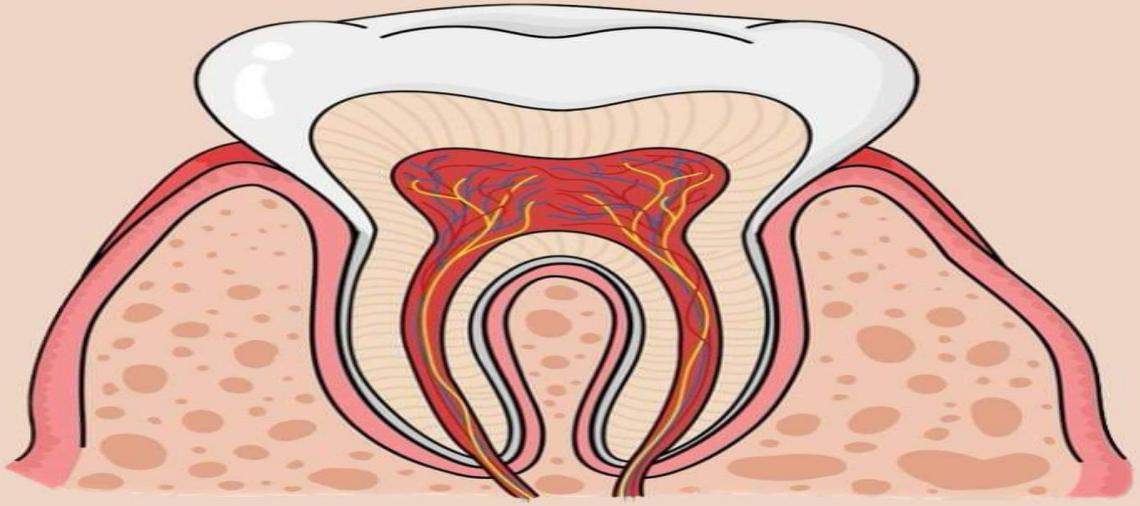
ANATOMY



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وَقُل رَّبِّ زِدْنِي عِلْمًا

Anatomy & Embryology

Cardiovascular system (Part 1)

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الجهاز الدوراني

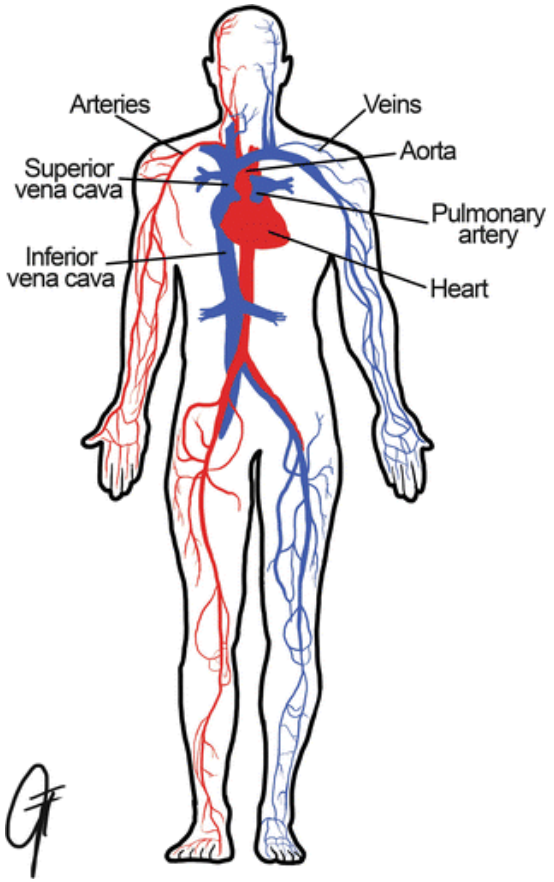
- **Circulatory system** is the system responsible for:

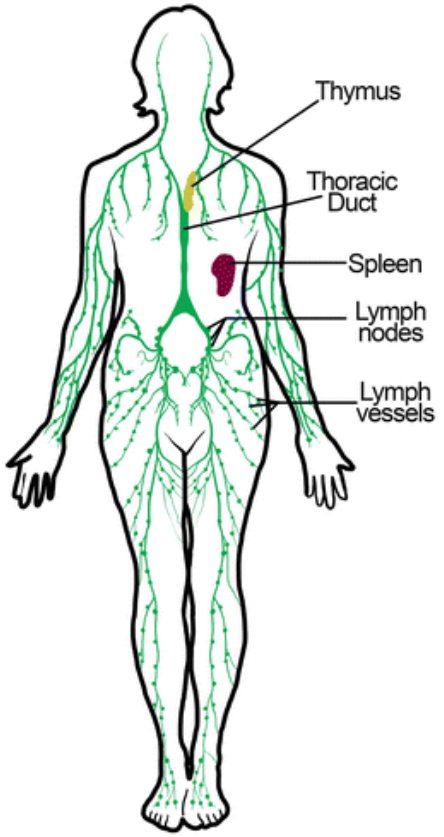
المواد الغذائية

  - Distributing nutrients and O_2 to all body tissues and removing wastes and CO_2 from all body tissues.
  - Regulates body temperature. اذا صار برد بصير Vc صار في حرارة بصير VD
  - Defence against infections and diseases. من خلال lymphatic system بس ما رح نحكي عنه

Can be divided into:

1. The cardiovascular system (CVS)
   Heart and blood vessels
2. Lymphatic system → General Anatomy ما رح نحكي عنه بـ
   Lymphatic vessels and lymphatic organs





Arteries and Veins

Blood vessels

شريان

They are oxygenated

- **Artery**: carries blood away from heart.
- **Vein**: carries blood towards the heart.

وريد

They are deoxygenated

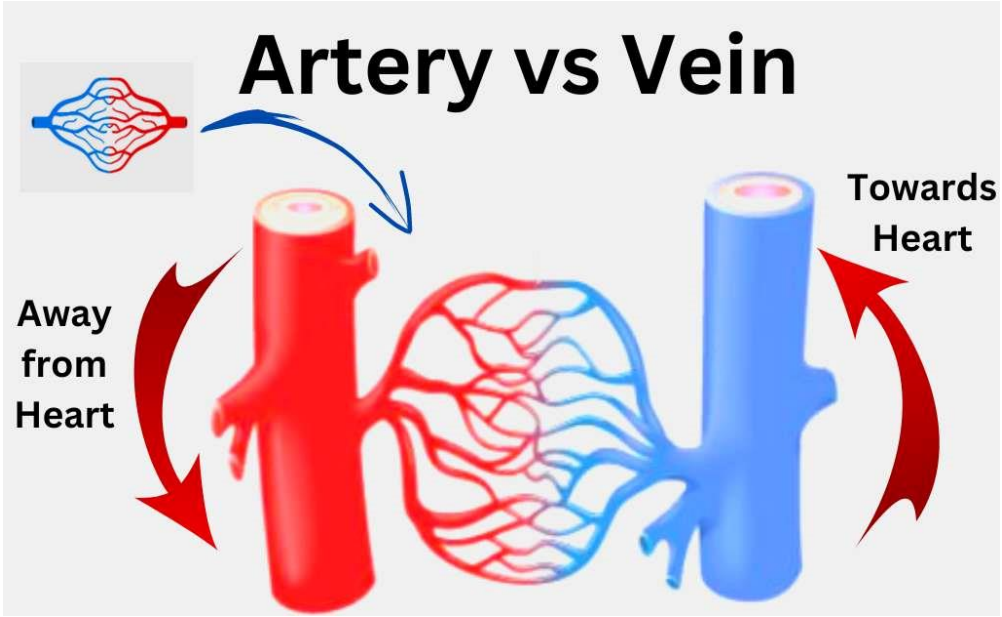
- Arteries always take blood away from the heart (a mnemonic to help you: artery=away).

هدول عبارة عن exceptions

(Pulmonary artery & pulmonary veins)

Deoxygenated blood

Oxygenated blood



The heart

General characteristics:

- The first structure starts working in embryonic life (by the end of 4th week).
  اول عضو في الجسم يبدأ يعمل مش يتكون
- An enlarged internally subdivided blood vessel, specialised for pumping.
- The heart is aligned **obliquely** in the thorax.
  جاي تقريبًا ع جهة اليسار
- Pumps blood through (1) **pulmonary circulation** and (2) **systemic circulation**
  بصير فيها ضخ للدم من الlungs للقلب
  بصير ضخ للدم لكل الجسم
  low pressure circulation
- Situated in the middle mediastinum and surrounded by **pericardium**
  Membrane

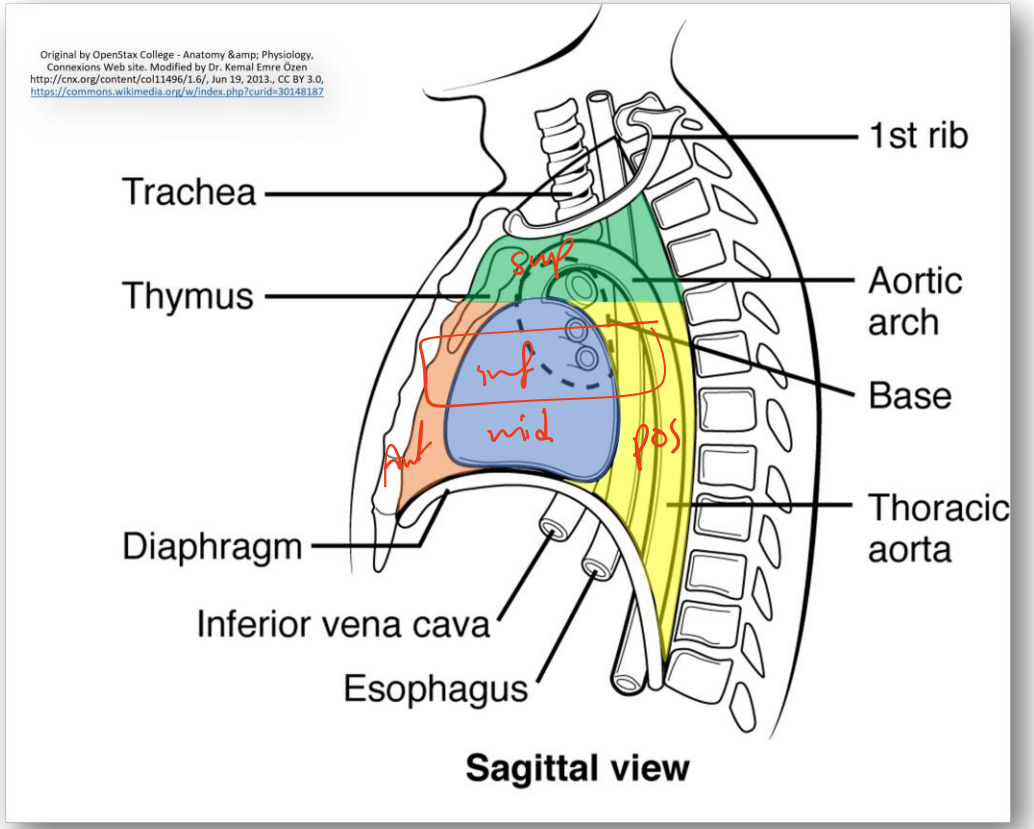
Location of heart

حتى نوصف الlocation لازم احفظ شو هما spaces

- **Mediastinum**, is a **space** in the thorax contains all the thoracic organs except the lungs. → pleura موجودين ب
- Divided into two parts, **superior and inferior**, the inferior mediastinum is further divided into anterior, middle and posterior
- **Pericardium** is **serous sac** situated in the middle mediastinum that surrounds and protects the heart.

around / related to the heart. serous membrane في عنا

excessive movement of the heart بيمنع



Superior mediastinum

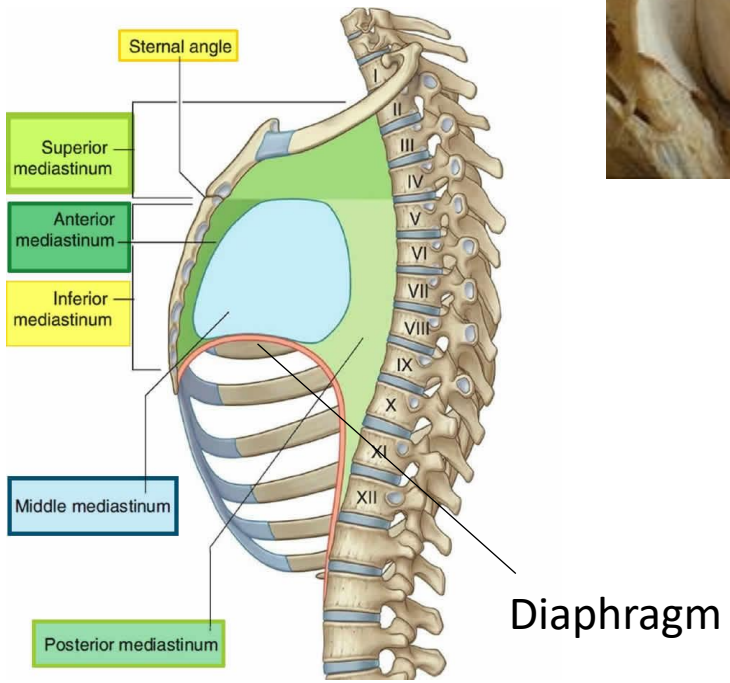
Anterior mediastinum

Middle mediastinum

Posterior mediastinum

Pericardium

- Boundaries:
  - Anteriorly: **body of sternum** and **2nd to 6th costal cartilages** → part of thoracic cage
  - Posteriorly: **5th to 8th thoracic vertebrae**
  - Inferiorly: **diaphragm** الحجاب الحاجز وهو main respiratory muscle.
- Functions of pericardium:
  - Restrict excessive movements of the heart
  - Act as a lubricated container → because of pericardial fluid.



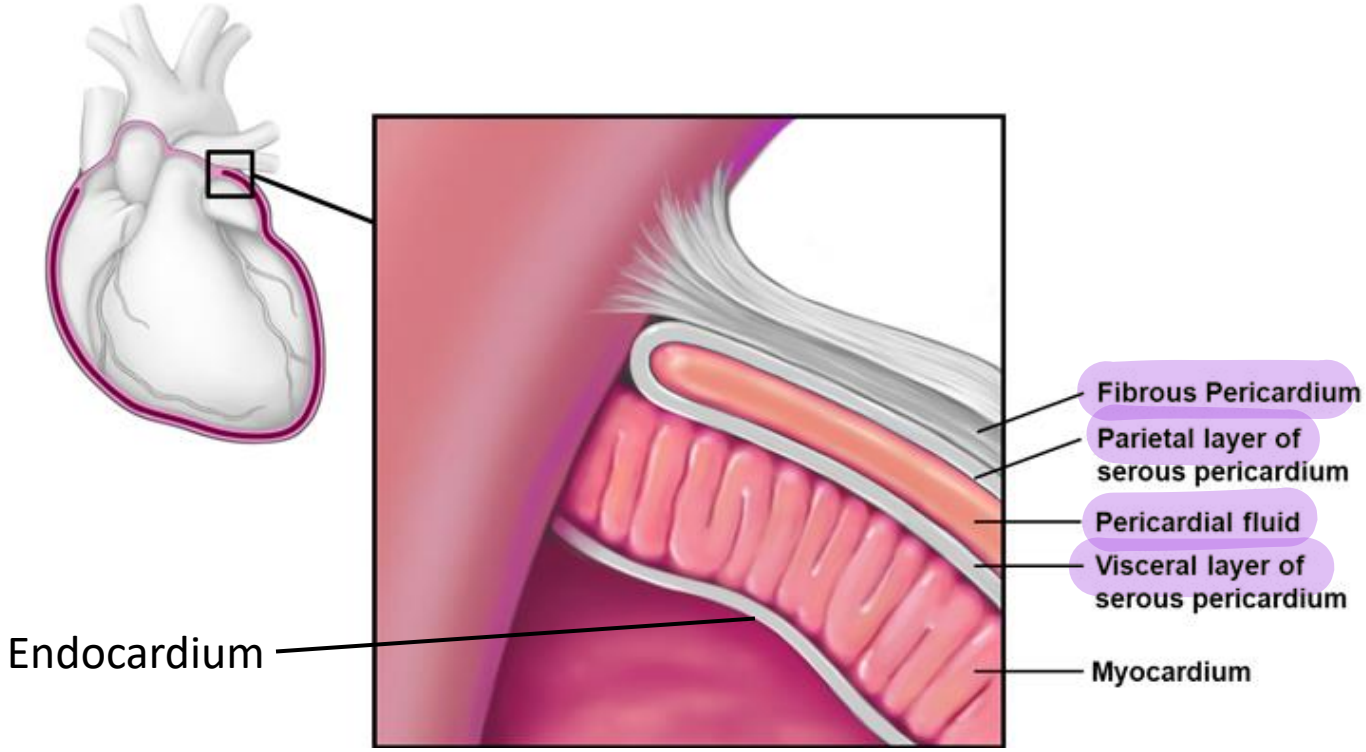
Pericardium

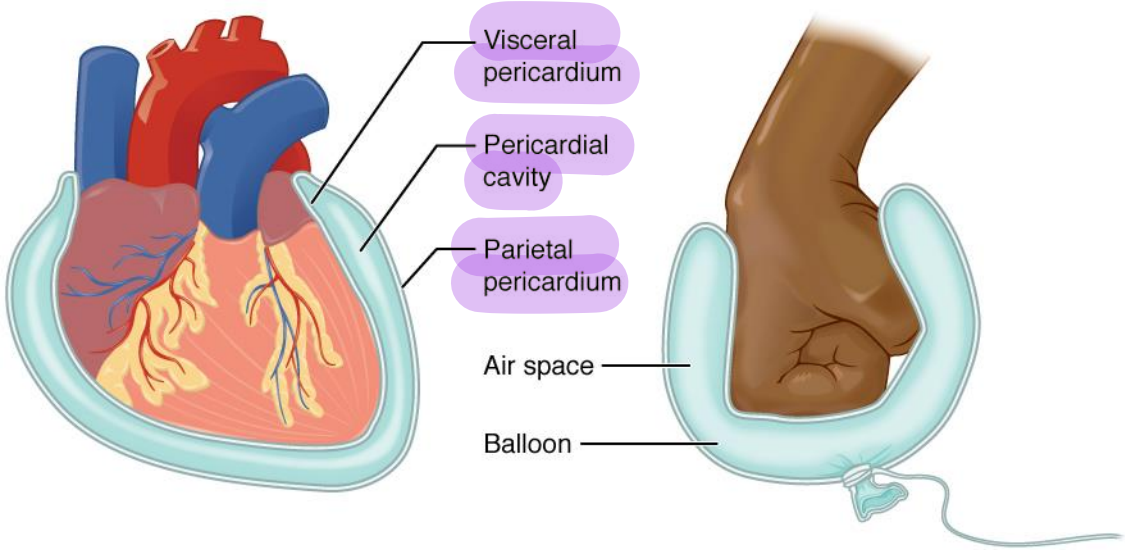
The pericardium is divided into:

- **Fibrous pericardium** (strong, outer layer), **attached firmly to the diaphragm below**
- **Serous pericardium** lines the fibrous pericardium and divided into:
  - **Parietal pericardium**
  - **Visceral pericardium** (epicardium)

Between the parietal and visceral layers of the heart there is a thin film of fluid called **pericardial fluid** (50ml)

smoothly بحيث يتحرك enough lubricantion of the heart تضمن انه يعمل

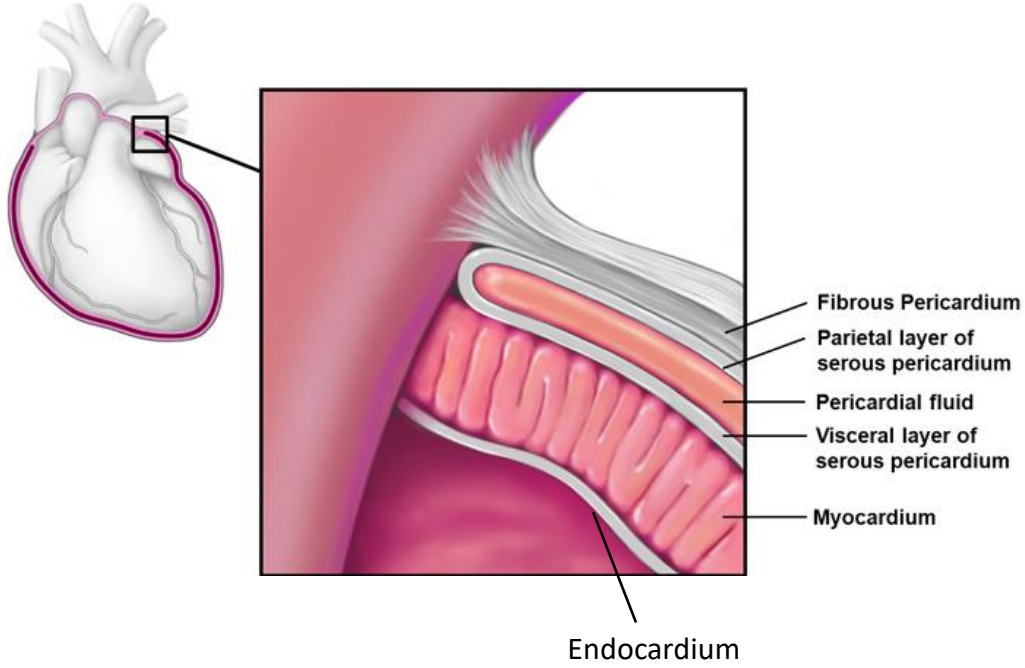


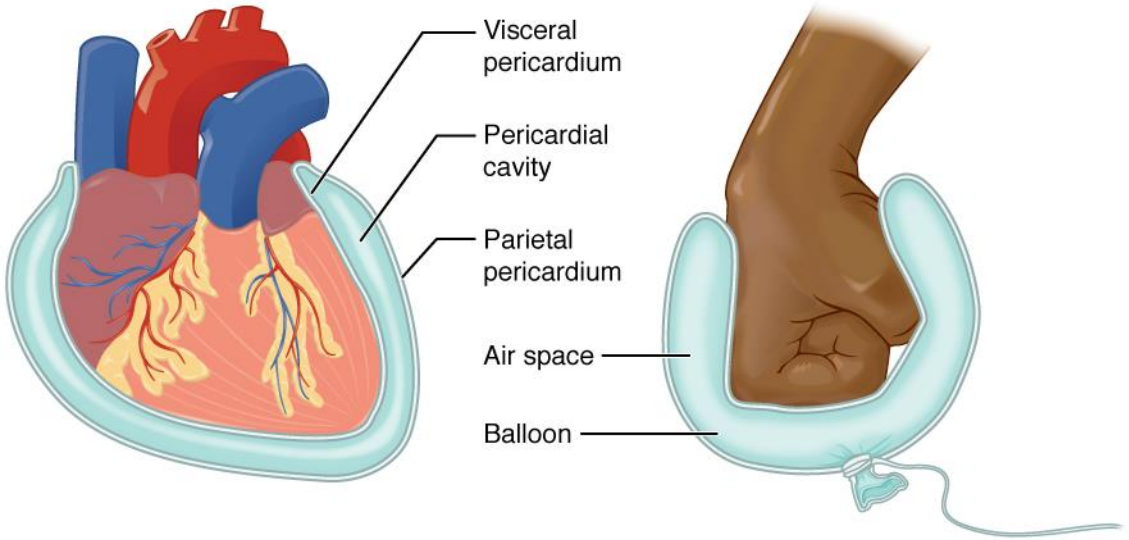


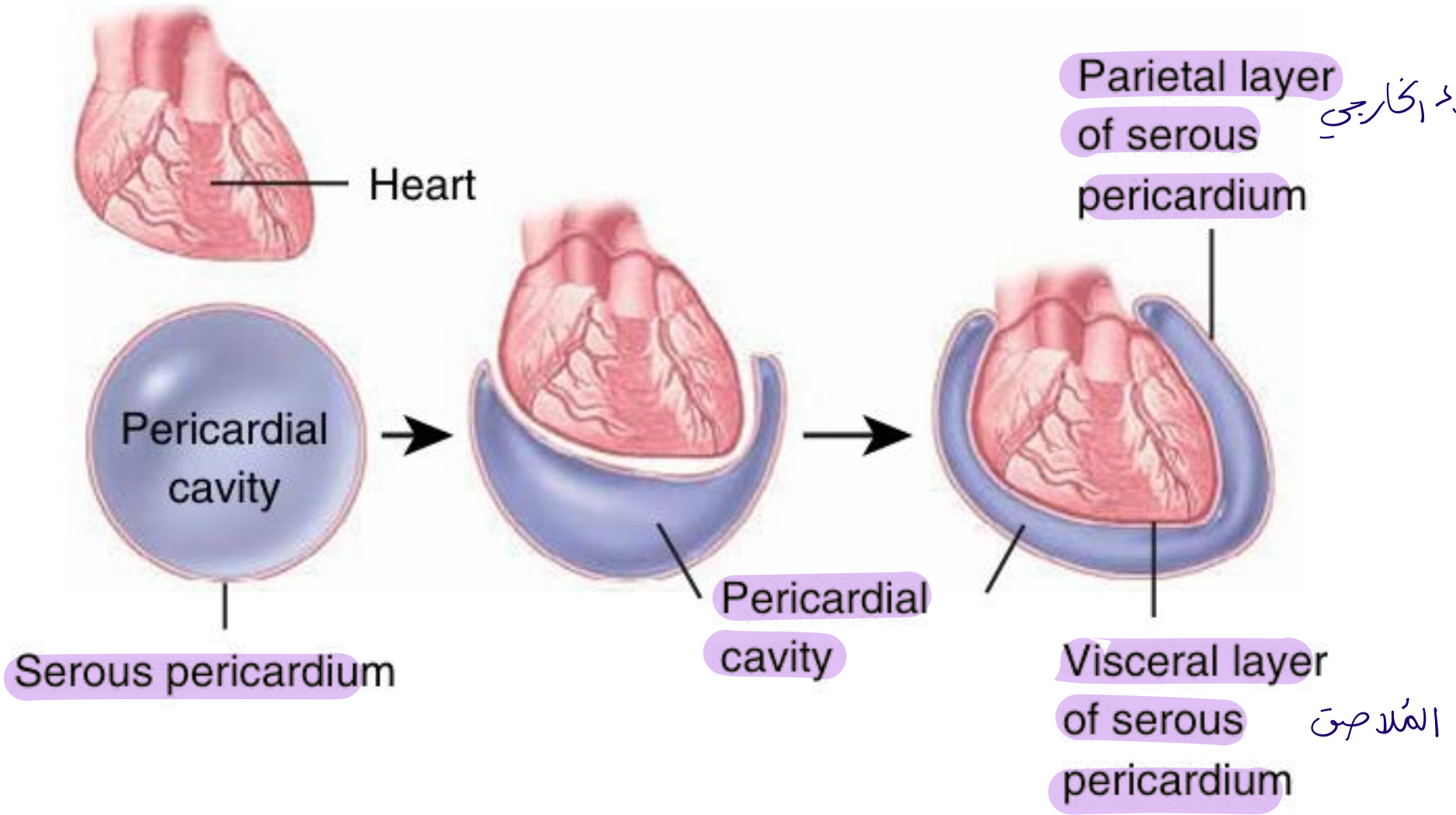
Pericardium

The pericardial fluid acts as a lubricant to facilitates the movements of the heart.

The parietal pericardium reflects around the roots of the large blood vessels to become continuous with **the visceral pericardium** that closely covers the heart.



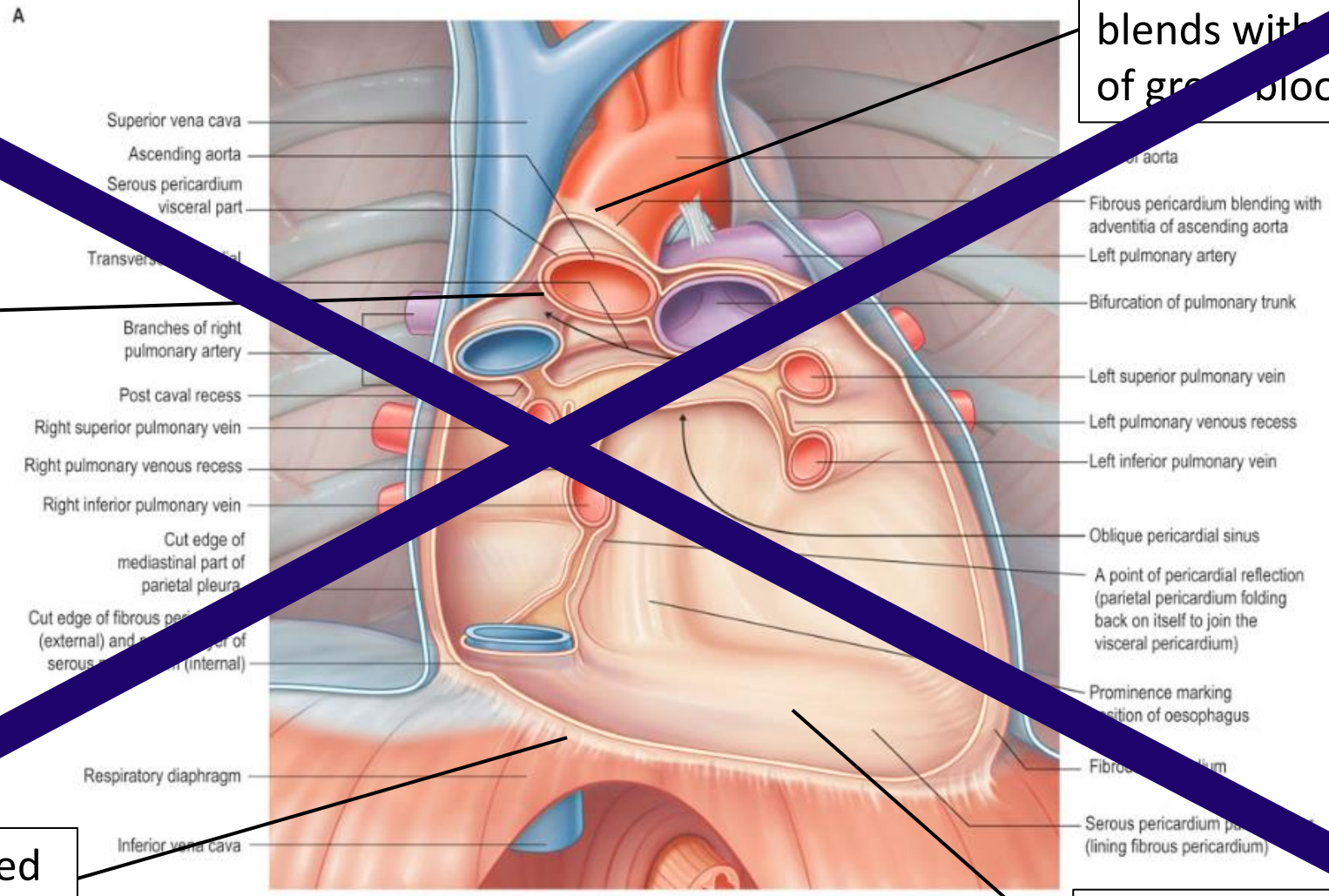



Heart
Pericardial cavity
Serous pericardium
Pericardial cavity
Parietal layer of serous pericardium
الجزء الخارجي
Visceral layer of serous pericardium
الملاصق

مش مطلوبة !!

Fibrous pericardium

Fibrous pericardium blends with the outer coat of great blood vessels



Visceral layer of serous pericardium

Fibrous pericardium attached to the diaphragm

Parietal layer of serous pericardium

Chambers of the Heart

- The heart contains four chambers:

  - **Two atria (atrium)** and **two ventricles**

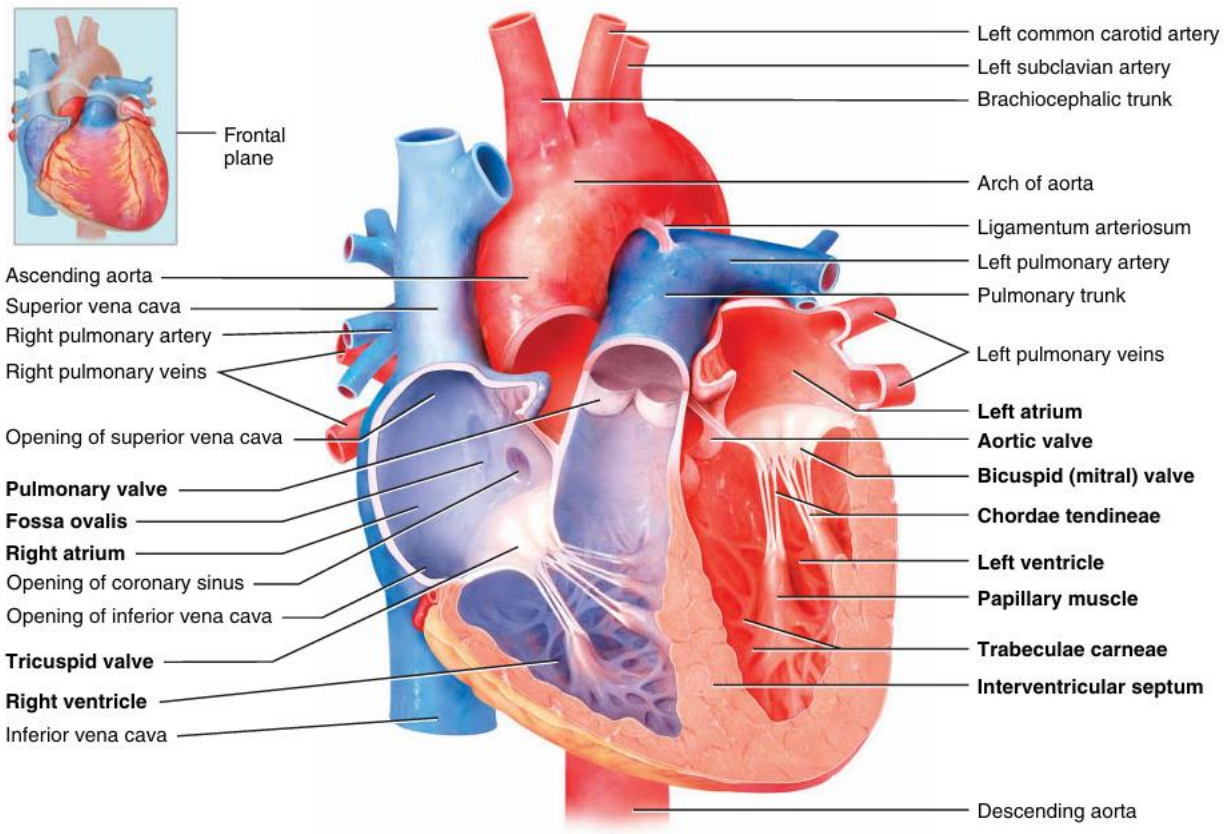
  The blood flows from Rt and Lt atria to the Rt and Lt ventricles, respectively.

  No connection between 2 ventricles or 2 atria

  RA+ RV (Right pump) Right heart (or pulmonary circuit)

  Right pump : blood nonoxygenated

  LA + LV (left pump) Left heart (or systematic circuit)



(a) Anterior view of frontal section showing internal anatomy

Chambers of the Heart

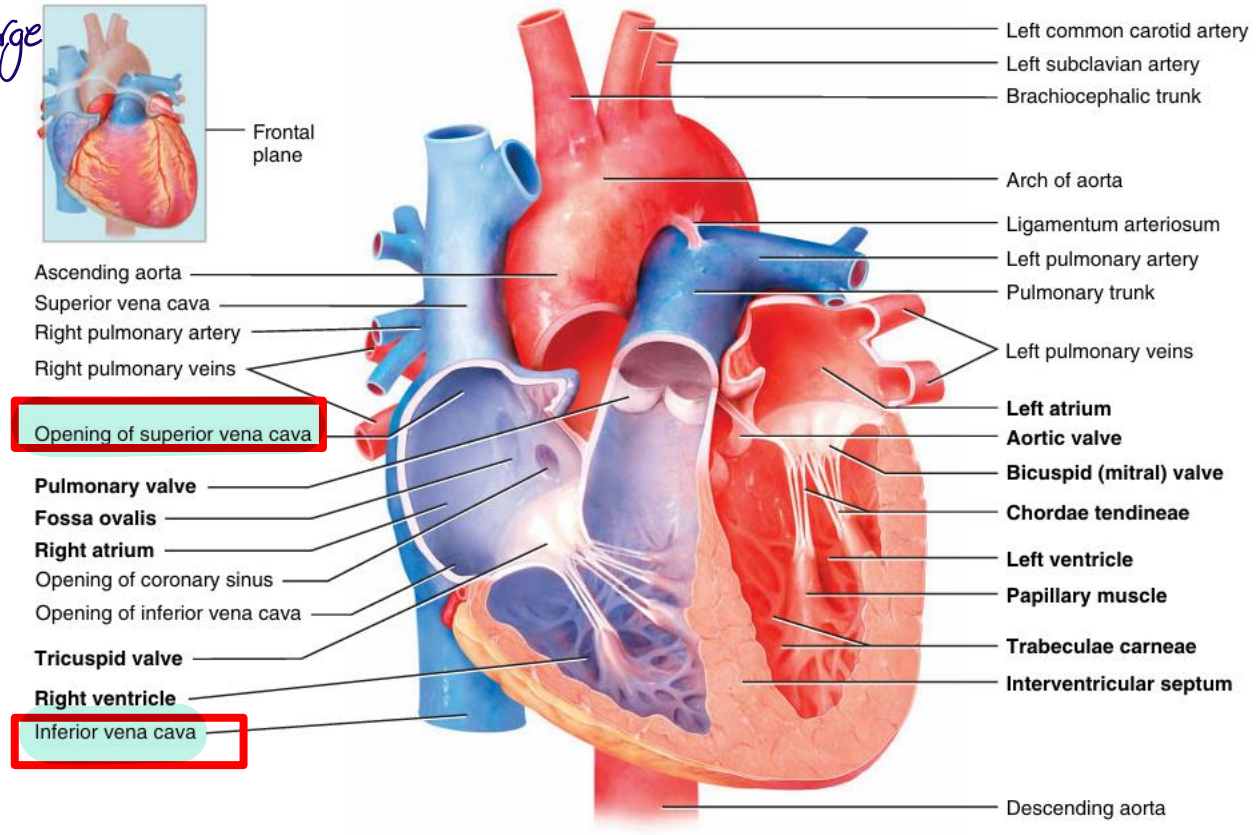
- The **Rt atrium** receives the openings of **superior vena cava** and **inferior vena cava.**

  Very large Veins

  Superior: head , noeck , upper limbs
  Inferior: upper part of pelvis, abdomen, chest

- The **Lt atrium** receives the openings of **the four pulmonary veins.**

  Oxygenated Blood (lungs)



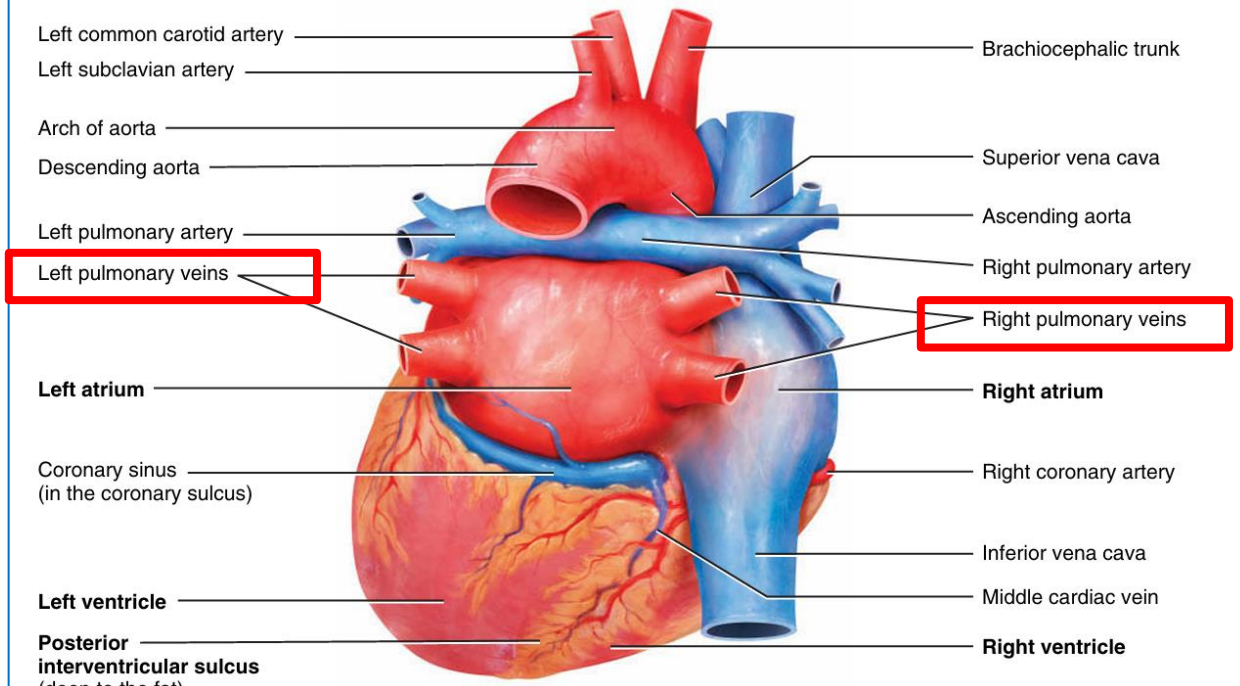
(a) Anterior view of frontal section showing internal anatomy

- The **Rt atrium** receives the openings of **superior vena cava** and **inferior vena cava.**

- The **Lt atrium** receives the openings of **the four pulmonary veins.**

The only exception
oxygenated blood هو الوحيد يلي فيه vein ← معمّ

- The outflow tract of the RV is called the **infundibulum. In LV,** the outflow tract is the area just below the aortic arch is named **vestibule**.

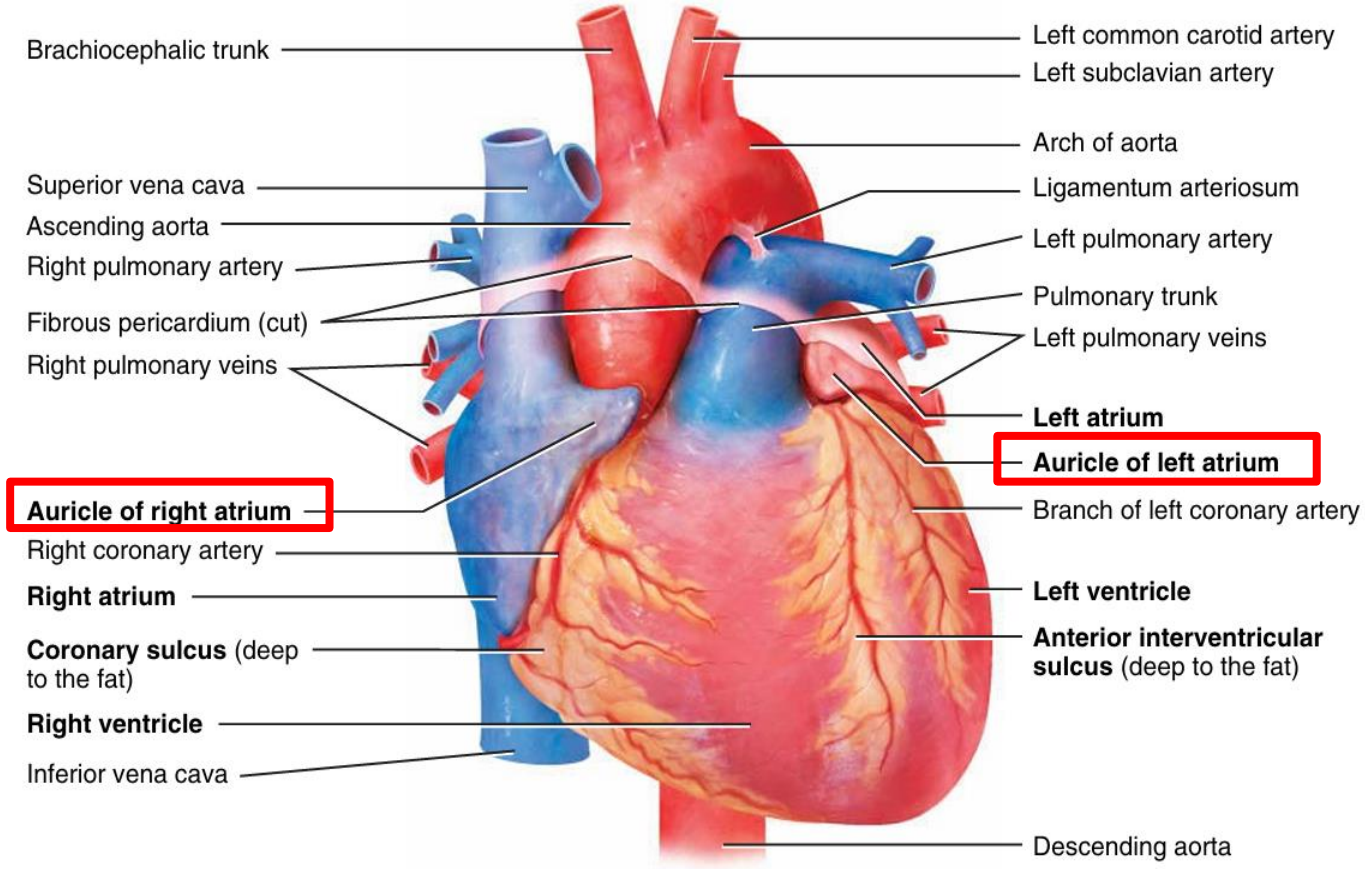


(c) Posterior external view showing surface features

- On the anterior surface of each atrium is a wrinkled pouchlike structure called an **auricle**. غضروف
- The anterior wall of the Rt atrium is **rough** and muscular while the posterior wall is **smooth**. برغي مهم

بتسمح بدخول الدم الى artia اكثر من capacity تاعتها خصوصًا Rt لانه بيصب فيه 2 important large veins

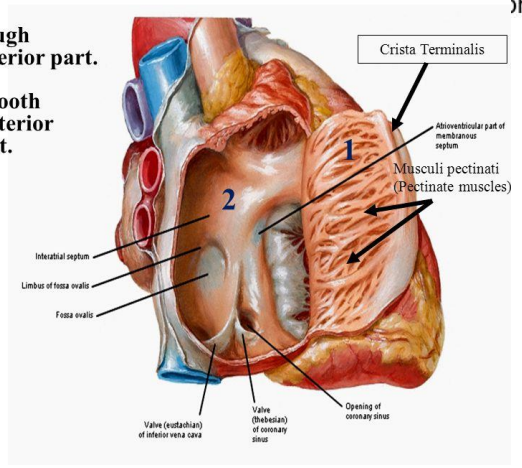
- **Function**: increases the capacity of an atrium slightly so that it can hold a greater volume of blood.



Right Atrium

or external view showing surface features

1. Rough anterior part.
2. Smooth posterior part.



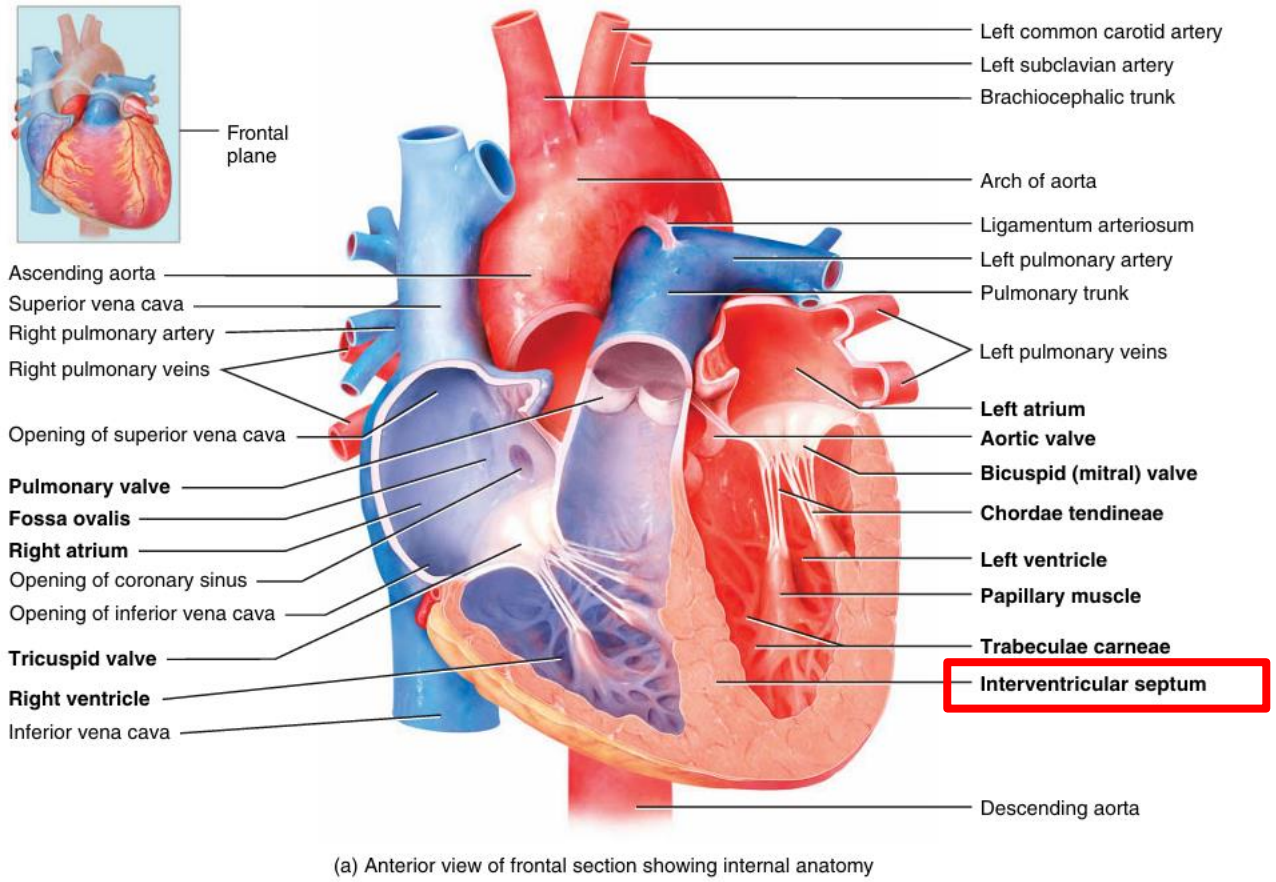
1- دخل الدم من sup & inf vena cave الى RT atria و بصير انقباض لجدرانه ف بتحرك الدم ل RT ventricle و بعدها ل Lungs عن طريق (pulmonary trunk) و very important structure هو يحتوي على deoxygenated blood

2- الدم دخل من LT artia و بعدها ل LT ventricle و بعدها بيصيرله انقباض ف بروح الدم ل الجسم من خلال ascending aorta و الدم فيه oxygenated

- Blood passes from the right ventricle into a large vessel called the **pulmonary trunk.** and from left ventricle into the largest artery of the body, **the ascending aorta**

- The right ventricle is separated from the left ventricle by a partition called the **interventricular septum.** Right view

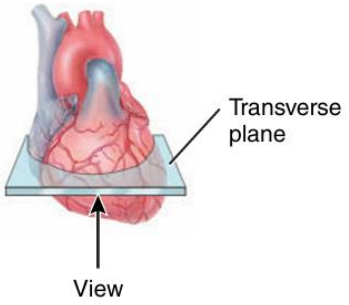
- The outflow tract of the RV is called the **infundibulum**. **In LV,** the outflow tract is the area just below the aortic arch is named **vestibule**. left view



(a) Anterior view of frontal section showing internal anatomy

مهمة جدًا

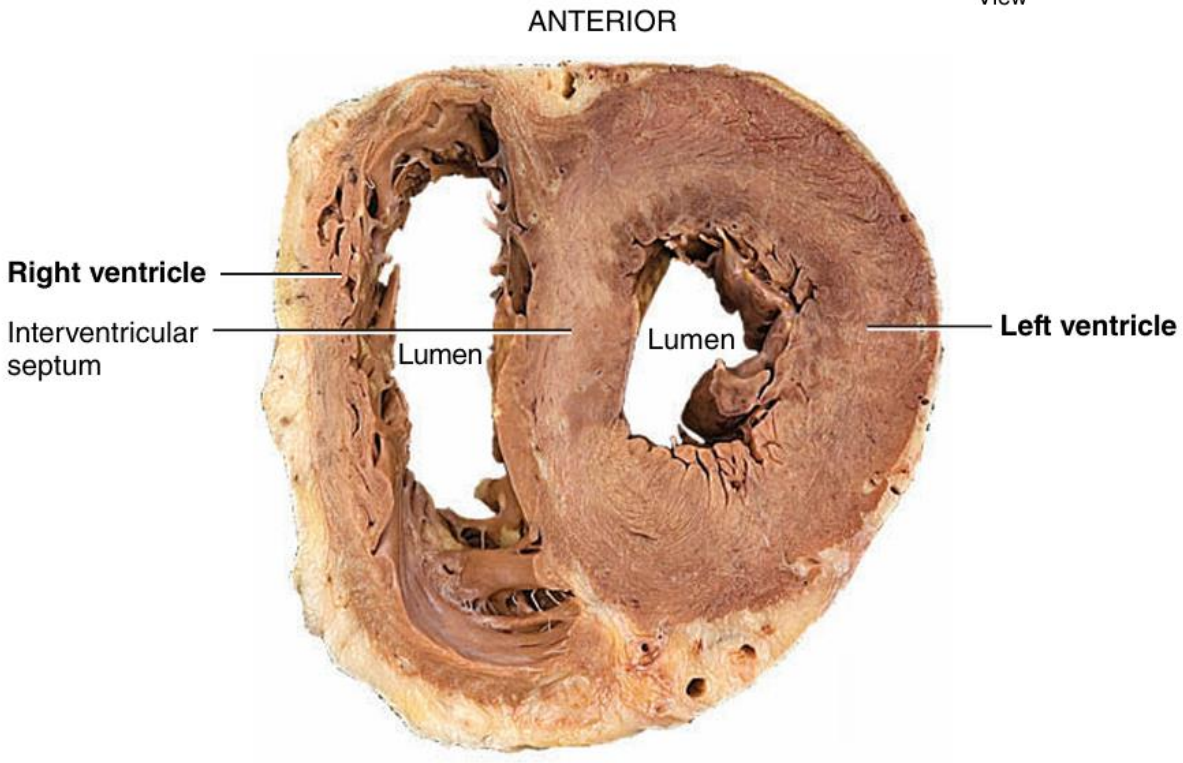
Anatomical differences between ventricles



- Left ventricle is **longer and narrower** than right ventricle

LV
أضيق
RV
more contractions و بيحتاج pumping عن مسؤول لانه thick دائمًا

- Walls of left ventricle are **three times thicker** (8–12 mm) than those of right ventricle



The orientation of heart

الاتجاه.

- About two-thirds of the mass of the heart lies to the left of the body's midline.
- The heart has **apex** and **base**

جزء بارز — قاعدة — LV — LA

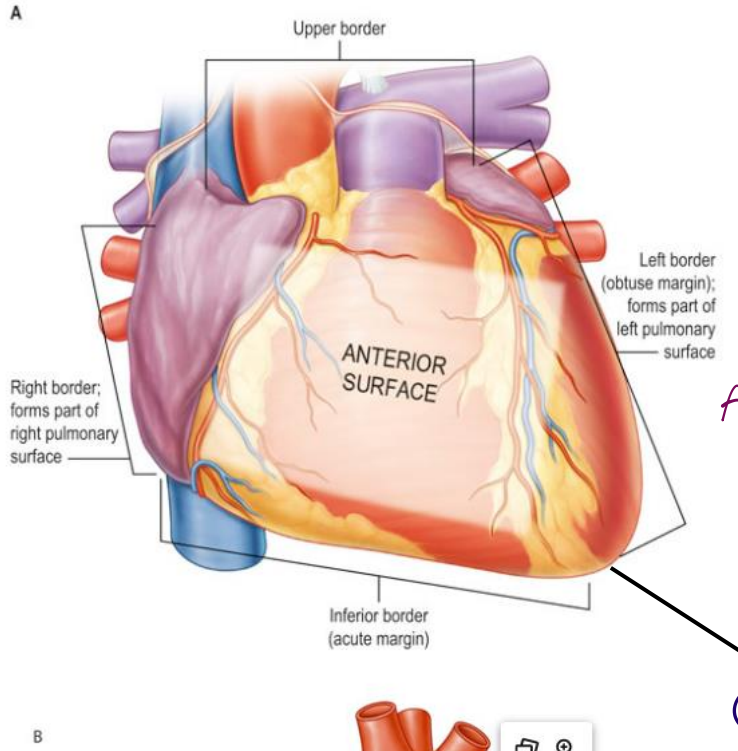
- **Apex**: the pointed tip of the heart directed downward, forward and to the left, and is formed of **the left ventricle.**

مهم جدًا

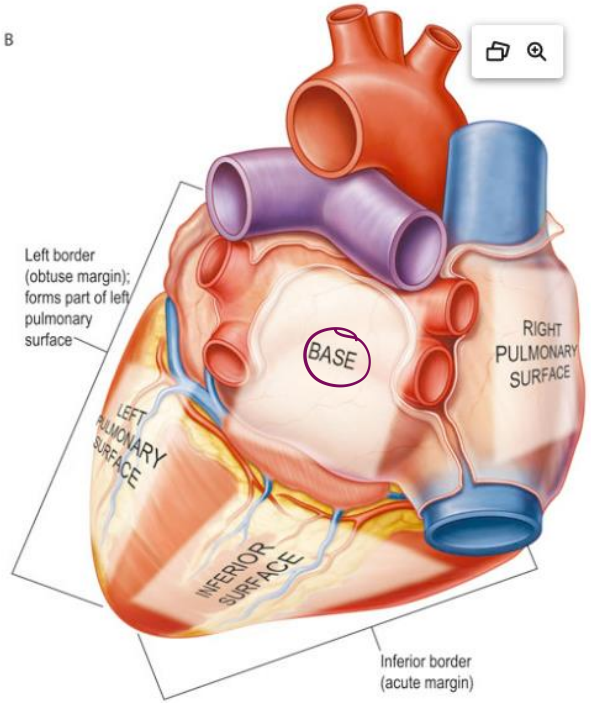
Apex ح تكون عكس

- **Base** of the heart (posterior aspect) is directed upward and posteriorly and is formed by the atria, mainly of **the left atrium**.

posterior surface — بعض الكتب بتسميها



Anterior view.

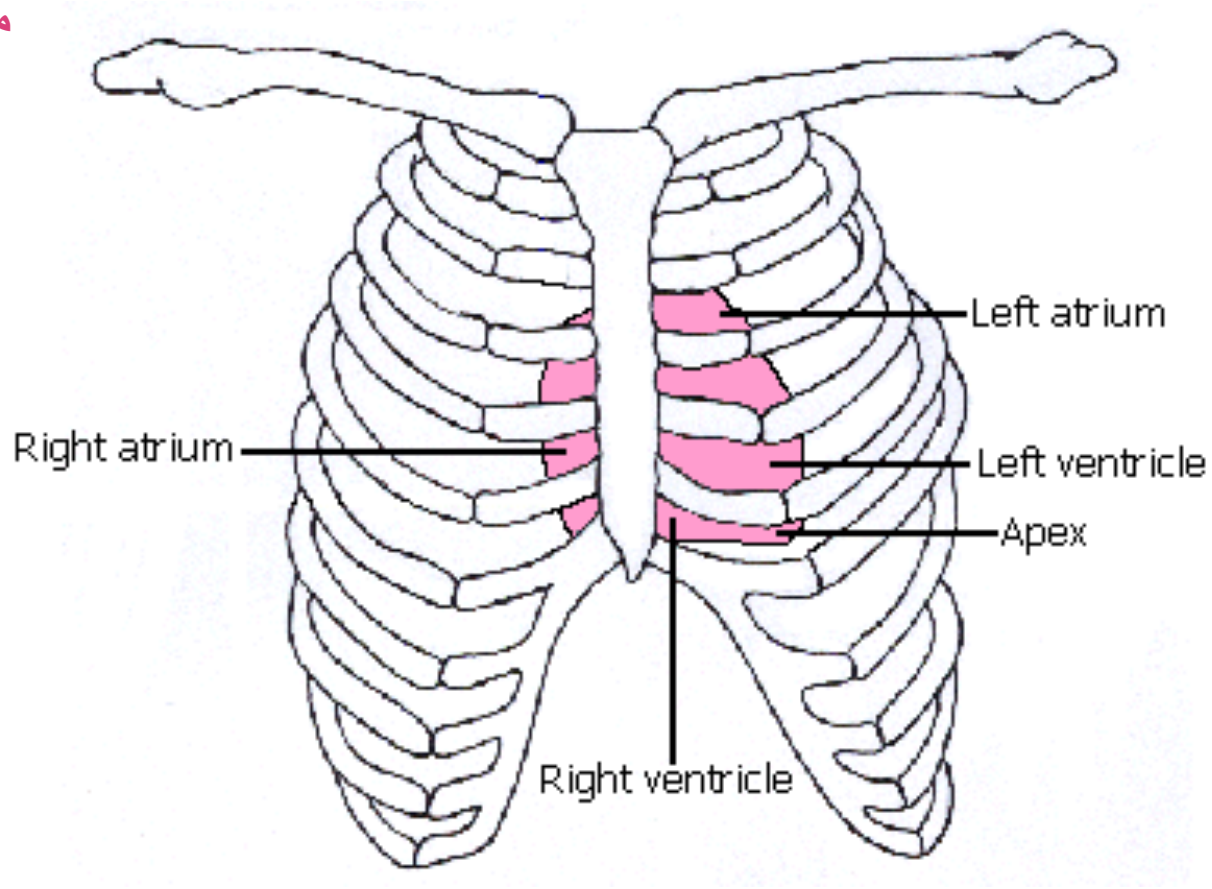


posterior view.

Apex of the heart

مهمة لطلاب الطب بس اعرفوها ع الماشي

- Lies at the level of the **left fifth intercostal space.** 9cm from the midline.



هاي معلومة حلوة.

Surfaces and borders of the heart

- The heart has several surfaces: **anterior (sternocostal)**, **inferior (diaphragmatic)**, and **right and left pulmonary** ← related to the lungs.

heart directly setting on diaphragm.

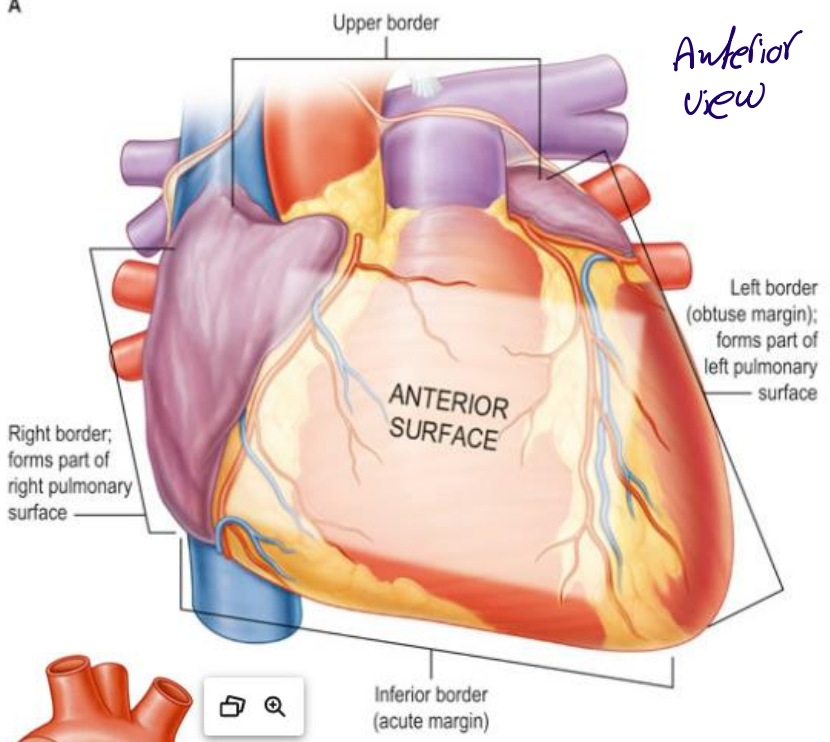
1. Anterior (sternocostal) surface: formed mainly by **right ventricle ~2/3rd**

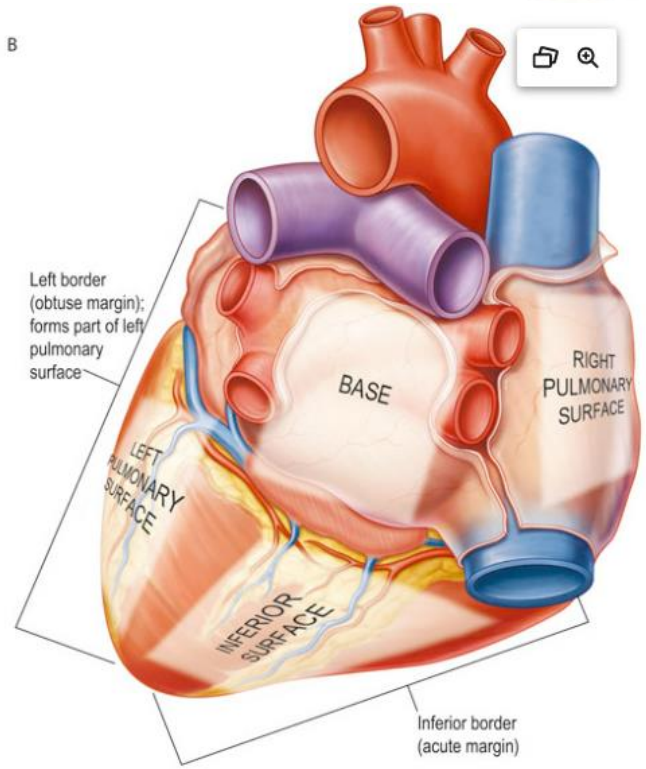
mainly بس أنا بعني other chambers في

2. Inferior (diaphragmatic) surface is largely formed by **left ventricle.**

3. Right pulmonary faces right lung

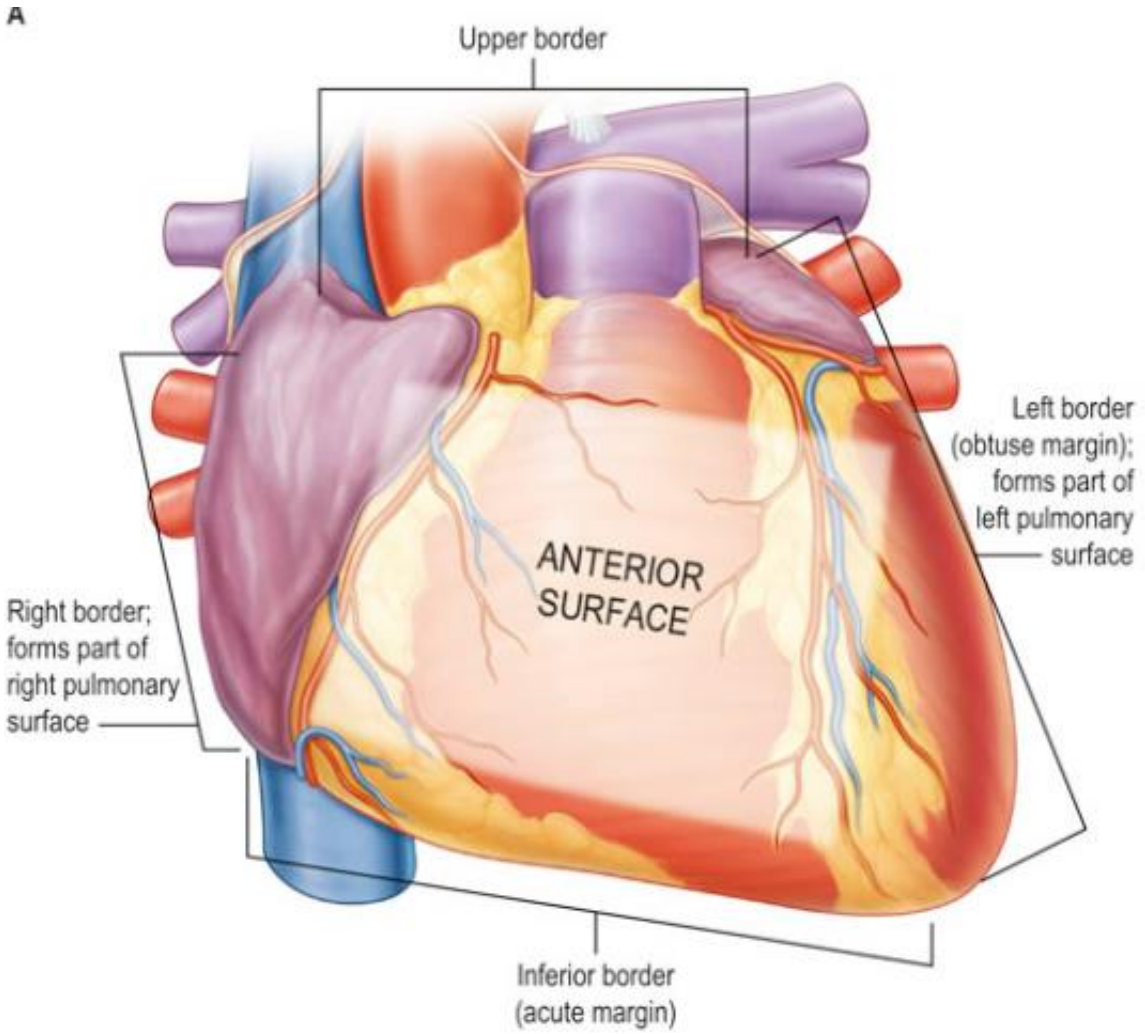
4. Left pulmonary faces left lung





Surfaces and borders of the heart

- And four borders; **superior, inferior, right and left.**
  - **Sup. Border>>> the two atria**
  - **Inf. Border >>> two ventricles**
  - **RT border >>> right atrium**
  - **LT border >>> left ventricle and left auricle**



Sulci on the cardiac surface

as groove
important structures. تمر

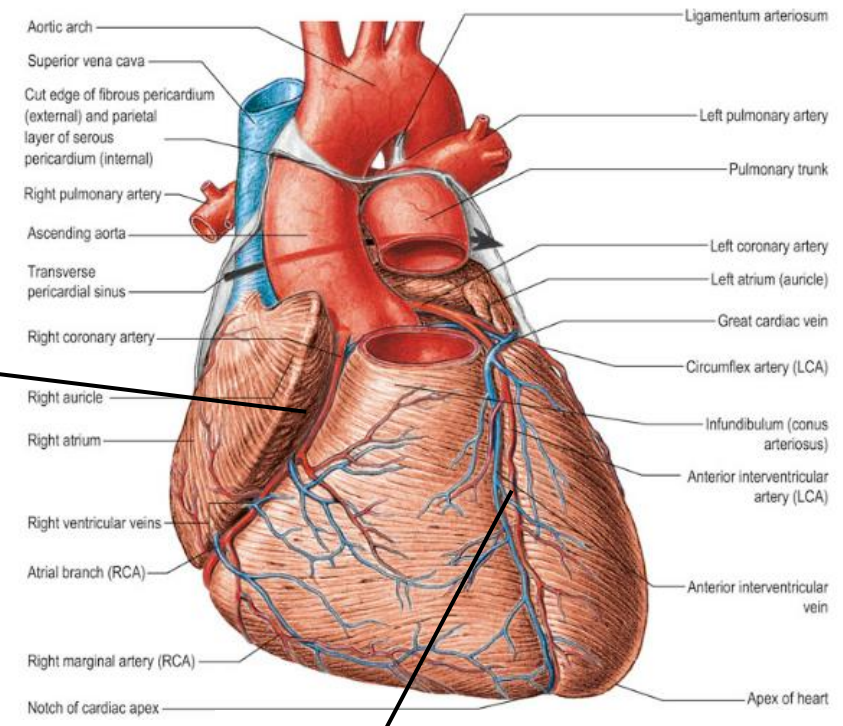
- **The atrioventricular (coronary) sulcus** separates the atria from the ventricles and contains the main parts of the right and circumflex coronary arteries.

There are two
One RT
One LT

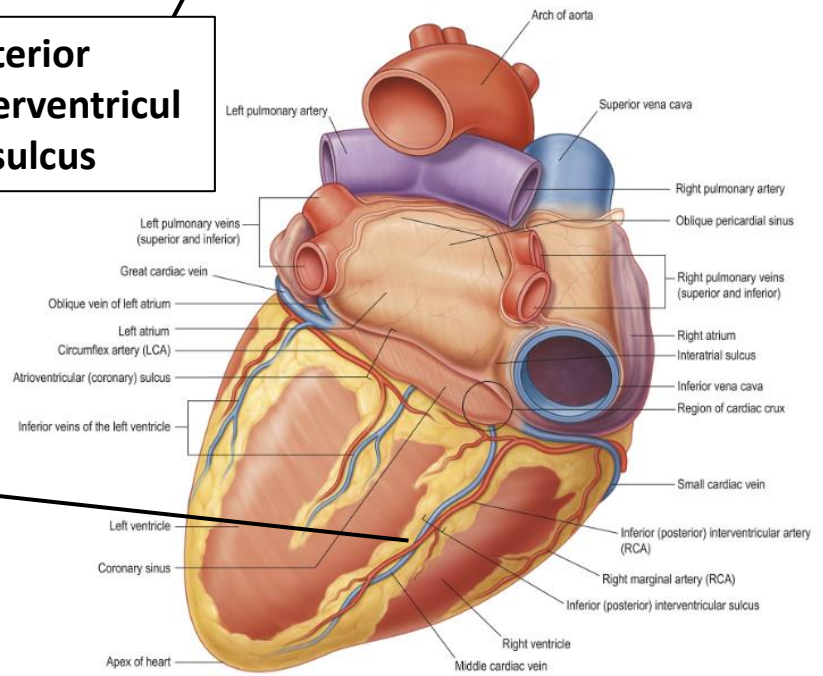
Between ventricles

- **The interventricular sulci** extend from the atrioventricular sulcus to the notch of the cardiac apex on the inferior border.

RT Atrioventricular sulcus



Anterior interventricular sulcus



Posterior interventricular sulcus

Valves of the heart

الصماعات

في عنا ارتباط كبير بين تسوس الاسنان و صمامات القلب
ف الناس يلي عندها مشاكل ب القلب او صمام صناعي ممكن التسوس ينقللهم البكتيريا و تسبب في وفاة المريض عن طريق major infection in blood و رح ناخده ب oral medicine

1. Atrioventricular valves

RT LT

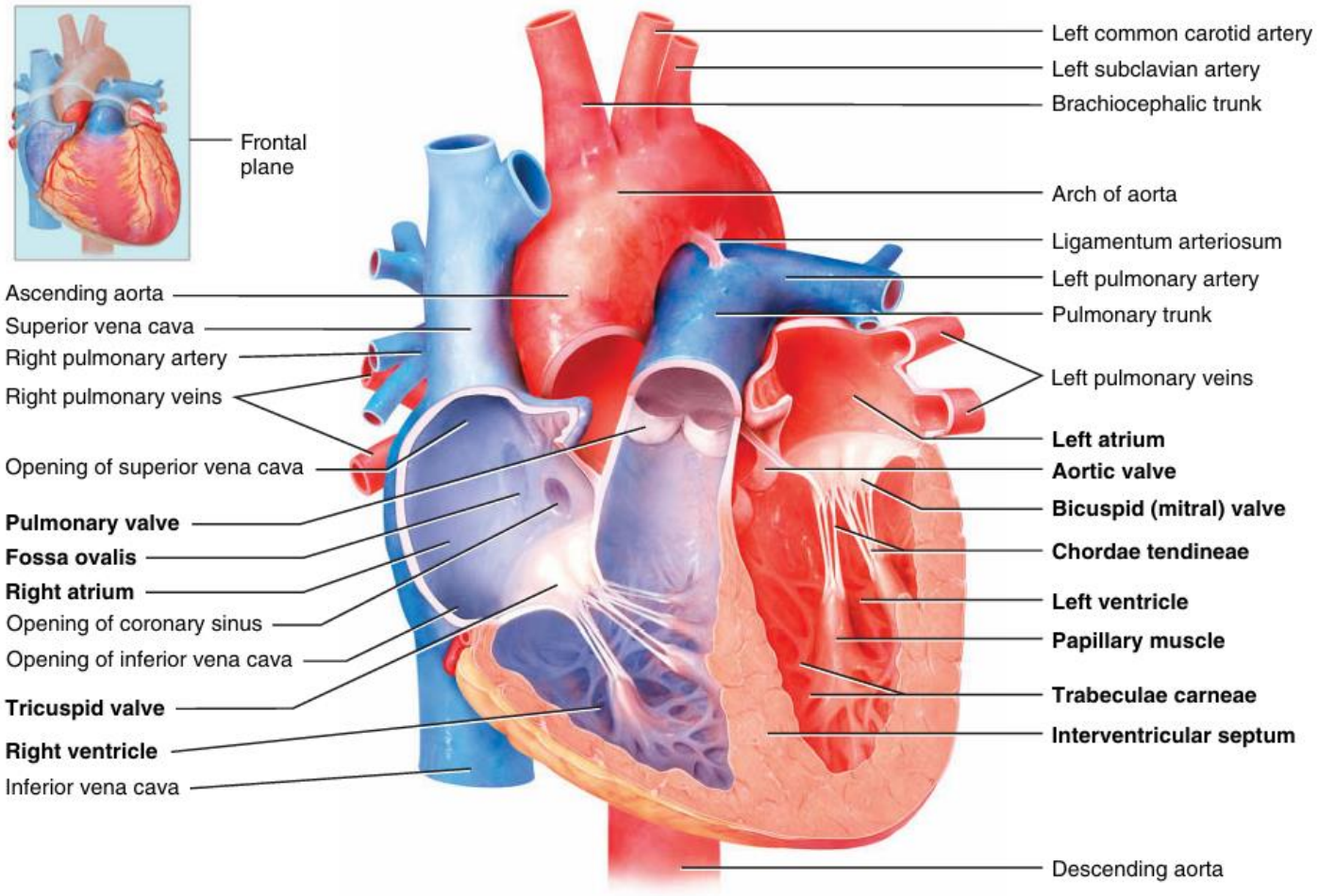
- Right and left

➢ The **right atrioventricular valve RAV** is tricuspid valve (has three cusps) → شي بيشبه الوريقات.

3

➢ The **left atrioventricular valve LAV** (Mitral valve) is bicuspid valve (has two cusps).

2



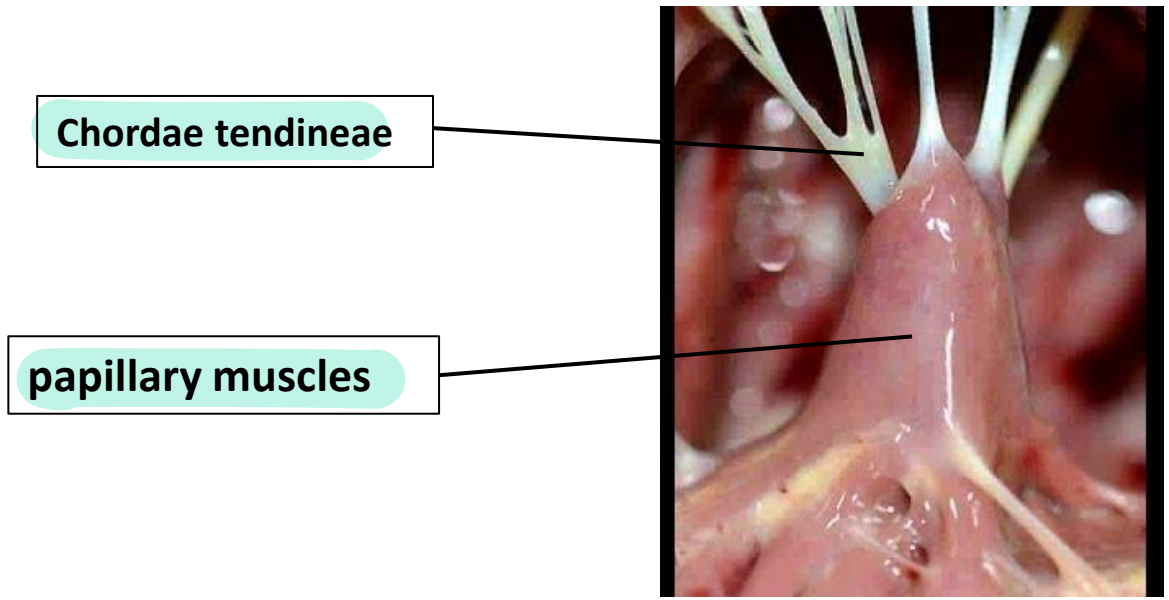
(a) Anterior view of frontal section showing internal anatomy

floor of the ventricle مع cusps of the valve تربط

Chorda tendinea are fibrous collagenous structures that support the leaflets of the atrioventricular valves and connect them to the **papillary muscles**.

In most cases, the RAV valve has three papillary muscles while the LAV valve has two.

each cusp → one papillary muscle.



Valves of the heart

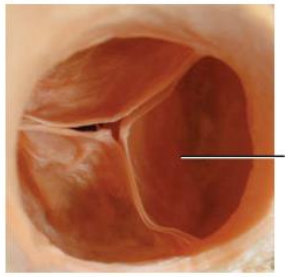
ما بين ventricle و الجهة يلي رح يروحلها الدم

2. Semilunar valves

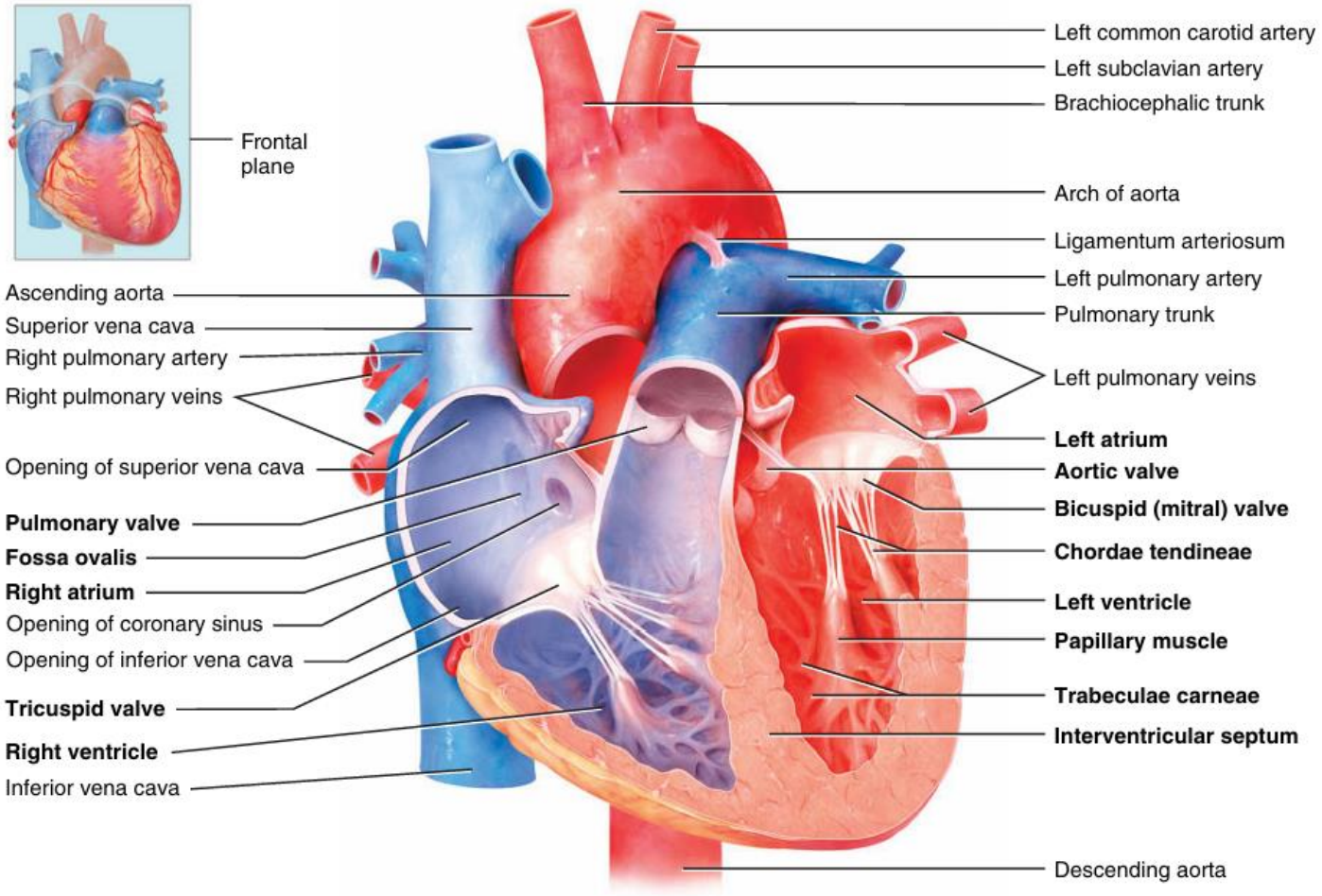
Formed of **three cusps** (تلاتهم مختلف), with a hollow space above each cusp called **sinus**

- **Aortic valve** → Between LV + Aorta
- **Pulmonary valve**

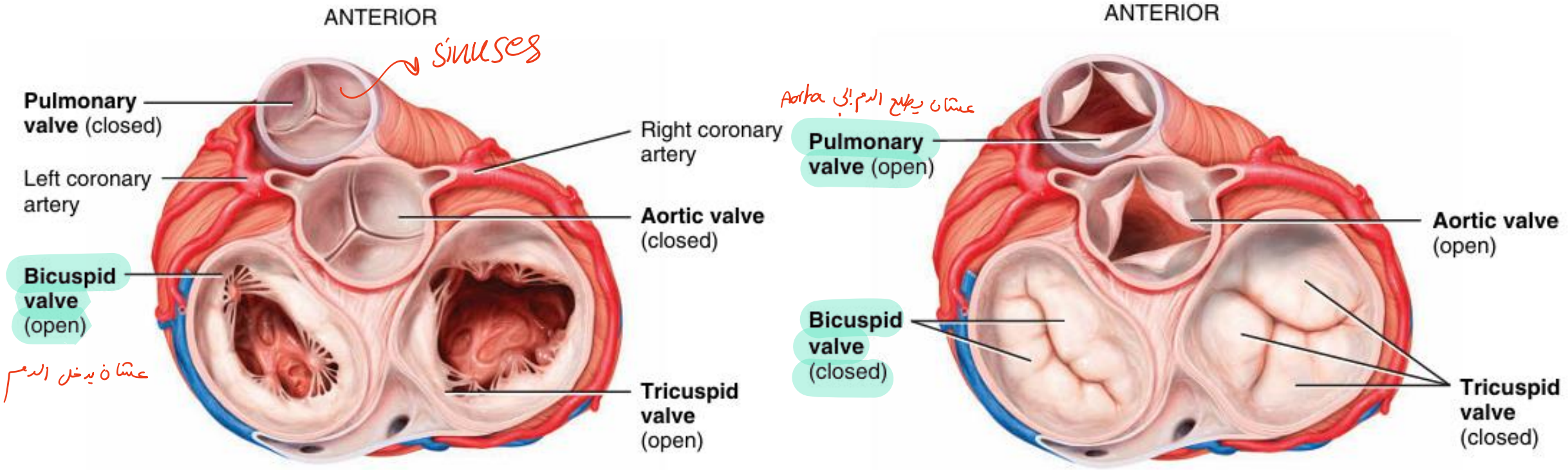
No Chorda tendinea or papillary muscles are associated with semilunar valves.



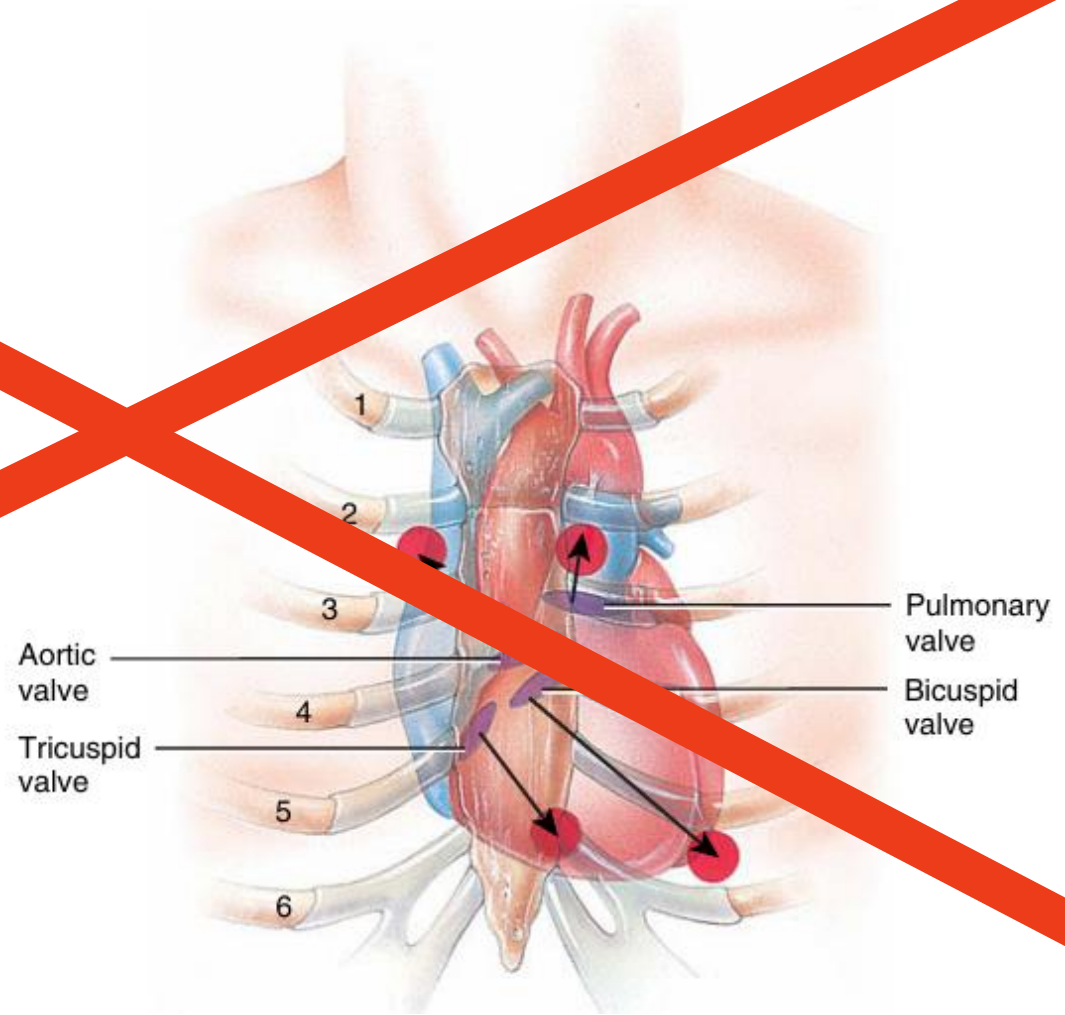
Dissection Shawn Miller, Photograph Mark Nielsen
(g) Superior view of aortic valve



(a) Anterior view of frontal section showing internal anatomy


ANTERIOR
sinuses
Pulmonary valve (closed)
Left coronary artery
Right coronary artery
Aortic valve (closed)
Bicuspid valve (open)
عشان يدخل الدم
Tricuspid valve (open)
ANTERIOR
Aorta عشان يطلع الدم الي
Pulmonary valve (open)
Aortic valve (open)
Bicuspid valve (closed)
Tricuspid valve (closed)

Listening to sounds within the body is called auscultation; it is usually done with a stethoscope.



Blood supply of the heart

Arterial supply مهمّة

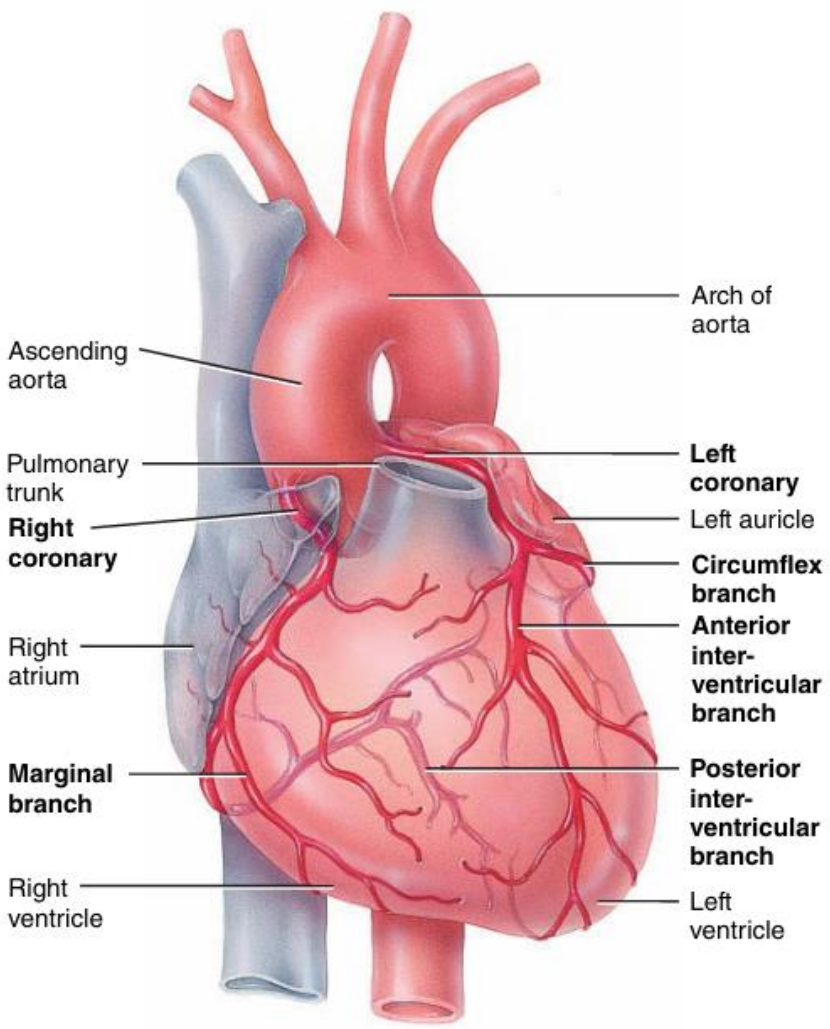
Branch of ascending aorta.

By the **coronary arteries** (Rt and Lt). Arise from the beginning of the ascending aorta. → الجزء اللي بيطلع إشي زي تاني محدش

الشرايين التاجية

Venous drainage:

Through small veins that opens in the **coronary sinus** that empties in the right atrium



(a) Anterior view of coronary arteries

Blood supply of the heart

مشاريح بنسأل عنها بالامتحان بس حلو بتحرفها

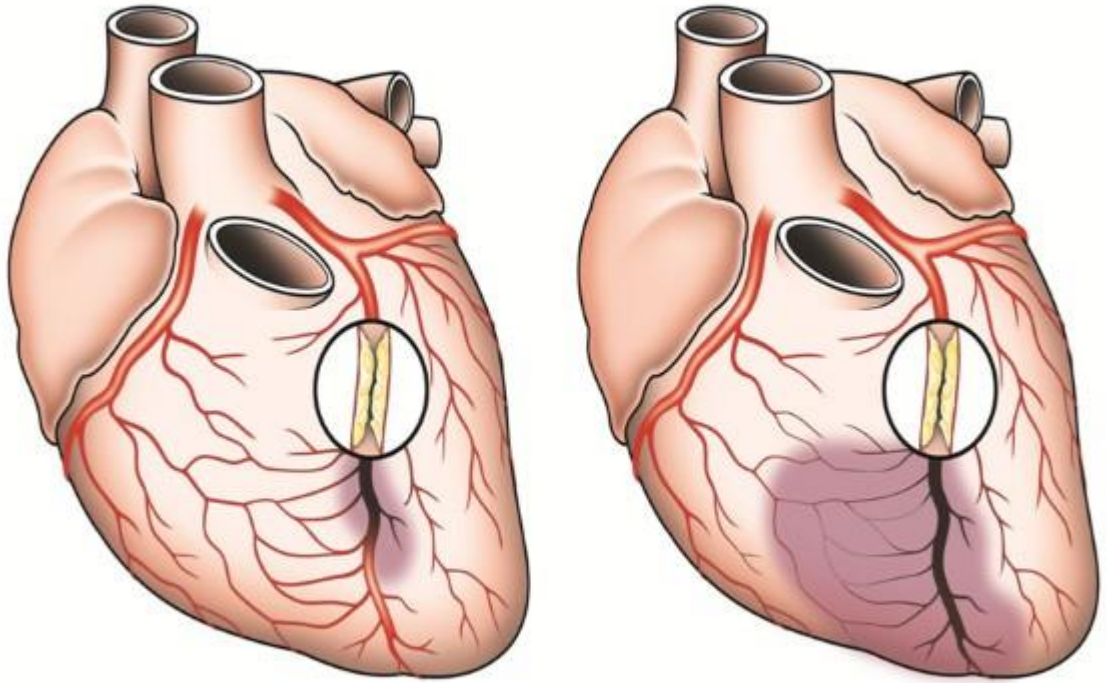
Collateral circulation is the anastomosis between the branches of the right and lef coronary arteries.

زي تأثرها بجميع الشرايين

The alternative route of blood flow to a body part through an anastomosis

The age is a key determinant of the collateral circulation development.

Figure 1



هاد الشخص عمره أكبر

Thank you!