The Cardiovascular System

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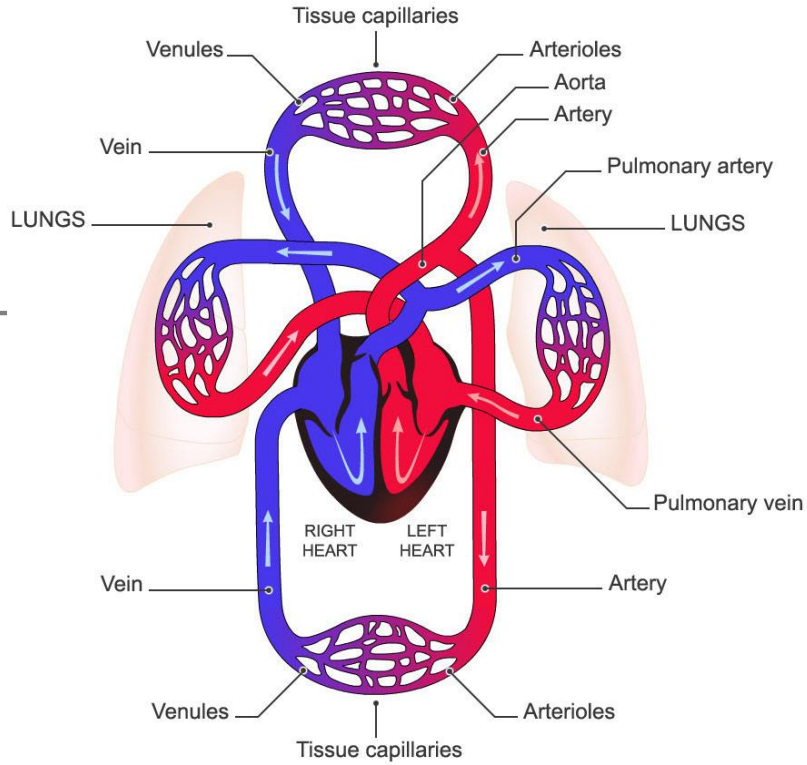
(2021)

good luck *

consist of :

1. The Blood
2. The Heart
3. and The Vessels



Adult connective tissue

Blood

fluid

blood lymph

- Fluid connective tissue (blood)
  - Extracellular matrix = plasma (55%)
  - Cellular elements = Red blood cells, White blood cells and Platelets (45%)

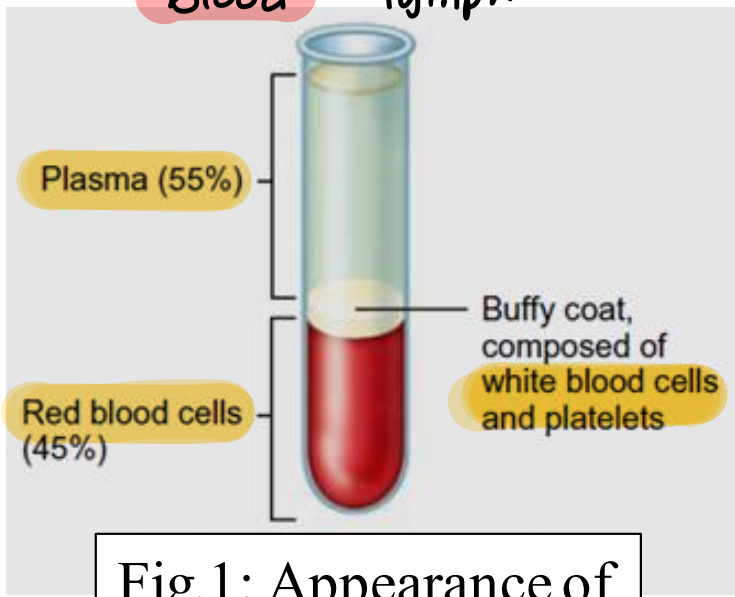
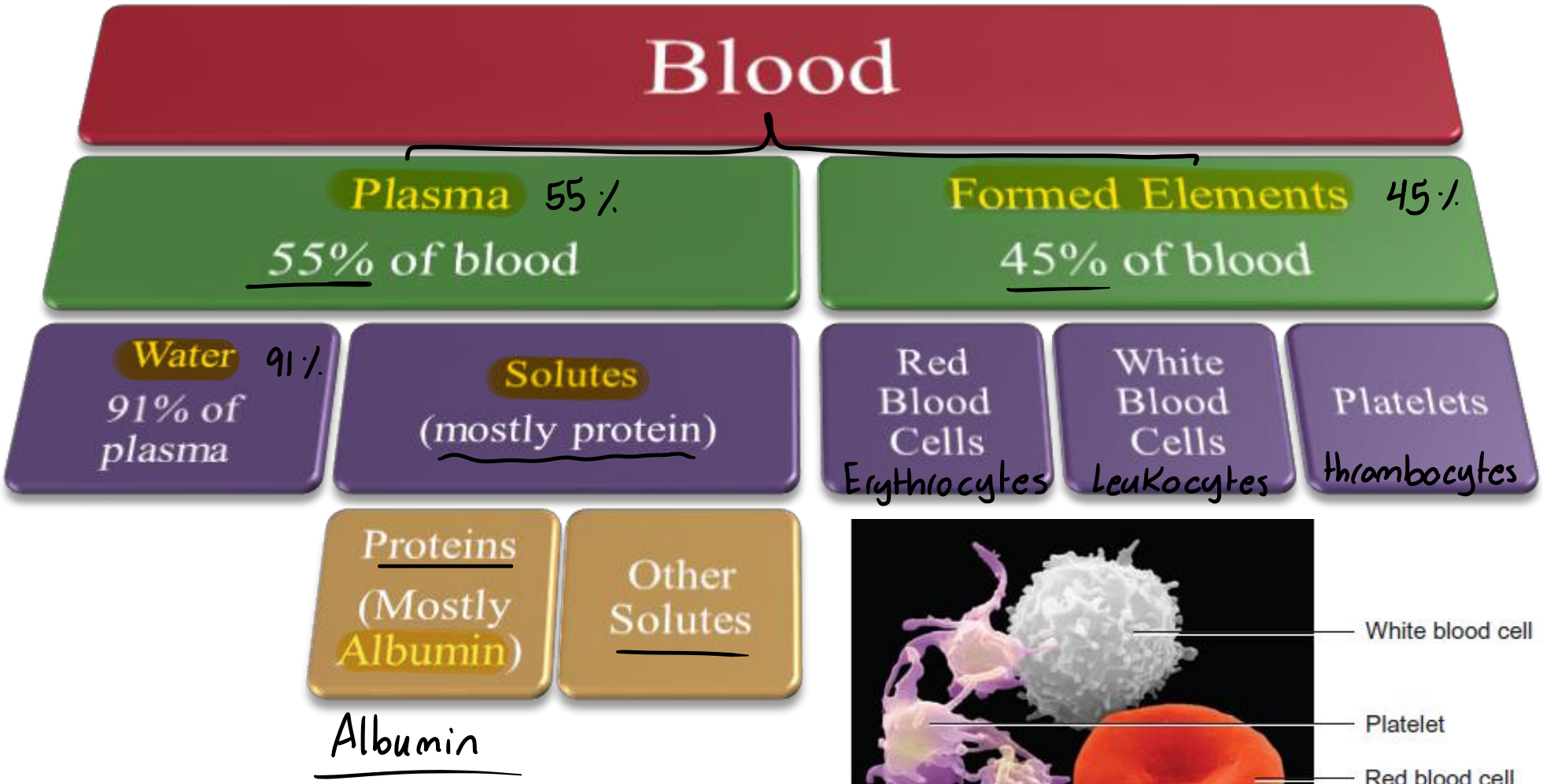
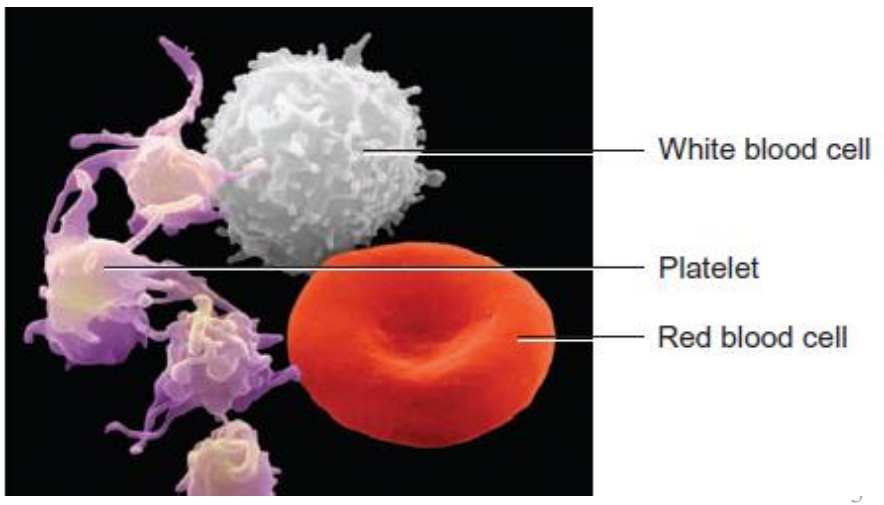


Fig.1: Appearance of centrifuged blood.

- Functions:
  1) Transportation
     - Gases, nutrients, hormones, waste products
  2) Regulation
     - pH, body temperature
  3) Protection
     - Clotting, white blood cells, proteins

Components of Blood





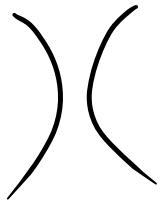
11. Which is the most abundant plasma protein?

A. alpha- and beta- globulins
B. albumin
C. mitochondria
D. haemoglobin

Formed Elements of Blood

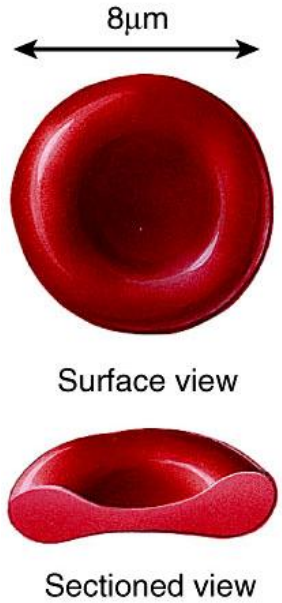
Red Blood Cells/ Erythrocytes

concave مقعر



مقعر مزدوج

- Biconcave disc in shape. This increases surface area.
- Lack nucleus and other organelles:
  - No mitochondria – doesn't use oxygen
- Strong, flexible plasma membrane. This allows the cell to change its shape without rupturing as it passes through narrow capillaries. تمزق
- Life span about 120 days. 3 months
- Cytoplasm filled with the oxygen-carrying protein hemoglobin. protein in red blood cells



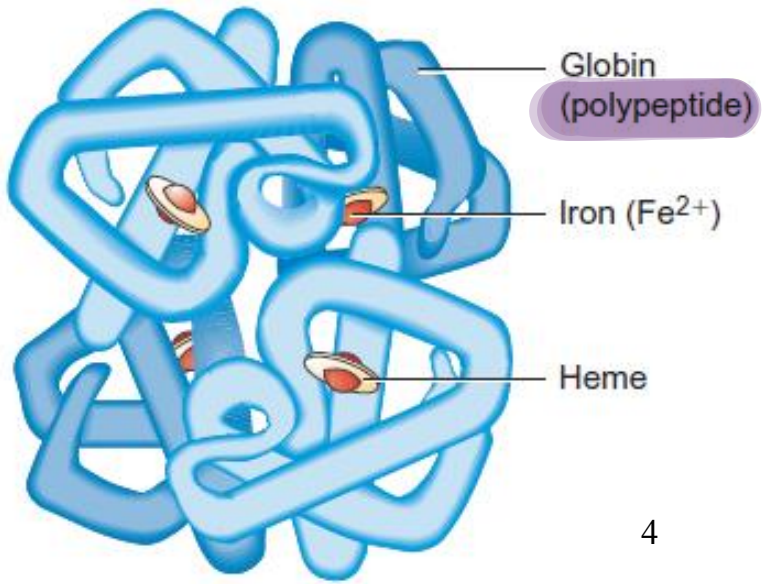


Fig.2: The shape of red blood cells and hemoglobin molecule.

Which of the following statements regarding red blood cells is/are TRUE?

A. Their biconcave shape increases surface area for gas exchange

B. They contain mitochondria to meet high energy demands

C. They have nucleus

D. Their plasma membrane allows deformation without rupture

E. A and D only

E

15. What are red blood cells primarily composed of?

A. alpha- and beta- globulins
B. albumin
C. mitochondria
D. haemoglobin

White Blood Cells/ Leukocytes

- Wandering cells: formed in bone marrow, circulate in blood and enter tissues.
- Respond to local factors in inflammation.

Function: ↗

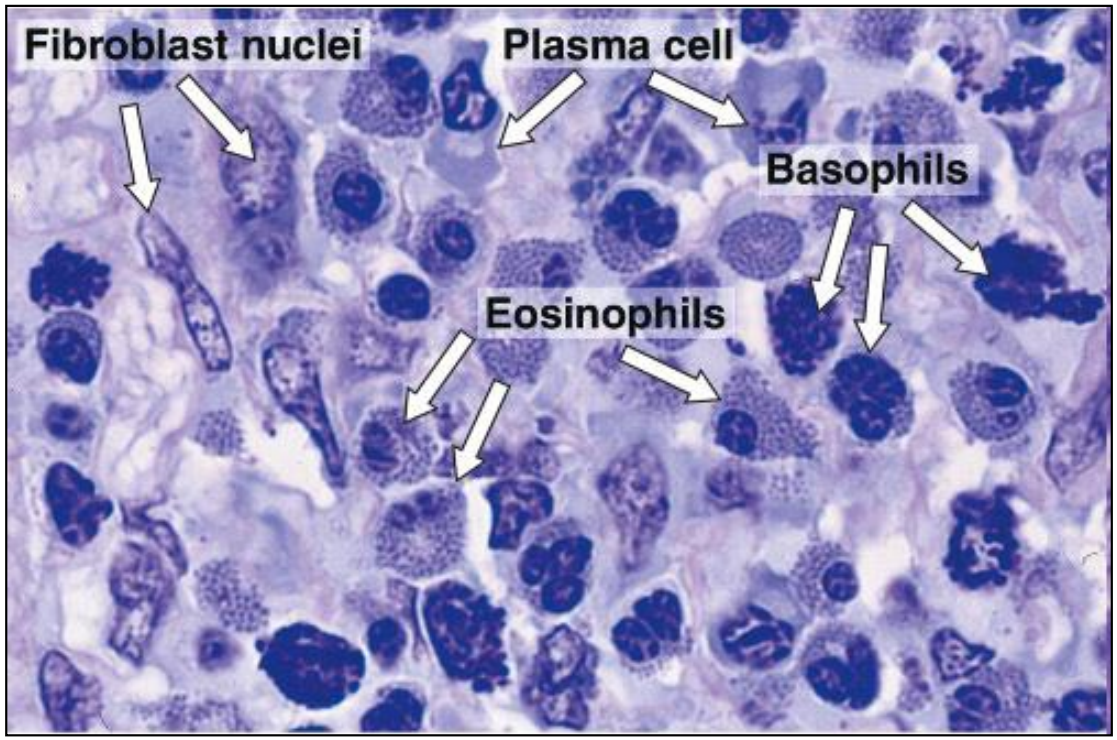
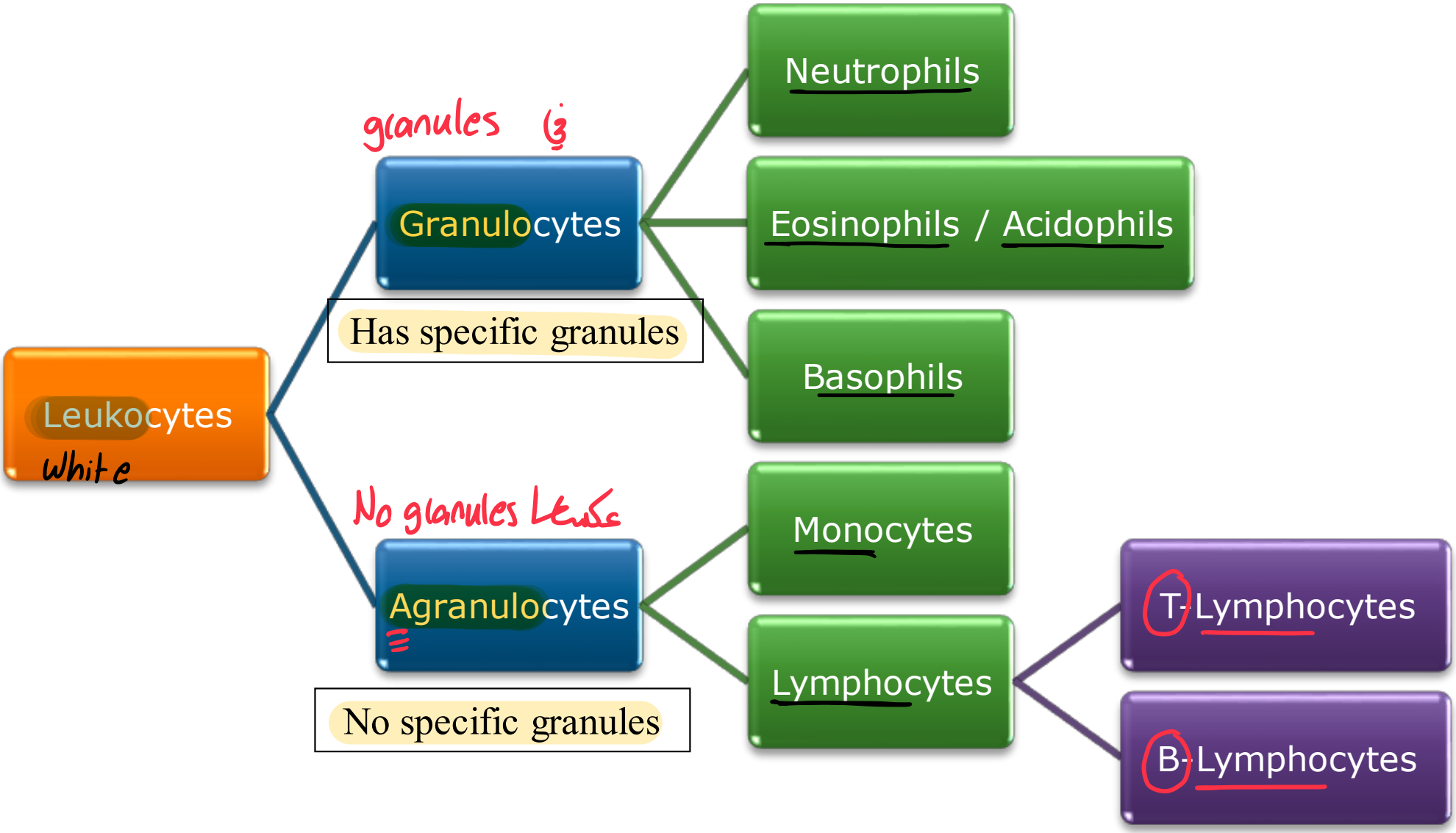


Fig.3: Leukocytes in inflamed tissue.

Classification of Leukocytes



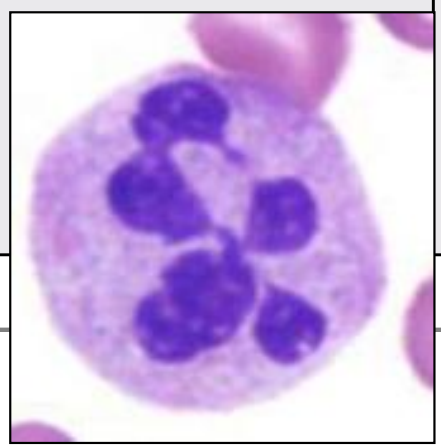
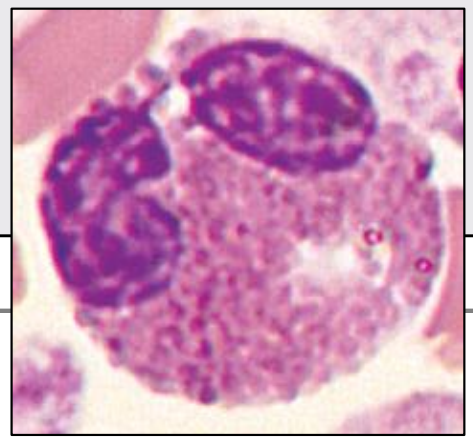
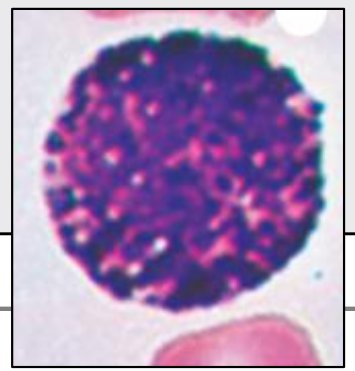
Granulocytes	Neutrophils	Eosinophils	Basophils
Abundance (% of leukocytes)	Most common	Acidophils	Least common
Nucleus	Multilobed	Bilobed	S shaped (obscured by granules)
Granules	Sparse and stain variably	Large eosinophilic	Large basophilic
Function	Phagocytosis	• Defense against parasitic infection • Allergic reactions	Release of inflammatory molecules
			

Fig.4: Granulocytes.

A leukocyte with a multilobed nucleus and sparse, variably staining granules is most likely:

A. Eosinophil

B. Basophil

C. Neutrophil

D. Monocyte

E. None of the above

C

24. Which statement about neutrophils is correct?

A. they have no nucleus
B. They contain large granules
C. They function in phagocytosis
D. eosinophils are one type of neutrophil

C

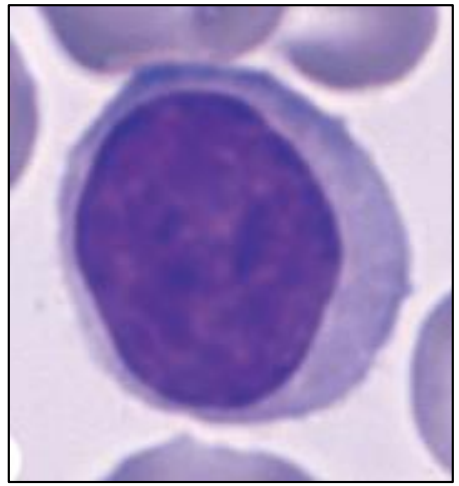
16. Which is the **LEAST** common type of white blood cell?

A. lymphocyte
B. basophil
C. thrombocyte
D. neutrophil

Agranulocytes:

- lymphocytes < T, B
- monocytes

Fig.5: Agranulocytes.



Lymphocytes:

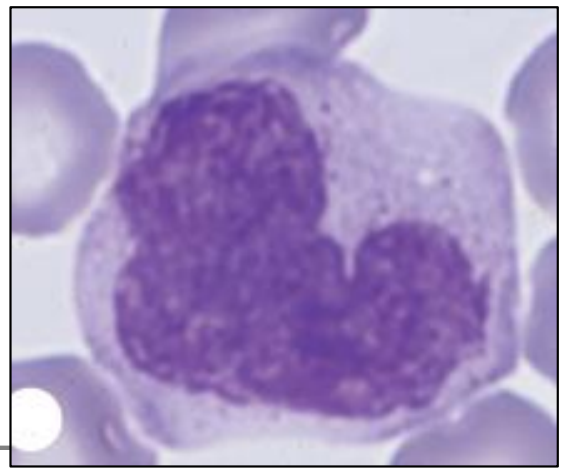
- Variable in size.
- Nucleus very dark and occupies most of the cell.
- Functions: T-cells → Cell mediated immunity.
  B-cells → Antibody-mediated immunity.

A B

Monocytes:

- Kidney or U-shaped nucleus.
- Cytoplasm basophilic.
- Function: formation of macrophages.

Mono



Which leukocyte is MOST directly involved in antibody-mediated immunity?

A. T-lymphocyte

B. B-lymphocyte

C. Monocyte

D. Neutrophil

E. All of the above

B

Platelets/ Thrombocytes

large

- Large cells in the bone marrow called ***Megakaryocytes*** send processes into blood vessels. These processes will splinter into small fragments called Platelets.
- This process continues until each megakaryocyte gives rise to about 2000 platelets.
- Each platelet is a disc-shaped structure surrounded by cell membrane and containing no nucleus but numerous vesicles containing blood-clotting promoting factors.
- Short life span: 5-9 days.
- Function: Stops bleeding by the formation of (1) platelet plug and (2) blood clot.

Platelets are BEST described as:

B. Cytoplasmic fragments derived from megakaryocytes
C. Cells with a lifespan of approximately 120 days
D. Essential only for platelet plug formation, not clotting
E. None of the above

B

ABO Blood Group

- Blood group is type of blood designated to a person based on the presence/absence of an antigen on the surface of RBCs.
- The ABO blood groups are based on the A and B antigens.
- Reason for antibodies presence not clear.

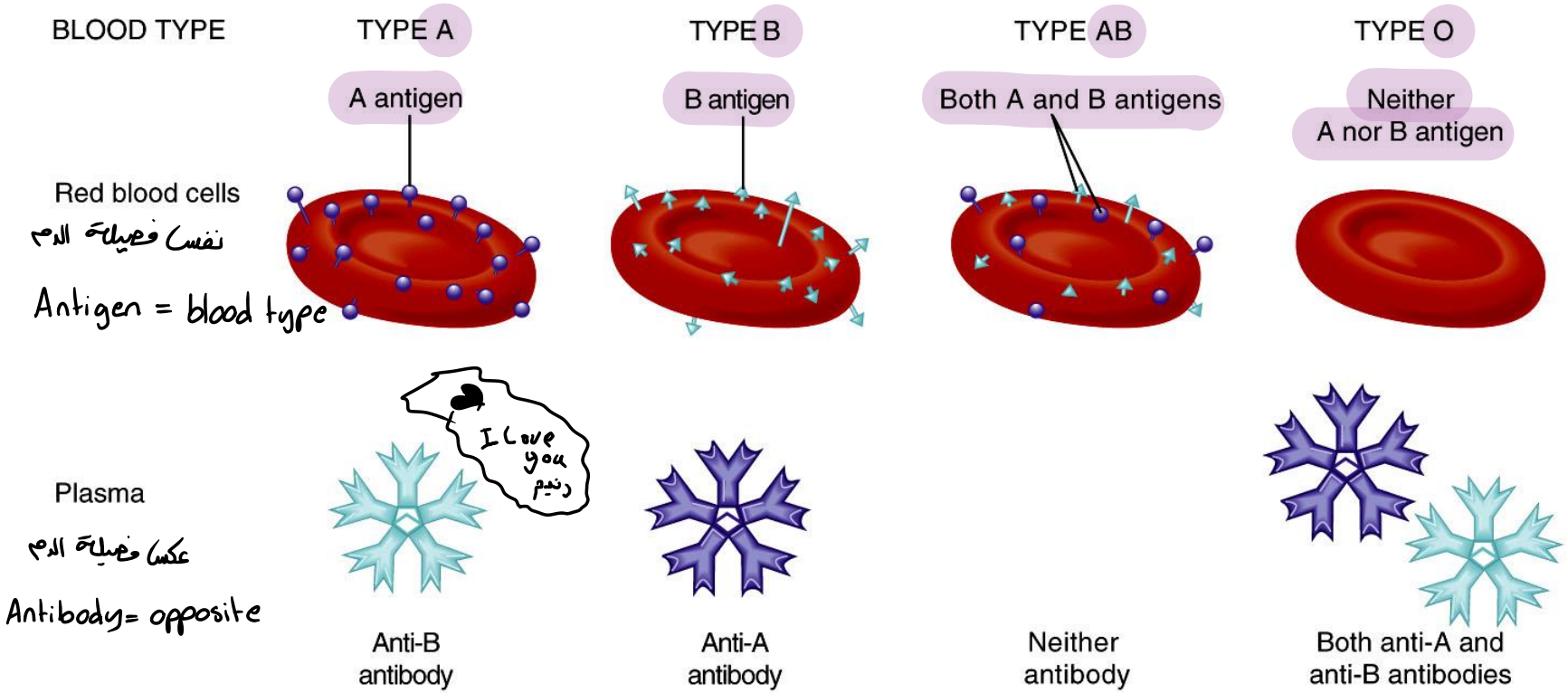
Blood Type	Antigen on RBCs	Antibody in Plasma
A	A	Anti-B
B	B	Anti-A
AB	A & B	None
O	None	Anti-A & Anti-B

3. The blood group known as the ABO system is based on the presence of what proteins on blood cells?

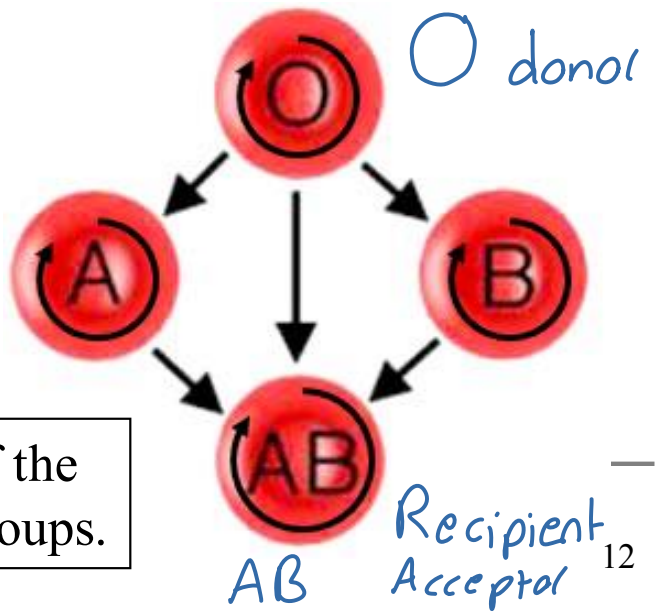
   A. antibodies
   B. antigens
   C. agglutinins
   D. immunoglobulins

   Answer is B:

Fig.6: Antigens and antibodies in the different blood groups.



- Each blood group can give to itself
- ***AB*** is the ***Universal Recipient***
- ***O*** Is the ***Universal Donor***



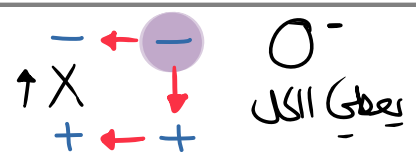


Fig.7: Relation of the different blood groups.

Blood type O contains A & B antigen?

True

False

21. What can be said about a person who has the "A" antigen on their red blood cells?

A. their blood contains anti-B
B. their blood contains anti-A
C. their blood contains anti-A and anti-B
D. their blood contains neither anti-A nor anti-B

A

10. Which individuals can receive any type of blood and are considered universal recipients?

A. A^+
B. O^-
C. AB^+
D. B^-

C

The Heart

A hollow pyramidal shaped muscular organ located within the pericardium in the middle mediastinum in the thoracic cavity.

The heart features:

- 3 surfaces (anterior, inferior and posterior).
- 4 borders (right, inferior, left and superior).
- Apex.
- 4 chambers (right and left atria and ventricles).

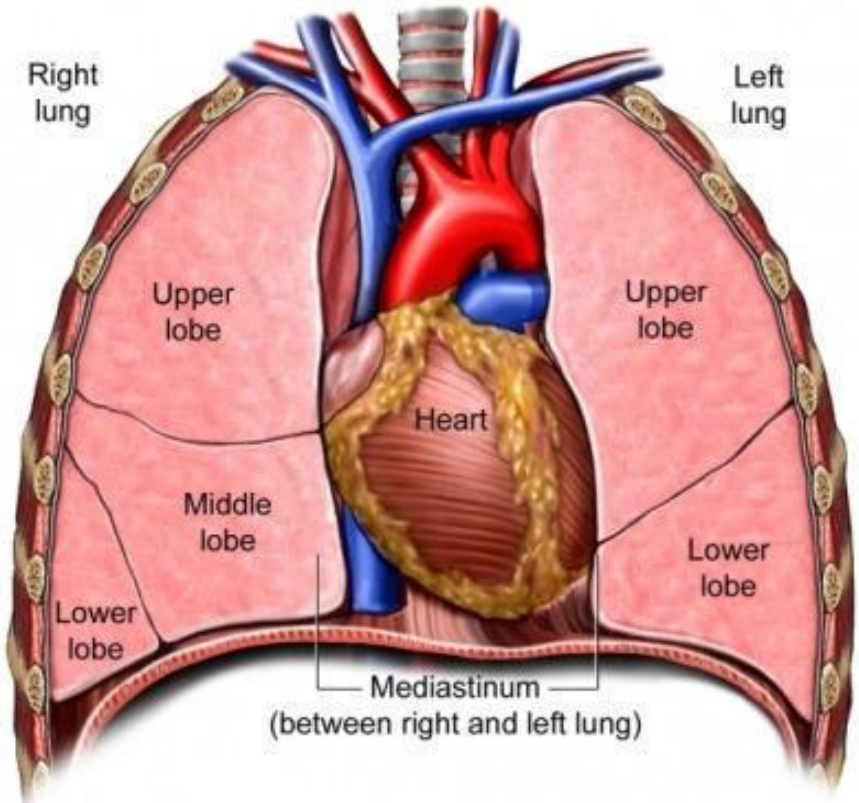


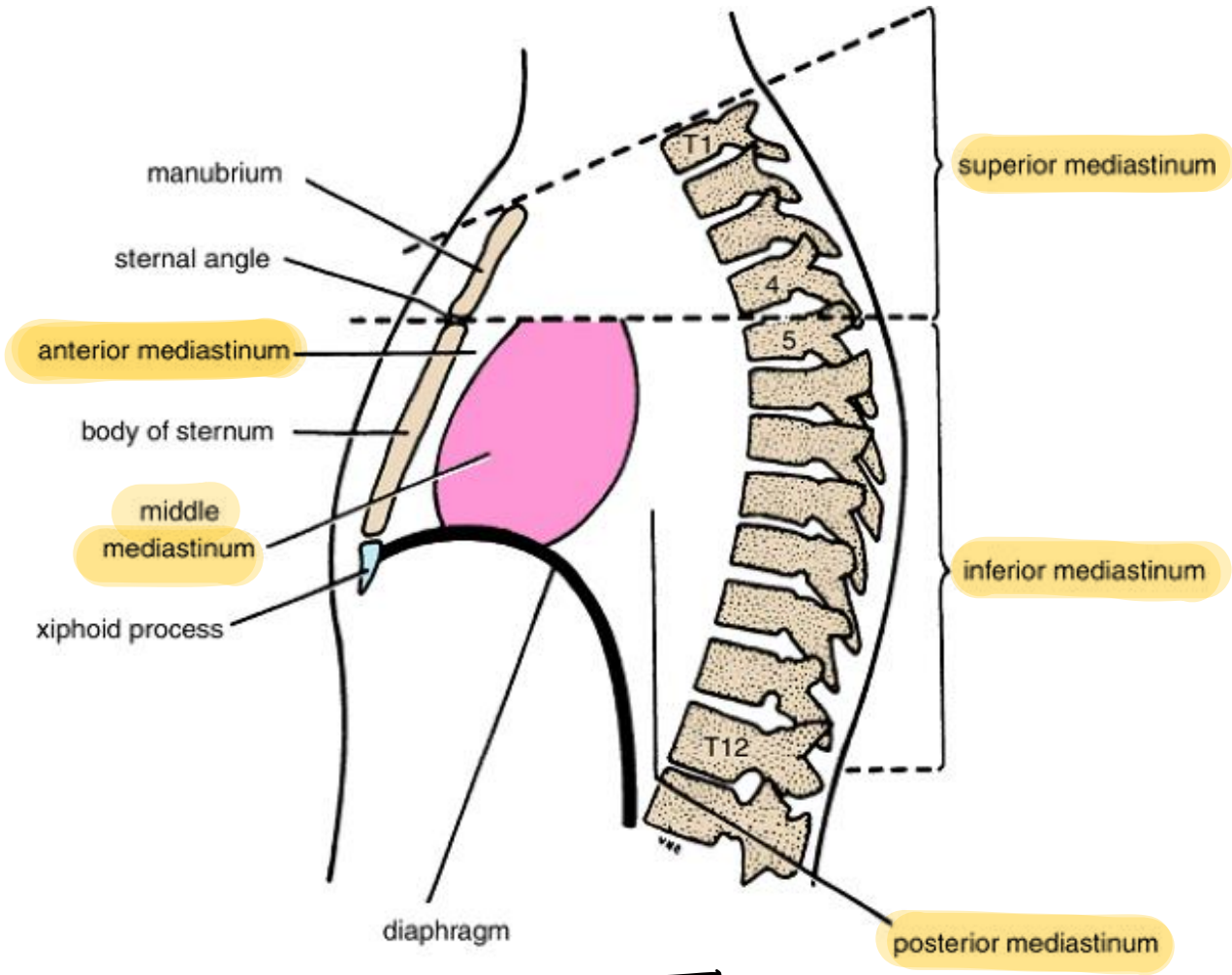
Fig.8: Position of the heart in the chest.

median septum of thoracic cavity

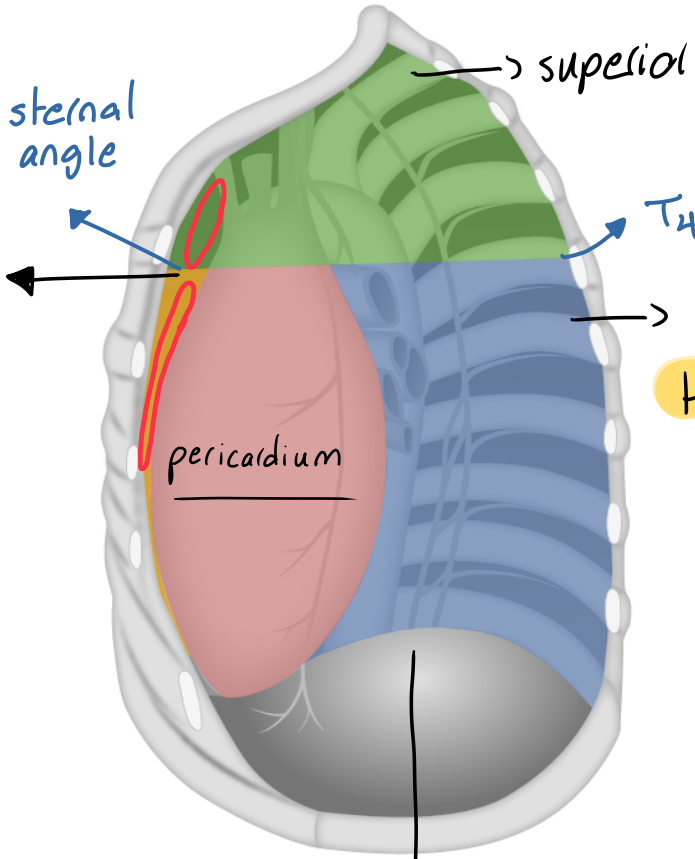
The Mediastinum:

- A midline region that extends from the thoracic outlet to the diaphragm. It's bounded by:
  - ❑ **Anteriorly**: Sternum
  - ❑ **Posteriorly**: Thoracic vertebrae
  - ❑ **Laterally**: Lungs and plurae
  - ❑ **Inferiorly**: Diaphragm

Fig.10: Lateral view of the mediastinum after removing the lung.



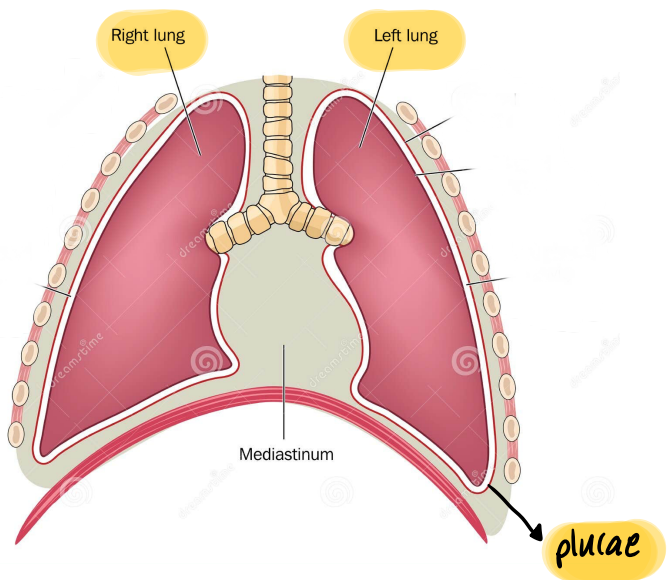
- The mediastinum is divided into superior and inferior parts by a plane passing from the sternal angle to the lower border of T4. The inferior mediastinum is divided into anterior, middle and posterior parts by the pericardium.



superior
- Superior mediastinum

inferior
- Anterior mediastinum
- Middle mediastinum
- Posterior mediastinum

laterally (lungs , pleurae)



Which statement(s) about the mediastinum is/are TRUE?

A. It is bounded anteriorly by the sternum

B. It is divided into superior and inferior parts at the level of T4

C. It contains only the heart

D. The pericardium divides the inferior mediastinum

E. A, B, and D

E

The Pericardium

Fibrous pericardium (outer)

serous pericardium (inner) — parietal layer, visceral layer

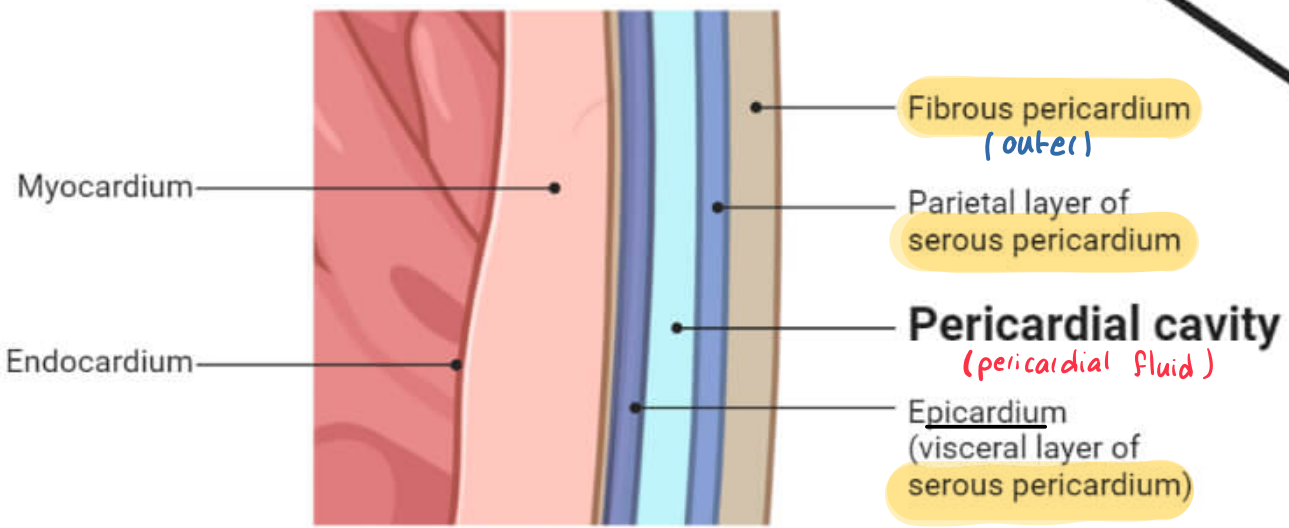
- Membrane surrounding and protecting the heart. Formed of 2 main parts:

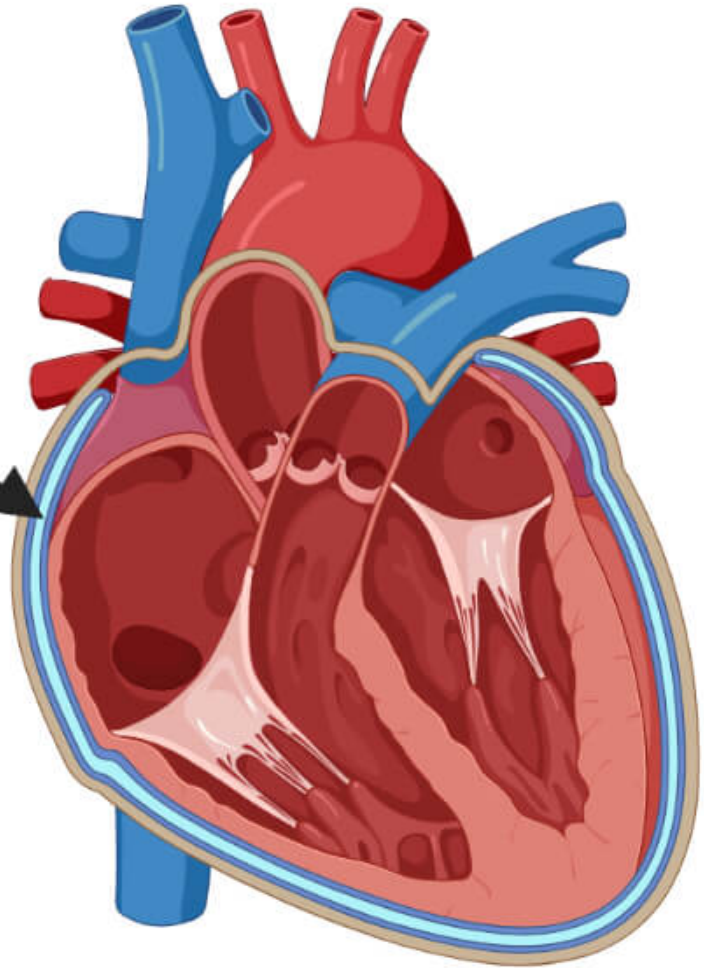
- Outer ***Fibrous pericardium***: tough layer that protects the heart and anchors it in place.
- Inner ***Serous pericardium*** (simple squamous epithelium): thin more delicate membrane. Formed of the parietal layer fused to fibrous pericardium and the visceral layer which is the epicardium.

- Between the two serous layers we have the pericardial cavity that's filled with the pericardial fluid to reduce friction.

Function &

Pericardium





Layers of the heart wall

Endocardium
myocardium thickest
epicardium (visceral layer)

1. ***Endocardium:*** Inner layer of the heart. Lined by endothelium (simple squamous epithelium) continuous with that of the blood vessels.

2. ***Myocardium:*** The thickest layer of the heart. Formed of cardiac muscle cells.

3. ***Epicardium:*** The outermost layer. The same as the visceral pericardium.

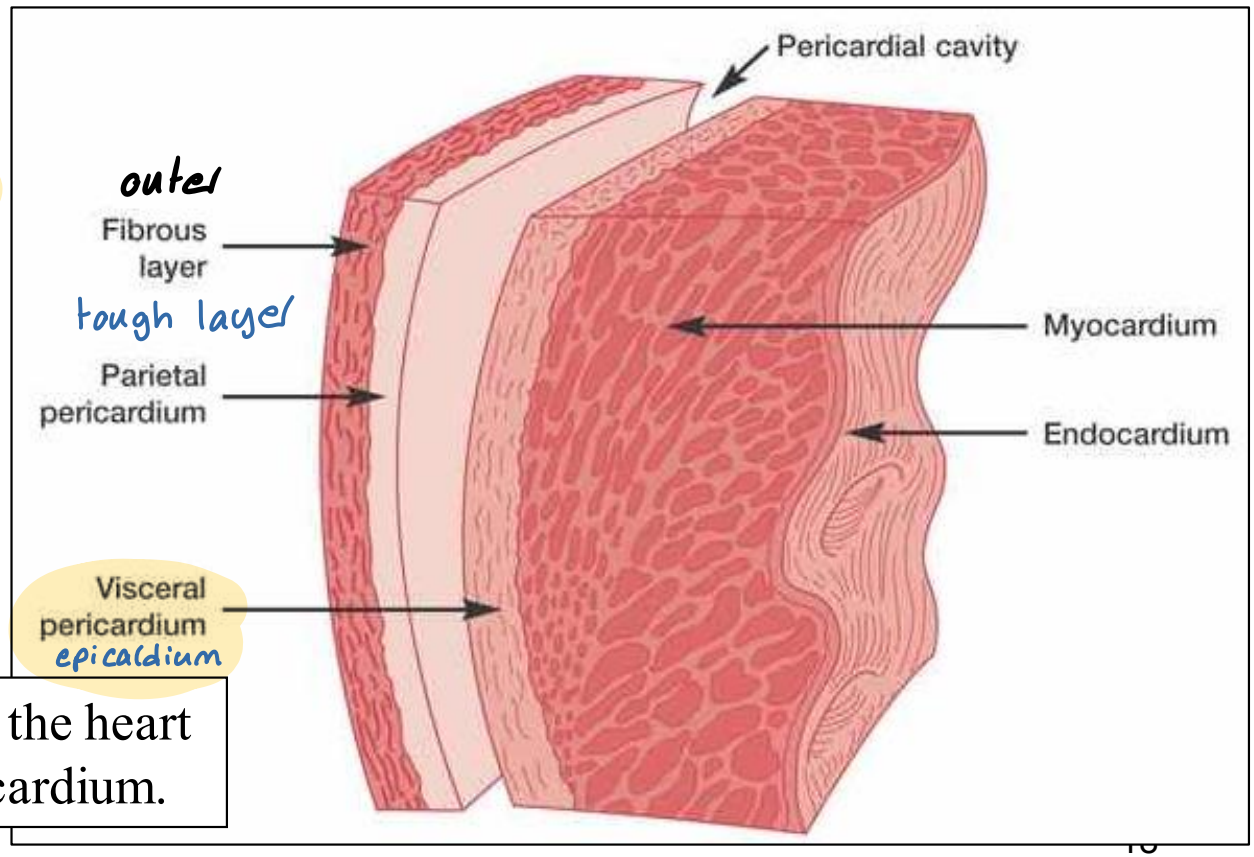


Fig.11: Layers of the heart wall and the pericardium.

3 Surfaces of the heart

Anterior
posterior (left atrium)
inferior

Anterior Surface:

- Formed by the:
  - Right atrium
  - Right ventricle
  - Left ventricle
- Related to the sternum.

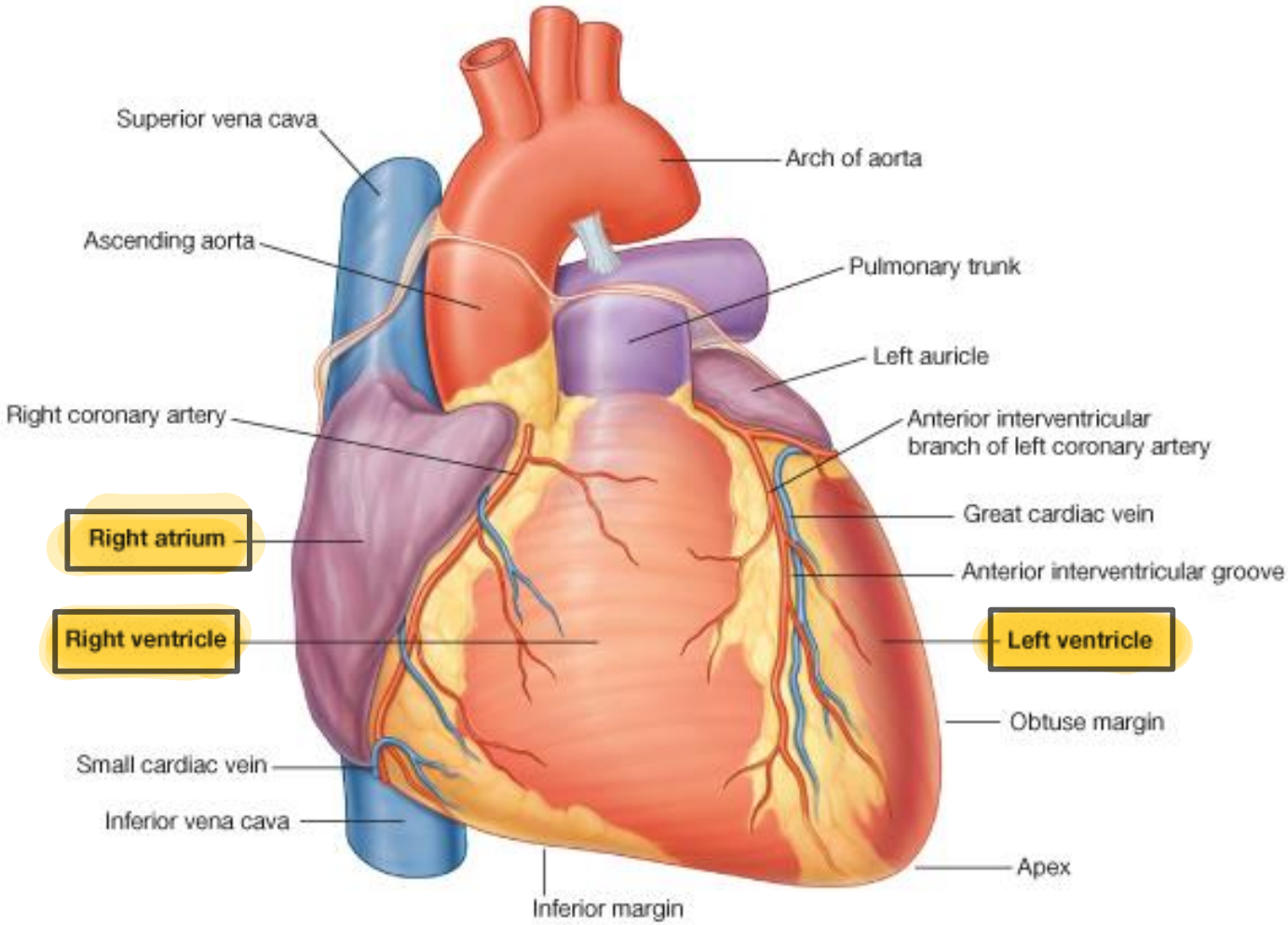


Fig.12: The anterior surface of the heart.

Posterior Surface (Base):

- Formed by the:
- Left atrium

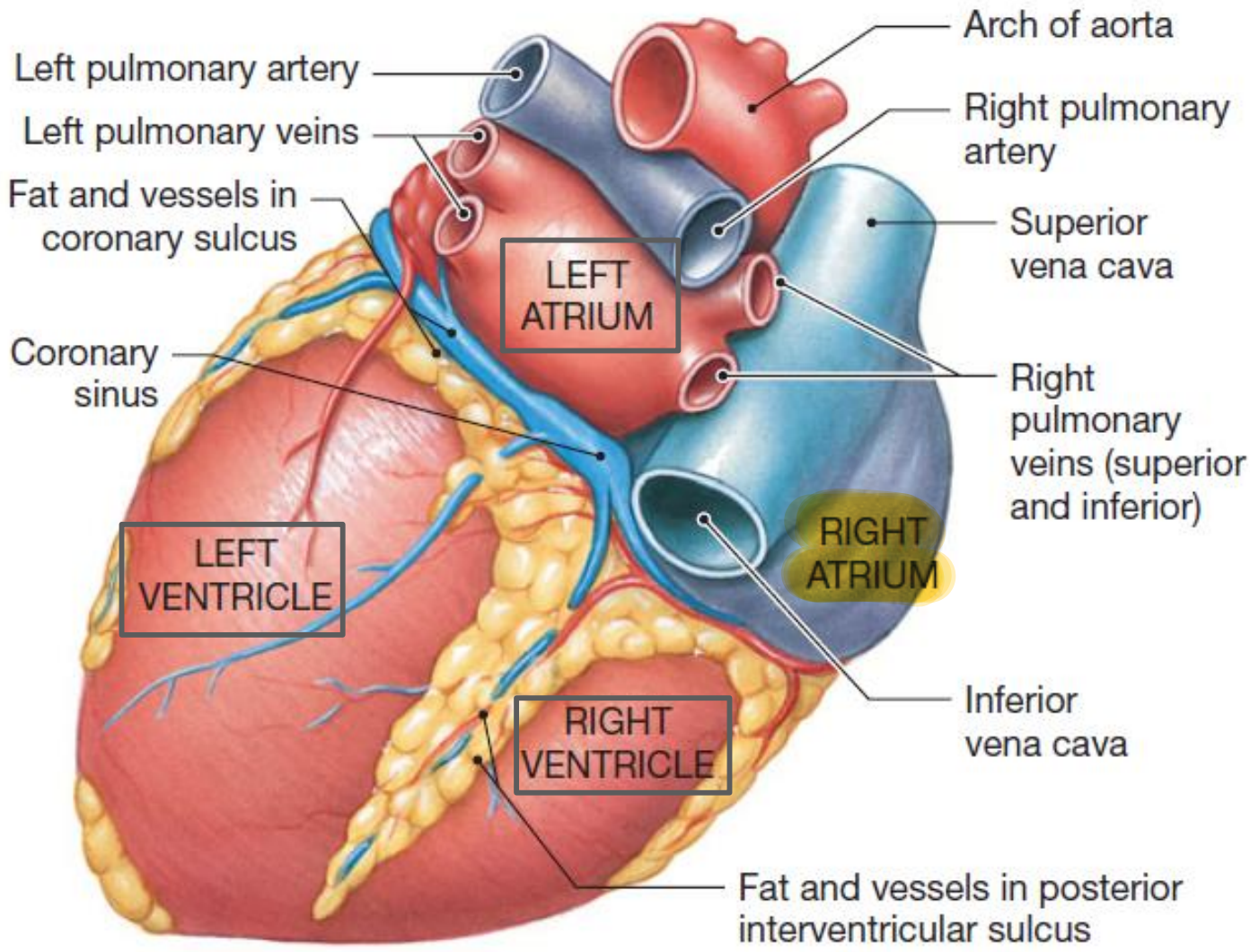
- Related to the esophagus.

Inferior Surface:

(ventricles)

- Formed by:
- Right ventricle
- Left ventricle

Fig.13: The posterior and inferior surfaces of the heart.



- It's the surface upon which the heart rests on the diaphragm.

Apex of the heart

- Formed by the left ventricle.
- Directed downwards, forwards and to the left.
- Located at the left 5th intercostal space 9cm from the midline.
- Can be felt by palpation.

عشان هيك يحكولنا قلبك بالنص بس مايل لليسار أكثر

Apex

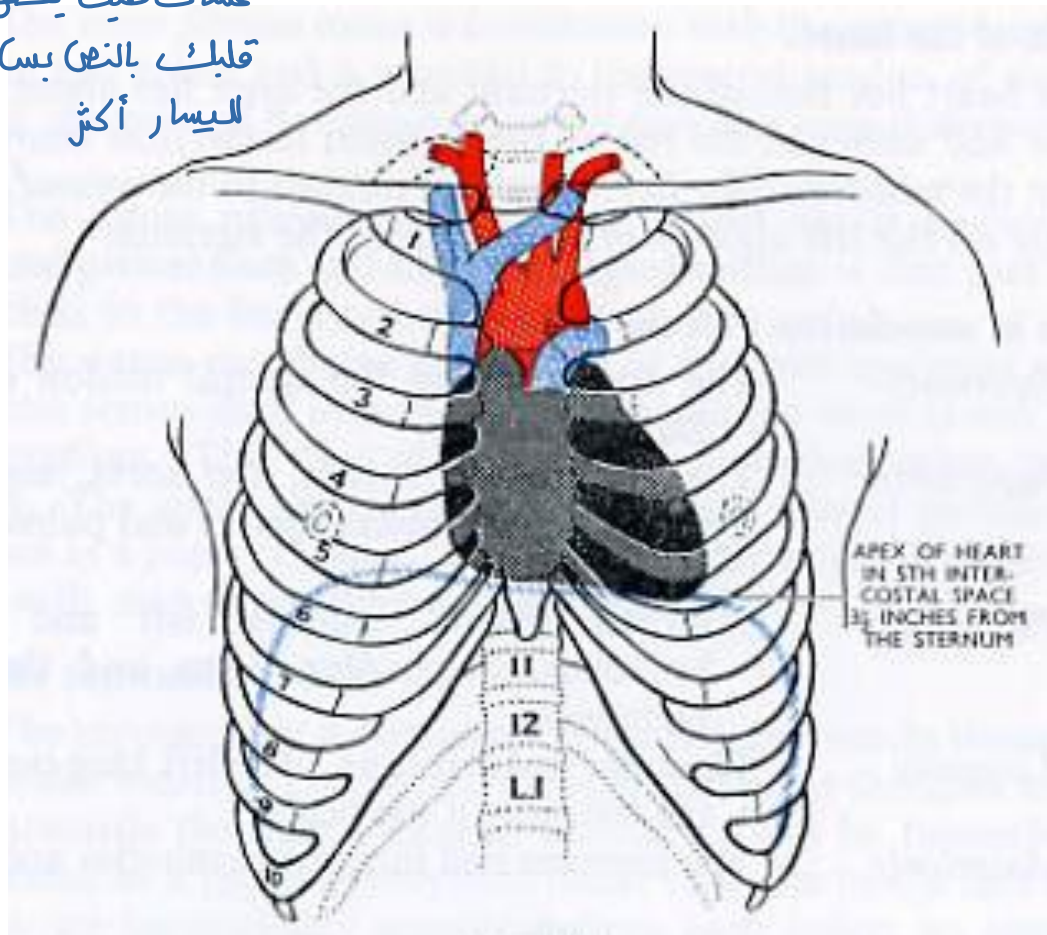
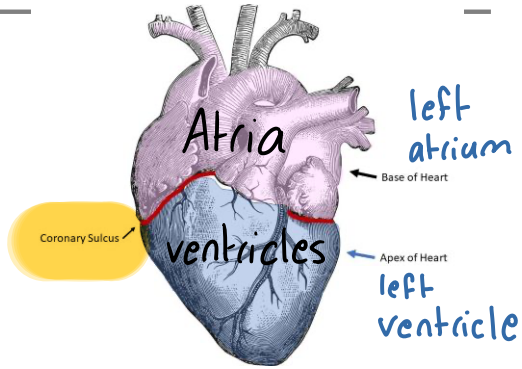


Fig.15: Location of the apex of the heart.

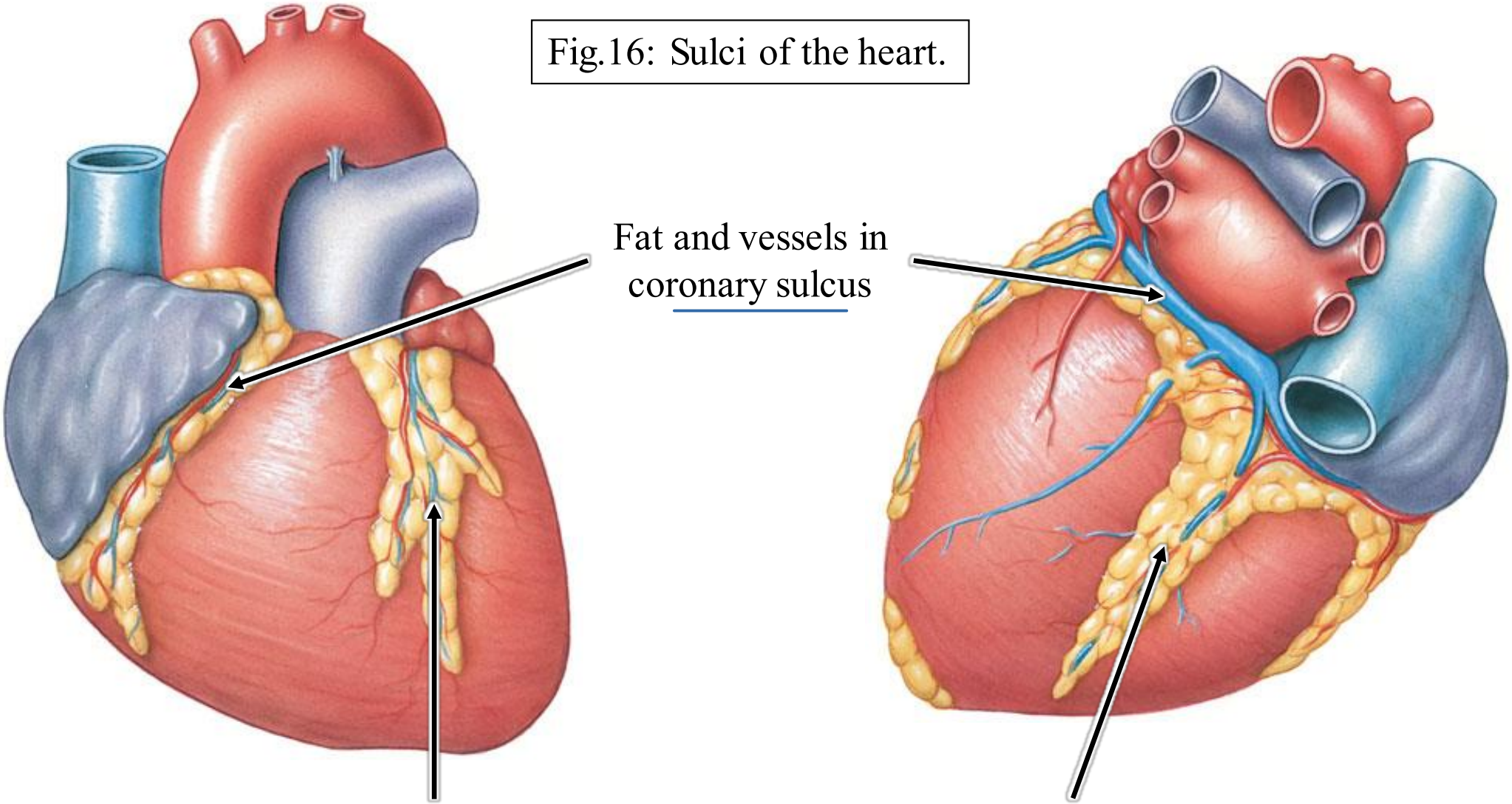
Chambers of the heart



- 2 atria – receiving chambers
  - Auricle: small pouch that increase capacity of atria
- 2 ventricles – pumping chambers
- Sulci – grooves on the surface of the heart that contain the coronary blood vessels.

1. ***Coronary sulcus***: separating the atria from the ventricles.
2. ***Anterior interventricular sulcus***: between the two ventricles anteriorly.
3. ***Posterior interventricular sulcus***: between the two ventricles posteriorly.

Fig.16: Sulci of the heart.



Anterior view

Posterior view

blood flow "حوت لو متذكريين من الفيسو سطليس"

The Right Atrium (RA)

- Receives blood from: (1)Superior vena cava, (2)Inferior vena cava, (3)Coronary sinus.
- Interatrial septum has fossa ovalis (remnant of foramen ovale)
- Blood passes through the right atrioventricular orifice (which's guarded by the tricuspid valve) into right ventricle فتحة

The Right Ventricle (RV)

- Possess trabeculae carneae – raised bundles of cardiac muscle fiber.
- Cusps of the tricuspid valve are connected to chordae tendinae which are connected to papillary muscles (3 in number). نتوءات
- Interventricular septum.
- Blood leaves through pulmonary orifice which's guarded by the pulmonary semilunar valve into pulmonary trunk.

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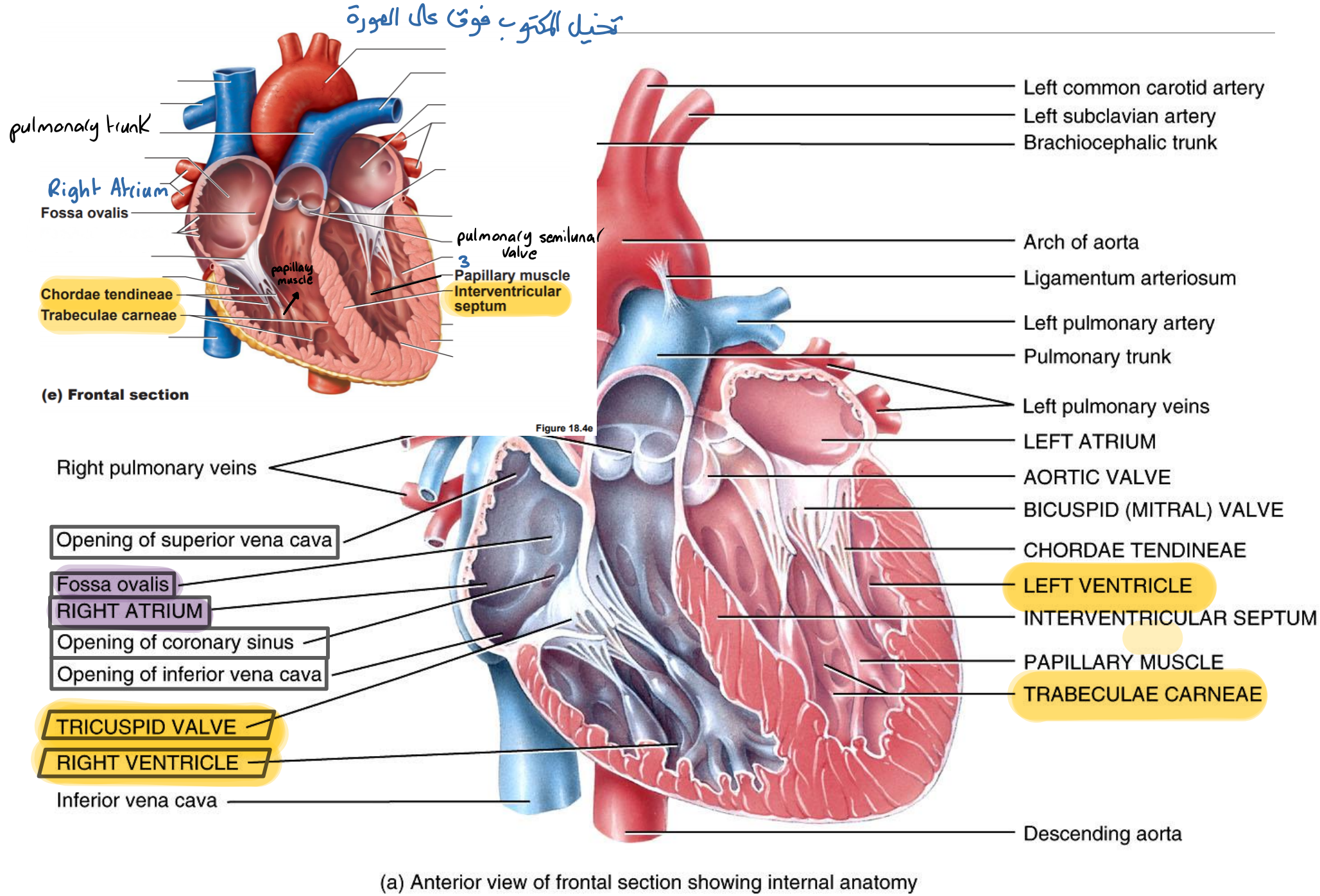


(a) Anterior view of frontal section showing internal anatomy

Fig.17: The left atrium and ventricle of the heart.

The Left Atrium (LA)

- About the same thickness as right atrium.
- Receives blood from the lungs through pulmonary veins.
- Blood Passes through the left atrioventricular orifice into the left ventricle. This orifice is guarded by the bicuspid/ mitral valve.

2

The Left Ventricle (LV)

Fig.18: R and L ventricles wall thickness and cavities.

- Thickest chamber of the heart.
- The cusps of the mitral valve are attached to chordae tendinae which are attached to papillary muscles (2 in number).
- Blood passes through aortic orifice into the aorta. This orifice is guarded by the aortic semilunar valve.
- The interventricular septum is convex on the side of the RV making the cavity of the LV larger.

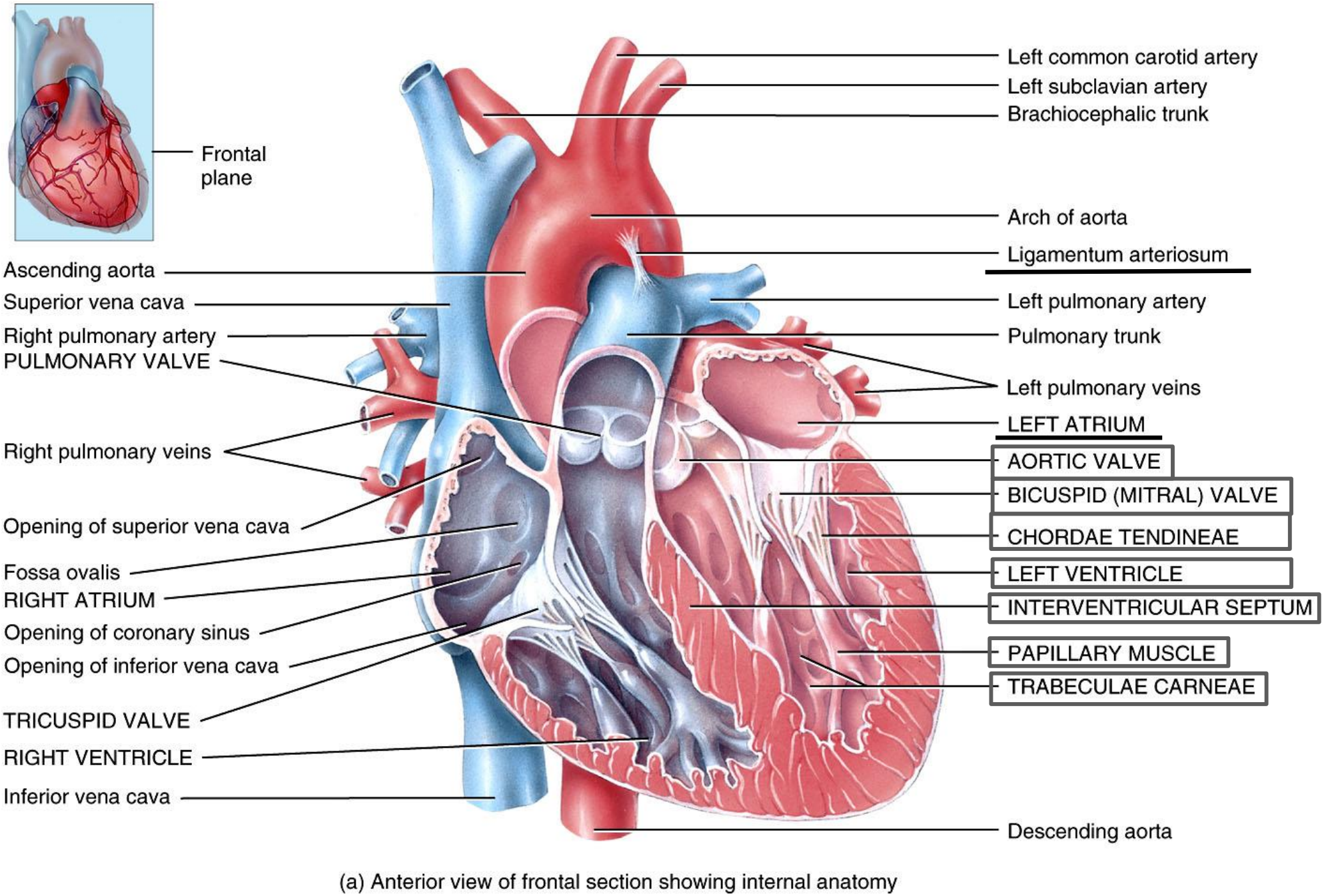
RV

LV

19. Which structure has the thickest wall?

A. the aorta
B. the inter-atrial septum
C. the left ventricle
D. the right ventricle

Answer is C: The LV has the thickest muscle wall.



(a) Anterior view of frontal section showing internal anatomy

Fig.19: The right atrium and ventricle of the heart.

The Fibrous Skeleton of the heart

- Dense collagenous connective tissue that forms (1)base for the valves, (2)point of insertion for cardiac muscles and (3)electrical insulator between atria and ventricles.

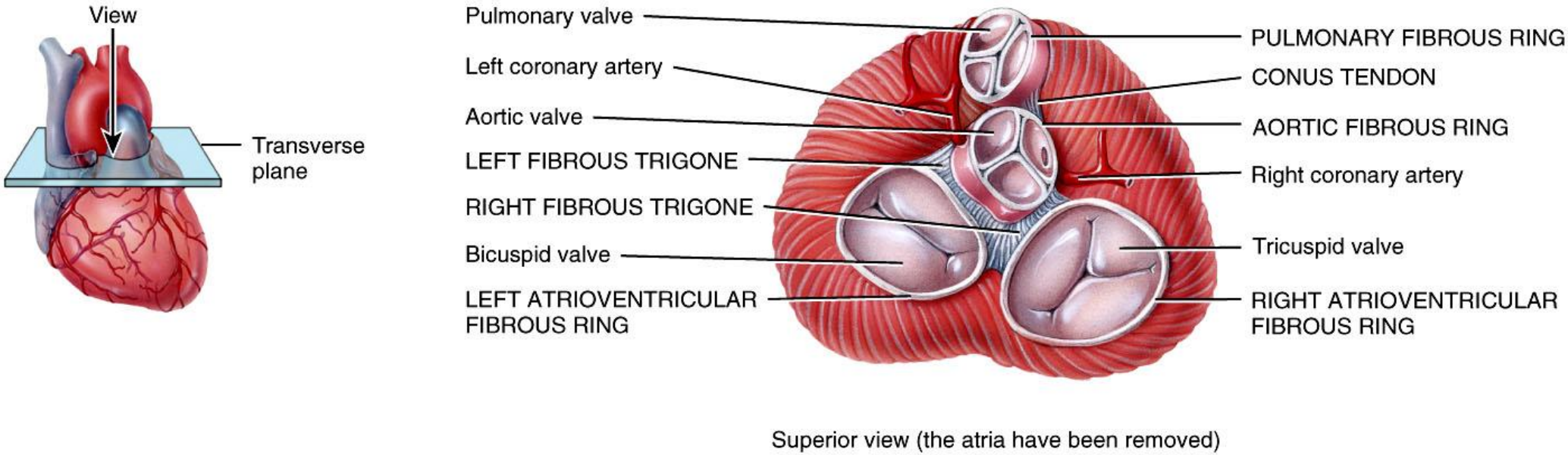


Fig.20: The shape and position of the fibrous skeleton of the heart.

Valves: Atrioventricular Valves

- Tricuspid (3 cusps) and bicuspid (2 cusps)

1. Atria contract/ ventricles relaxed
   - The higher pressure inside the atria pushes the cusps aside opening the valves and the cusps project into the ventricles
   - In the ventricles, papillary muscles are relaxed and chordae tendinae slack ventricles relaxed
2. Atria relax/ ventricles contract
   - Higher pressure in the ventricles drives the cusps towards the atria until edges of the cusps meet and close the valve
   - Papillary muscles contract tightening the chordae tendinae and preventing regurgitation

ارتجاع

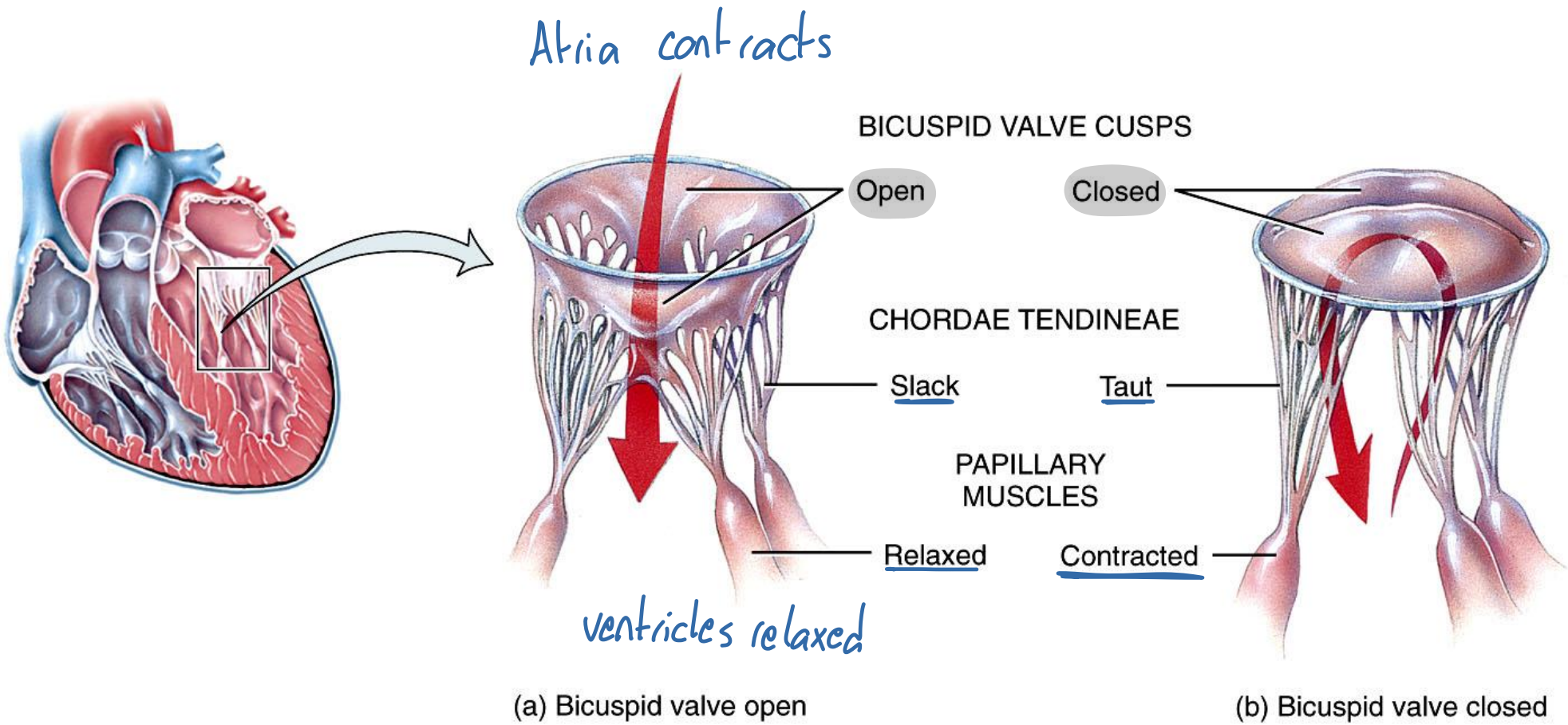
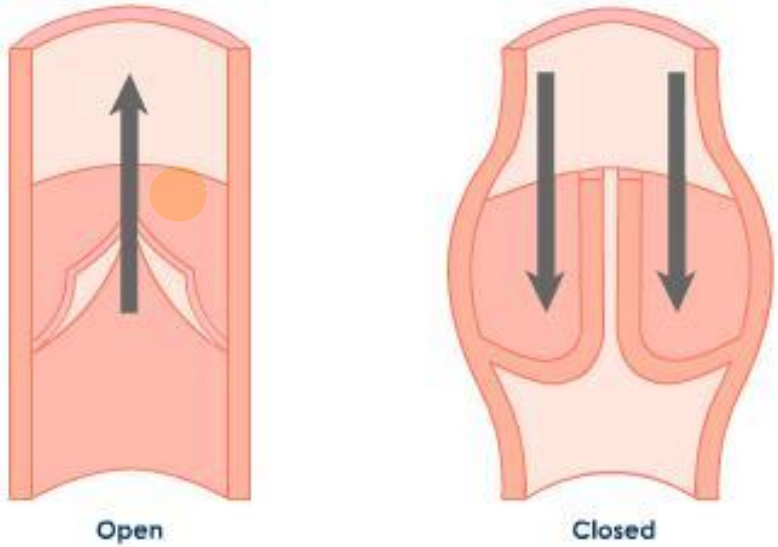


Fig.21: How the atrioventricular valves function.

Valves: Semilunar Valves

- Aortic and pulmonary valves (each has 3 cusps).
- When ventricles contract the pressure in ventricles exceeds pressure in arteries pushing the cusps aside and opening the valve.
- As ventricles relax, some blood flows back towards the ventricles, but blood fills the valve cusps closing them tightly.
- The aortic valve has openings for the coronary arteries into which blood flows when LV relaxes.



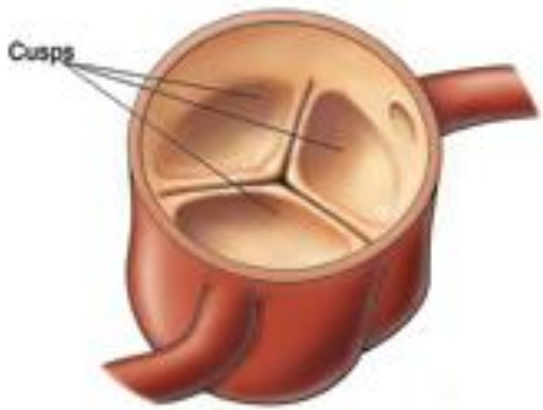


Fig.22: Above, how the semilunar valves function. Below, opening of the coronary arteries.

سؤال

Left ventricle relaxed

aortic valves closed

10. Starting at the APEX of the heart and moving superiorly, what is the correct order in which you would encounter the four anatomical structures below?

A. valves, chordae tendonae, papillary muscle, ventricle
B. ventricle, papillary muscle, chordae tendonae, valves
C. papillary muscle, chordae tendonae, ventricle, valves
D. chordae tendonae, valves, ventricle, papillary muscle

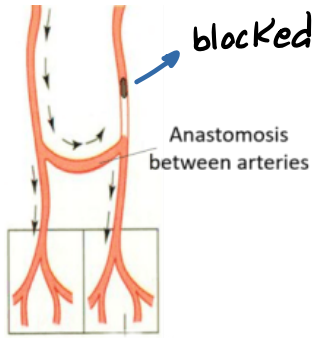
Answer is B: The apex is the pointy end of the heart (the inferior end). So ventricles are first, then papillary muscle to which are attached the chordae tendonae, superior to which are the atrio-ventricular valves.

1. Blood flow through the heart follows which of the sequences listed below?

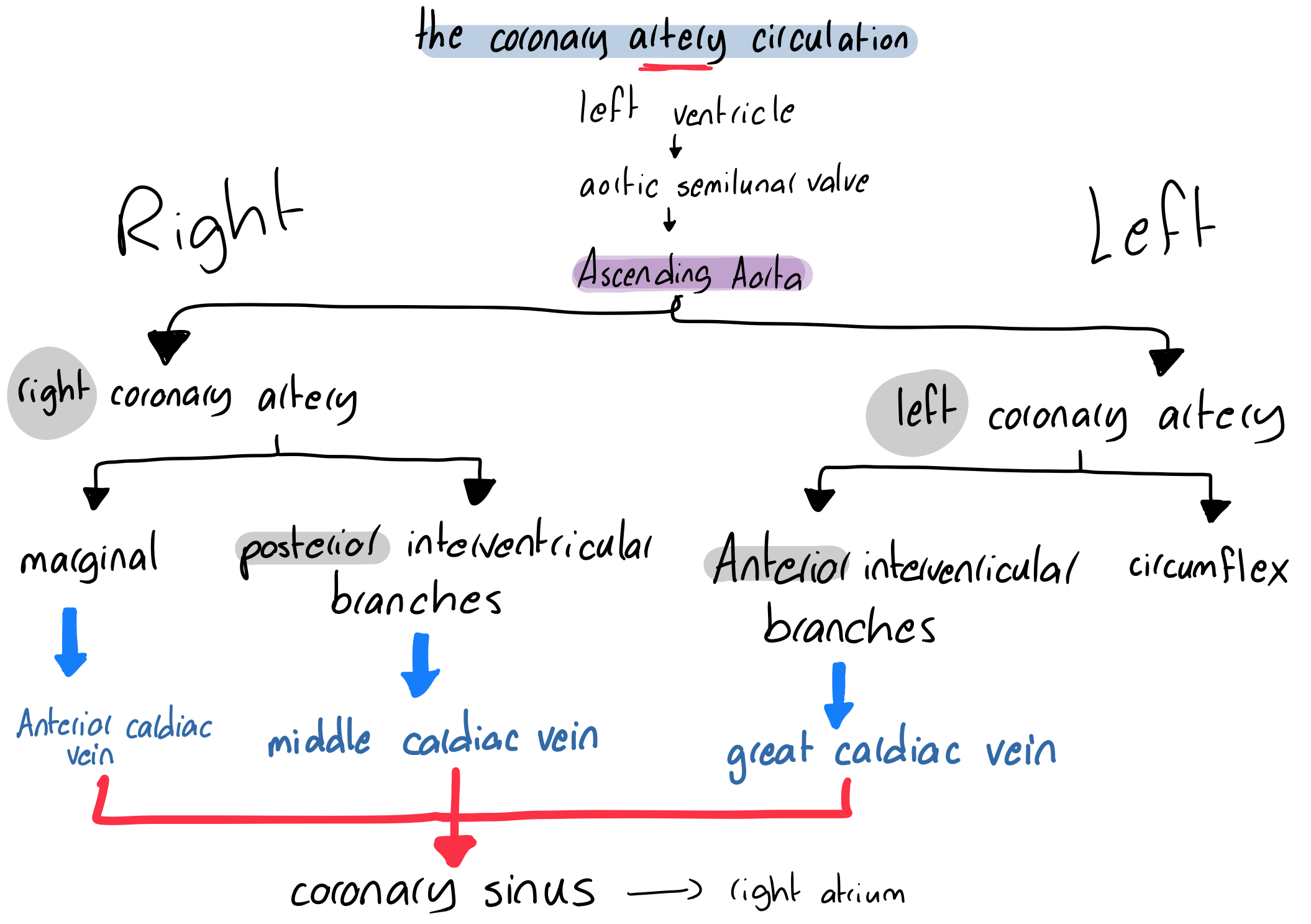
   A. from left atrium, then mitral valve, right ventricle, aorta, left ventricle
   B. from right atrium, then mitral valve, right ventricle, pulmonary trunk, left ventricle.
   C. from pulmonary trunk, then tricuspid valve, left atrium, aortic valve, aorta
   D. from vena cava, then right ventricle, pulmonary trunk, left ventricle, aorta.

   Answer is D: The mitral valve (bicuspid valve) comes after the right ventricle; the tricuspid valve comes before the pulmonary trunk.

The Coronary Circulation

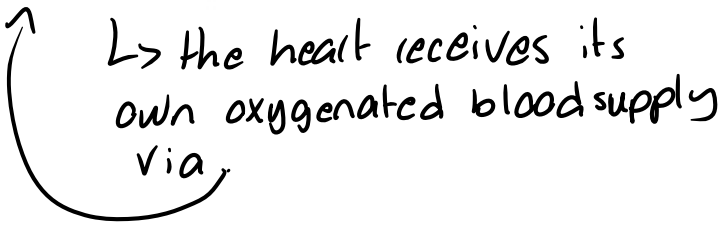


- The heart has its own network of blood vessels.
- Coronary arteries branch from ascending aorta.
  - Anastomoses provide collateral circuits ⟹ معنى الجملة
    - Allows heart muscle to receive sufficient oxygen even if an artery is partially blocked
- **Left Coronary Artery** → Anterior Interventricular and Circumflex branches
- **Right Coronary Artery** → Marginal and Posterior Interventricular branches
- Coronary veins:
  - Include the **Great, Anterior, and Middle cardiac veins**
  - Drain into **Coronary Sinus** (in the coronary sulcus)
    - ↳ between the atria and ventricles


the coronary artery circulation
left ventricle
aortic semilunar valve
Right
Left
Ascending Aorta
right coronary artery
left coronary artery
marginal
posterior interventricular branches
Anterior interventricular branches
circumflex
Anterior cardiac vein
middle cardiac vein
great cardiac vein
coronary sinus → right atrium

20. Which tissue is supplied with blood via the coronary arteries?

A. the lungs
B. the myocardium
C. the corona
D. the aorta



Answer is B: The heart (myocardium) is supplied by the coronary circulation.

31. What is the outermost layer of the heart wall known as?

رکزوا

A. epicardium
B. pericardium
C. parietal membrane
D. endocardium

Answer is A: "Epi-" refers to "on top of". It is the visceral part of the pericardium.

Coronary circulation is characterized by:

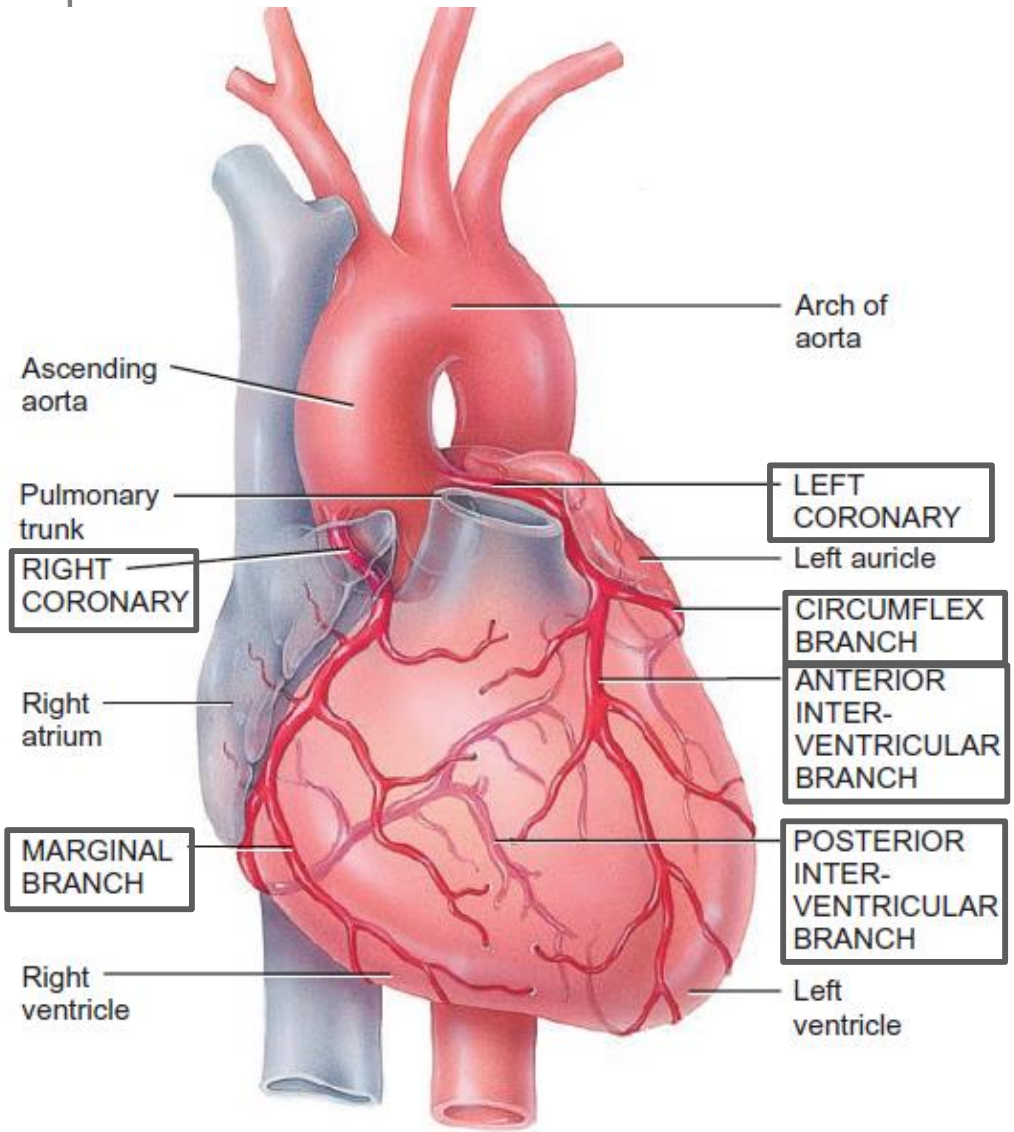
A. Arteries arising from the pulmonary trunk

B. Veins draining directly into the SVC

C. Anastomoses providing collateral circulation

D. Blood flow occurring mainly during systole

E



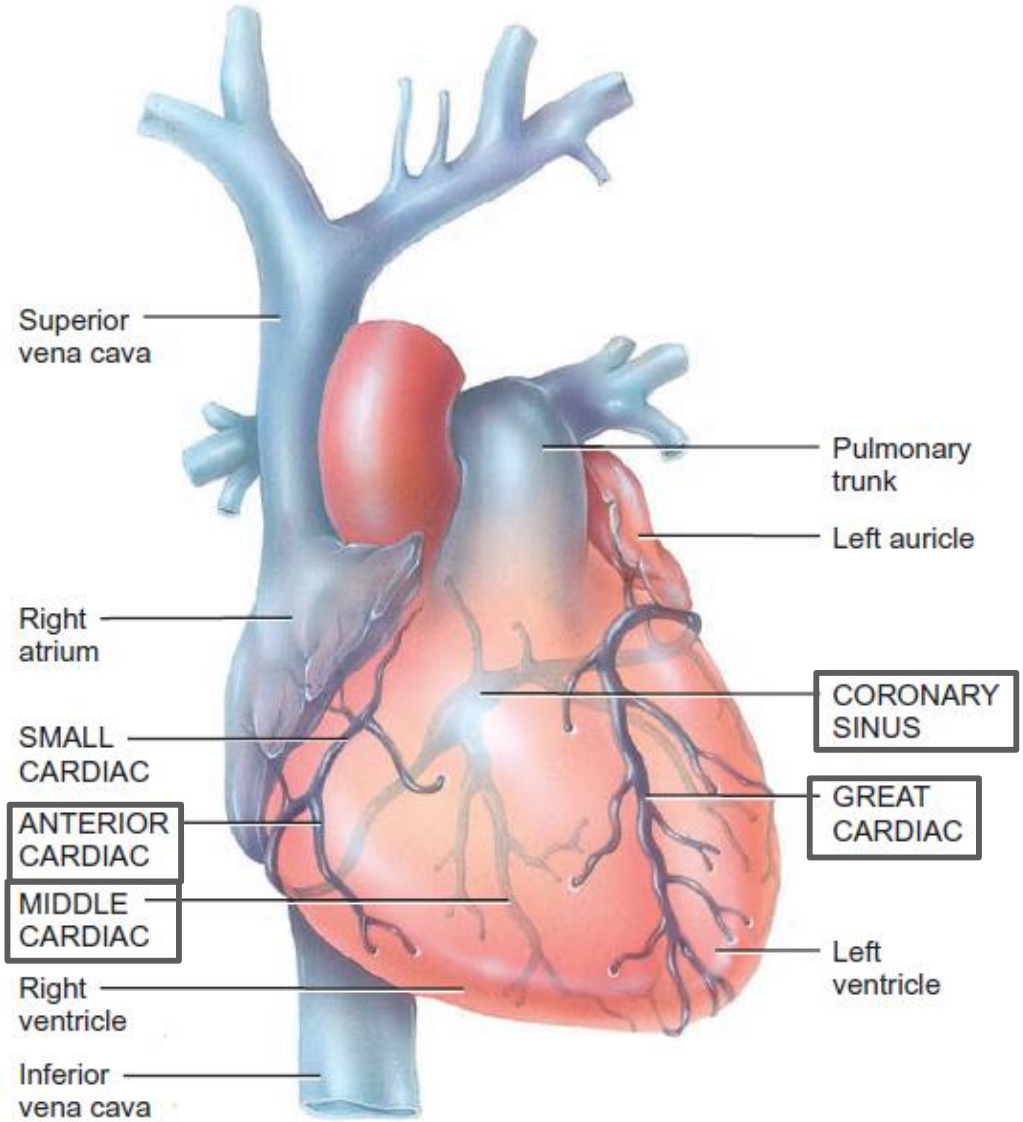


Fig.24: The coronary circulation.

21. What is the innermost layer of the heart wall known as?

A. epicardium
B. pericardium
C. visceral pericardium
D. endocardium

Answer is D: “endo-” means on the inside. Epicardium is also known as the visceral pericardium, is on the outside of the heart.

The Blood Vessels

- Tube-like structures through which blood is carried

- 5 main types:
  - **Arteries** – carry blood AWAY from the heart
  - **Arterioles**
  - **Capillaries** – site of exchange
  - **Venules**
  - **Veins** – carry blood TOWARDS the heart and they possess valves

→ all veins carry oxygenated blood

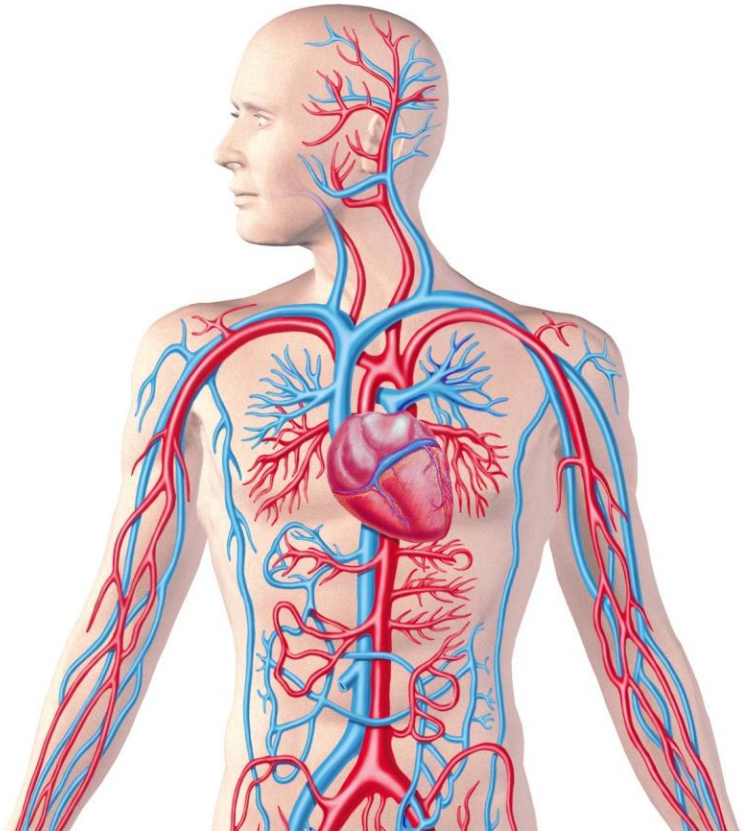
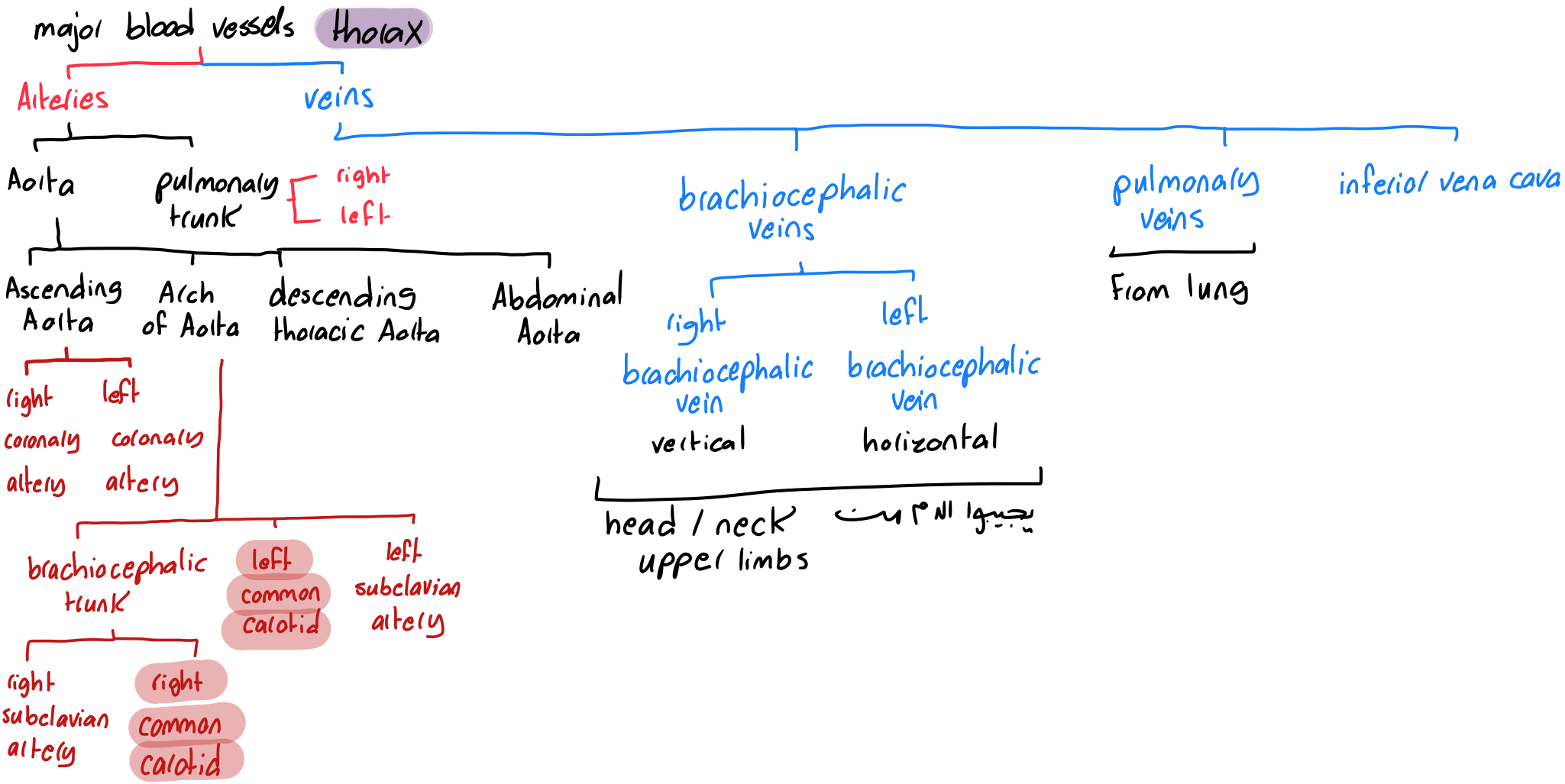


Fig.25: The blood vessels.


major blood vessels
thorax
Arteries
veins
Aorta
pulmonary trunk
right
left
Ascending Aorta
Arch of Aorta
descending thoracic Aorta
Abdominal Aorta
right coronary artery
left coronary artery
brachiocephalic trunk
left common carotid
left subclavian artery
right subclavian artery
right common carotid
brachiocephalic veins
right brachiocephalic vein
vertical
left brachiocephalic vein
horizontal
head / neck
upper limbs
يجيبوا الدم من
pulmonary veins
From lung
inferior vena cava

Major Blood Vessels of the Thorax

The Major Arteries

- the aorta
- the pulmonary trunk

The Aorta

- ❖ Is the largest artery in the body
- ❖ Arises from the LV

- ❖ Divided into 4 parts:

1. Ascending aorta
2. Arch of aorta
3. Descending Thoracic aorta
4. Abdominal aorta

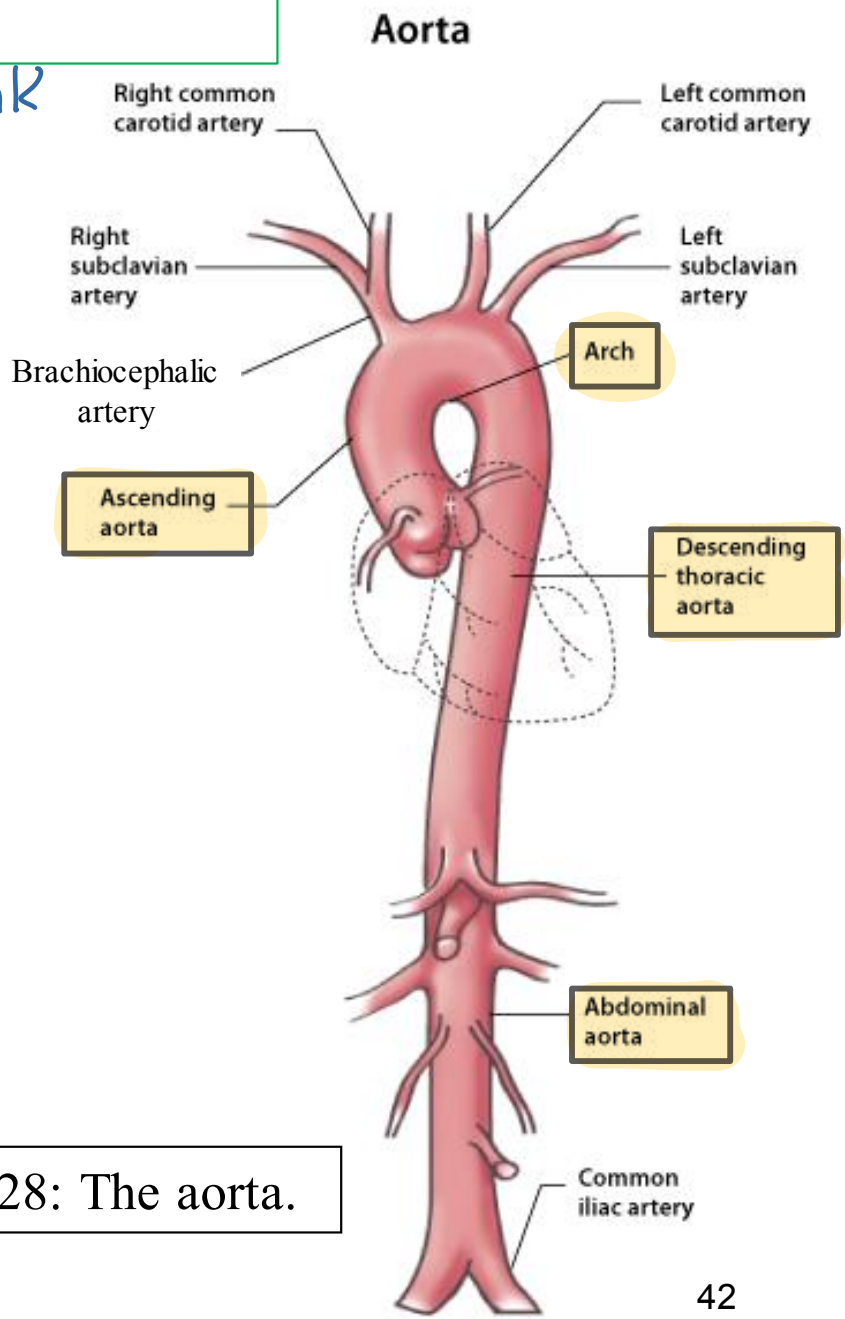


Fig.28: The aorta.

Where does gas and nutrient exchange primarily occur in the vascular system?

- ○ Veins
- ○ Arteries
- ○ Capillaries
- ○ Arterioles

Important Branches (In the Thorax):

✓ Ascending Aorta: (coronary alteries)

1. Right Coronary artery
2. Left Coronary artery

○ Arch of aorta:

1. Brachiocephalic trunk
   a. Right Subclavian artery
   b. Right Common Carotid artery
2. Left Common Carotid Artery
3. Left Subclavian Artery

○ Descending Thoracic Aorta:

Gives various branches to nearby structures

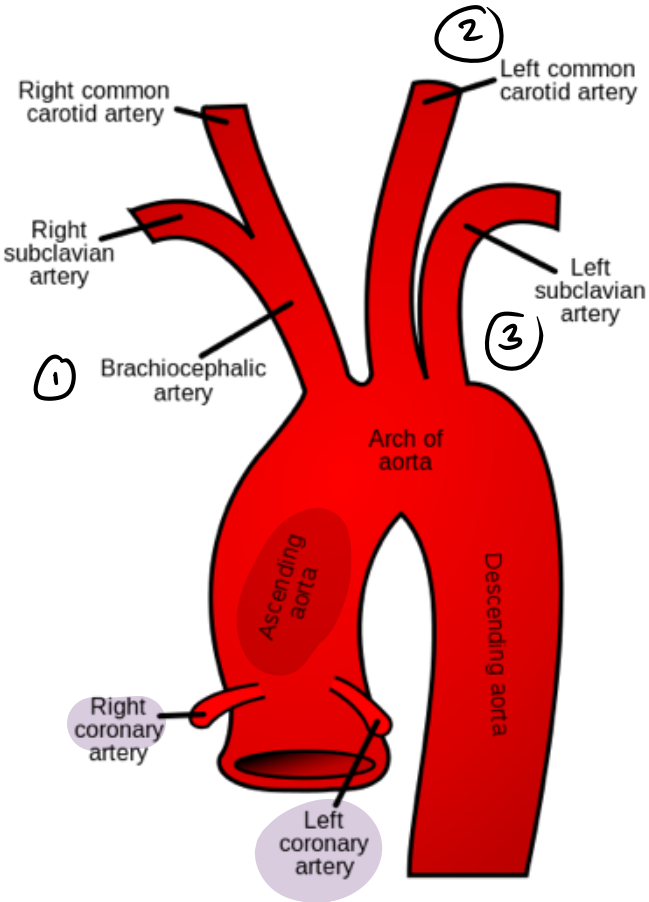
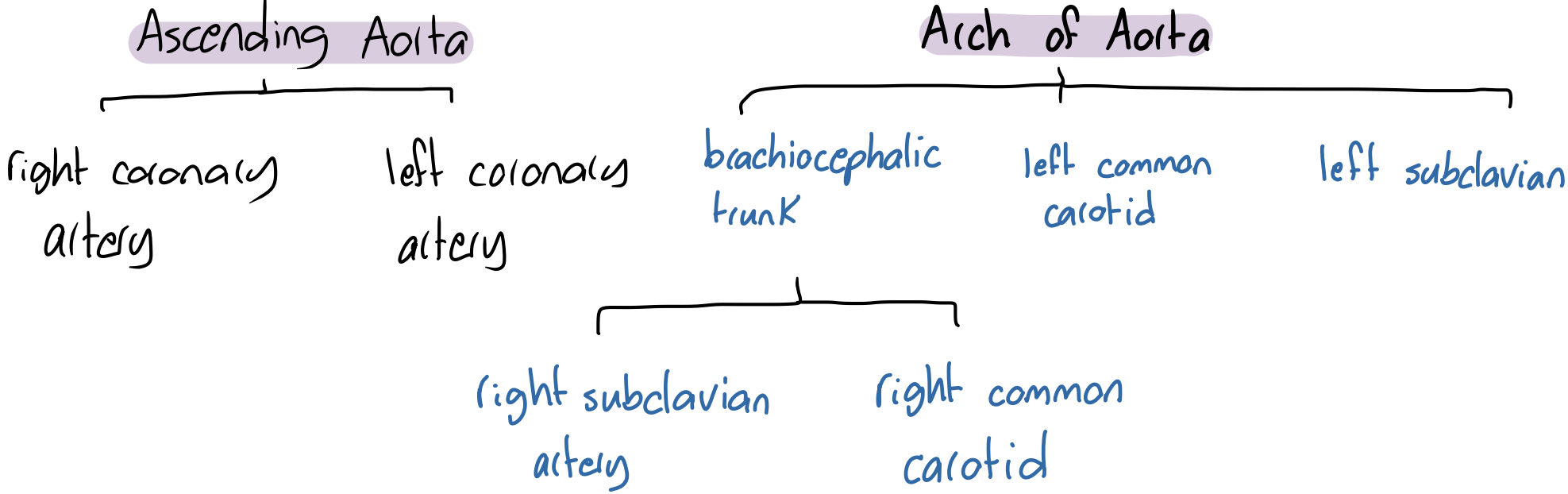


Fig.29: The ascending and the arch of aorta.


Ascending Aorta
right coronary artery
left coronary artery
Arch of Aorta
brachiocephalic trunk
left common carotid
left subclavian
right subclavian artery
right common carotid

Away of the heart

The Pulmonary Trunk (Artery)

- Is the only artery in the body which carries ***deoxygenated blood.***
- Arises from the RV.
- Divides into the Right and Left Pulmonary arteries which pass into the corresponding lung.
- The pulmonary trunk is connected to the arch of aorta by the *ligamentum arteriosum*.
  - This is the remnant of the ductus arteriosus which shunted blood from the pulmonary trunk to the aorta during fetal life thus bypassing the lung. During fetal life, the fetus does not need his lungs because it already receives oxygenated blood from the mother.

حول

يتجاوز ←

The ligamentum arteriosum is a remnant of the:

A. Foramen ovale

B. Ductus venosus

C. Ductus arteriosus

D. Umbilical vein

E. None of the above

C

The Brachiocephalic veins:

The right brachiocephalic vein is vertical, whereas the left is more horizontal. They drain blood from the head, neck and upper limbs. They unite to form the Superior Vena Cava (SVC) which opens into the RA.

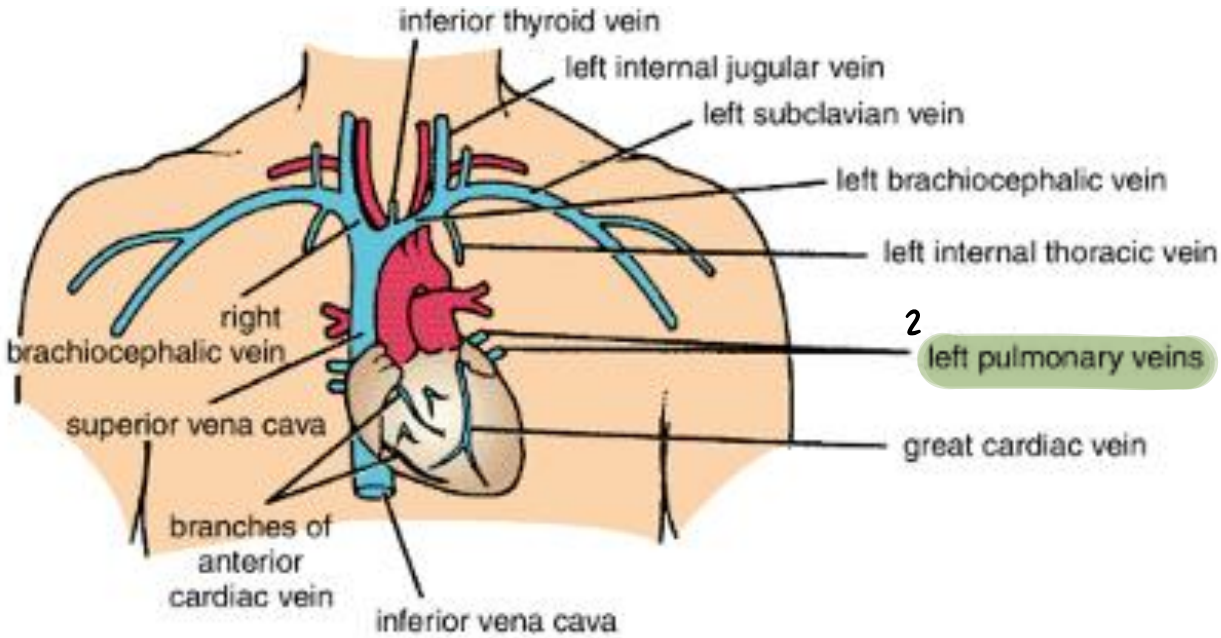


Fig.32: The major veins of the thorax..

The Pulmonary Veins:

These are 4 veins (2 from each lung) that carry ***oxygenated blood*** from the lung to the LA of the heart. Only veins that carry oxygenated blood.

The only

The Inferior Vena Cava (IVC):

This is formed in the abdomen and its terminal part enters the thorax (through the diaphragm) to open into the RA.

Q

All veins carry deoxygenated blood and all arteries carry oxygenated blood :

True

False

except لو مافي False

(فيها العكس) the pulmonary circulation

true

major blood vessels head / neck

Arteries

the carotid artery

مرافقين internal jugular vein
vagus nerve

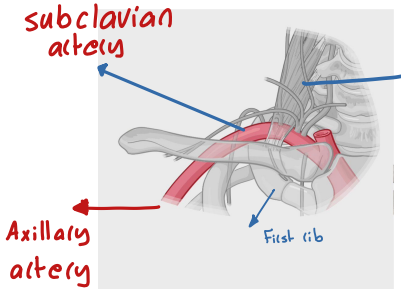
وصل لعند upper border of thyroid cartilage

- external carotid artery
- internal carotid artery

carotid pulse can be felt here

the subclavian artery

Arch laterally



Veins

blood drains

from brain

sinuses

internal jugular vein (inside skull)

pass through jugular foramen

وهي نازل IJV جنب internal carotid common carotid arteries

from neck

- internal jugular vein
- external jugular vein

اتحدوا

subclavian vein

brachiocephalic vein

39. Which of the following definitions best describes veins?

A. a vessel that carries blood towards the heart.
B. a vessel that carries oxygenated blood.
C. vessels that carry blood away from the heart.
D. vessels whose walls are composed of three tunics.

Answer is A: Veins carry blood towards the heart.

Which vessel carries deoxygenated blood?

A. Pulmonary veins

B. Pulmonary trunk

C. Aorta

D. Coronary arteries

E. Two of the above

B

Major Blood Vessels of the Head and Neck

The Major Arteries

The Carotid Arteries

- Responsible for supplying blood to structures in the head and neck.
- They ascend superiorly in the neck where they are closely related to the internal jugular vein and the vagus nerve.
- About the level of the upper border of the thyroid cartilage, each artery divides into the ***external and internal carotid arteries.*** (this is where the carotid pulse can be felt).

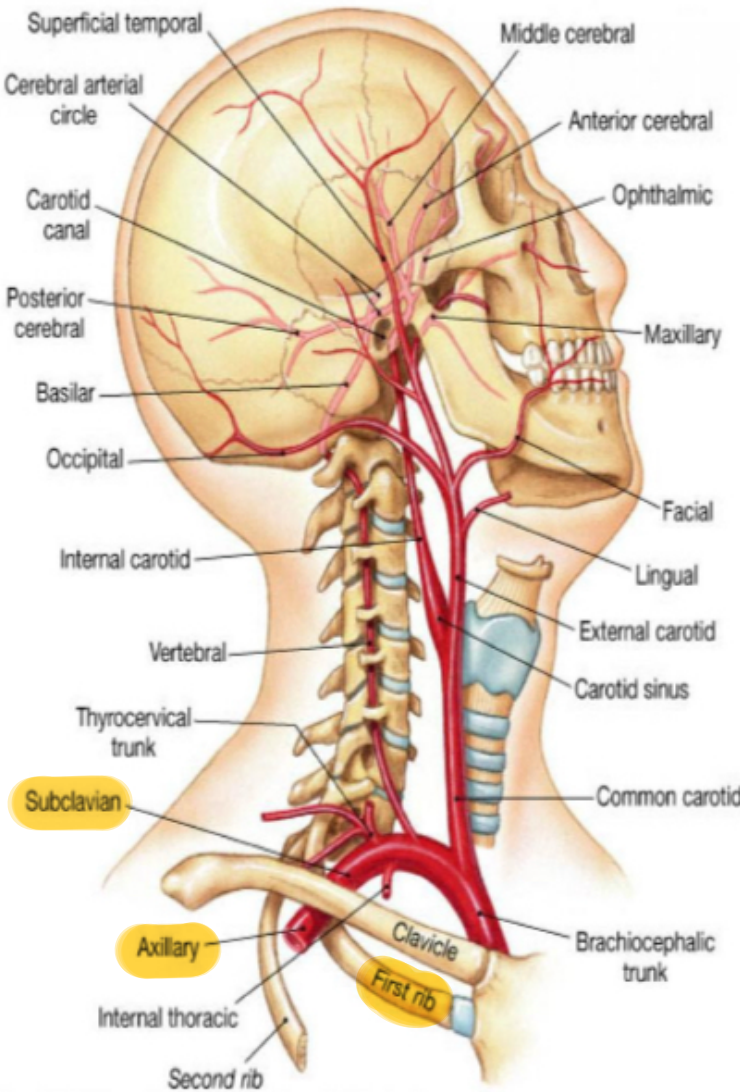


Fig.33: The carotid arteries.

The Subclavian Arteries

- The right and left subclavian arteries arch laterally from their origins.
- At the outer border of the first rib they become the axillary artery.
- The scalenus anterior muscle is related to this artery.
- They give off several branches that supply various structure in the head, the neck, and even the chest

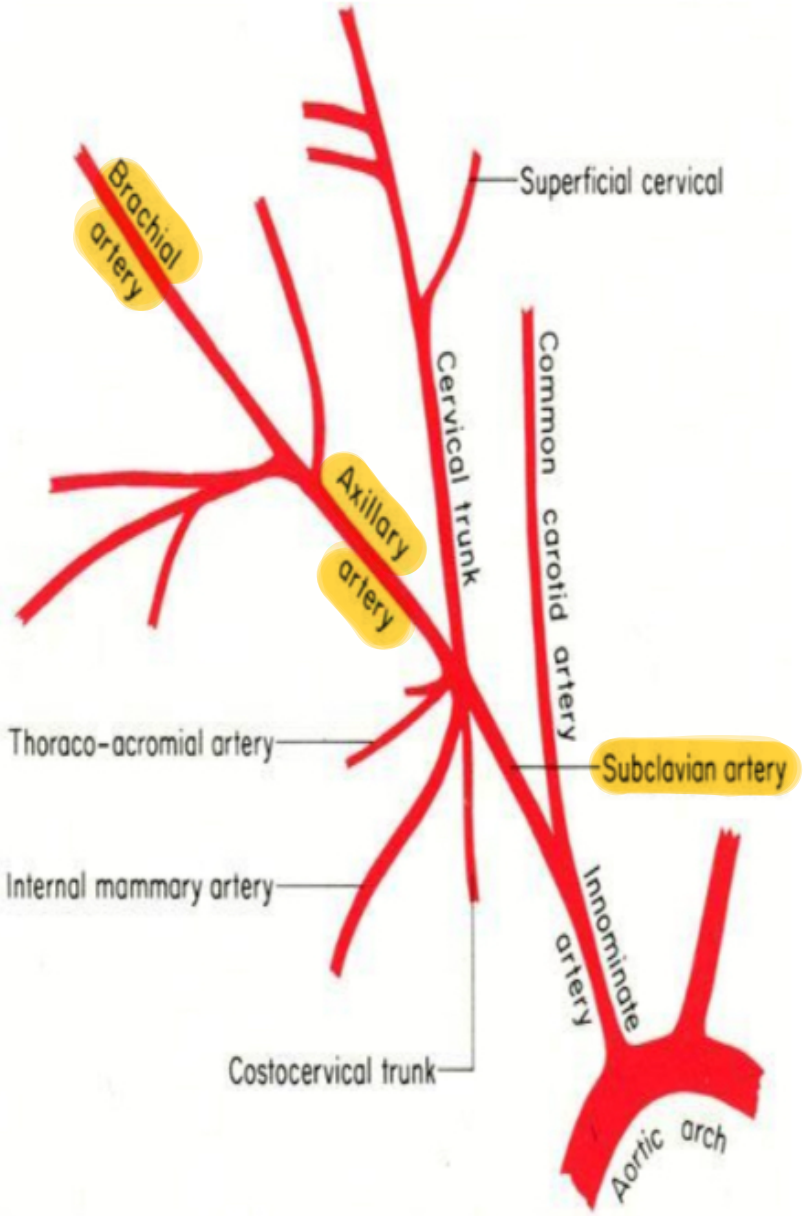
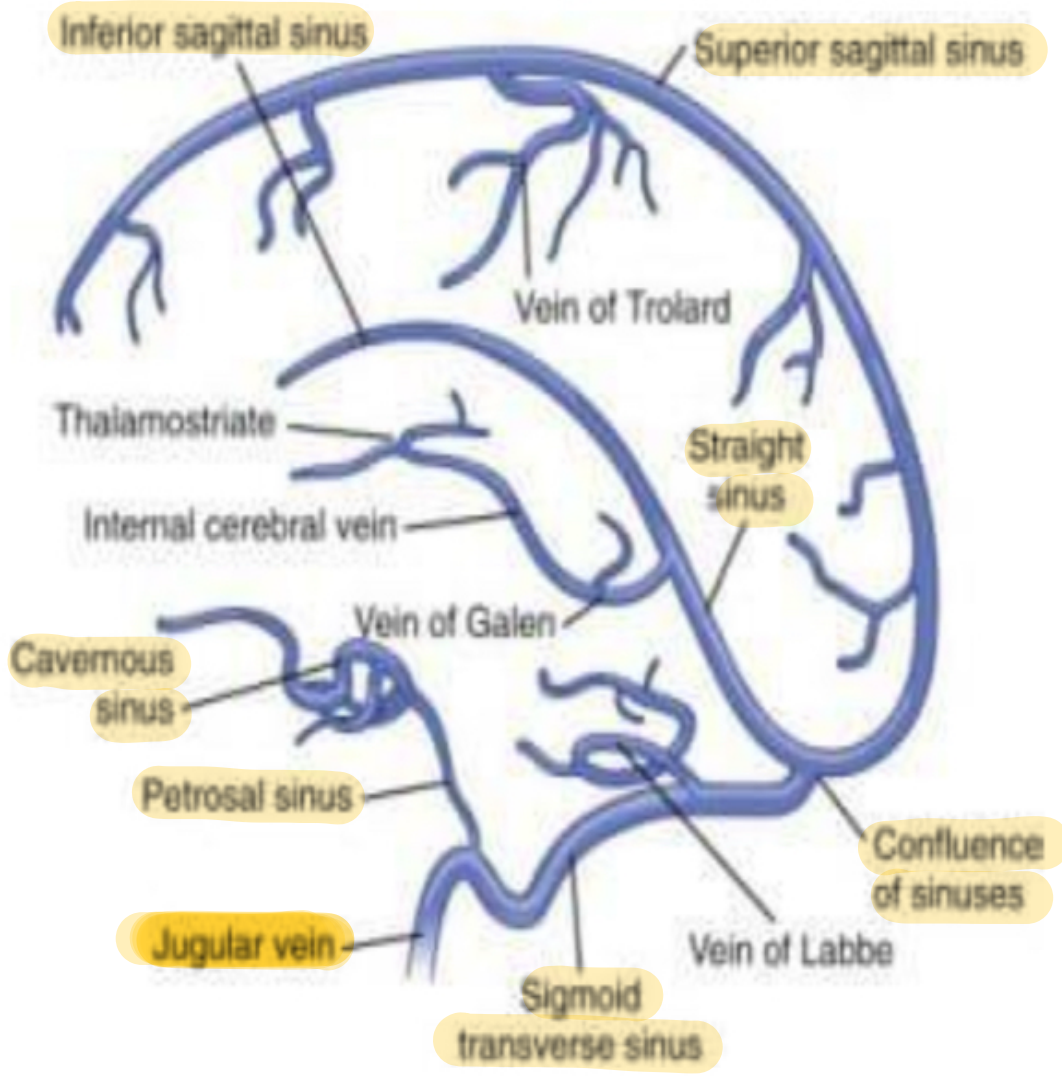


Fig.35: The subclavian arteries.

The Major Veins

- All blood from the brain (and related structures) drains into ***sinuses*** (enlarged veins). These sinuses eventually drain into the **internal jugular vein** (IJV).
- The IJV is formed inside the skull, leaves the skull by passing through the jugular foramen and descends through the neck in close relation to the internal carotid and common carotid arteries.

Fig.36: Venous sinuses of the brain.



- Blood from the neck drain into IJV and the **external jugular vein**.

- The external jugular will drain into the subclavian vein. This vein will unite with the IJV to form the brachiocephalic vein.

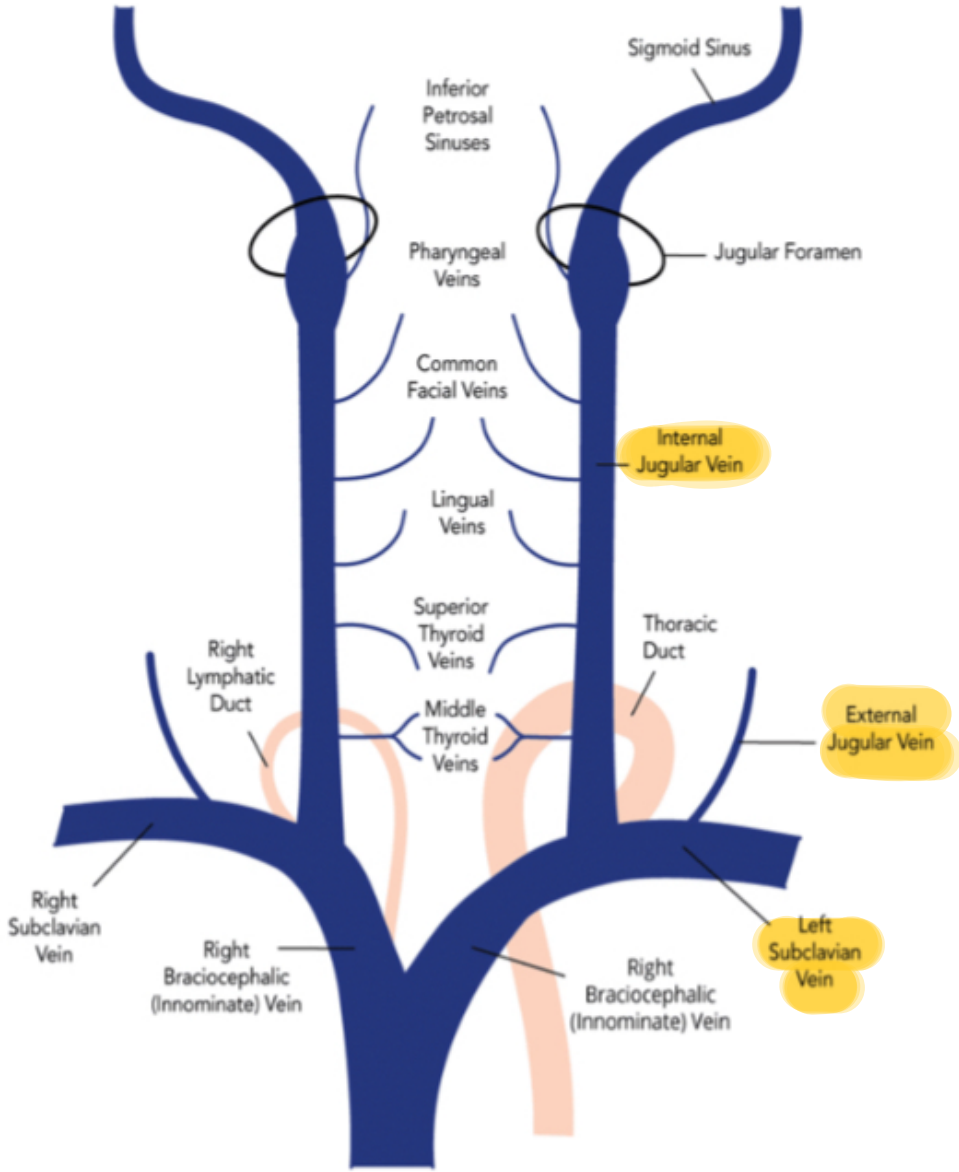
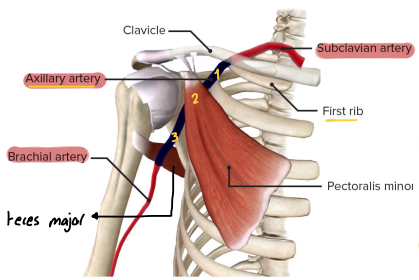


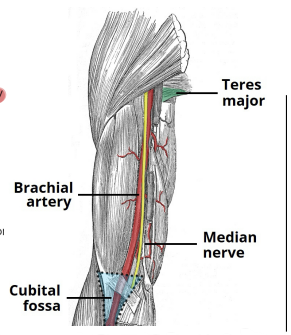
Fig.37: Internal Jugular Vein Branches.

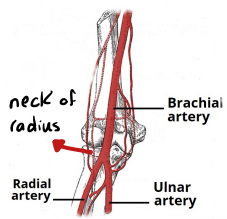
major blood vessels upper limb

major Arteries

- Axillary
- brachial
- Radial and ulnar







major veins

- deep veins
- superficial vein

start as a network

- cephalic vein — lateral
- basilic vein — medial

connected at the elbow by

median cubital vein

يكمل باسم

- cephalic vein
- basilic vein + يتحد مع brachial vein

Axillary vein

subclavian vein

Major Blood Vessels of the Upper Limb

The Major Arteries

The Axillary Artery

- It's the direct continuation of the subclavian artery when it passes the lateral border of the first rib.
- The pectoralis minor muscle divides the artery into 3 part.
- Its several branches supply surrounding structures.
- At the lower border of the teres major muscle, it becomes the brachial artery.

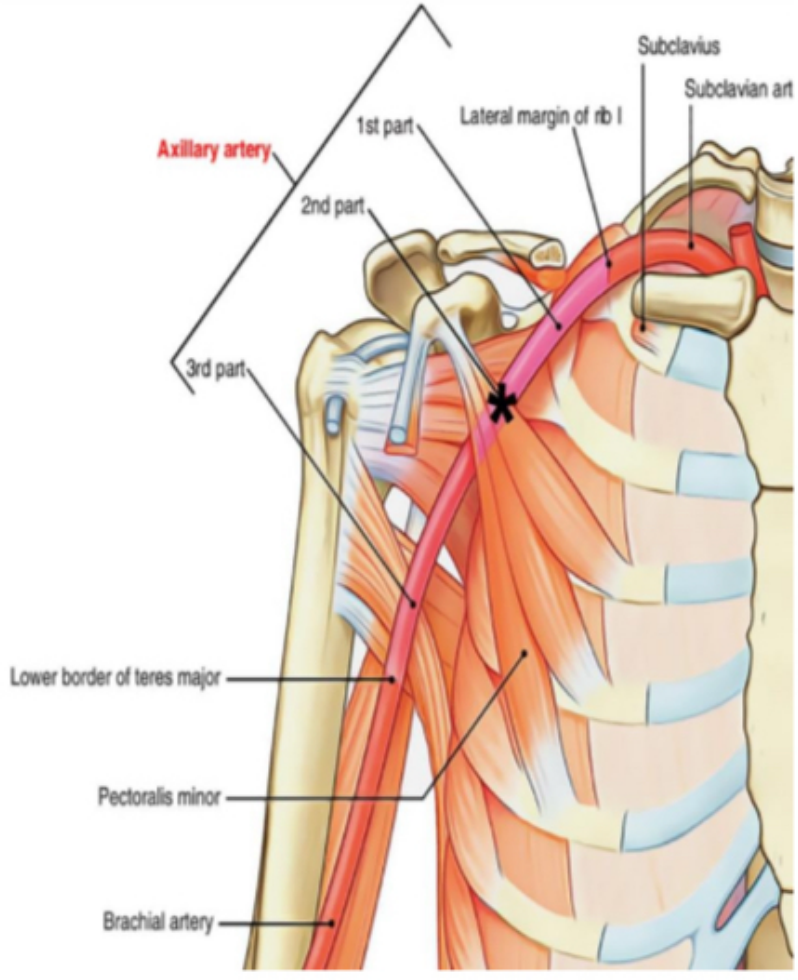


Fig.38: The axillary artery.

The Brachial Artery

- The direct continuation of the axillary artery when it passes the lower border of the teres major muscle. Its branches supply surrounding structures.
- It terminates at the neck of the radius by dividing into the radial and ulnar arteries.
- In the cubital fossa, the brachial artery passes medial to the tendon of the biceps muscle where it's superficial. This is the site for taking the brachial pulse and measuring the blood pressure.

brachial artery

cubital fossa

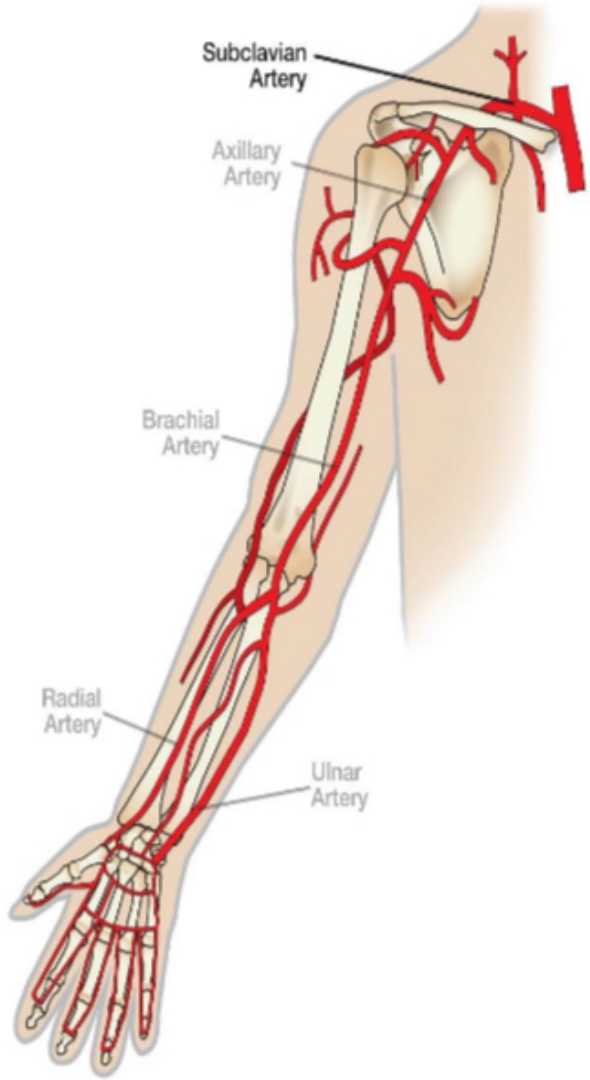


Fig.39: The brachial artery in the cubital fossa.

The Radial and Ulnar Arteries

- The radial artery passes down on the lateral aspect of the forearm. The ulnar passes on the medial side. The radial and ulnar arteries supply structures in the forearm.
- They enter the palm where they form the superficial and deep palmar arches. The two palmar arches supply structures in the hand and fingers.
- The radial artery is superficial as it passes over the wrist. It's here that the radial pulse can be felt.

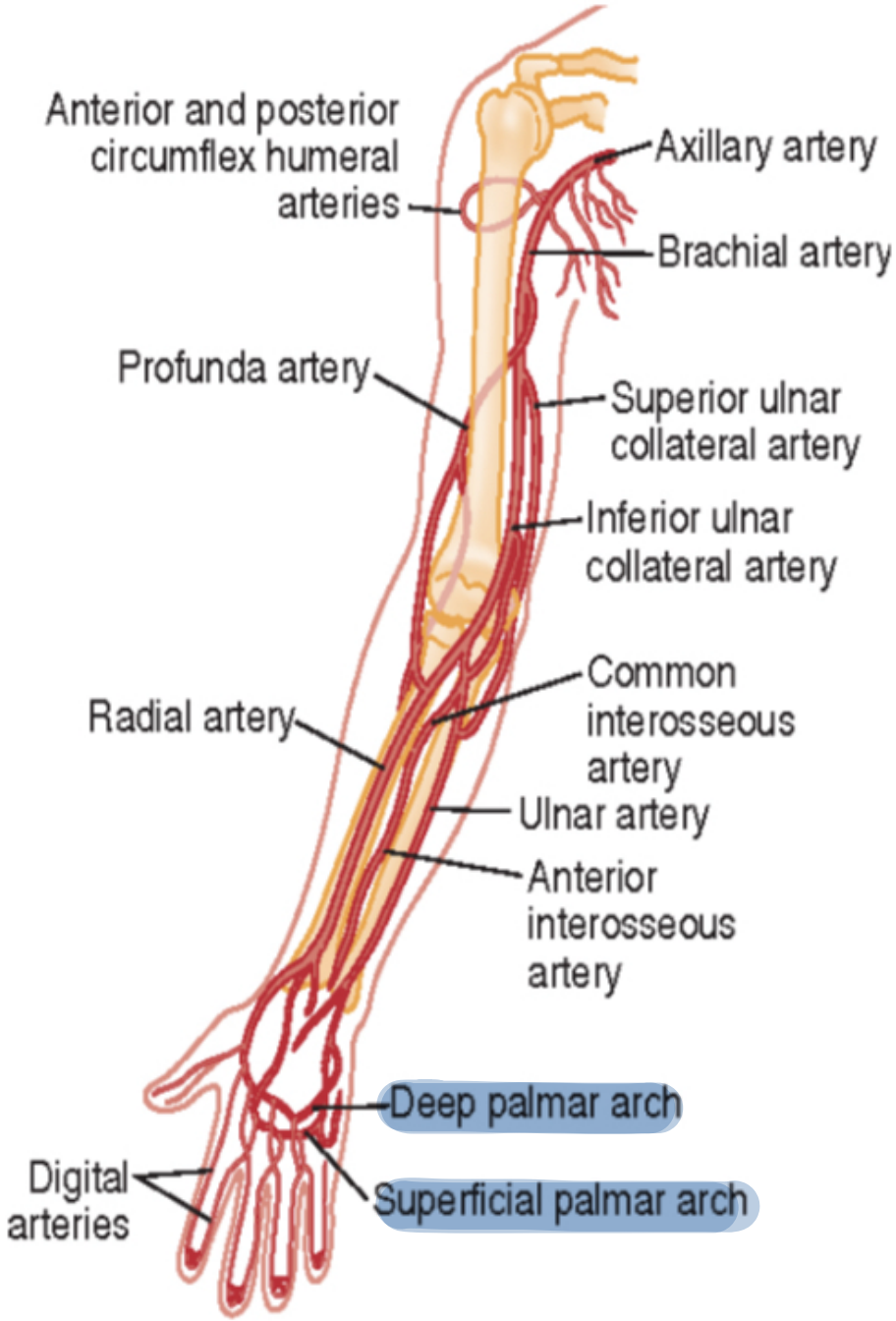
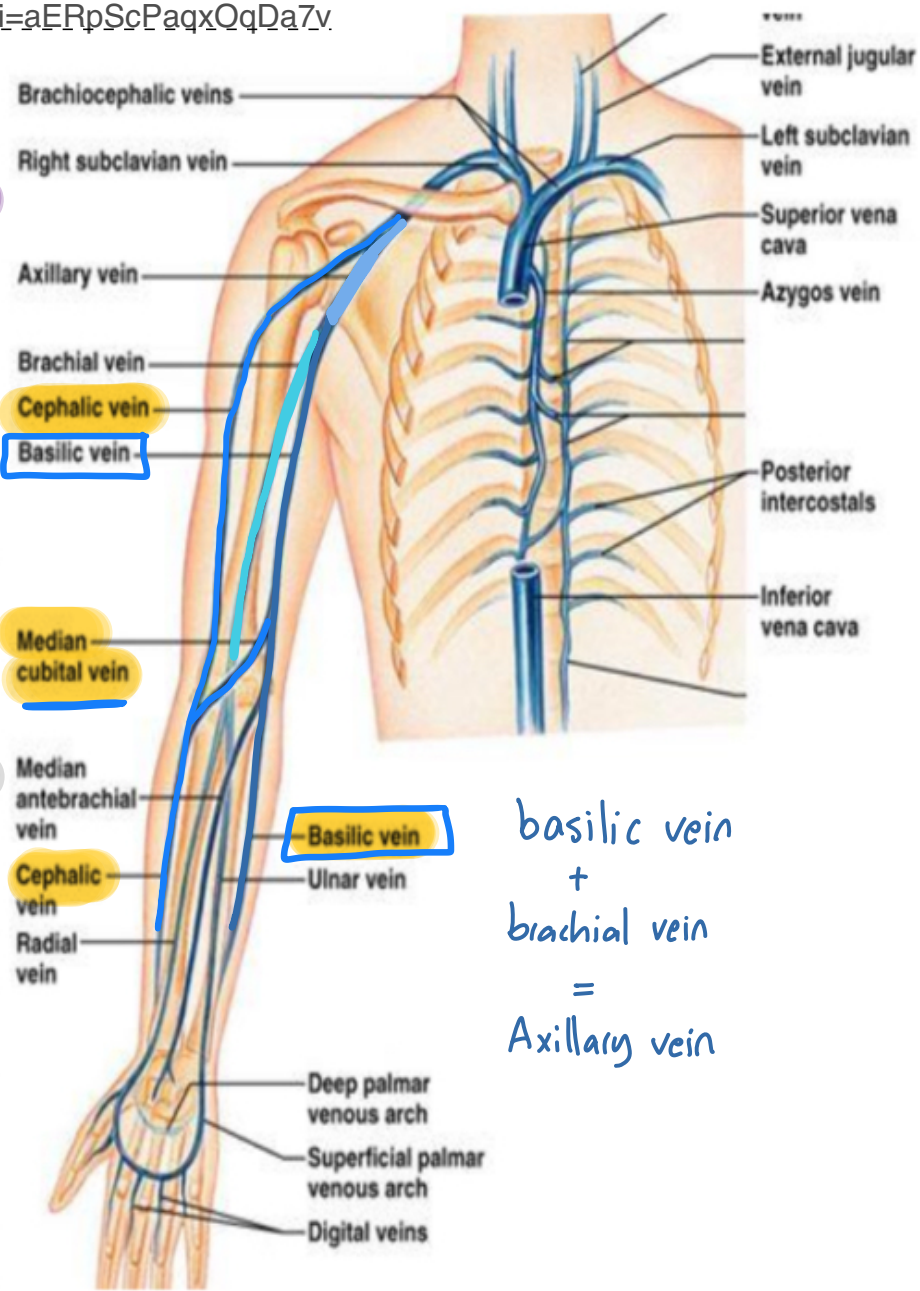


Fig.40: Arteries of the upper limb.

The Major Veins

https://youtu.be/N3ClyTJCo6U?si=aERpScPaqxOqDa7v

- In the upper limb, we have superficial and deep veins. The **superficial veins** run just under the skin. They start as a network on the dorsum of the hand. From this network the **cephalic and basilic** veins arise. These two superficial veins are connected at the elbow by the **median cubital vein**. Superficial veins are used to take blood samples.
- The basilic vein unites with the median cubital vein and continue as basilic vein in the arm. The basilic vein in the arm unites with the brachial vein to form the axillary vein (a large deep vein accompanying the axillary artery). This will join with the cephalic vein. Upon passing the outer border of the first rib, the axillary vein becomes the subclavian vein.



basilic vein + brachial vein = Axillary vein

Fig.41: Veins of the upper limb.

Major Blood Vessels of the Abdomen

The Major Arteries

The Abdominal Aorta → 2 common iliac arteries

- The abdominal aorta is the continuation of the descending thoracic aorta. It **begins** where the aorta passes through the diaphragm to enter the abdominal cavity opposite **T12** vertebra.
- The abdominal aorta is closely related to the vertebral column and the IVC.

inferior vena cava

- It **terminates** opposite **L4** by dividing into the two Common Iliac Arteries.

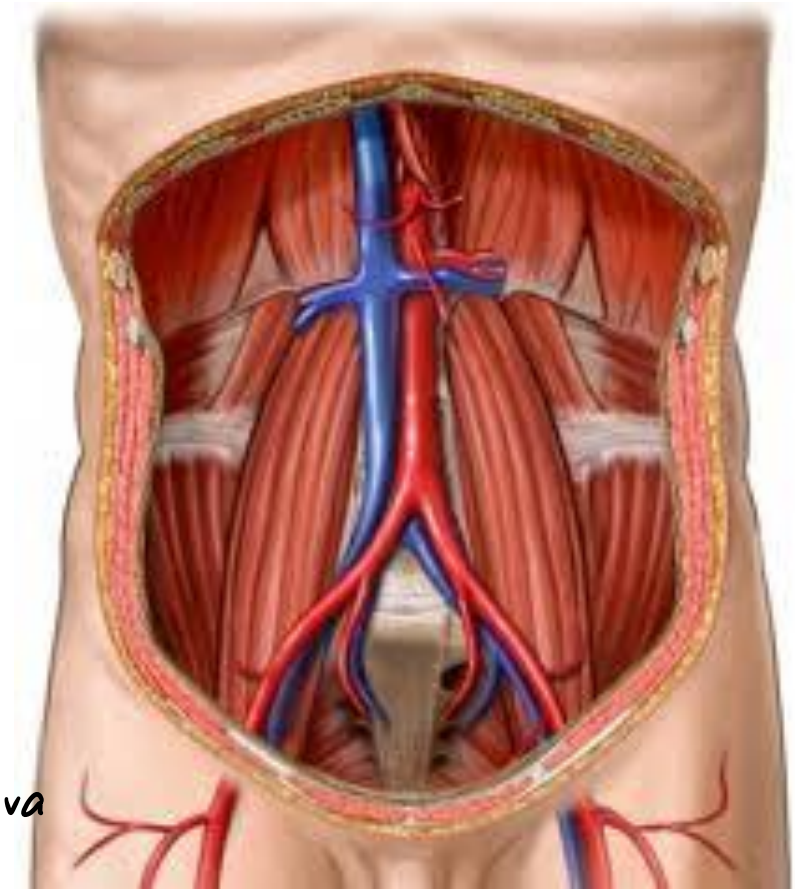
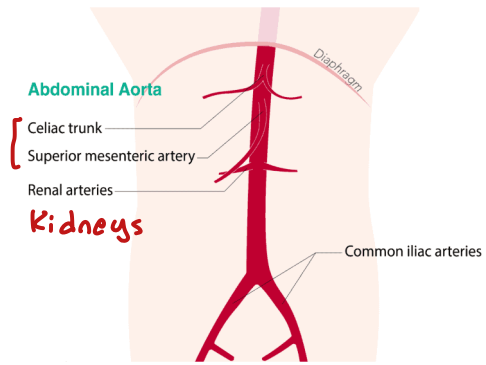


Fig.41: The abdominal aorta and the inferior vena cava.

Branches

- Celiac trunk, superior mesenteric artery, and inferior mesenteric artery which supply organs of the digestive system in the abdomen.
- Suprarenal arteries supply the adrenal gland.
- Renal arteries supply kidneys.
- Others.

digestive system



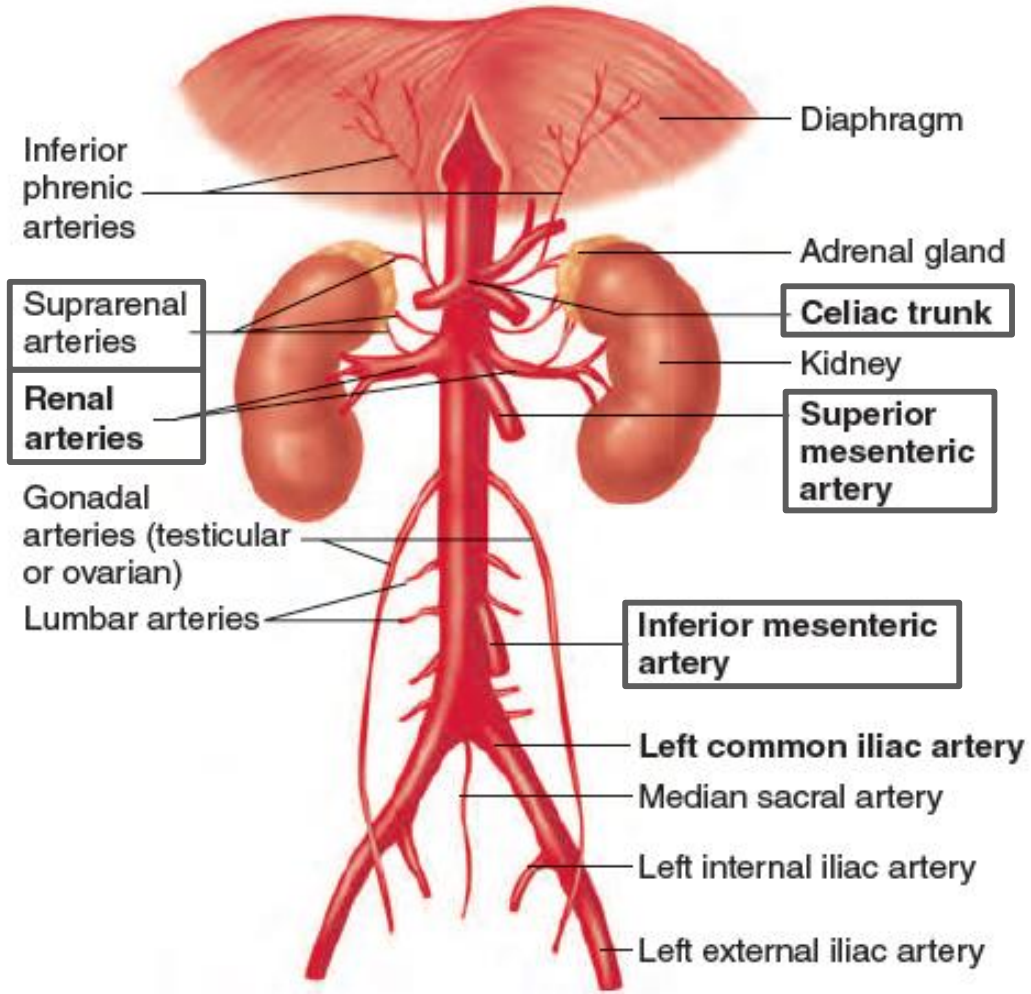


Fig.42: Branches of the abdominal aorta.

The Major Veins

- All Blood from the abdomen drains ultimately into the IVC. (inferior vena cava)
- The IVC passes upwards close to the abdominal aorta, then passes through the diaphragm at level of **T8** to enter the thorax where it opens into the RA.
- The blood from the digestive organs (esophagus, stomach, small and large intestines, liver, pancreas and spleen) drains first into the **Portal vein** then into the IVC.

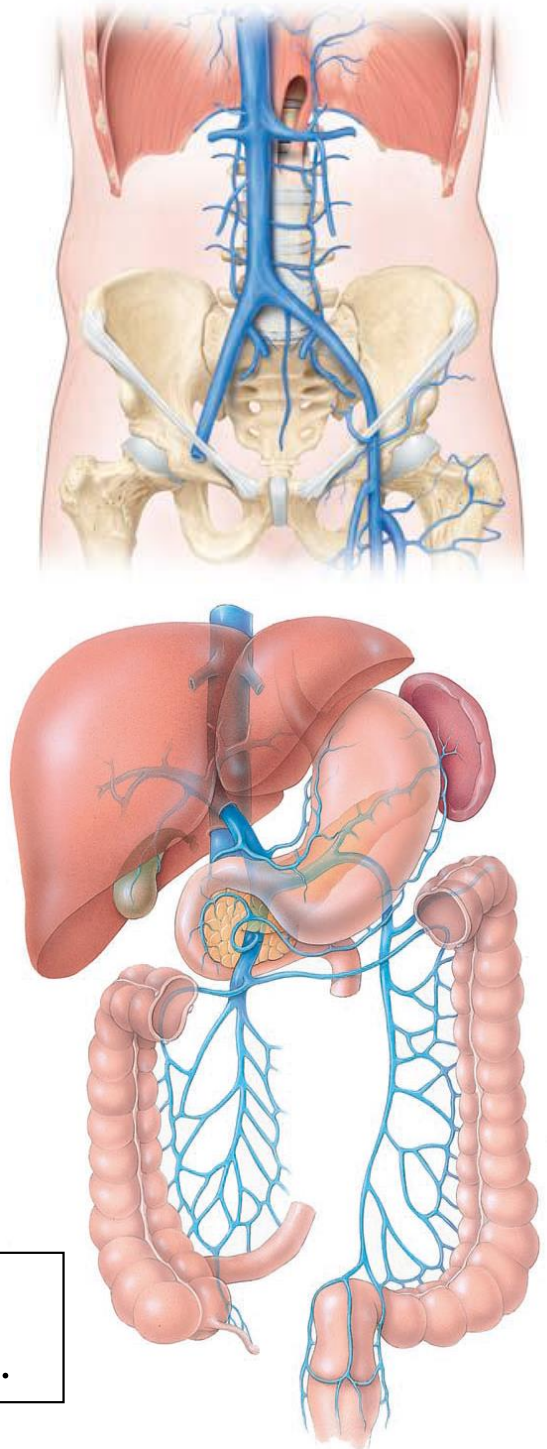


Fig.43: The inferior vena cava (above) and the portal vein (below).

Blood from the digestive organs reaches the inferior vena cava through the:

A. Hepatic vein

B. Portal vein

C. Splenic vein

D. Inferior mesenteric vein

E. None of the above

major blood vessels of lower limb

Arteries

Abdominal Aorta

common iliac artery

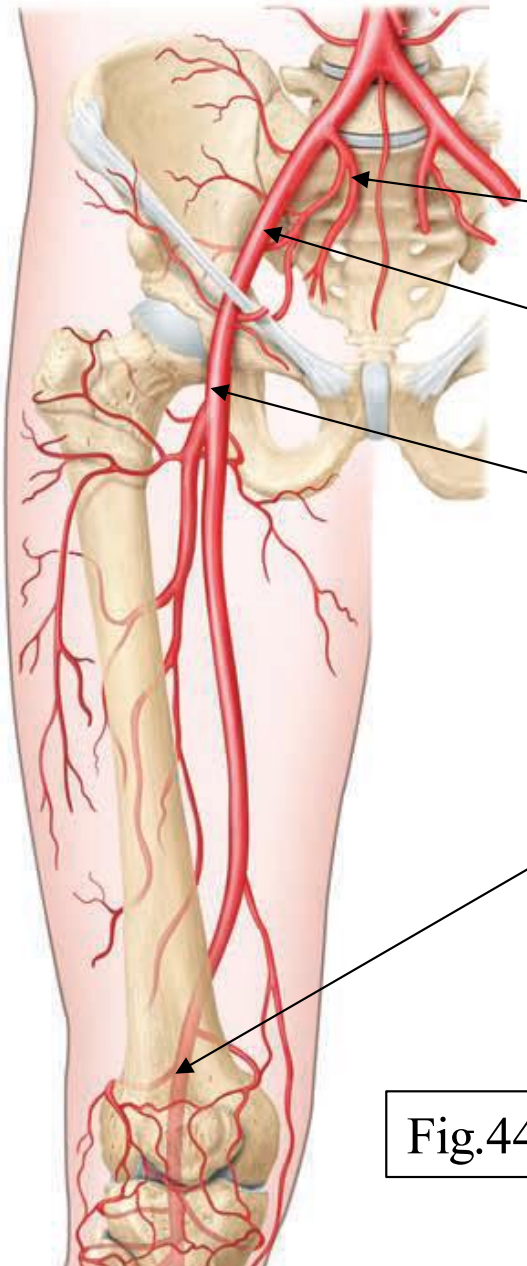
- internal iliac artery
  - pelvis
- external iliac artery
  - pass the thigh
  - Femoral artery
    - supply thigh/knee
    - Jog W Knee joint
    - popliteal artery
      - supply leg foot

veins

- superficial veins
  - great saphenous vein → femoral vein
  - small saphenous vein → popliteal vein
- deep veins
  - Venae comitante

Major Blood Vessels of the Lower Limb

The Major Arteries



- Each common iliac artery soon divides to give the internal and external iliac arteries.
- The **internal iliac artery** supplies structures in the pelvis.
- The **external iliac artery** passes into the thigh where it becomes the femoral artery.
- The **femoral artery** gives branches that supply structures in the thigh and the knee joint.
- When this artery reaches the knee joint it becomes known as the **popliteal artery**. The branches of this artery supply structures in the leg and foot.

Fig.44: Major arteries of the lower limb.

What is the primary function of the internal iliac artery?

- Carries blood to the brain
- Carries blood towards the pelvis
- Carries blood to the arms
- Carries blood to the lungs

B

The Major Veins

- ✓ Here we have superficial and deep veins.
- ✓ The deep veins are venae comitantes. Some large deep veins correspond to the larger arteries.
- ✓ The superficial veins are:

a. The **Great Saphenous vein** which drains into the femoral vein.

b. The **Small Saphenous vein** which drains into the Popliteal vein.

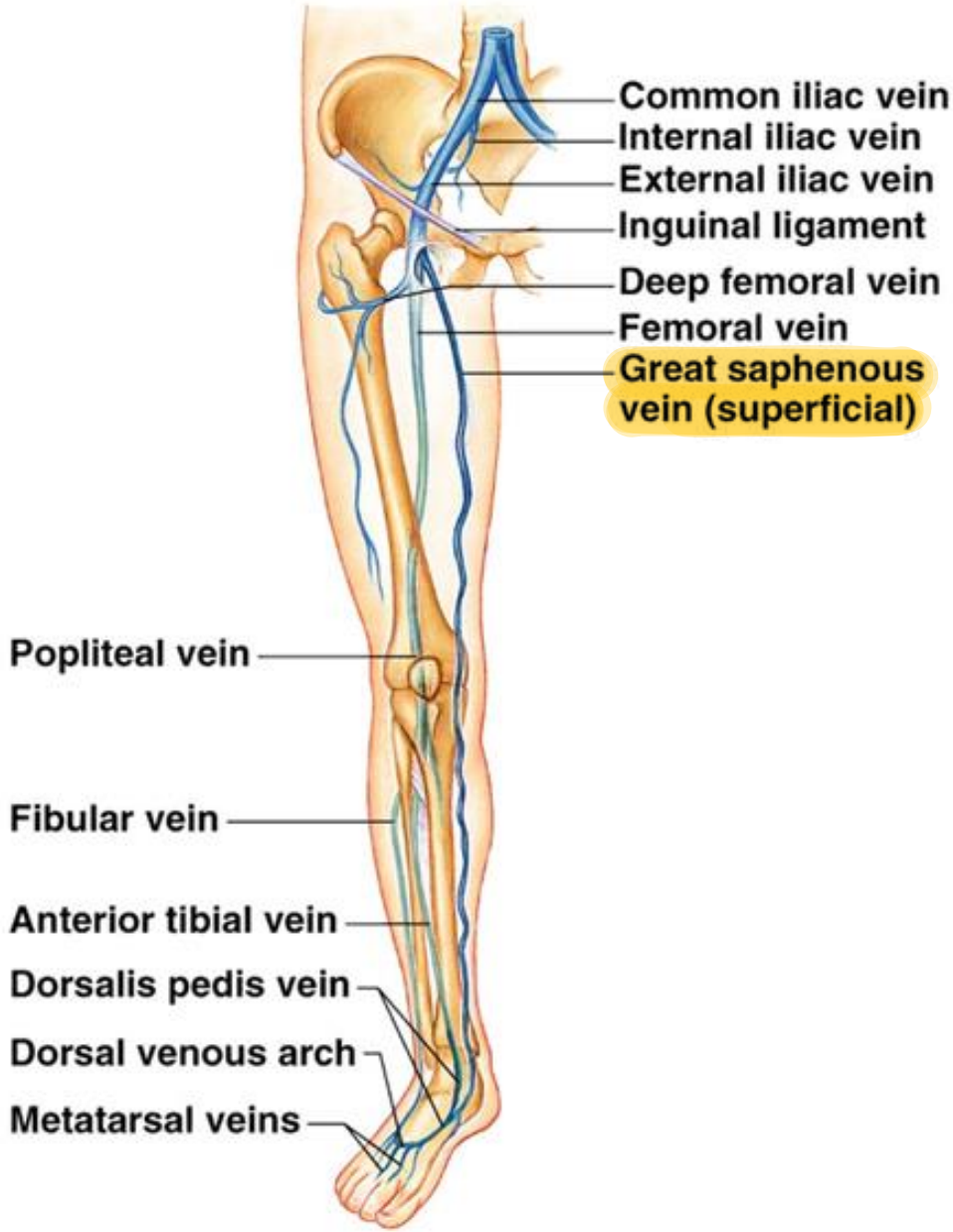


Fig.45: Major veins of the lower limb.

The largest artery in the human body is the:

- ○ Femoral artery
- ○ Carotid artery
- ○ Pulmonary artery
- ○ Aorta