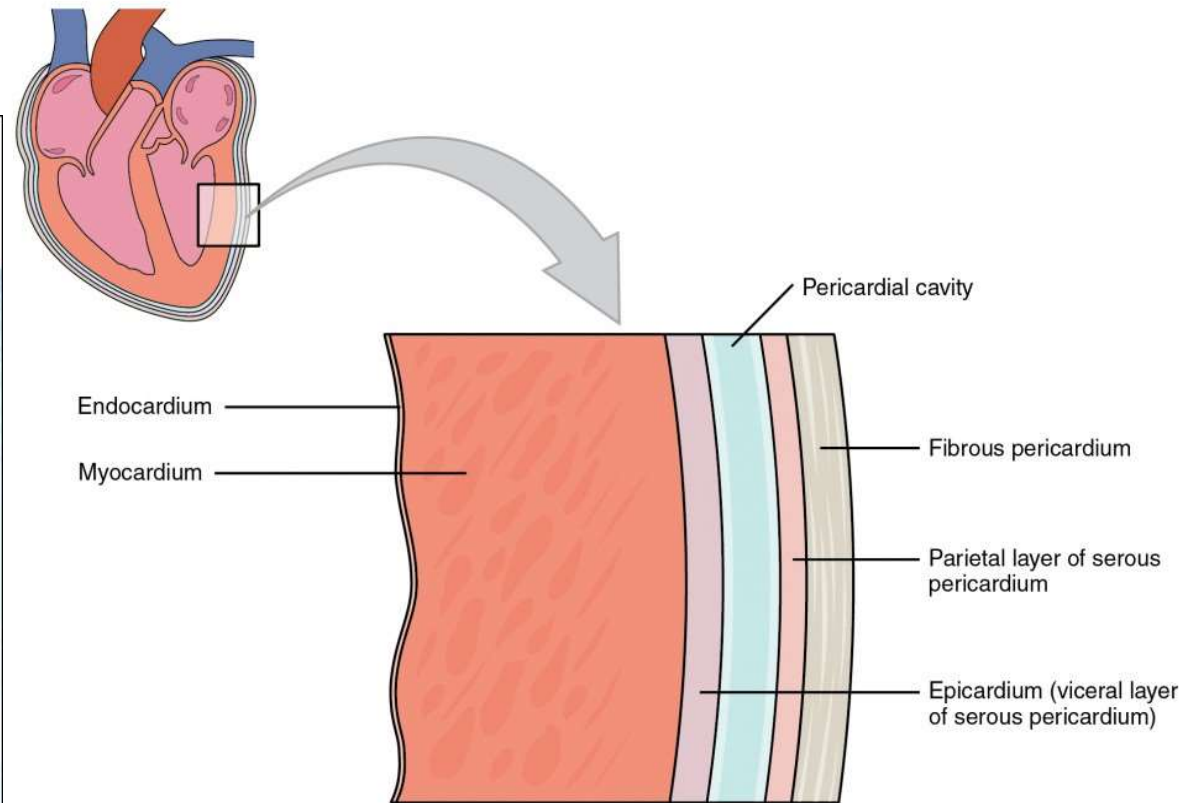
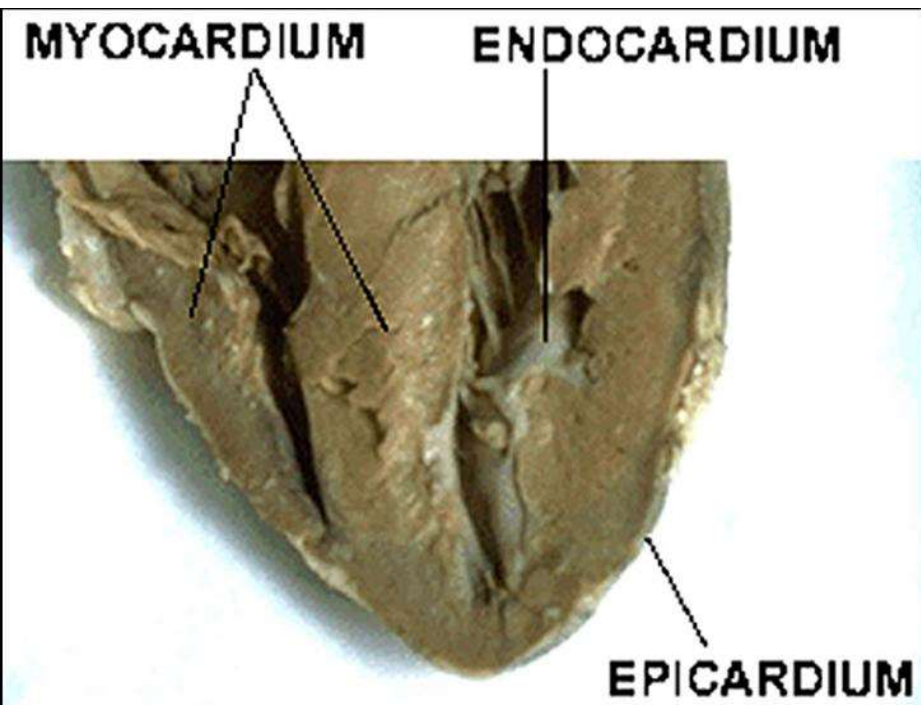
**FIGURE 1.49. Cardiac cycle.** The cardiac cycle describes the complete movement of the heart or heartbeat and includes the period from the beginning of one heartbeat to the beginning of the next one. The cycle consists of diastole (ventricular relaxation and filling) and systole (ventricular contraction and emptying). The right heart (blue side) is the pump for the pulmonary circuit; the left heart (red side) is the pump for the systemic circuit.

The wall of each heart chamber consists of three layers, from superficial to deep

**1- Endocardium** : a thin internal layer (endothelium)

**2. Myocardium** : a thick middle layer composed of cardiac muscle.

**3. Epicardium** : a thin external layer (mesothelium) formed by the visceral layer of serous pericardium



## The fibrous skeleton of the heart

The cardiac muscle fibers are anchored to the fibrous skeleton of the heart

It is formed of dense collagen fibers

It composed of

**1- Four fibrous rings** (L. anuli fibrosi) that surround the orifices of the valves

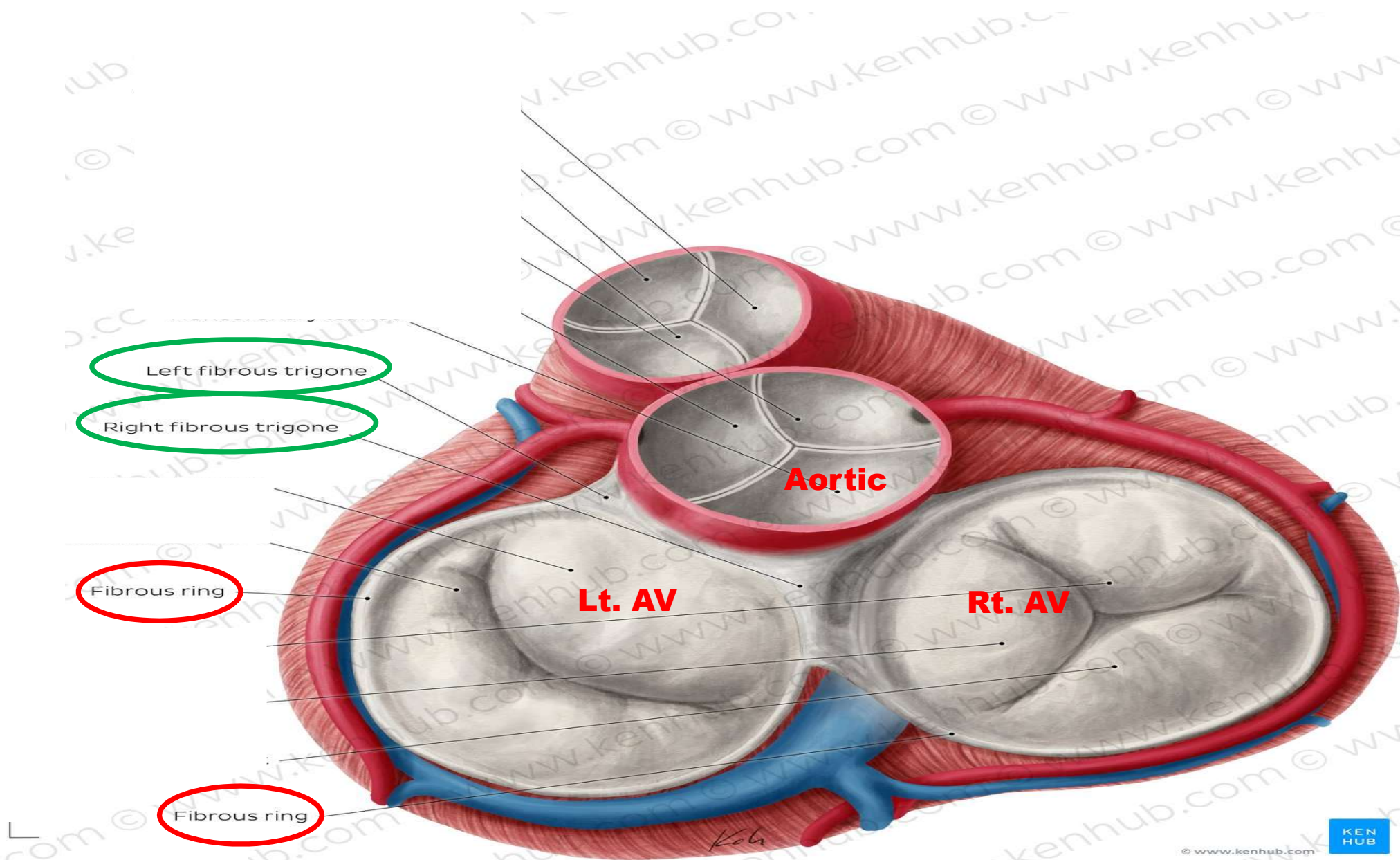
**2- Fibrous trigone** (right and left ) formed by connections between the rings

**A. The right trigone** is a connective tissue between the aortic ring and right atrioventricular ring .

**B. The left trigone** is formed by a connective tissue between the aortic ring and the left atrioventricular ring.

**3-Membranous parts** of the interatrial and interventricular septa.







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**Fibrous ring of left atrioventricular valve**



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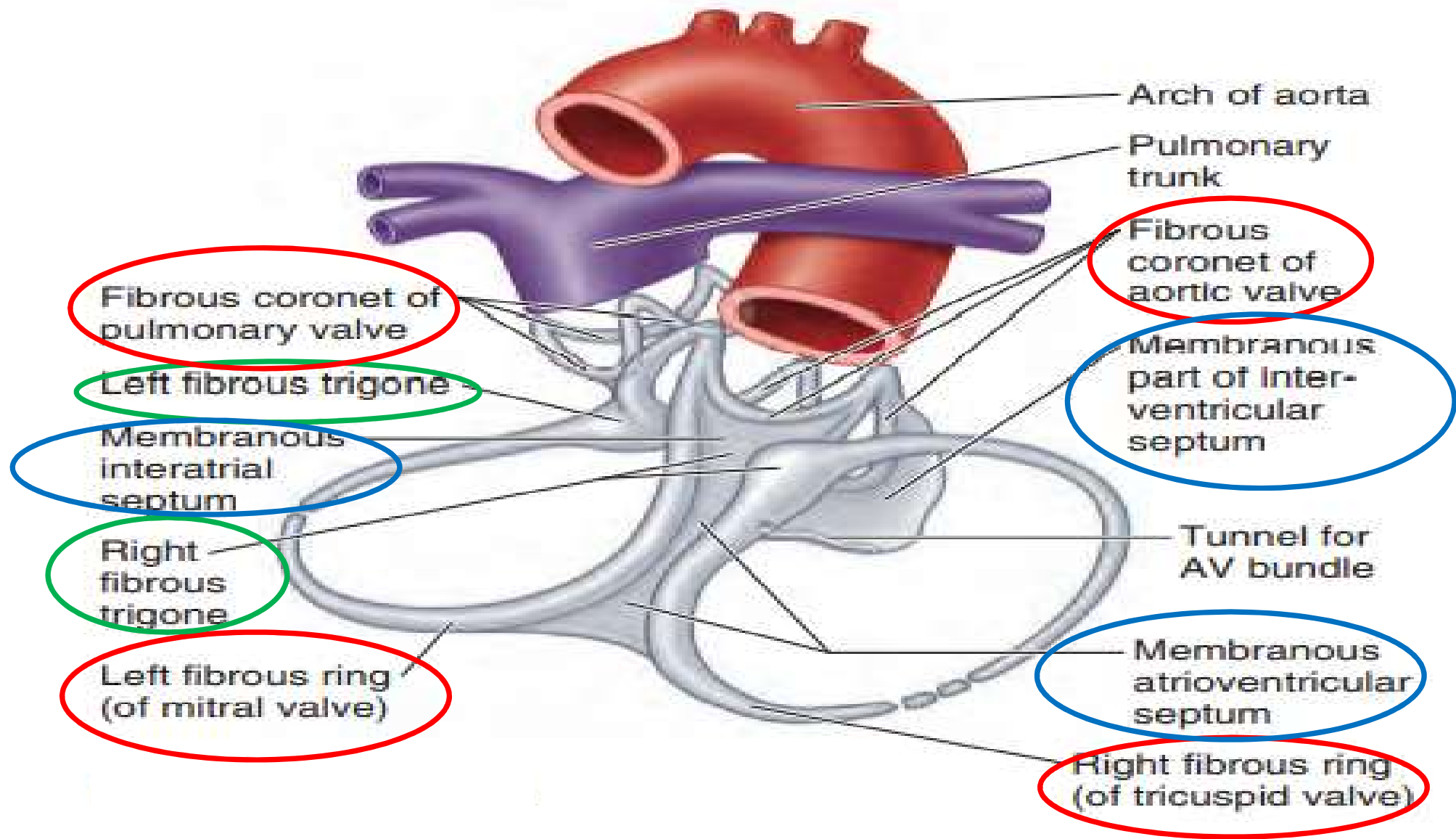
**Fibrous ring of right atrioventricular valve**



**Right fibrous trigone**



**Left fibrous trigone**

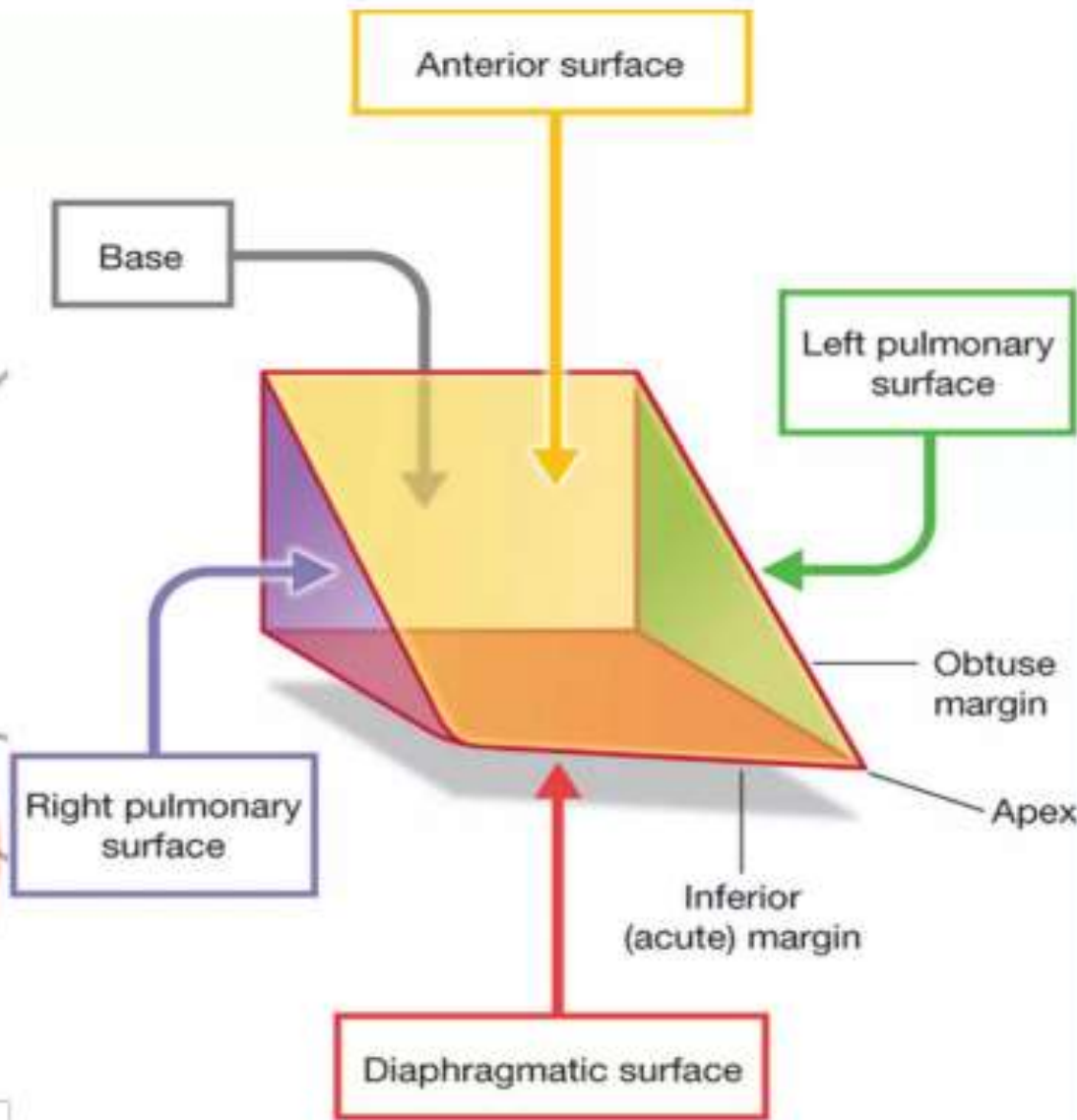
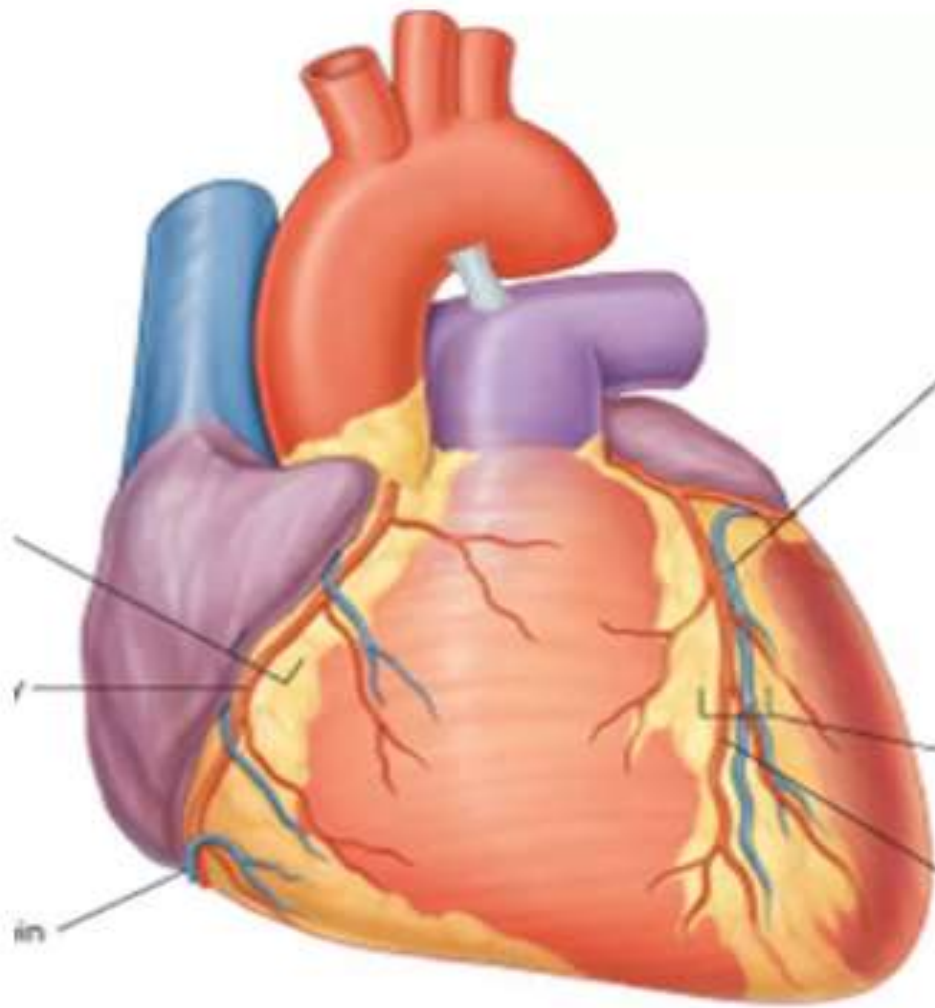


## Functions of cardiac skeleton

1. Separates of the atria from the ventricles
2. Provides attachment for the myocardium
3. Acts as Framework for the attachment of myocardial fibers
4. Provides attachment points for valve leaflets and cusps
5. Maintains valve orifices open and prevents them from being overly distended
6. Acts as an electrical insulator between the atria and ventricles

# External Morphology of the Heart

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The heart is a pyramidal in shape , It has  
Apex , base ,four surfaces and four borders

**Base :** Located posteriorly

**Apex:** Formed by the left ventricle.

**Four surfaces** ( anterior or sternocostal and inferior or diaphragmatic ,right and left surfaces).

**Four borders** ( right, left , superior and inferior ).



**Four grooves** atrioventricular (Coronary sulcus ), anterior interventricular , inferior (posterior) interventricular and interatrial grooves.

**Atrioventricular (Coronary sulcus ):** Separates two atria from two ventricles .

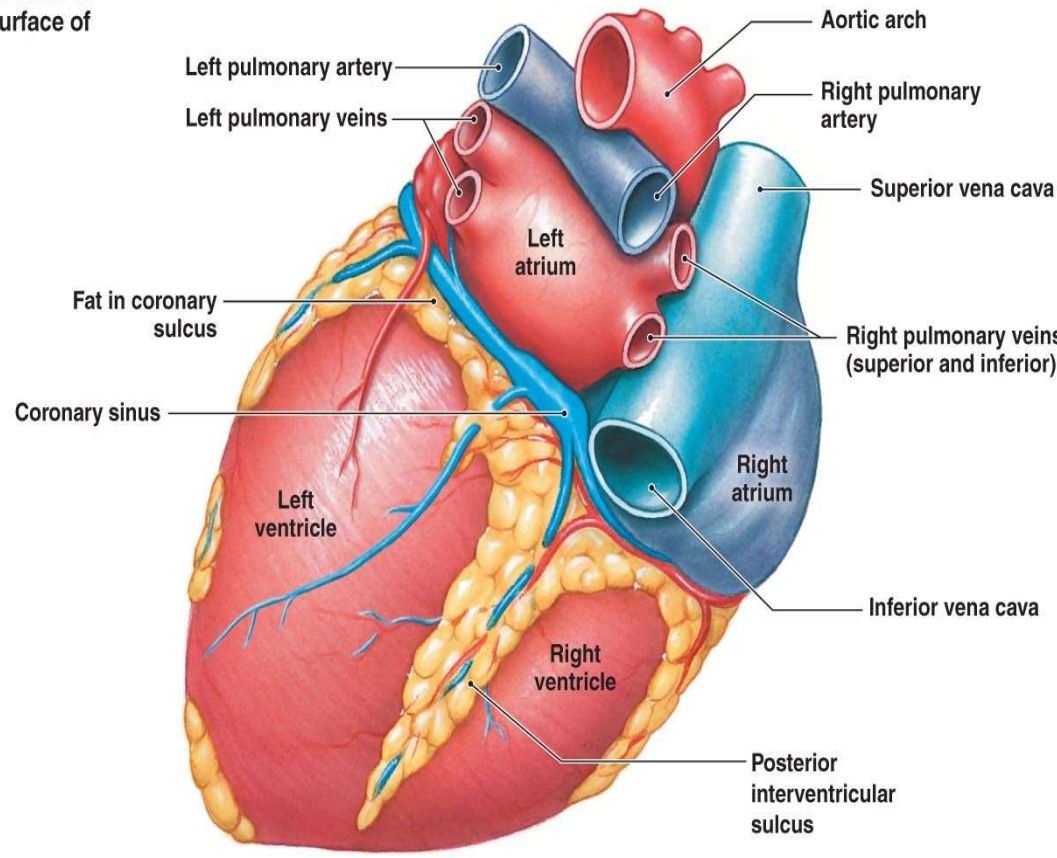
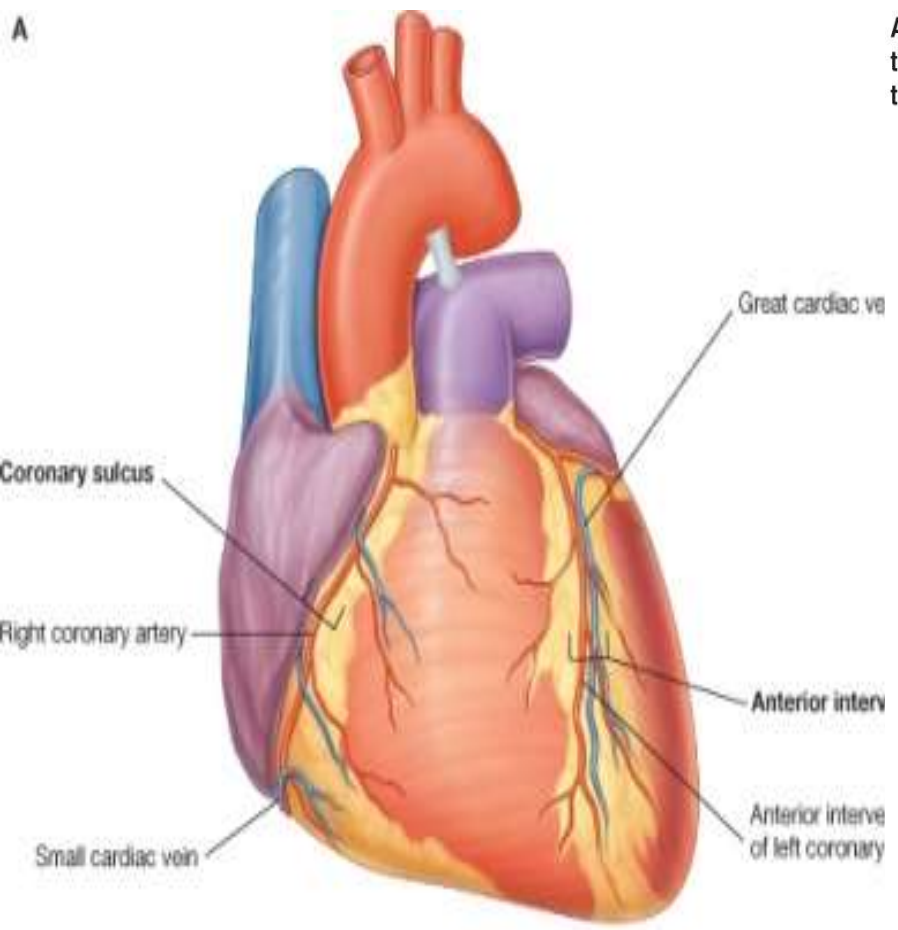
**Anterior interventricular :** Separates two ventricles , it lies on the anterior surface of the heart.

**Inferior (Posterior) interventricular:** Separates two ventricles , it lies on the inferior surface of the heart

**Interatrial :** It is marked on the posterior surface, while anteriorly it is hidden by the pulmonary artery and aorta.

A

A diagrammatic view of the posterior surface of the heart

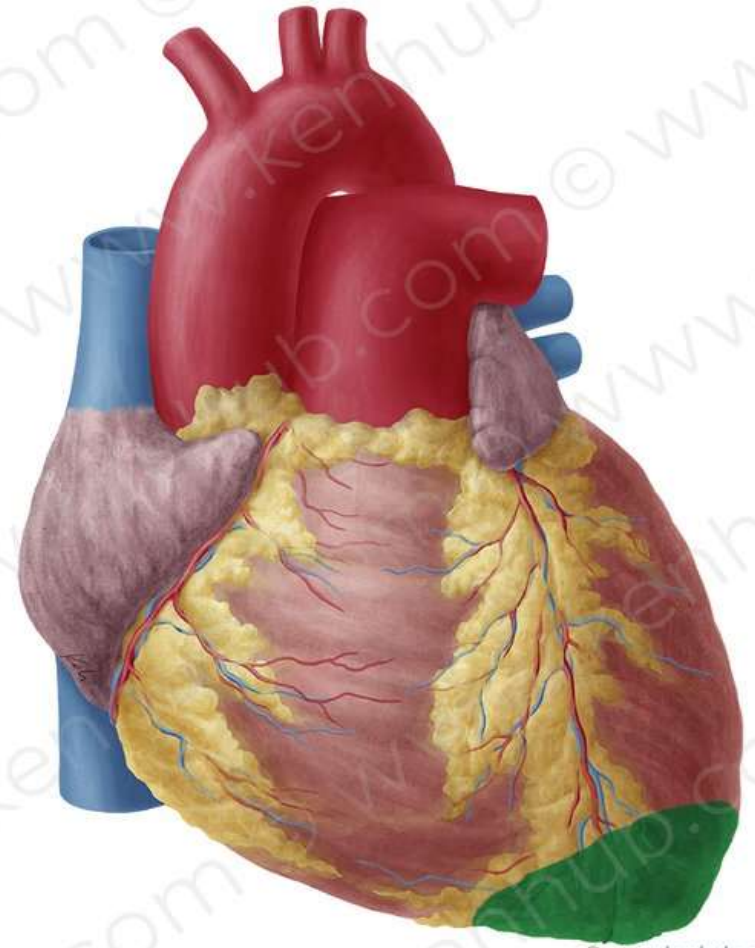


Posterior surface

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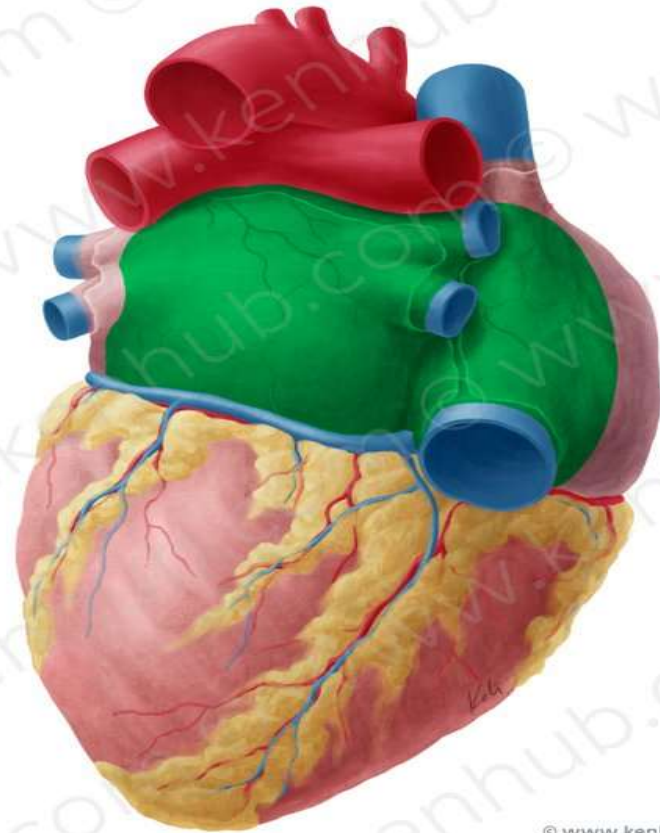
## The apex of the heart :

- ❑ Is formed by the infero-lateral part of the left ventricle.
- ❑ It lies posterior to the left 5th intercostal space, 9 cm (a hand's breadth) from the median plane.
- ❑ It is the site mitral valve auscultation



## The base of the heart

- ❑ It is located posteriorly (opposite the apex)
- ❑ It is formed mainly by the left atrium, with a lesser contribution by the right atrium.
- ❑ The base is related posteriorly to bodies of T6–T9
- ❑ It is separated from the vertebrae by the pericardium, oblique pericardial sinus, esophagus, and descending aorta.



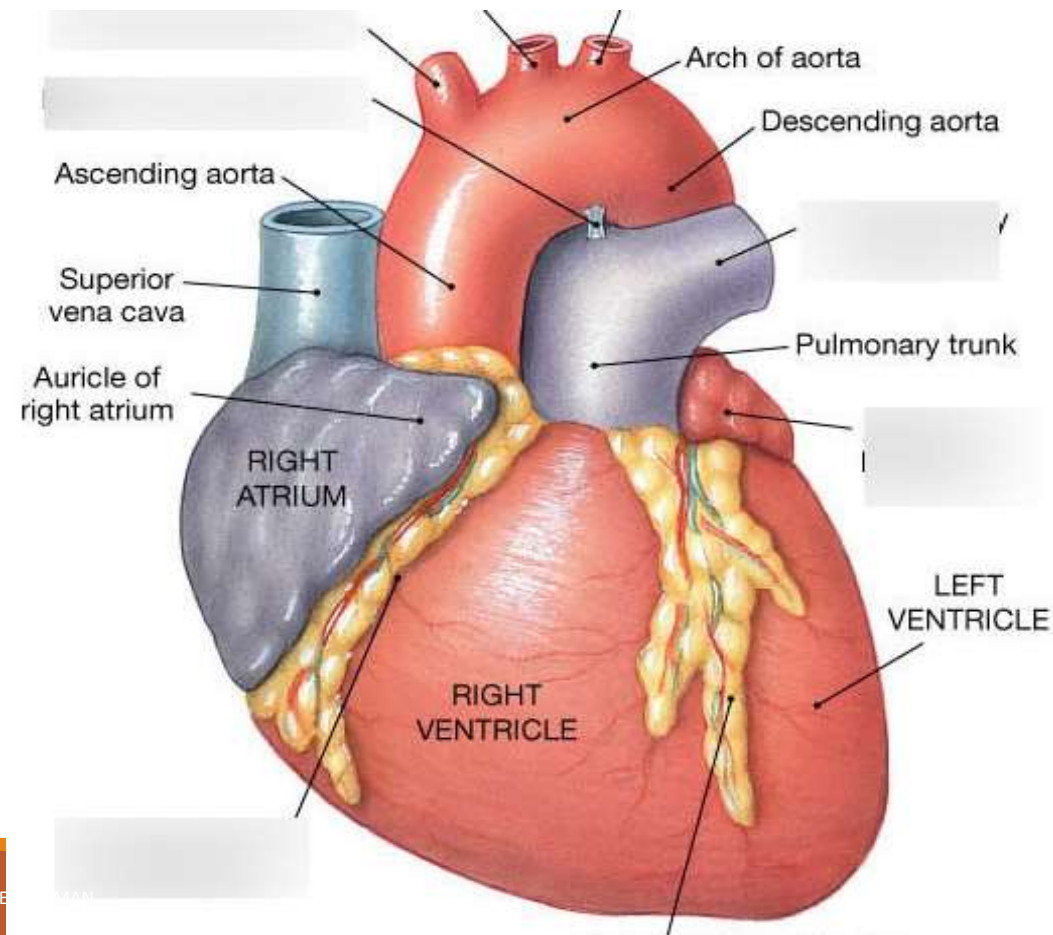
**Anterior (sternocostal) surface** , formed by

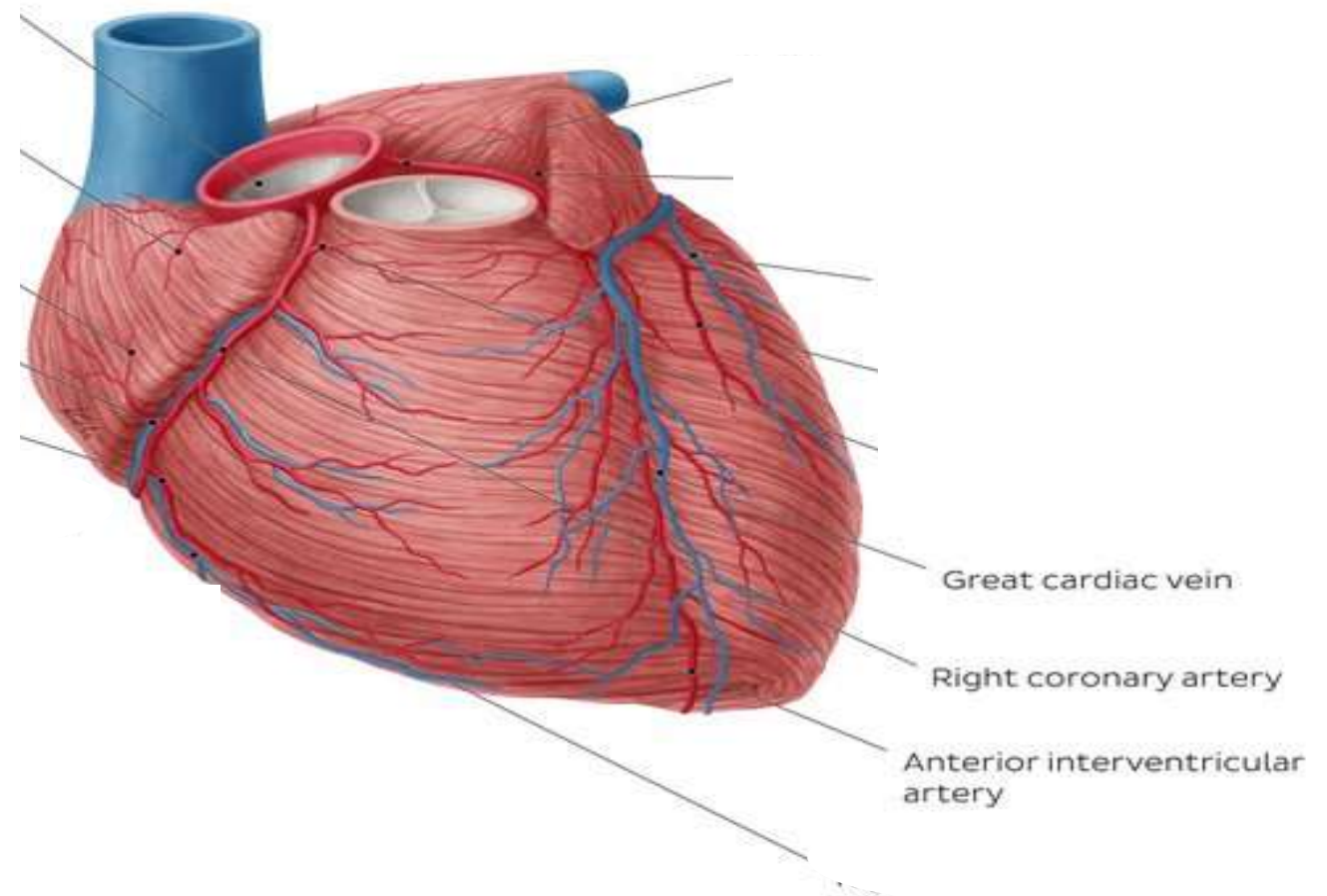
➤ **Right atrium** (mainly).

➤ **Ventricular part:** consists of

Right ventricle (2/3) and Left ventricle (1/3).

Both ventricles are separated by **anterior interventricular groove**, which contains: 1- Anterior interventricular artery      2- Great cardiac vein





## **Anterior interventricular groove**

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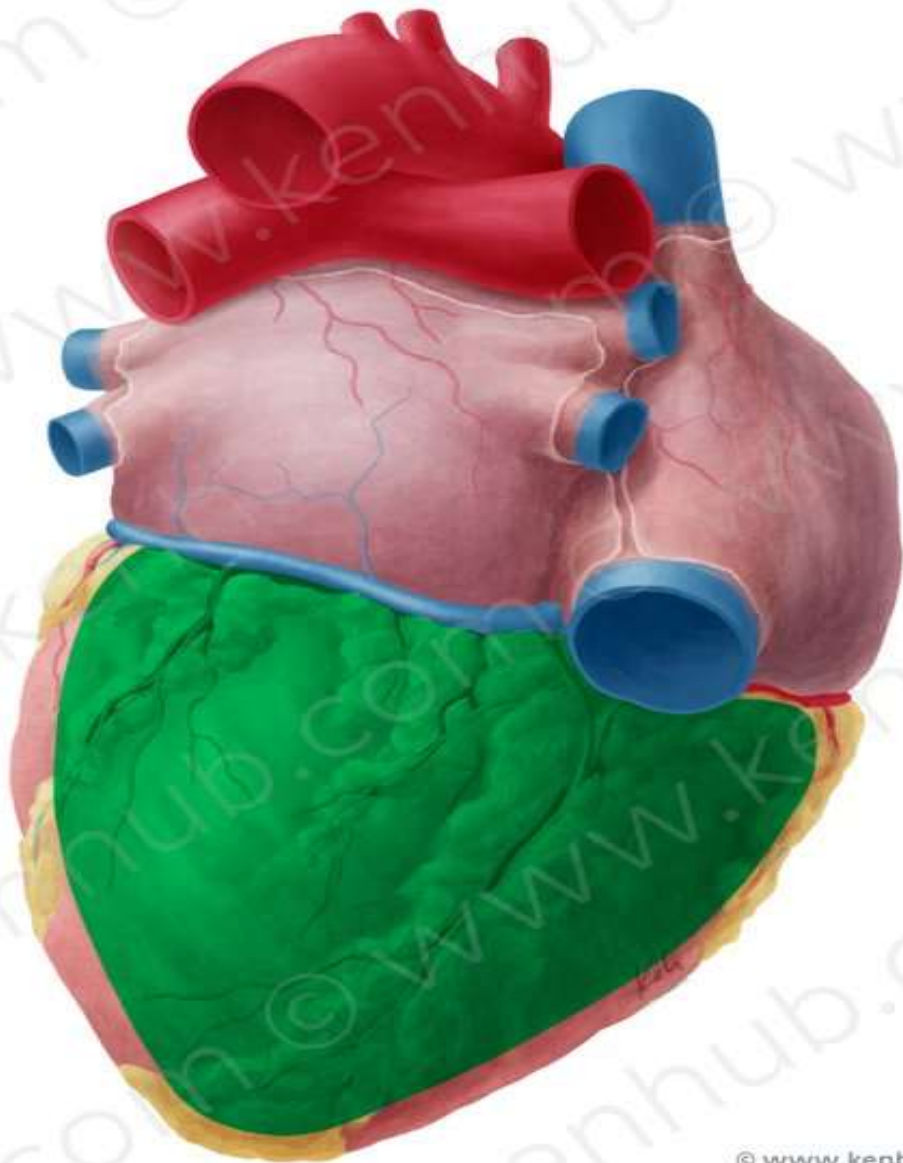


**Diaphragmatic (inferior) surface** : it is related mainly to the central tendon of the diaphragm , It is consists of  
Left ventricle (2/3) , Right ventricle (1/3).

❑ Both ventricles are separated by **posterior interventricular groove** which contains: 1. Posterior interventricular artery. 2. Middle cardiac vein.

❑ This surface is separated from the base of the heart by **atrioventricular (coronary) sulcus**, which contains:

1. The right coronary artery
2. The circumflex branch of the left coronary artery
3. The coronary sinus
4. The small cardiac vein



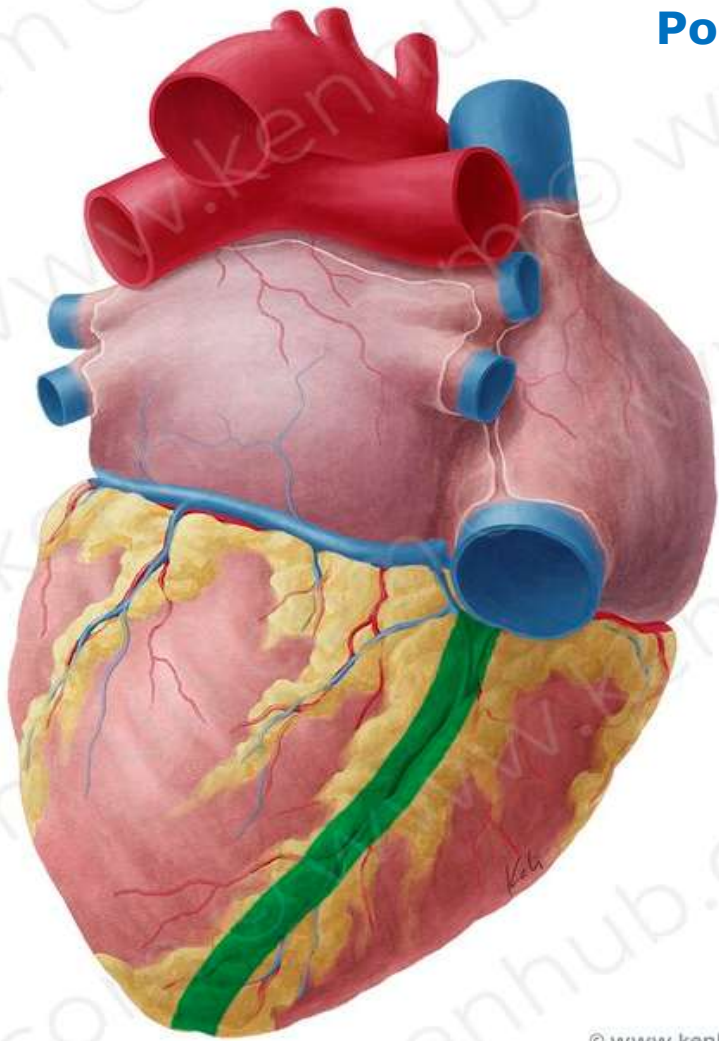
## Diaphragmatic surface of the heart

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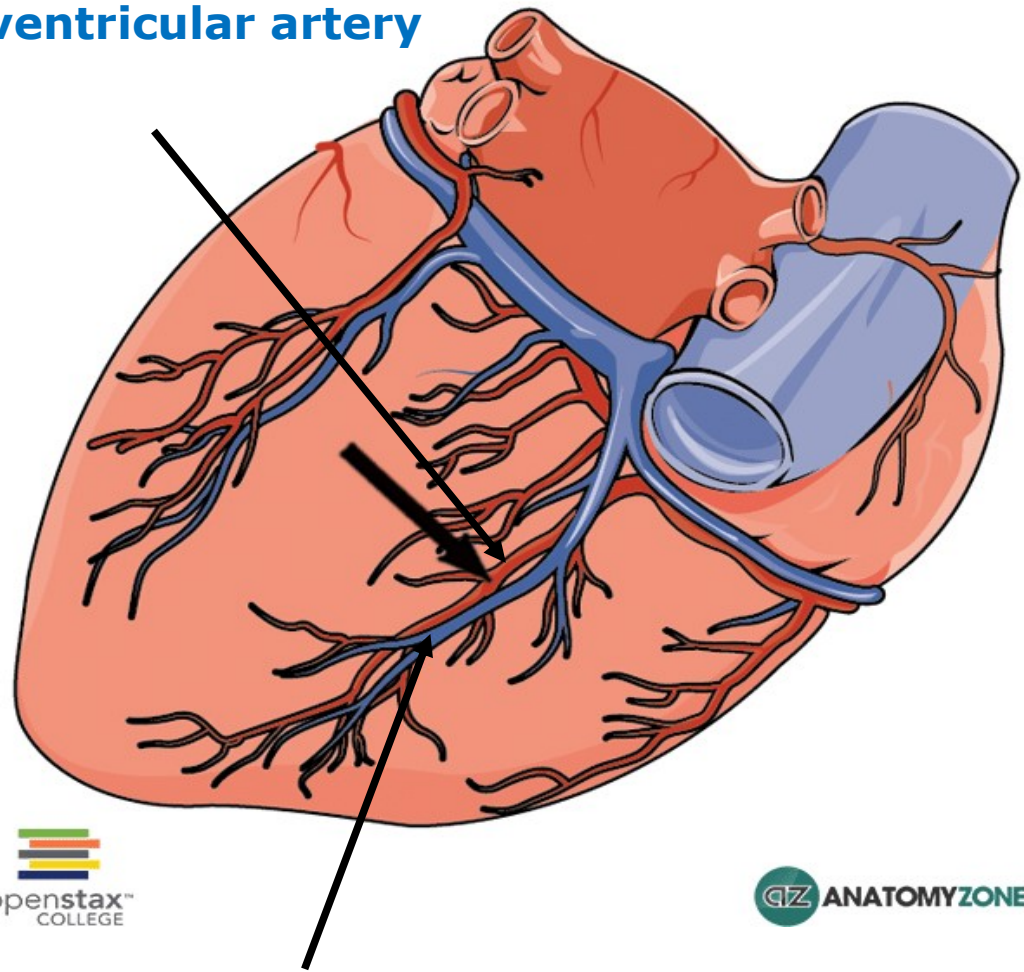
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## Posterior interventricular artery

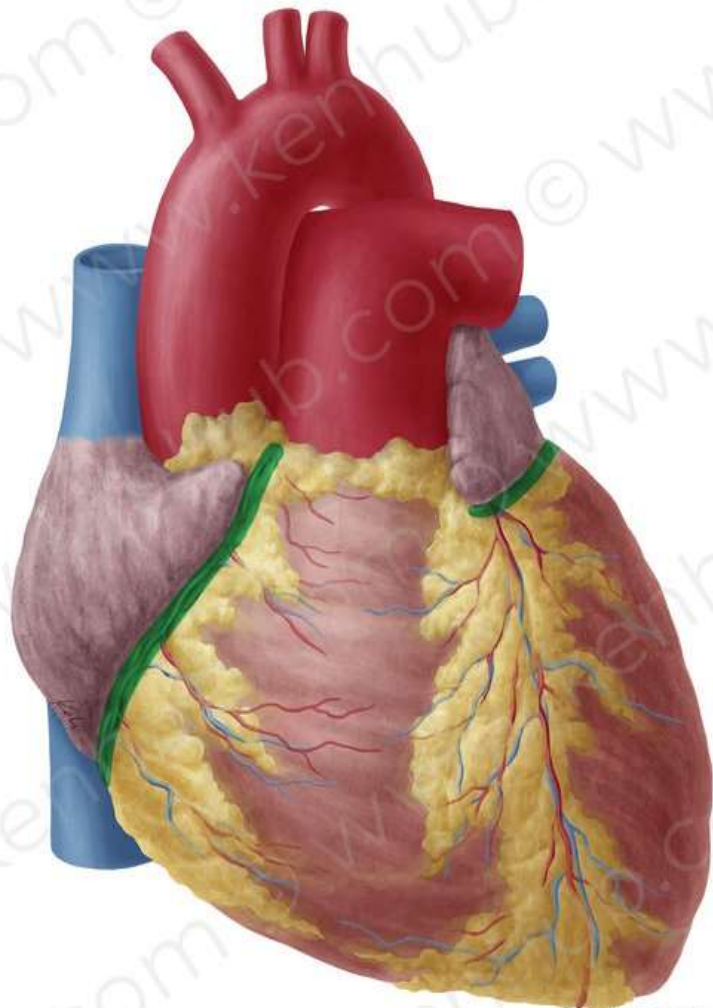


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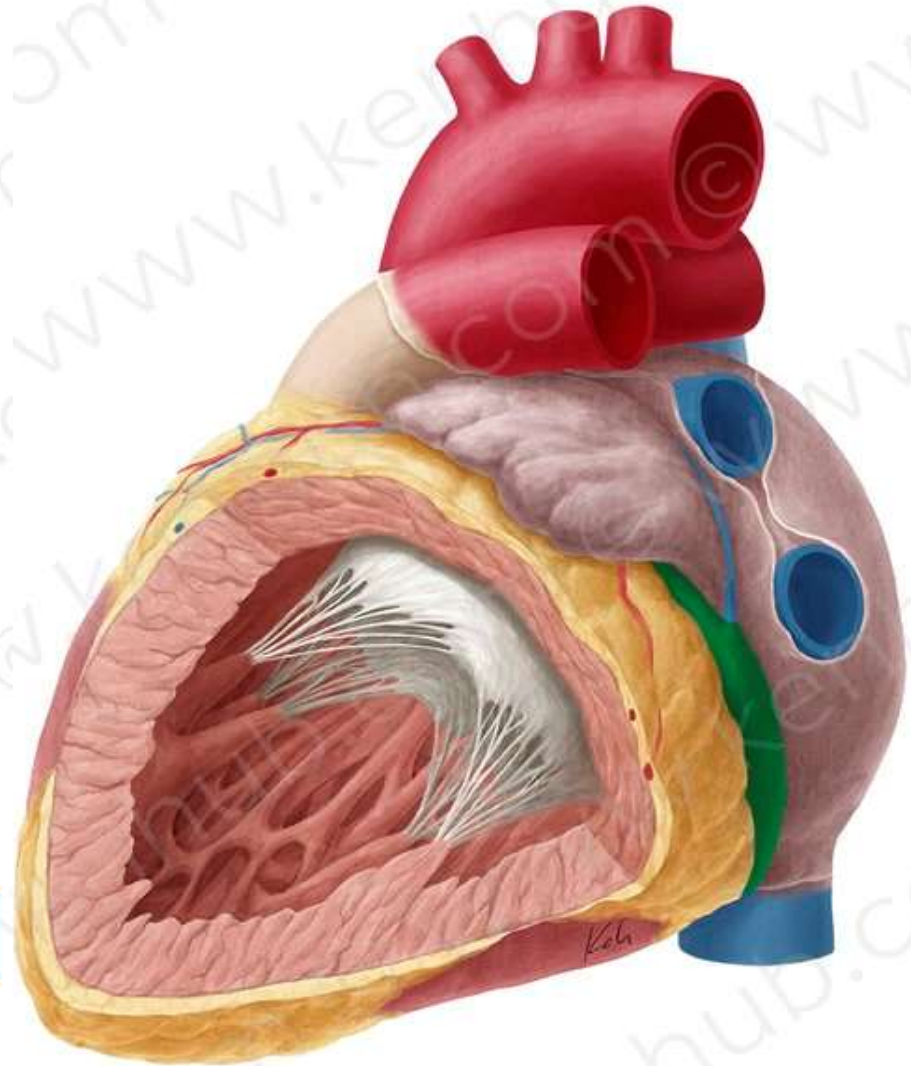
## Middle cardiac vein.

## Posterior interventricular groove



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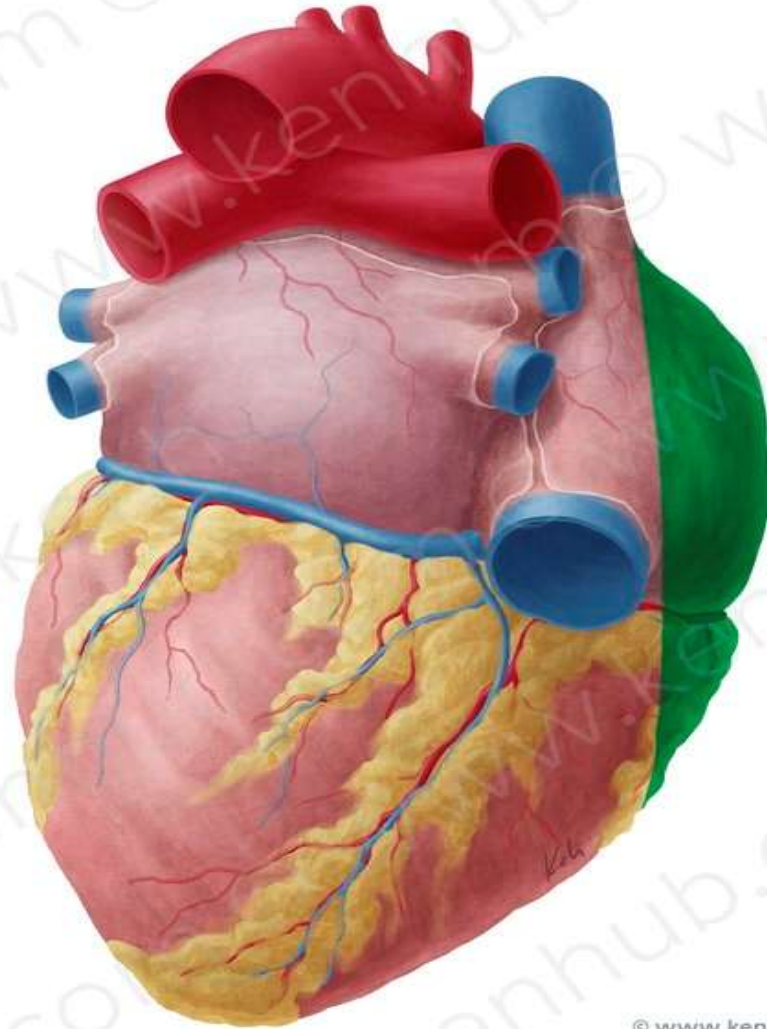


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## Coronary sulcus

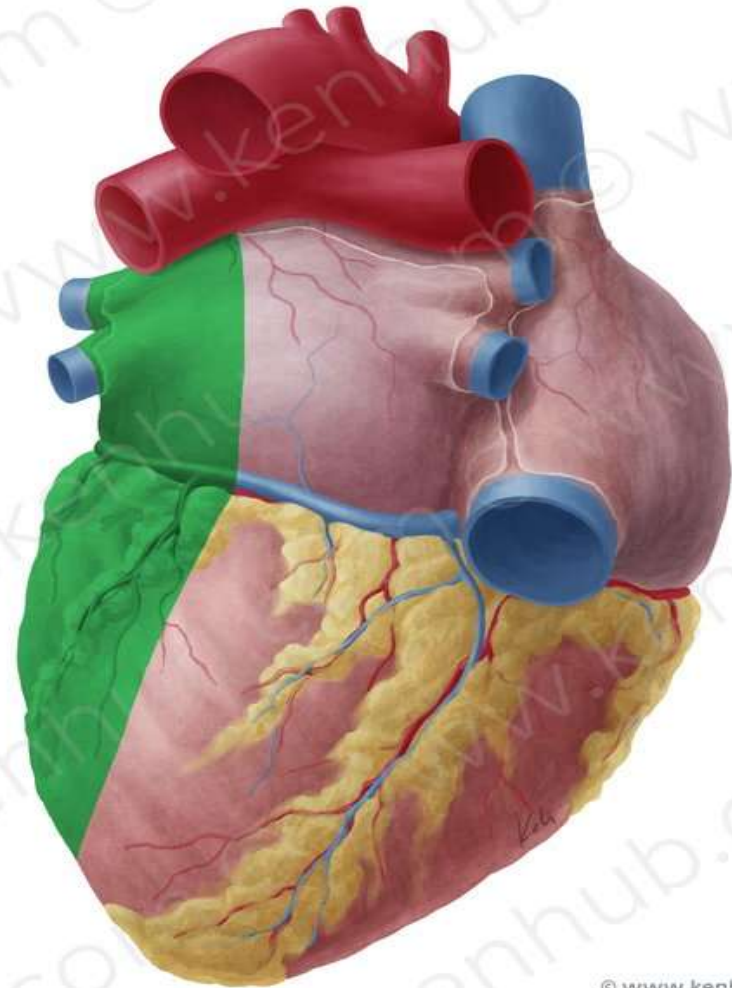
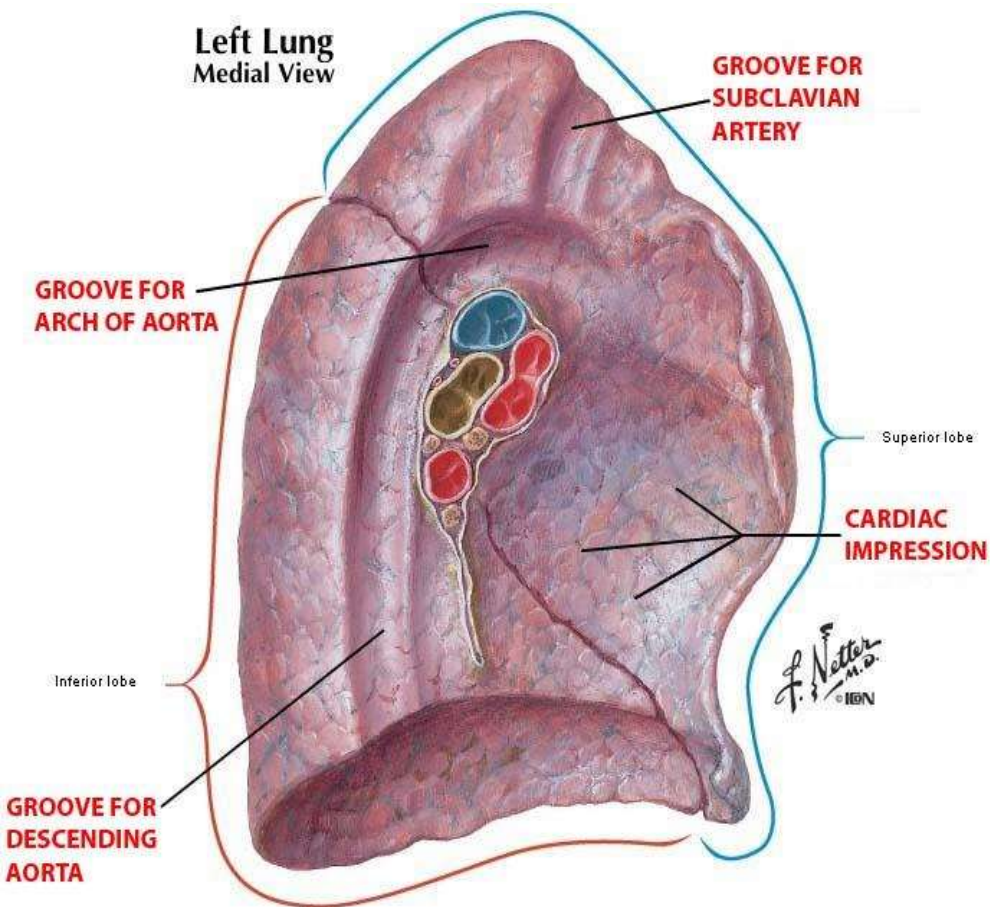
**Right surface ;** formed mainly by the right atrium



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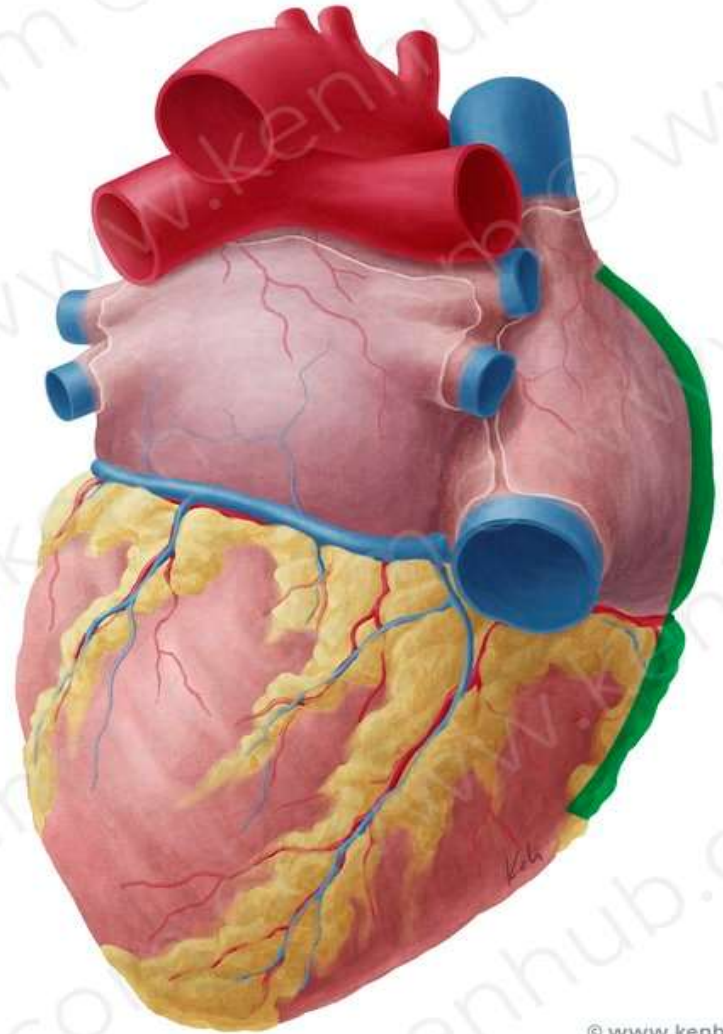
**Left surface** ; formed mainly by the left ventricle; it forms the cardiac impression in the left lung



# Borders of the heart

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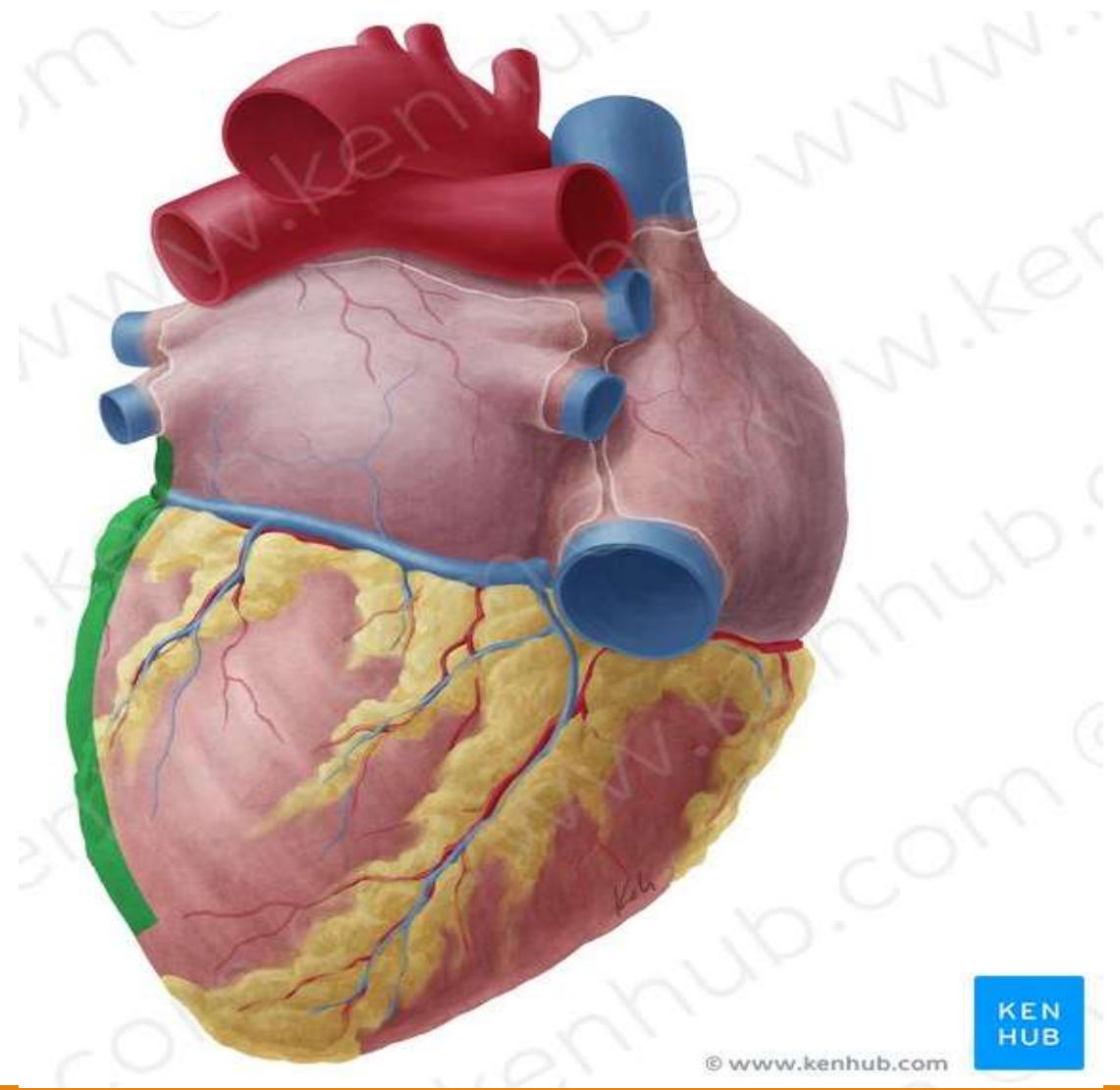
**Right border :** formed by the right atrium and extending between the SVC and the IVC.



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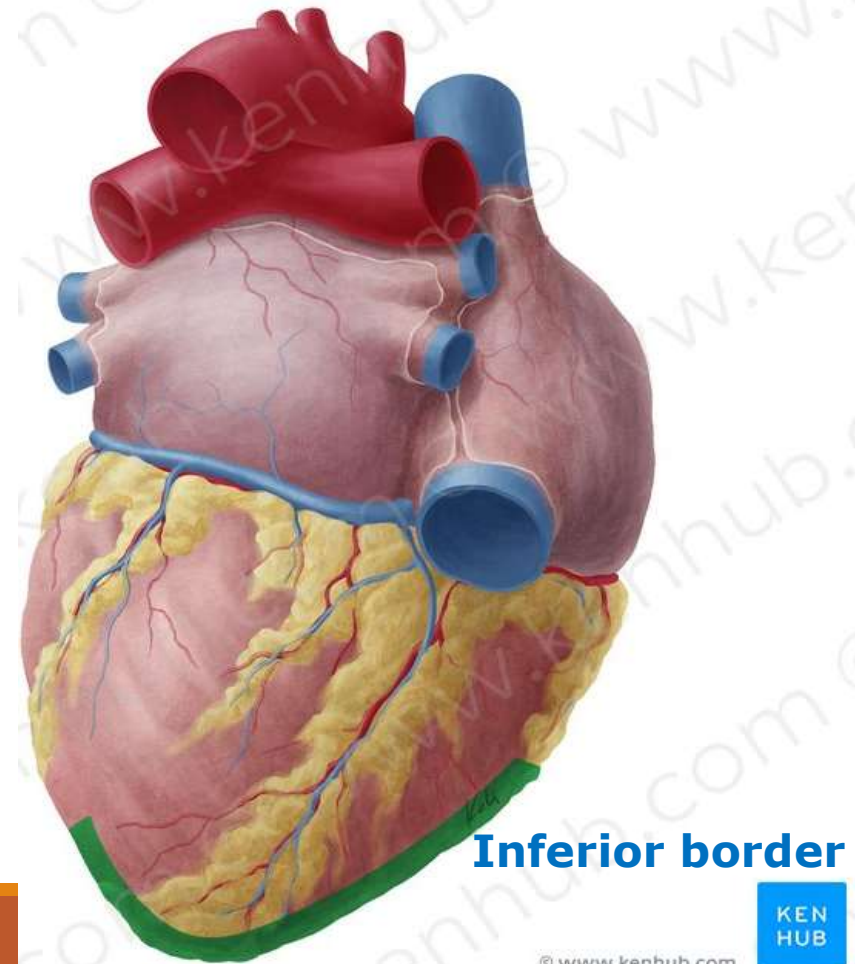


**Left border :** formed mainly by the left ventricle and slightly by the left auricle

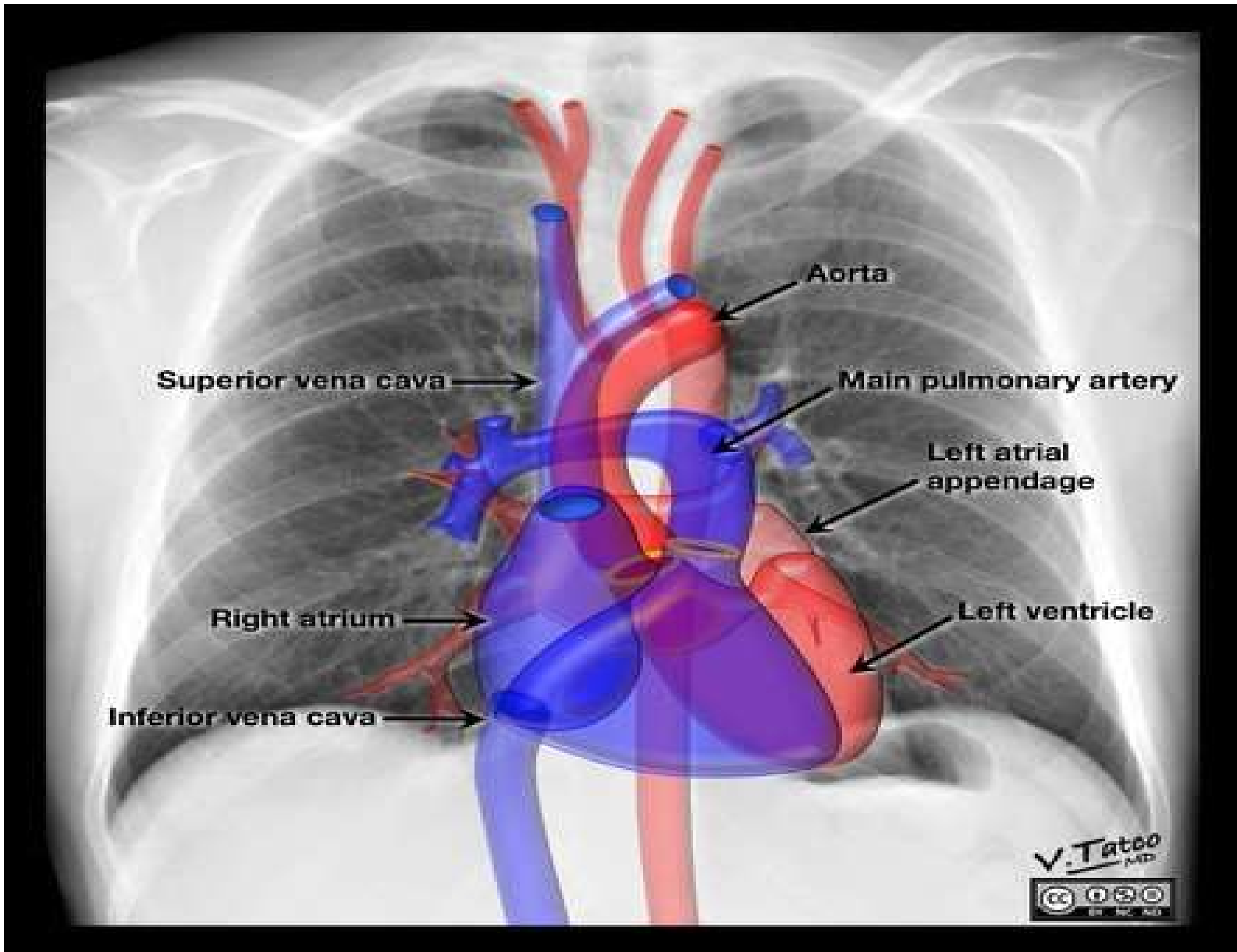


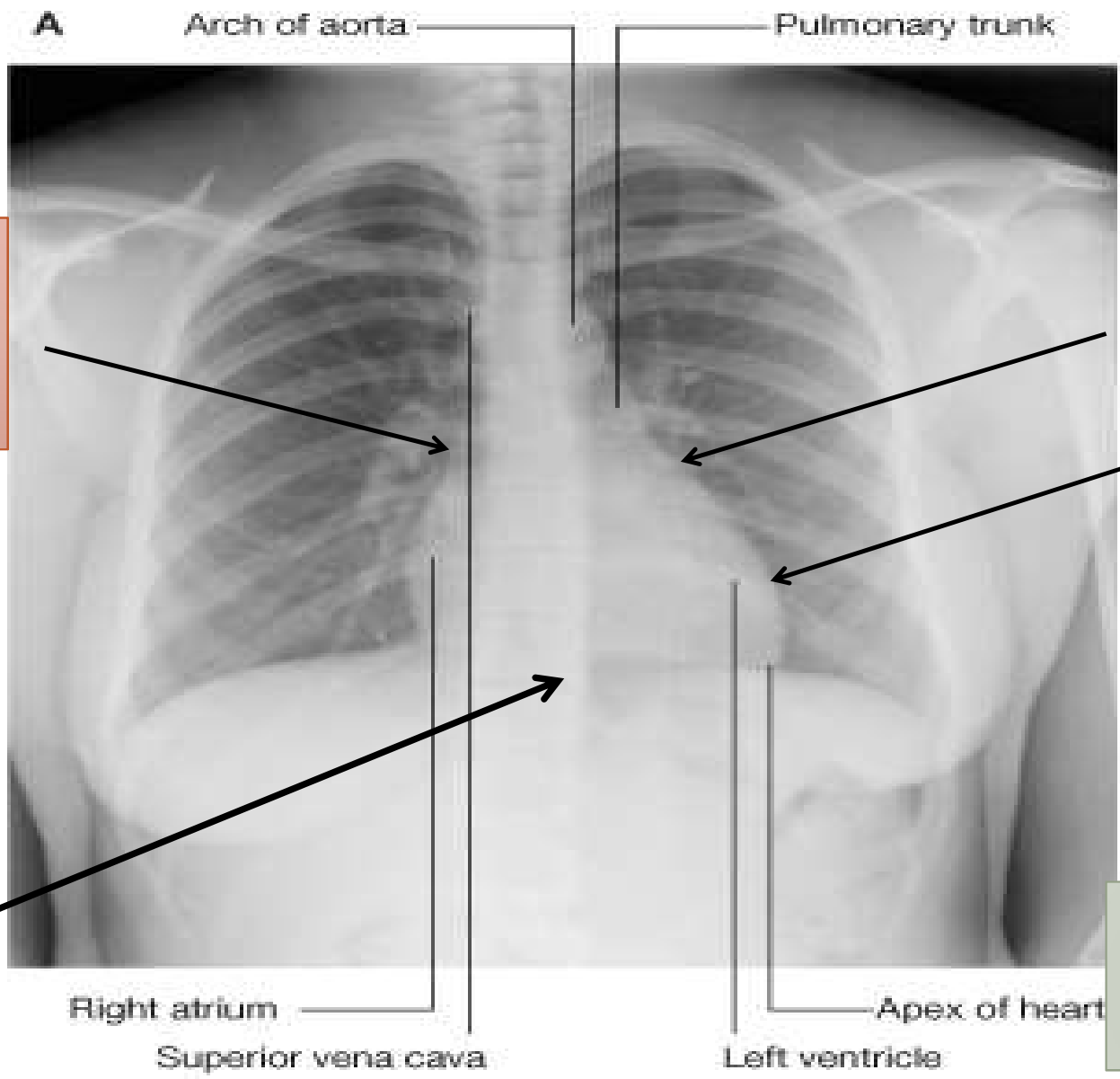
**Superior border** : is formed mainly by the left atrium and completed by the right atrium.

**Inferior border** : is formed mainly by the right ventricle and slightly by the left ventricle.









The right border is formed by the right atrium;

The left border, by the left auricle; and below, by the left ventricle

The lower border is formed mainly by the right ventricle but also by the right atrium;

the apex is formed by the left ventricle.

