



Introduction to Anatomy

1st Year Medical Students

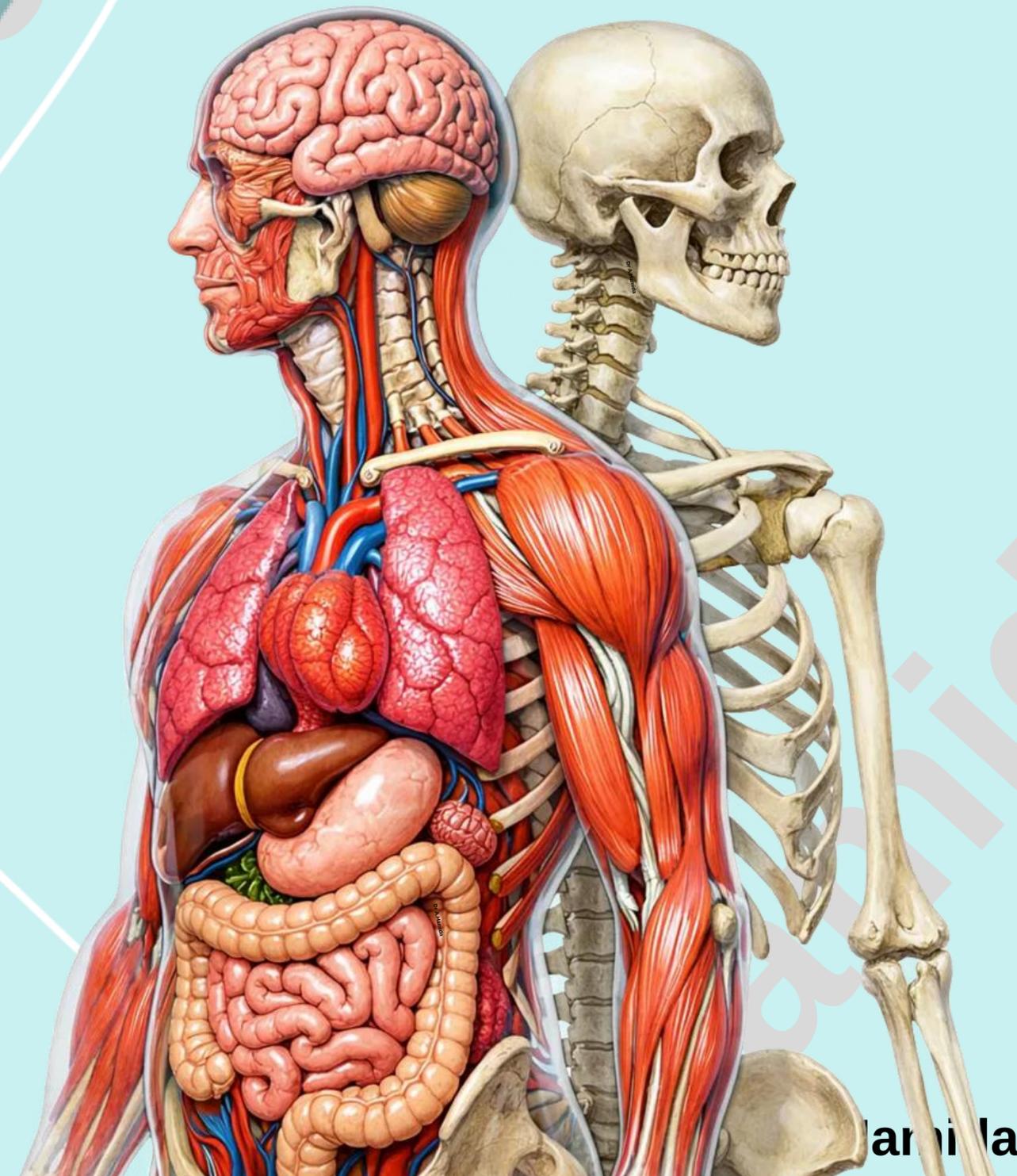
**2025-2026
Second Semester**

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Hamida

Course Outline:

1 Introduction and Terminology

2 Skeletal System

3 Cardiovascular System

4 Lymphatic System

5 Nervous System

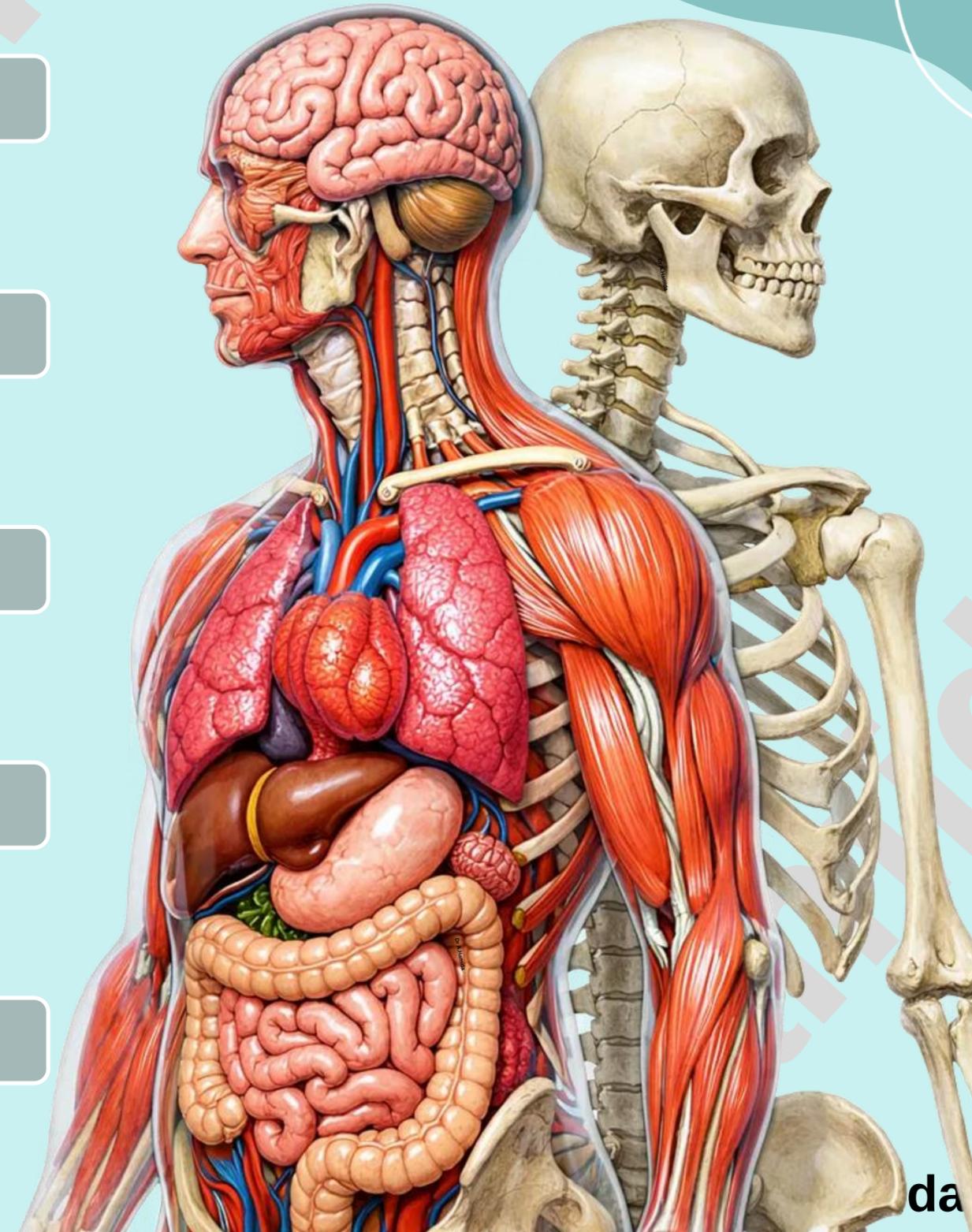
6 Muscular System

7 Respiratory System

8 Digestive System

9 Urinary System

10 Endocrine System



3

Cardiovascular System

- The **cardiovascular system** (cardio- = heart; vascular = blood vessels)
- The system supplies nutrients to and removes waste products from various tissues of the body.
- The cardiovascular system consists of the:
 1. **Heart**, which pumps **blood** throughout the body.
 2. **Blood Vessels**, which are a closed network of tubes that transport the **blood**.

3

Cardiovascular System

System Outline:

3.1

Blood

3.2

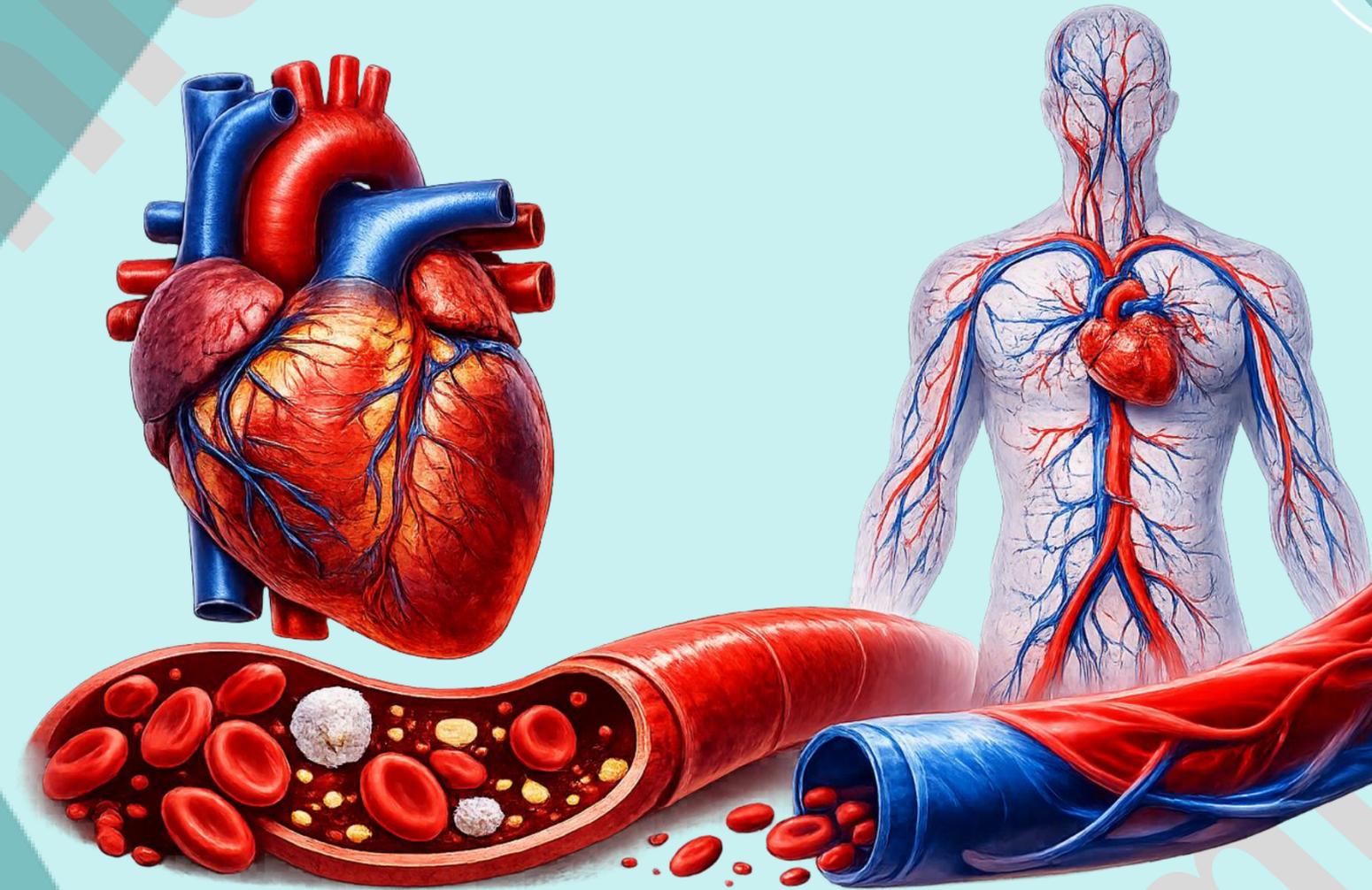
Heart

3.3

Blood Vessels

Cardiovascular System

1. Blood



➤ The blood is a highly specialized connective tissue consisting of:

1. Plasma

- It is the fluid portion of the blood.
- About ninety percent of it is made up of water, and the remaining portion consists of proteins, inorganic salts, lipids, and other dissolved substances.

2. Blood Cells

The blood cells are of three types:

i. Red blood cells (RBCs) or erythrocytes

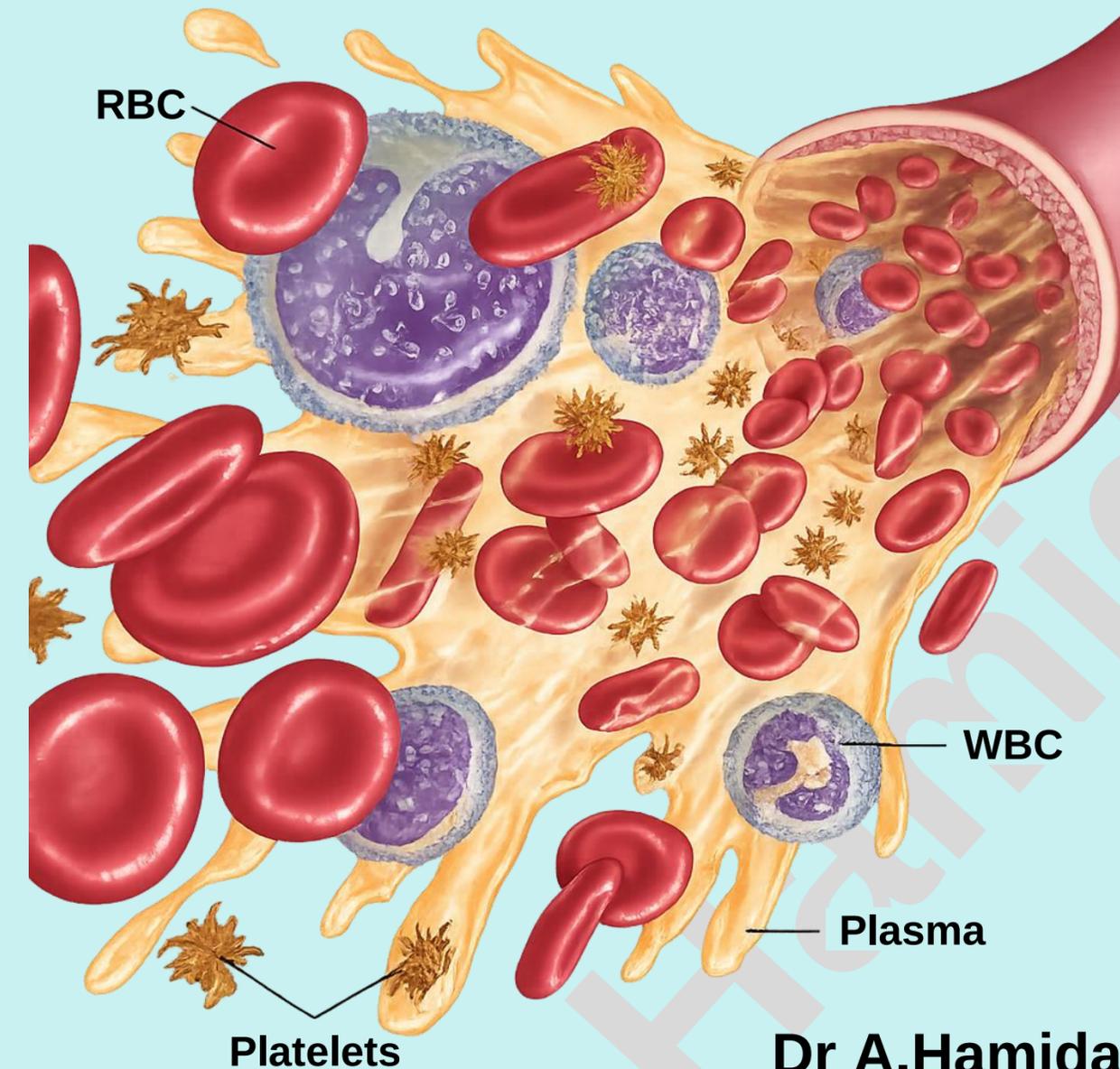
- They are disc-shaped cells that lack nuclei and mitochondria.
- They transport oxygen from the lungs to body cells and deliver carbon dioxide from body cells to the lungs.

ii. White blood cells (WBCs) or leukocytes:

- Protect the body from invading pathogens and other foreign substances

iii. Thrombocytes (platelets):

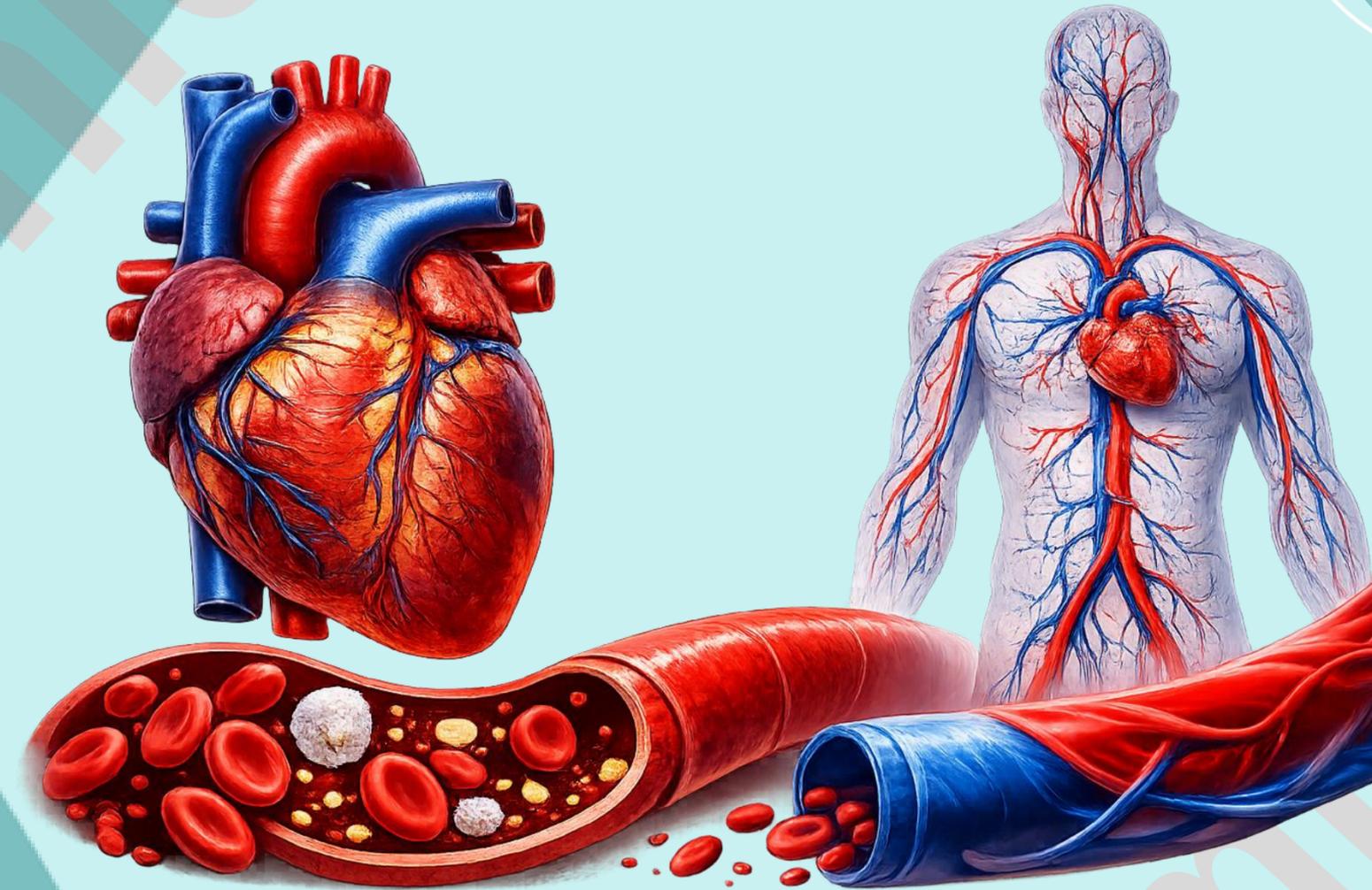
- The platelets play an important role in blood clotting.



3

Cardiovascular System

2. Heart



3.2 Cardiovascular System-Heart

Outline:

3.2.1 Location of the heart

3.2.2 Shape of the heart

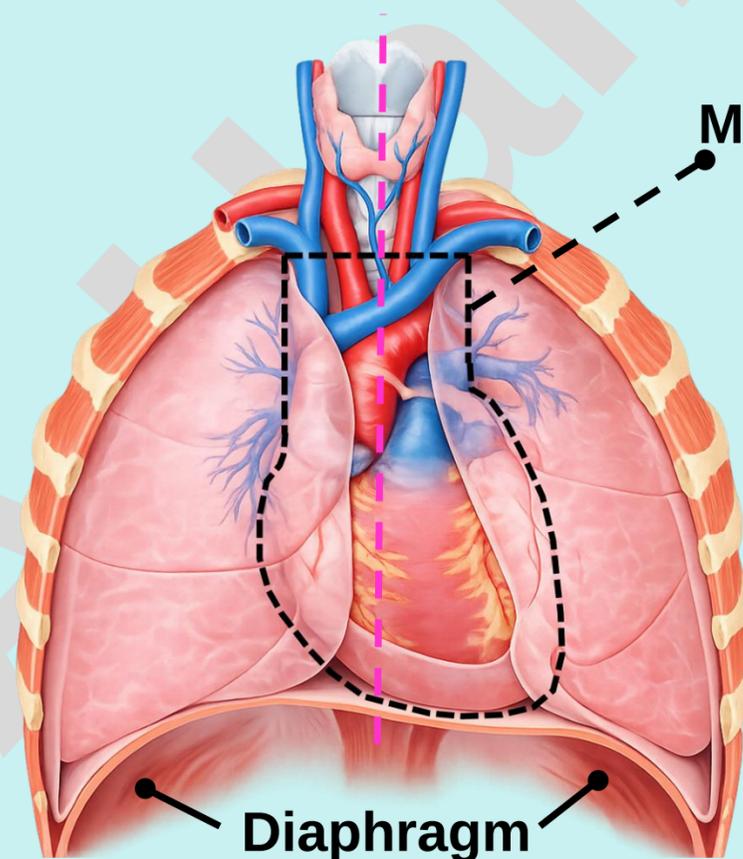
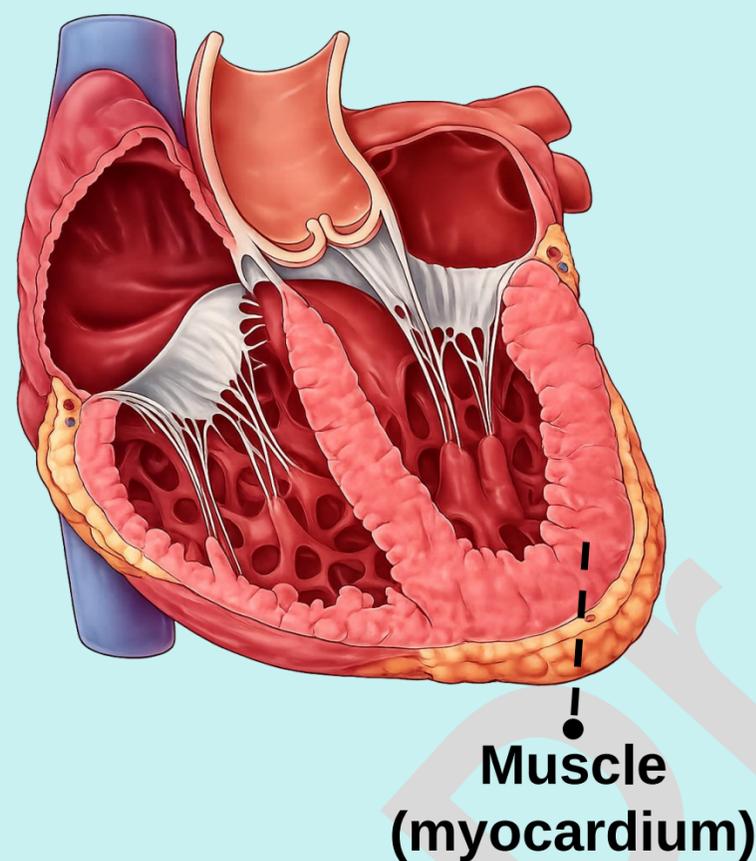
3.2.3 Pericardium

3.2.4 Chambers of the Heart

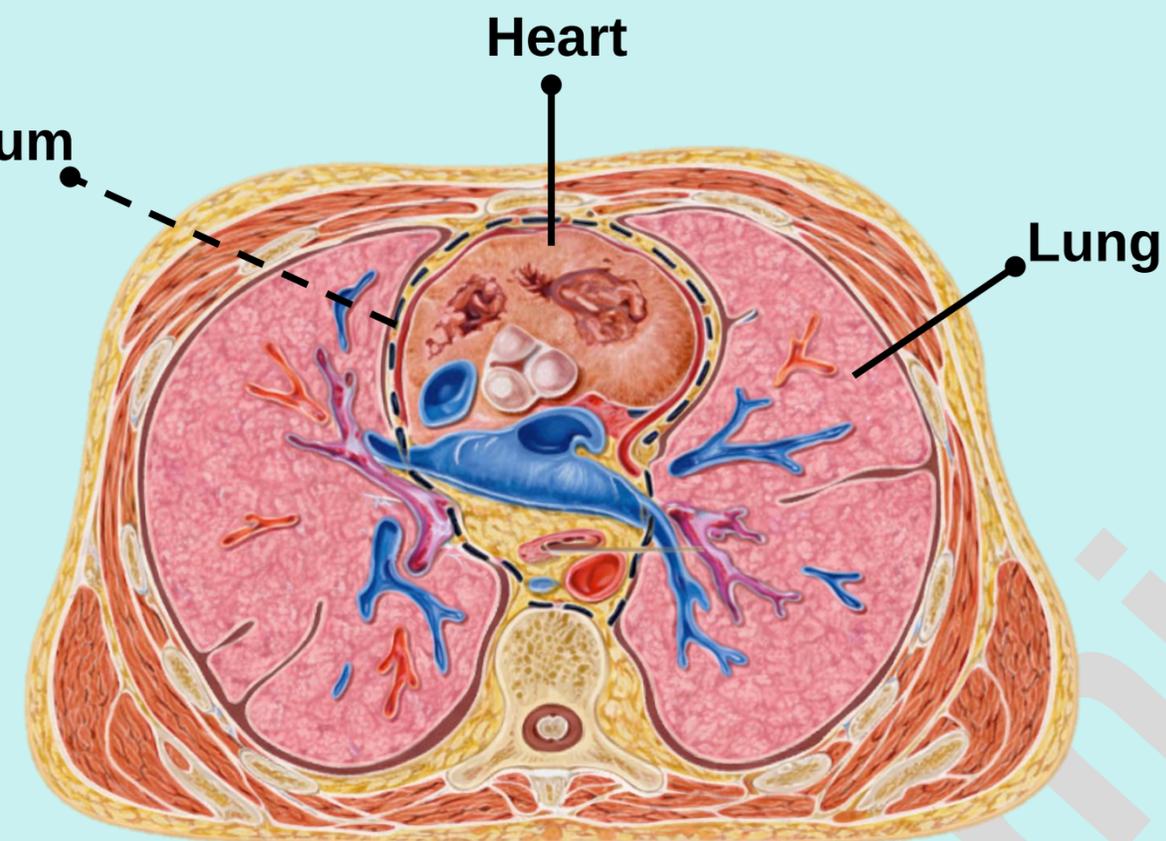
3.2.5 Valves of the Heart

Location of the heart

- The heart is a four-chambered, hollow muscular organ, roughly the size of a clenched fist.
- It is situated in the thoracic cavity between the lungs in a cavity known as mediastinum.
- It rests on the diaphragm, near the midline of the thoracic cavity (about two-third of the heart is located on the left of the midline and one-third on the right of the midline)



Anterior view of the heart

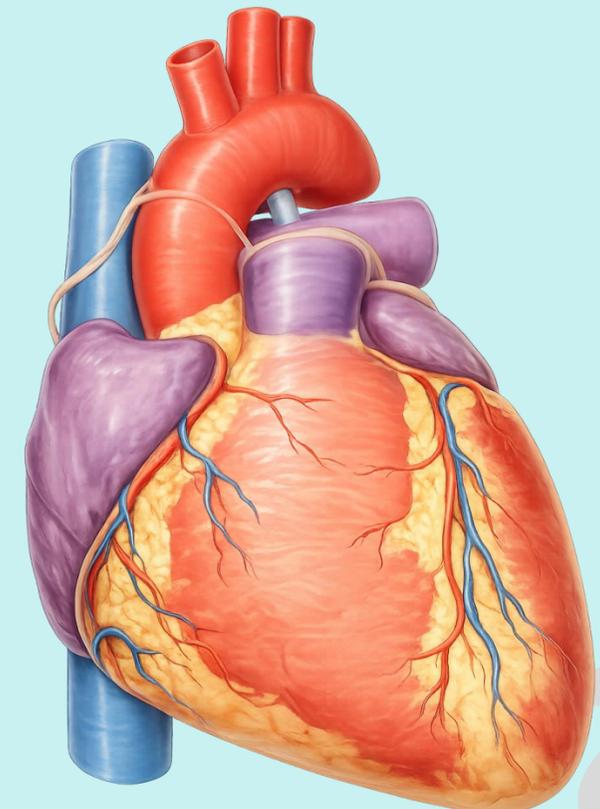
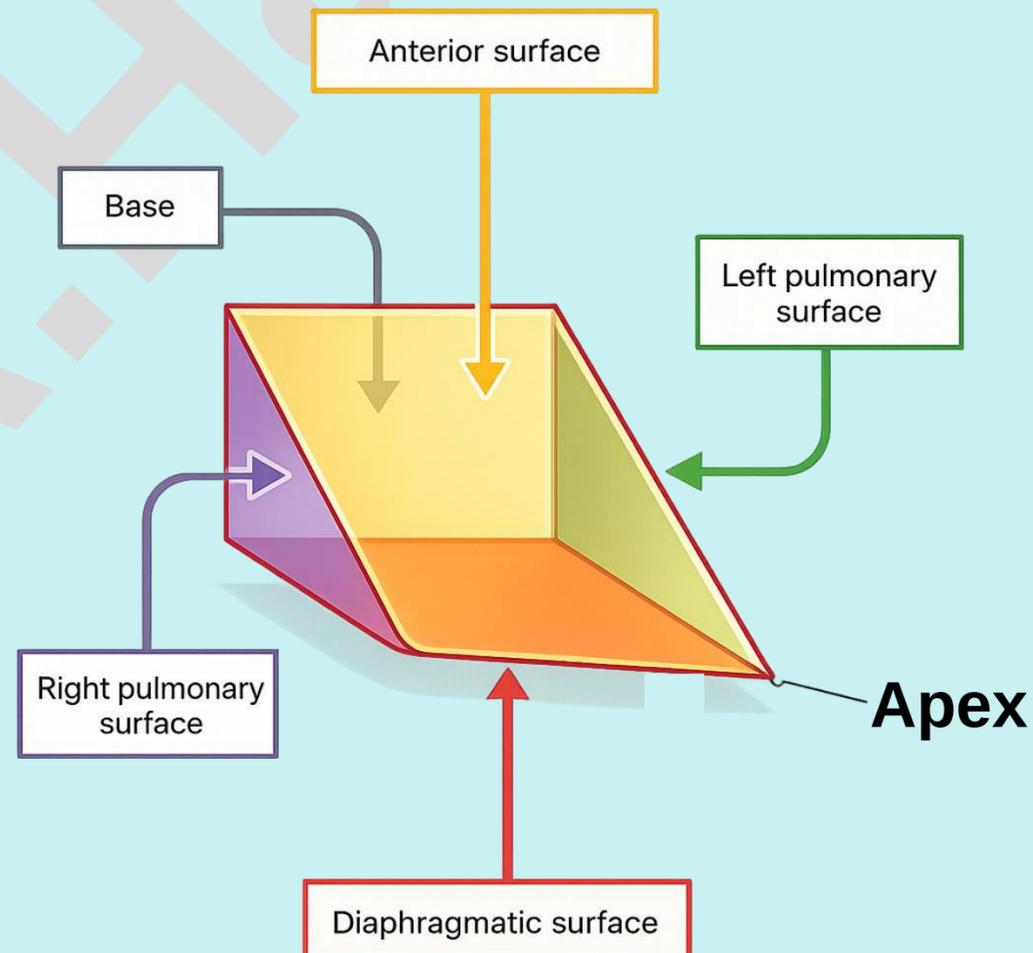


Transverse section of the thoracic cavity showing the heart in the mediastinum

Shape of the heart

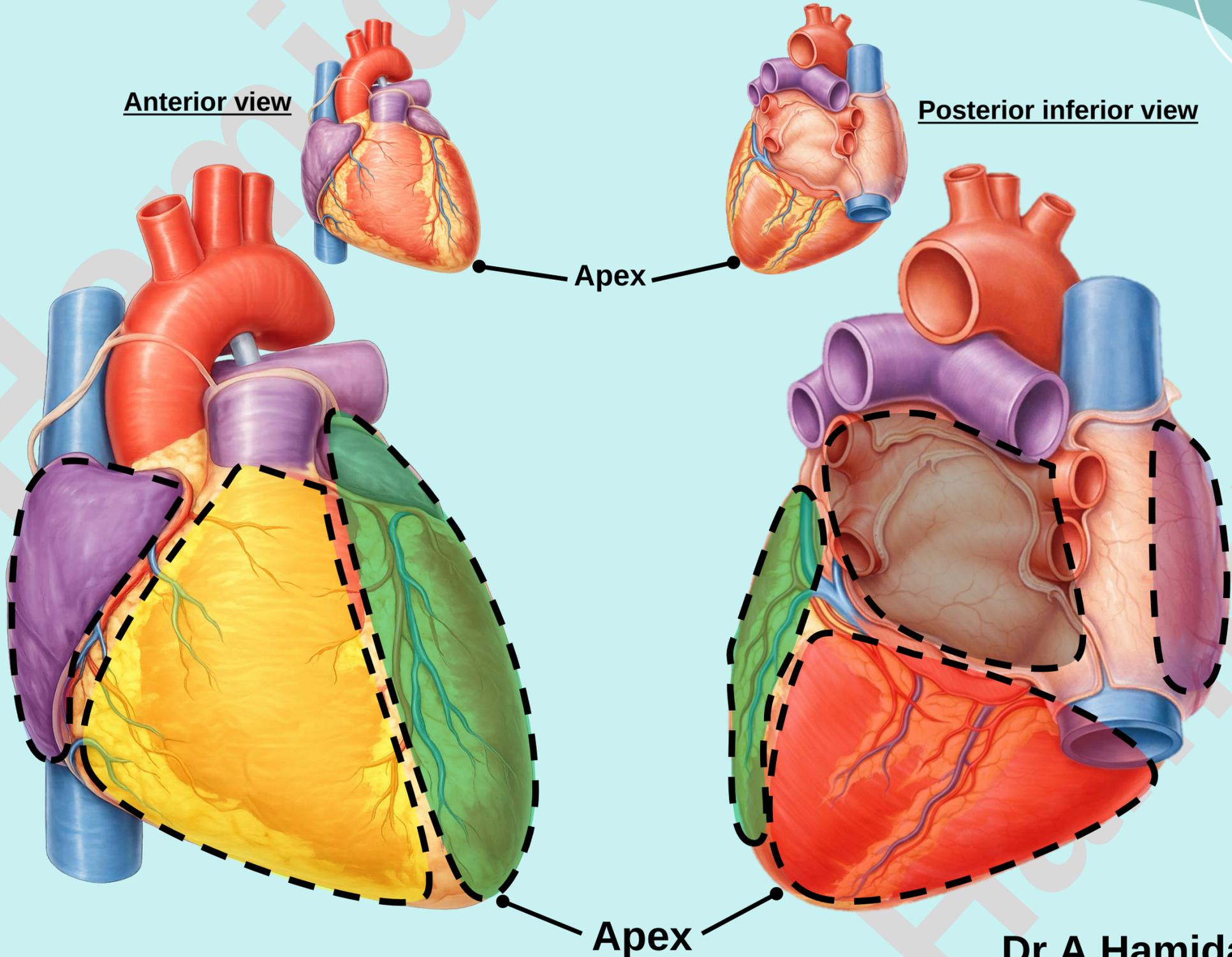
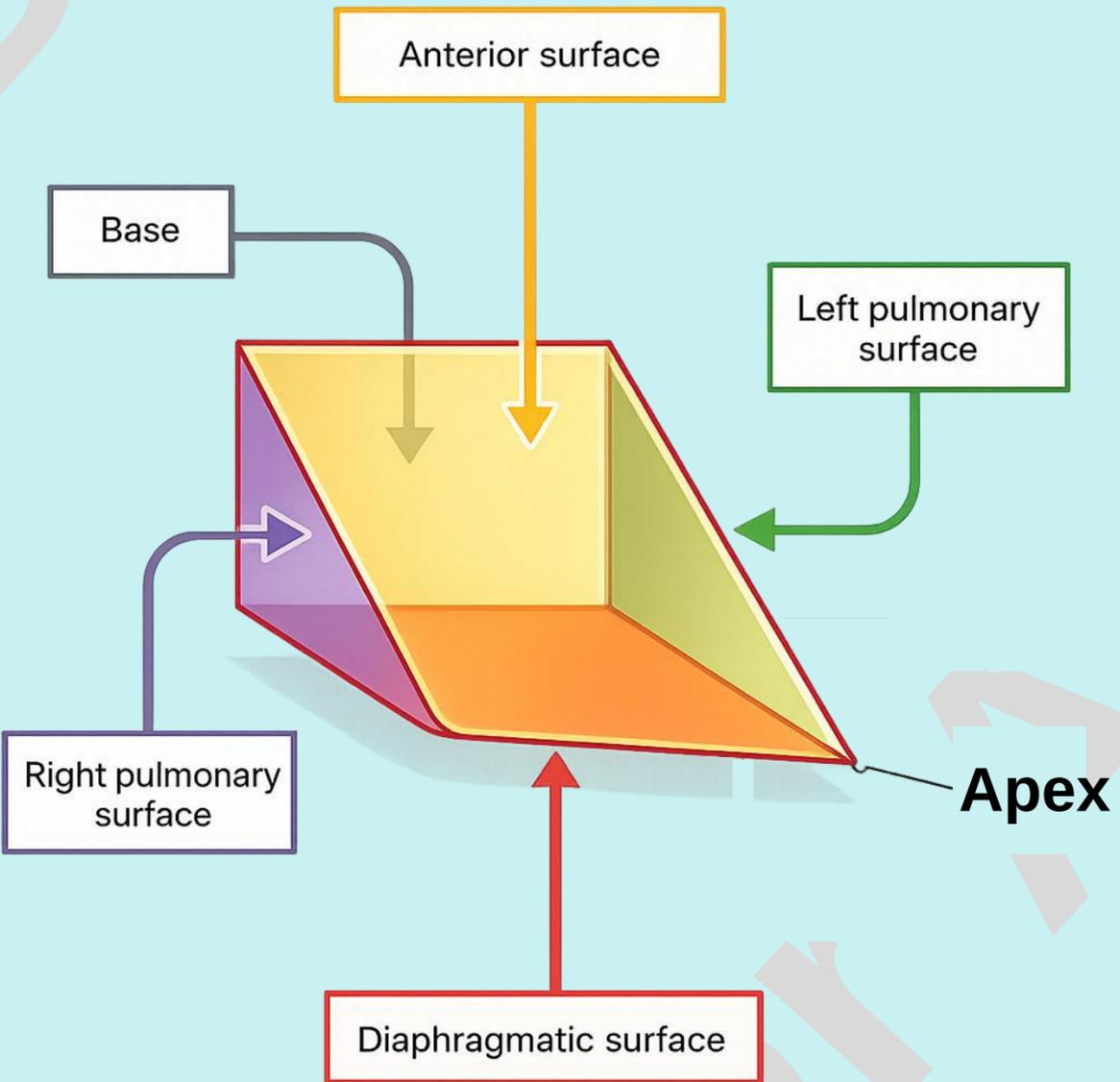
➤ The heart is somewhat pyramid-shaped, lying on its side, with an apex, a base, and four surfaces.

- The apex is directed anteriorly, inferiorly, and to the left.
- The base is opposite the apex and forms the posterior aspect of the heart.
- Surfaces:
 - i. **Anterior surface (sternocostal surface):** lies deep to the sternum and ribs.
 - ii. **Inferior surface (diaphragmatic surface):** is the part of the heart that rests mostly on the diaphragm.
 - iii. **Right surface:** faces the right lung.
 - iv. **Left surface:** faces the left lung.



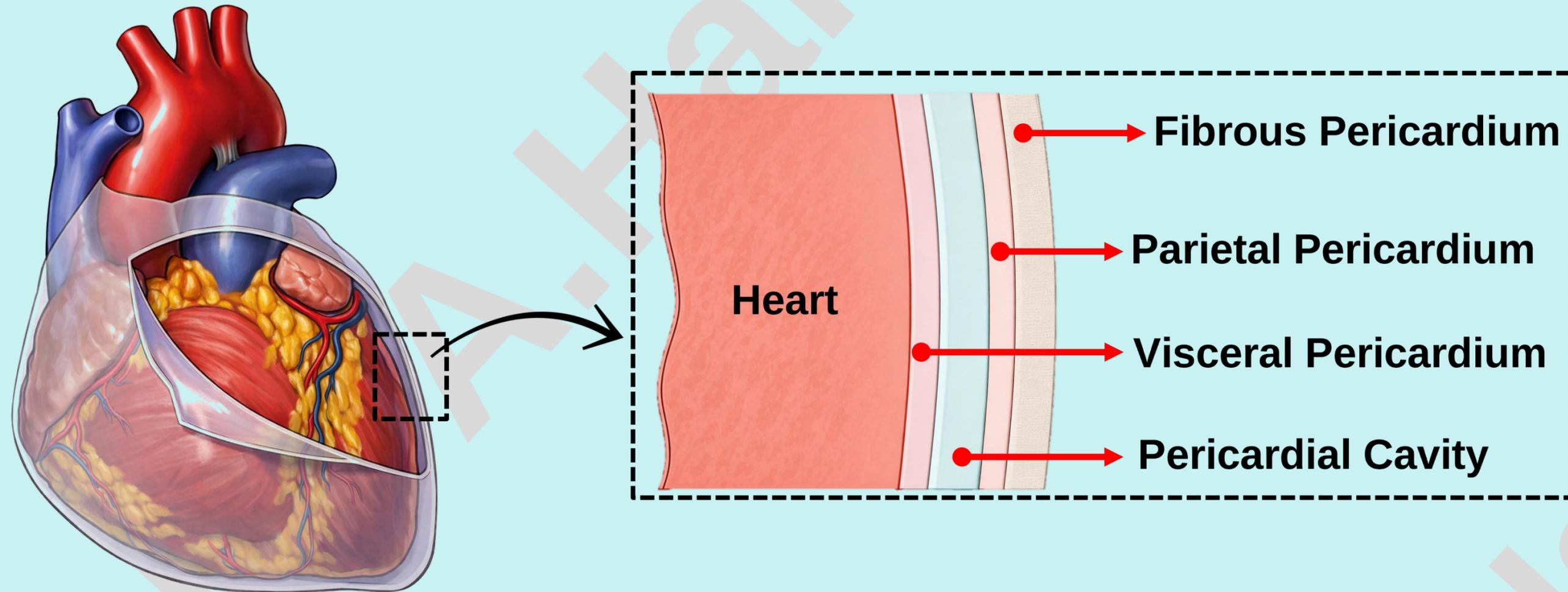
Shape of the heart

➤ The heart is somewhat pyramid-shaped, lying on its side, with an apex, a base, and four surfaces.



Pericardium

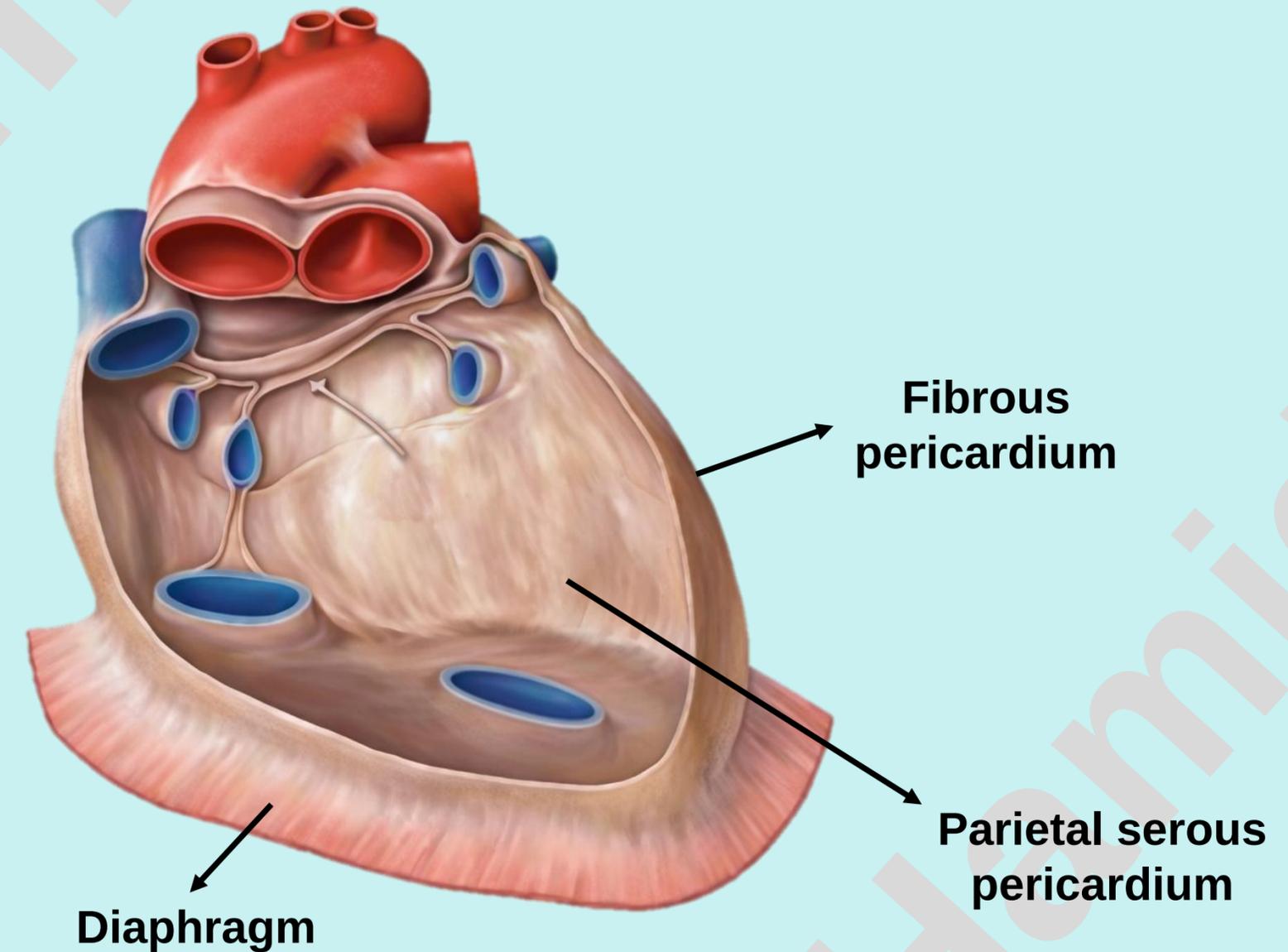
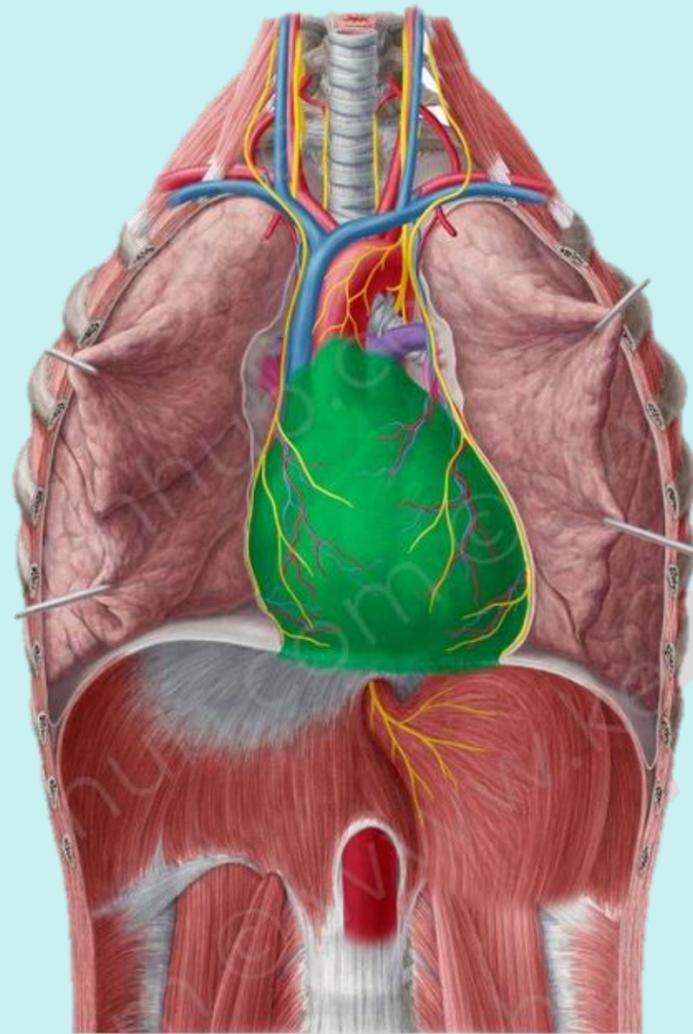
- It is the membrane that surrounds and protects the heart
- The pericardium consists of two main parts:
 1. Fibrous pericardium (superficial layer).
 2. Serous pericardium (deeper layer).



Pericardium

1. Fibrous pericardium (superficial layer):

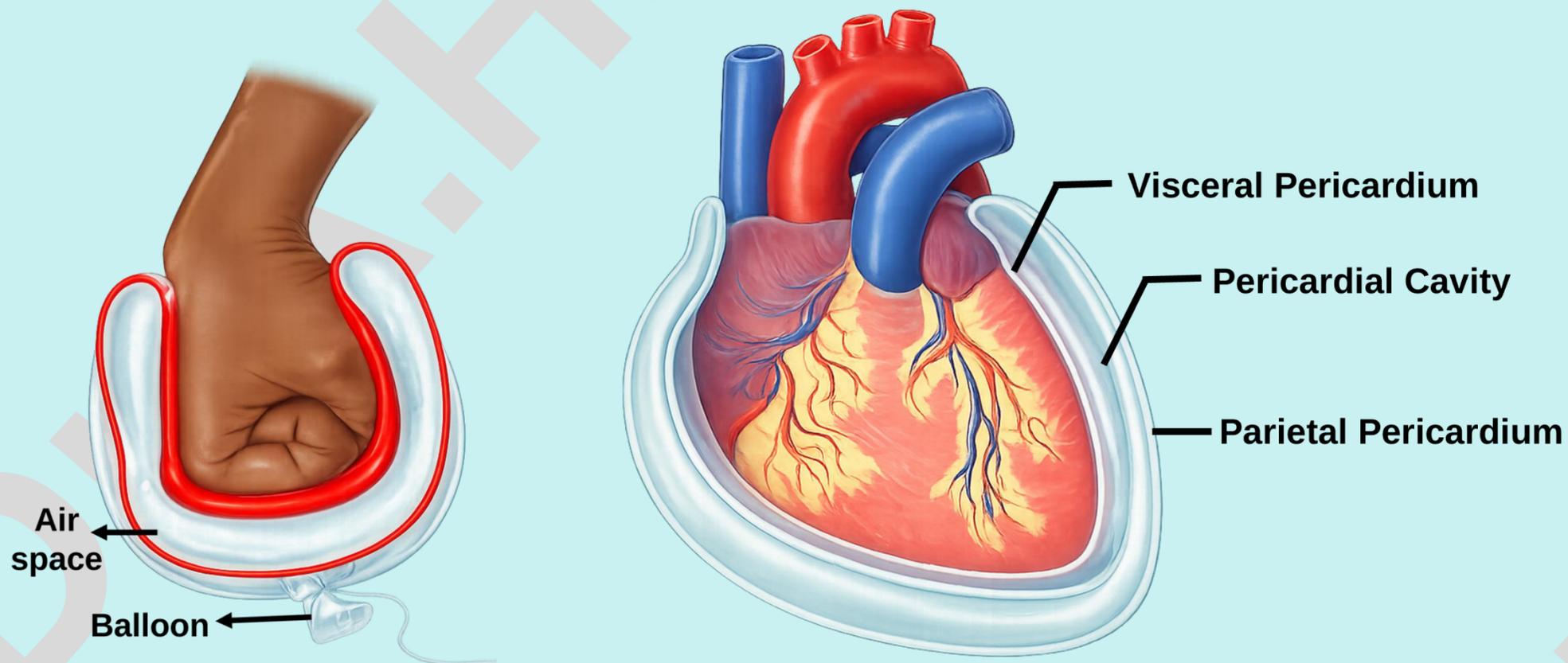
- It is composed of tough, inelastic, dense irregular connective tissue.
- It prevents overstretching of the heart, provides protection, and anchors the heart in the mediastinum.



Pericardium

2. Serous pericardium (deeper layer):

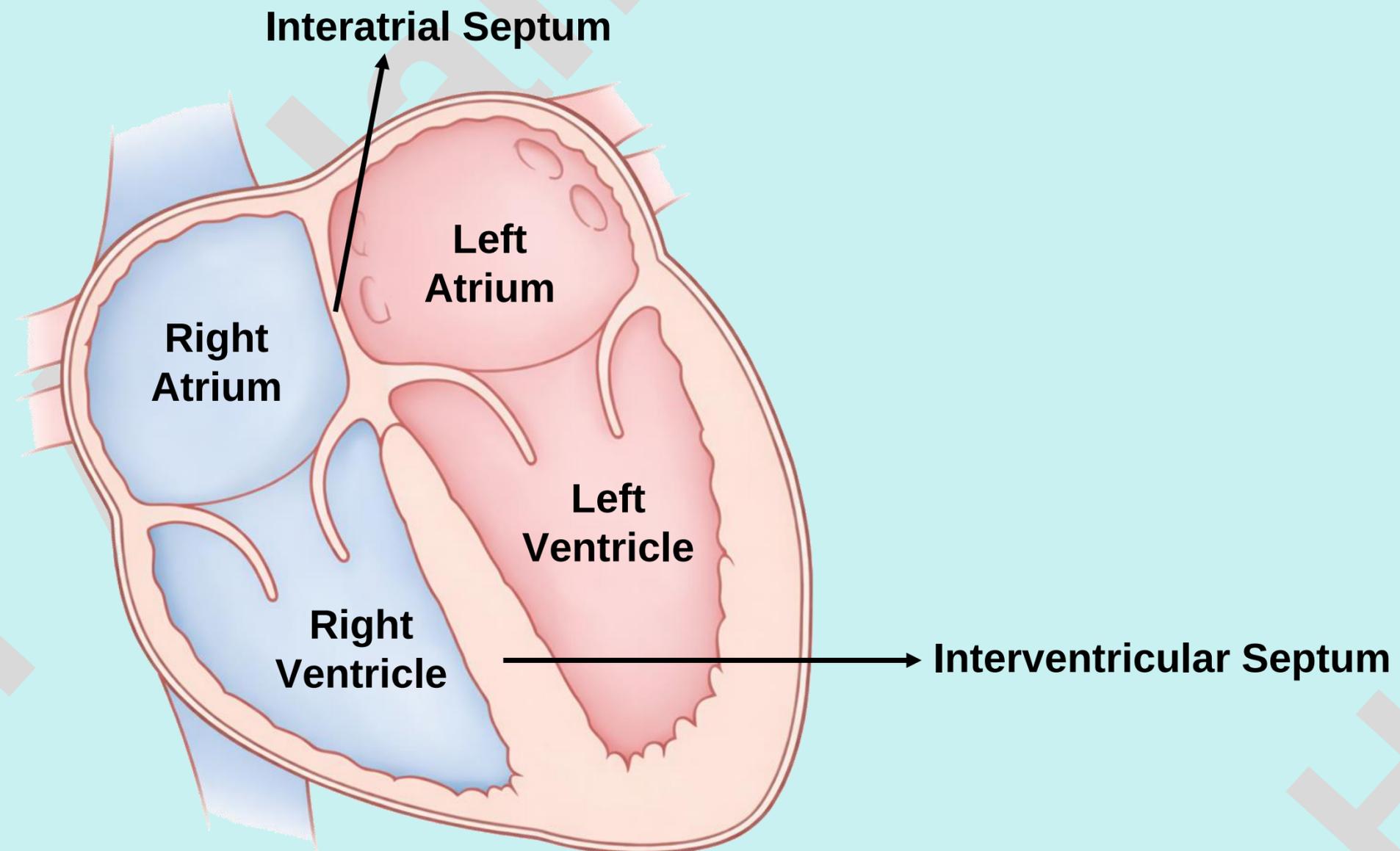
- It is a thinner, more delicate membrane that forms a double layer around the heart.
- The outer parietal layer lines the inner surface of the fibrous pericardium and is fused to it.
- The inner visceral layer adheres tightly to the surface of the heart (it is also called the epicardium)
- Between the parietal and visceral layers of the serous pericardium is a cavity called the pericardial cavity.
- It contains a few milliliters of lubricating serous fluid, known as pericardial fluid, which reduces friction between the layers of the serous pericardium as the heart moves.





➤ The interior of the heart is divided into four chambers:

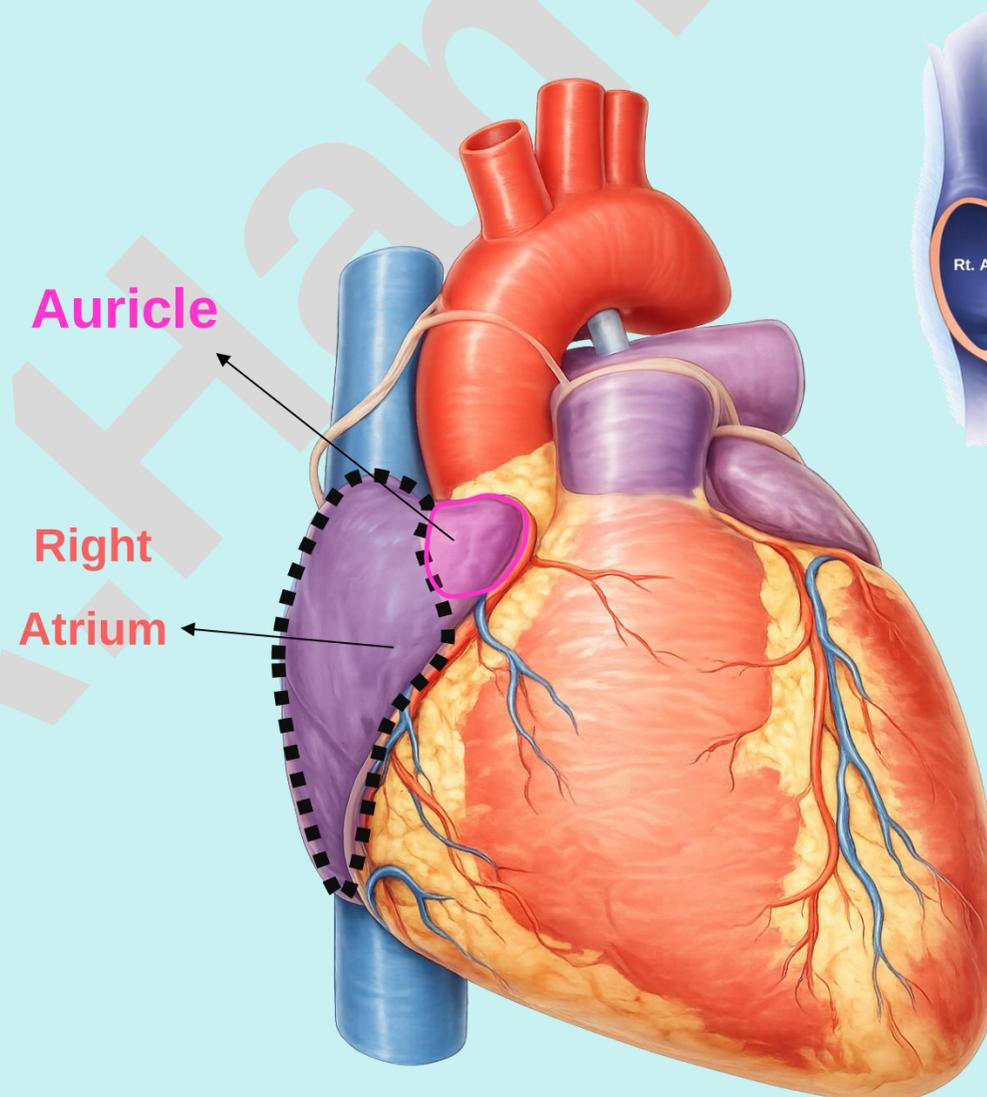
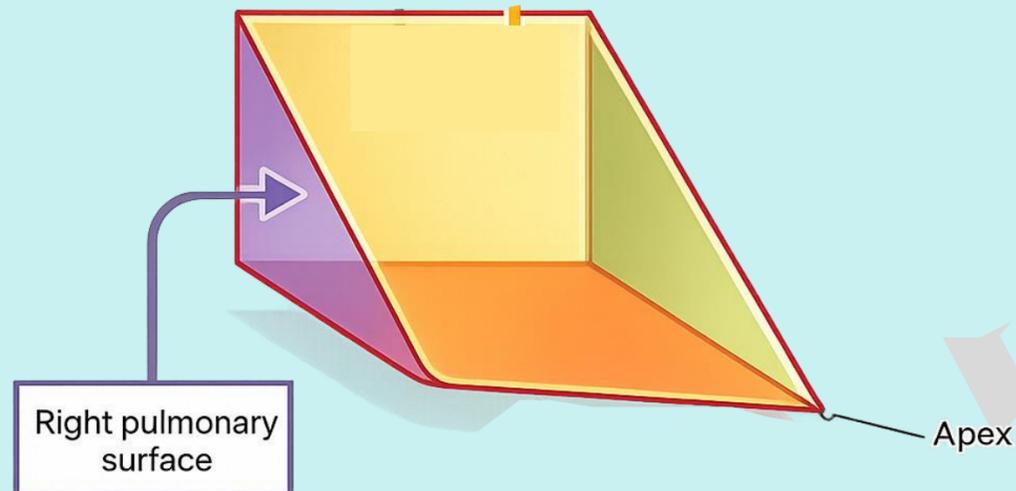
- **Right and Left atria (above):** separated from each other by interatrial septum
- **Right and Left ventricles (below):** separated from each other by interventricular septum.



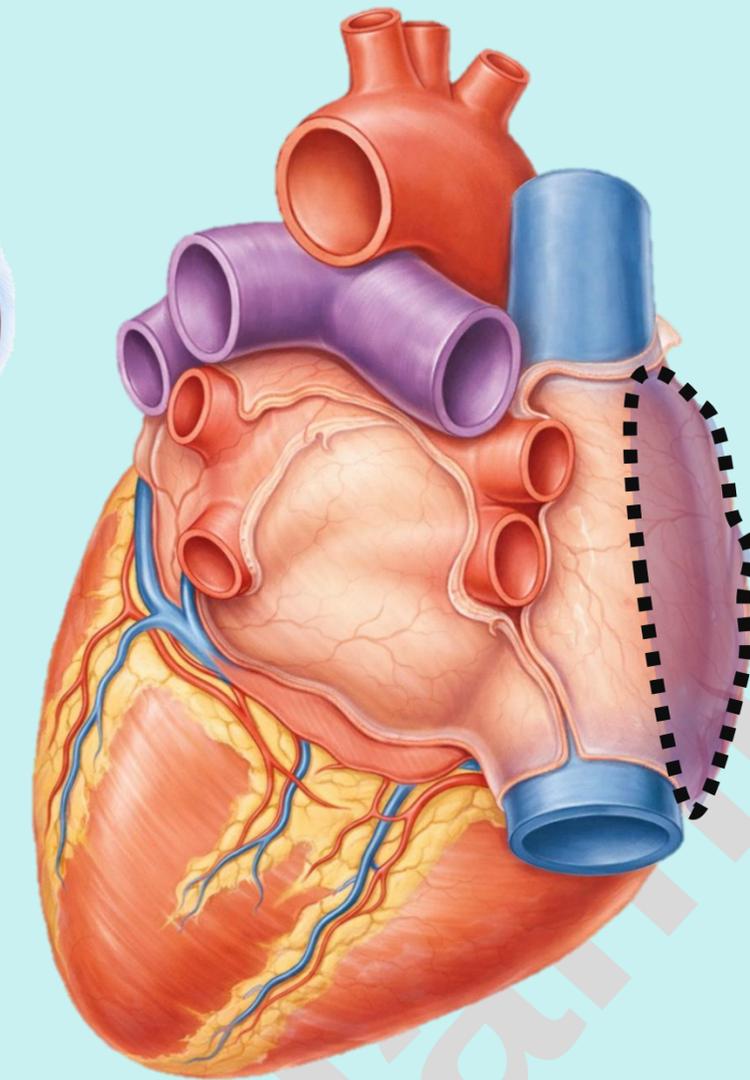
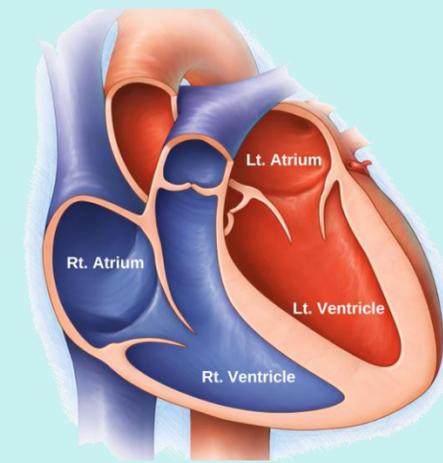


➤ Right Atrium

- The right atrium forms the right surface of the heart
- It has an ear-shaped appendage called an auricle; each auricle slightly increases the capacity of an atrium so that it can hold a greater volume of blood.



Anterior view

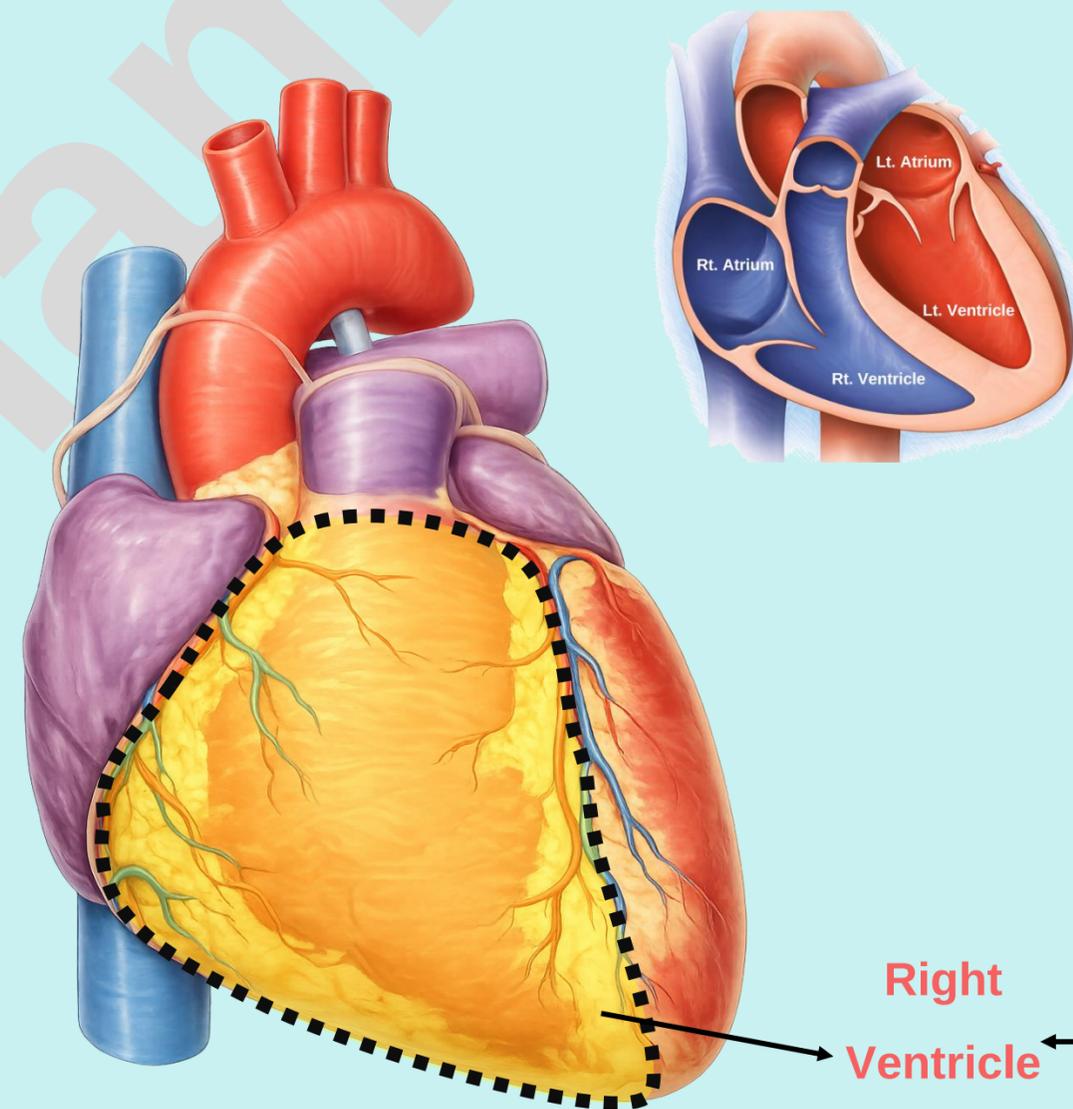
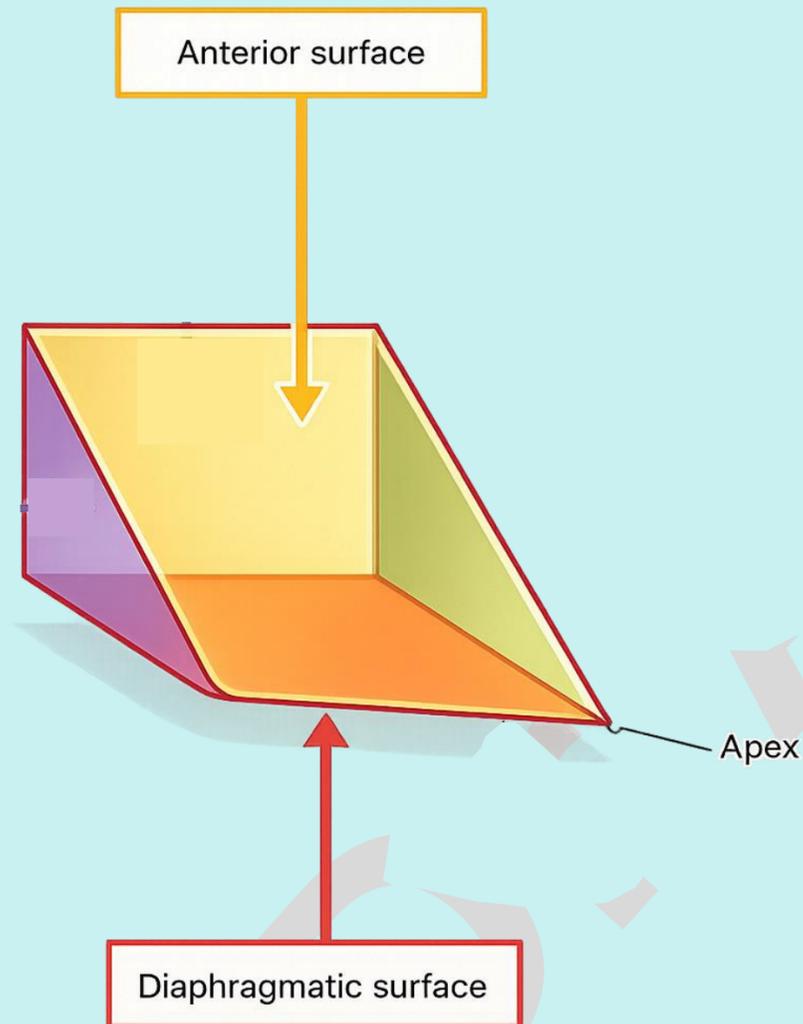


Posterior-inferior view
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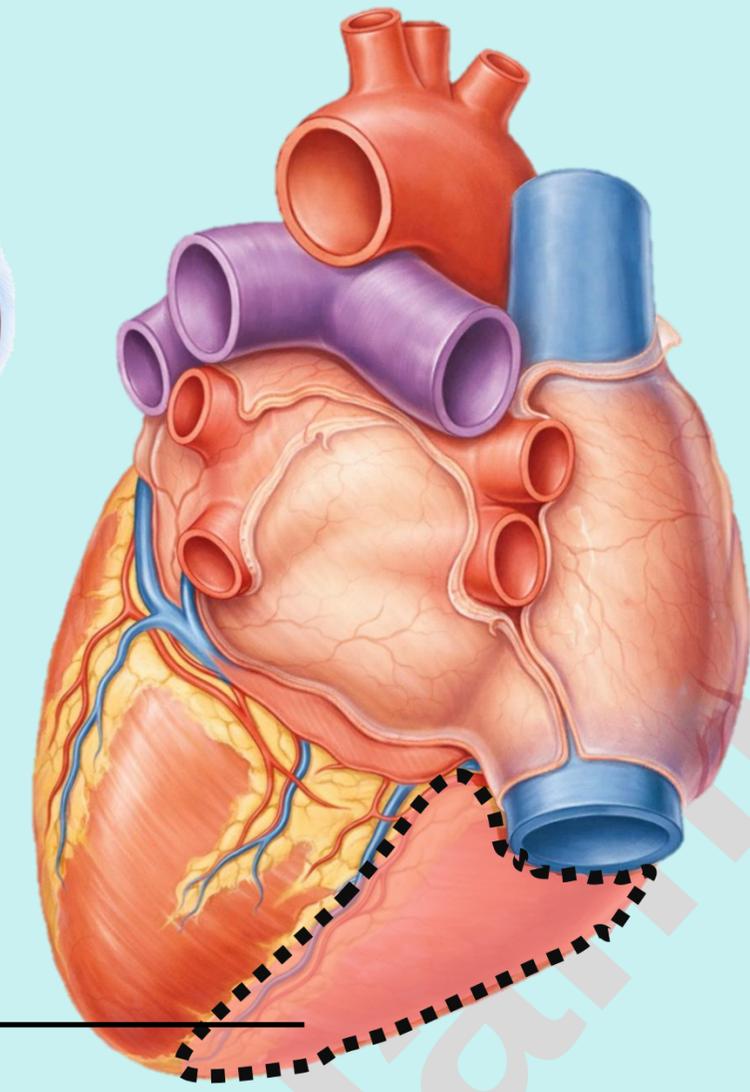


➤ Right Ventricle

- The right ventricle forms most of the anterior surface and part of the diaphragmatic surface of the heart.



Anterior view



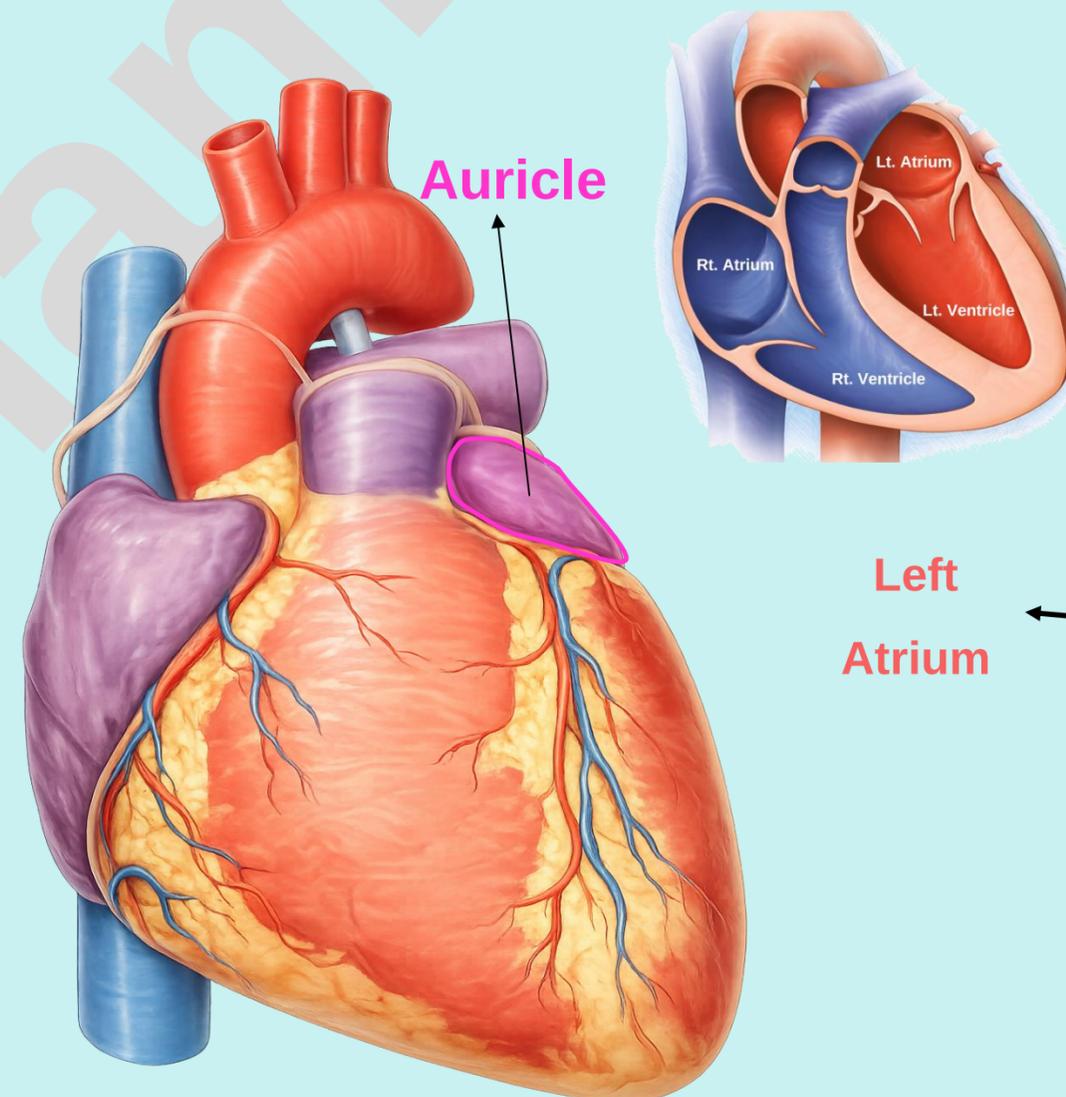
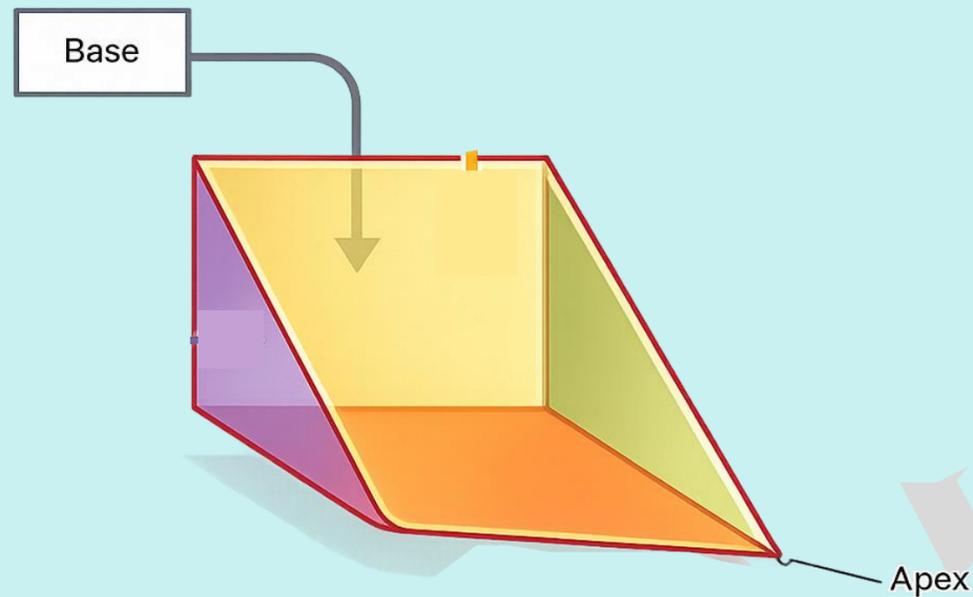
Right
Ventricle

Posterior-inferior view
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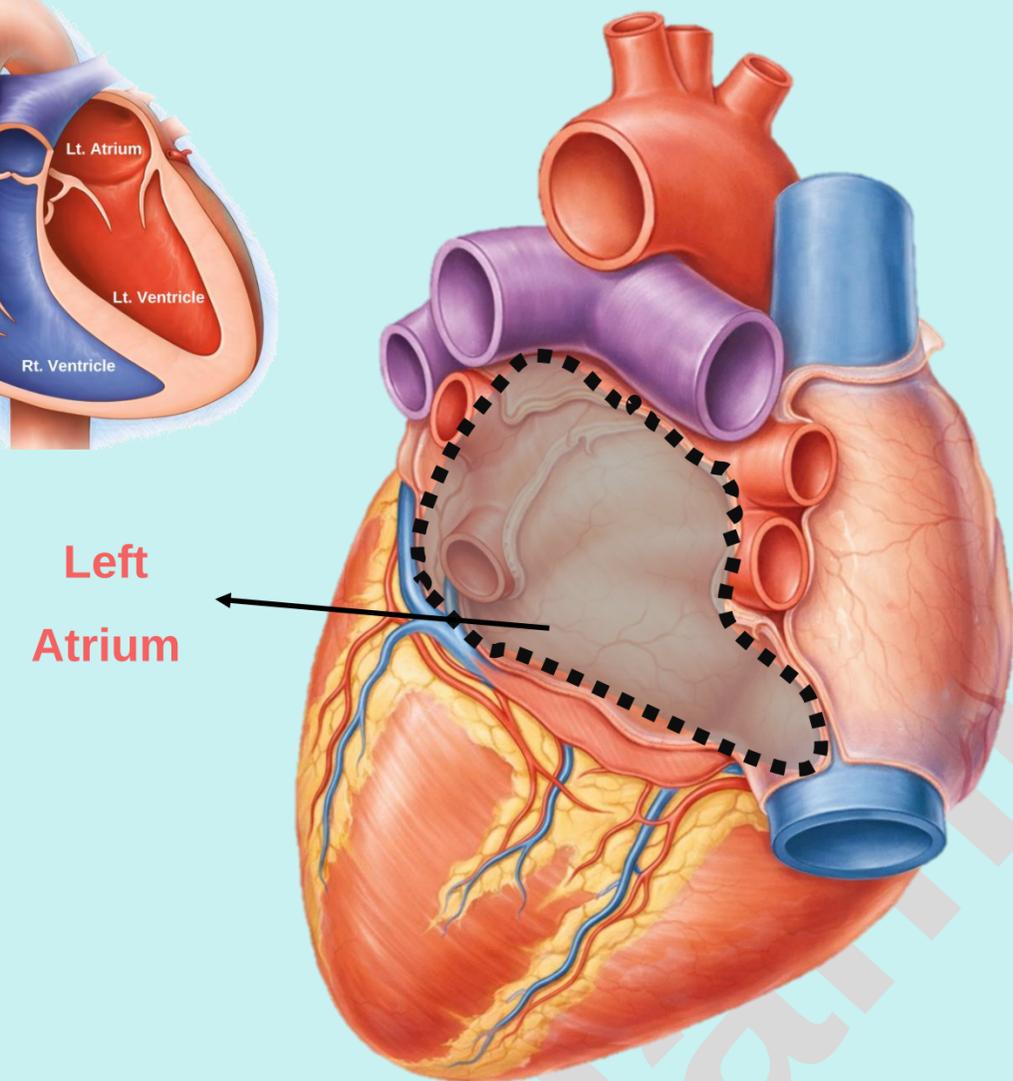


➤ Left Atrium

- The left atrium forms most of the **base of the heart** (or posterior surface).
- It has an ear-shaped appendage called an **auricle**.



Anterior view

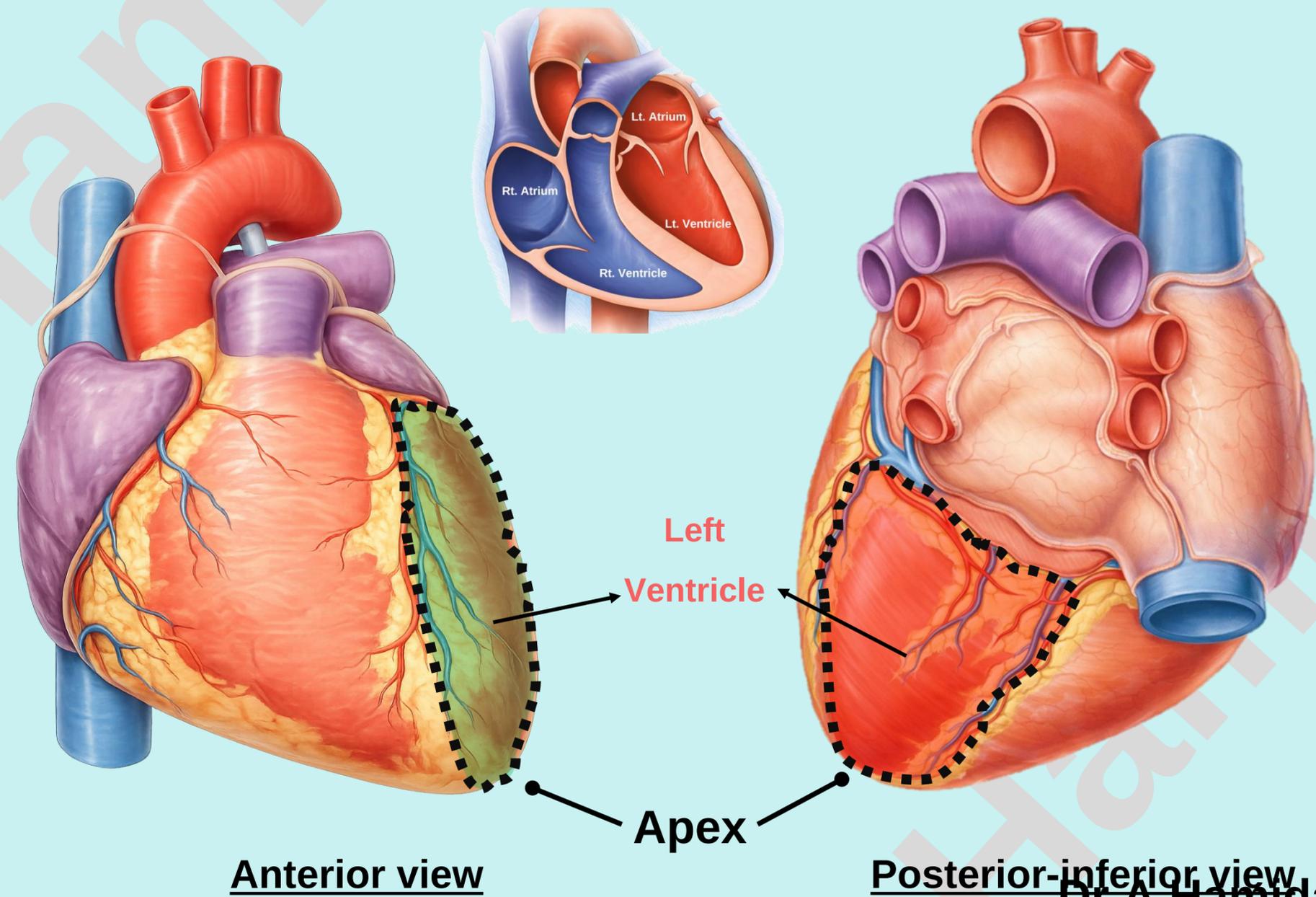
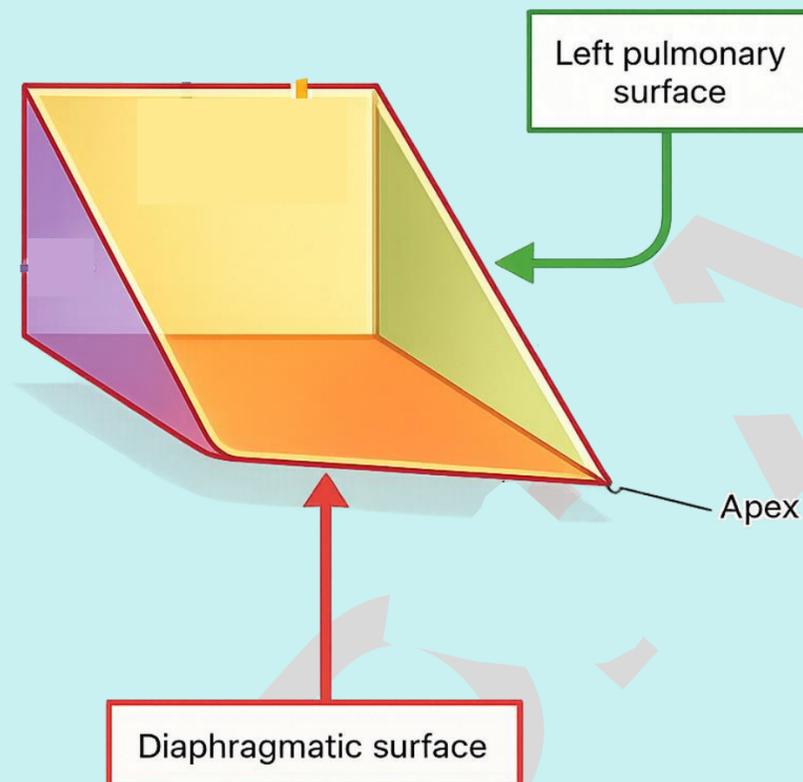


Posterior-inferior view
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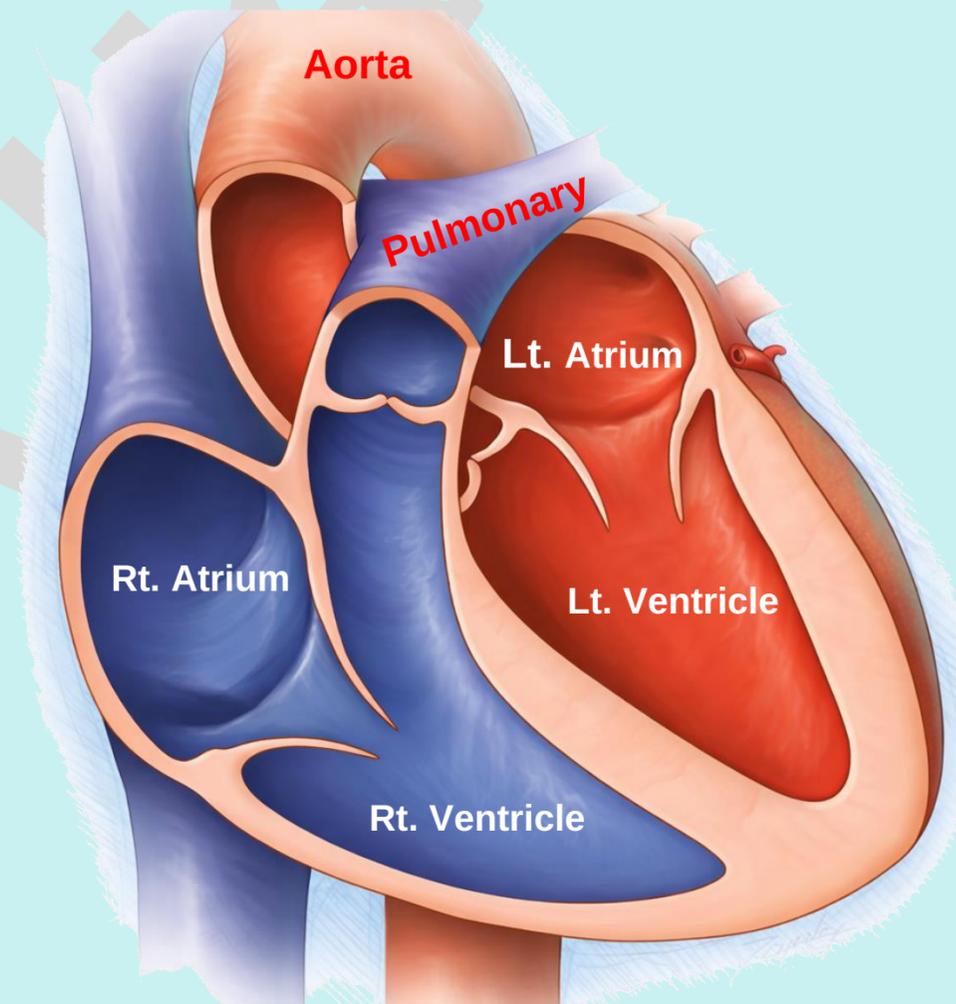
➤ Left Ventricle

- The left ventricle is the thickest chamber of the heart.
- It forms most of the left surface, part of the diaphragmatic surface, and the apex of the heart.



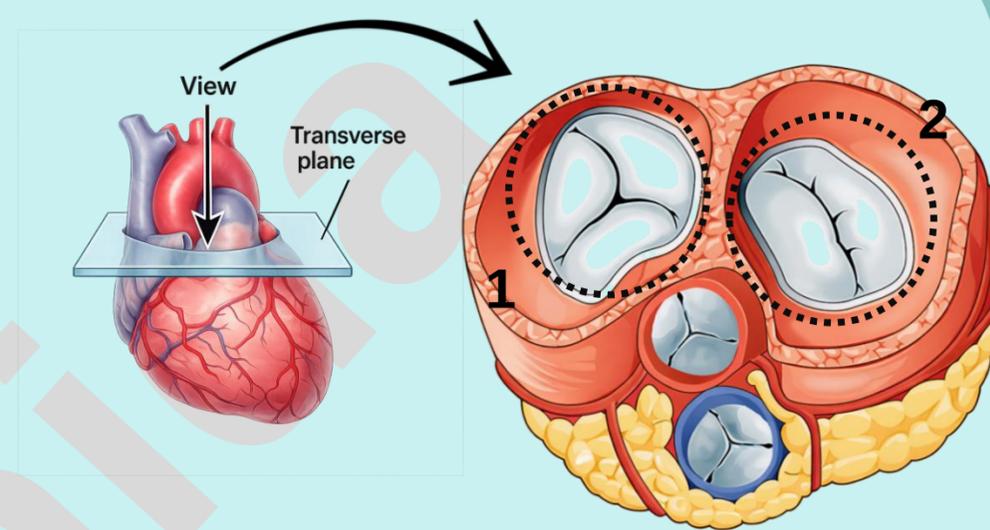
Valves of the Heart

- There are two pairs of valves in the heart:
 - (a) a pair of atrioventricular valves (Tricuspid valve and Bicuspid valve)
 - (b) a pair of semilunar valves (Aortic valve and Pulmonary valve)
- Each of the four valves helps ensure the one-way flow of blood by opening to allow blood to pass through and then closing to prevent backflow (regurgitation) of blood.



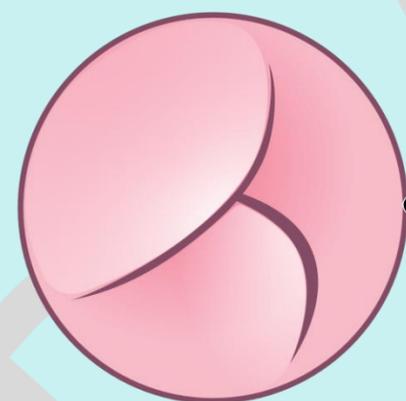
➤ Atrioventricular Valves (AV):

- They allow the flow of blood from the atria into the ventricles and prevent backflow of blood into the atria.

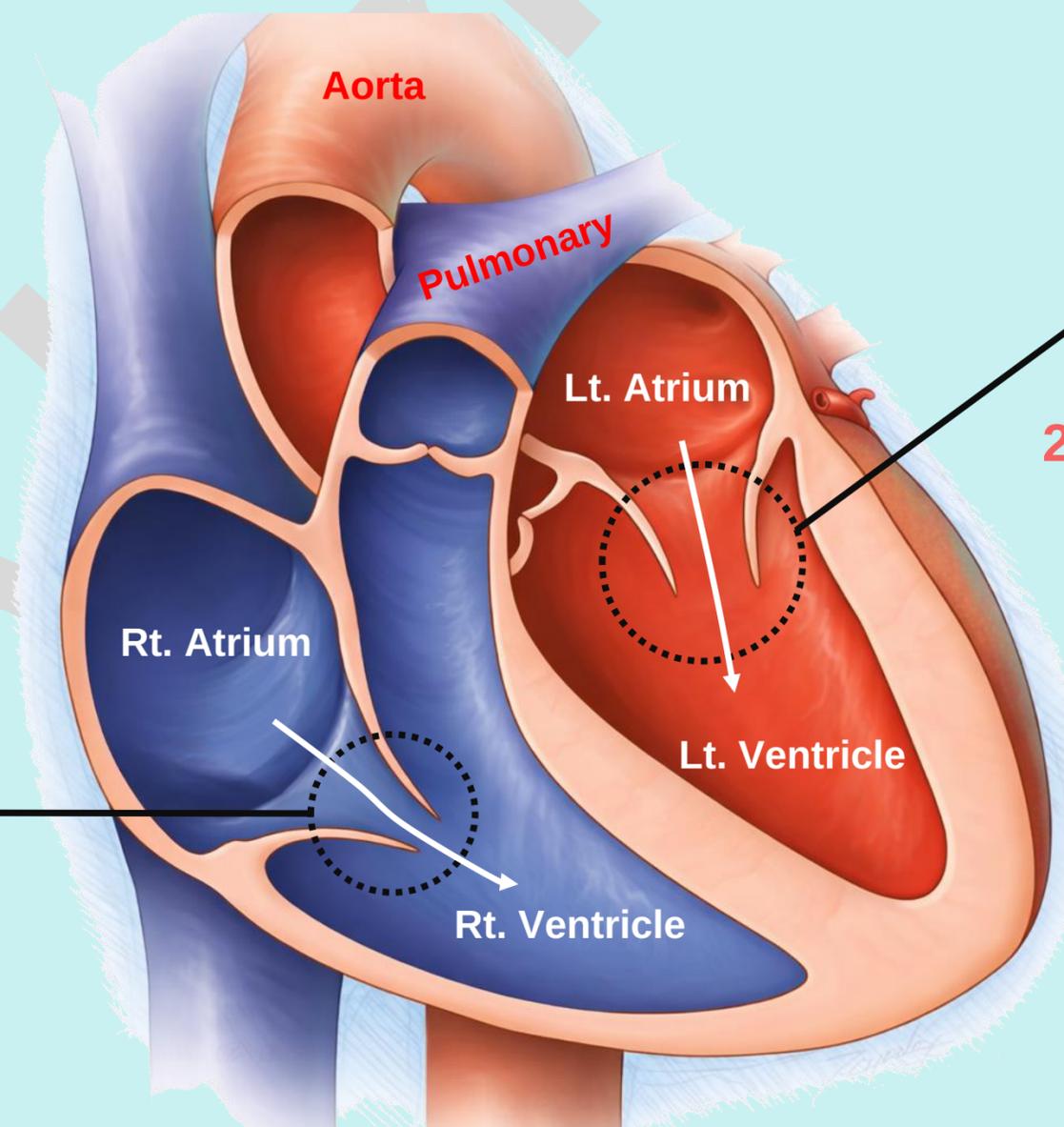


1. Right atrioventricular valve:

- Located between the right atrium and right ventricle.
- It is also known as the tricuspid valve; as the name indicates, it has three cusps (anterior, posterior, and septal).



Tricuspid valve



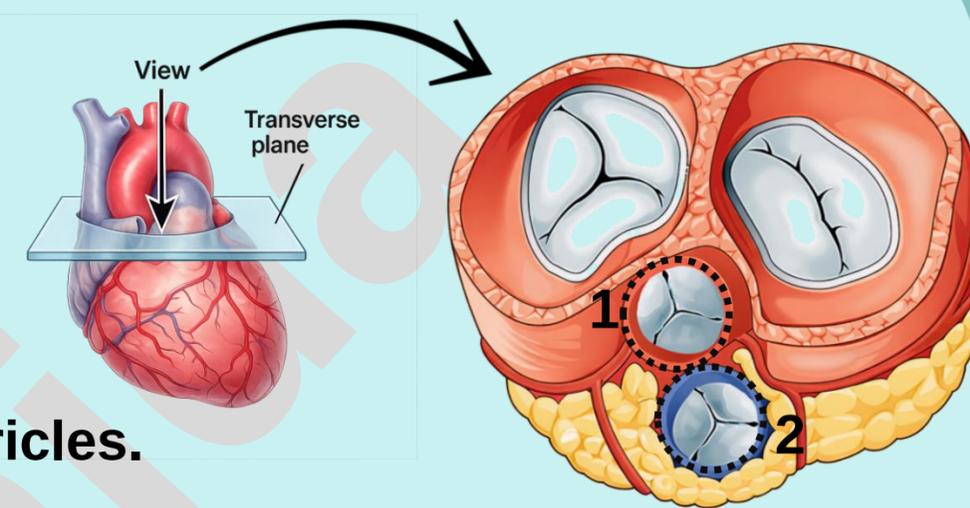
Mitral valve
(bicuspid valve)

2. Left atrioventricular valve:

- Located between the left atrium and left ventricle
- It is also known as mitral valve or bicuspid valve; as the name indicates, it has two cusps (anterior and posterior).

➤ Semilunar Valves:

- They allow ejection of blood from the ventricles into the arteries and prevent backflow of blood into the ventricles.
- They are composed of three crescent-shaped cusps, hence the name “semilunar.”

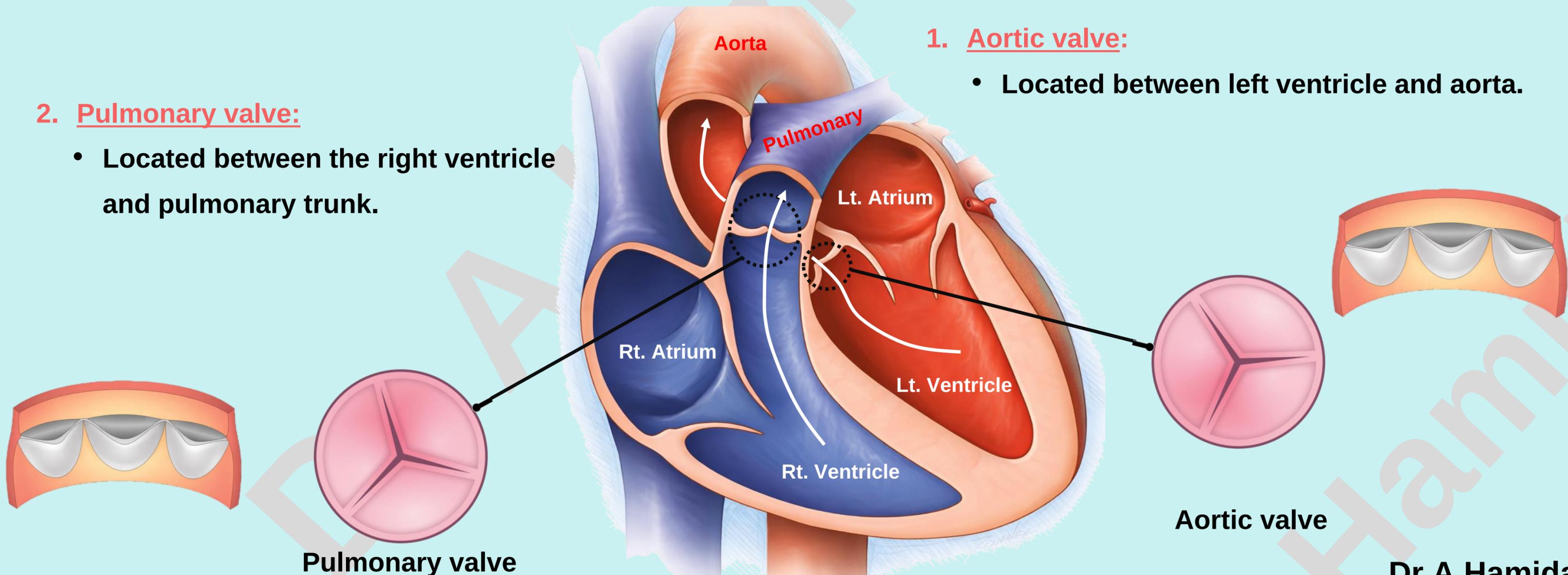


2. Pulmonary valve:

- Located between the right ventricle and pulmonary trunk.

1. Aortic valve:

- Located between left ventricle and aorta.



Pulmonary valve

Aortic valve

Valves of the Heart

➤ Atrioventricular Valves (AV):

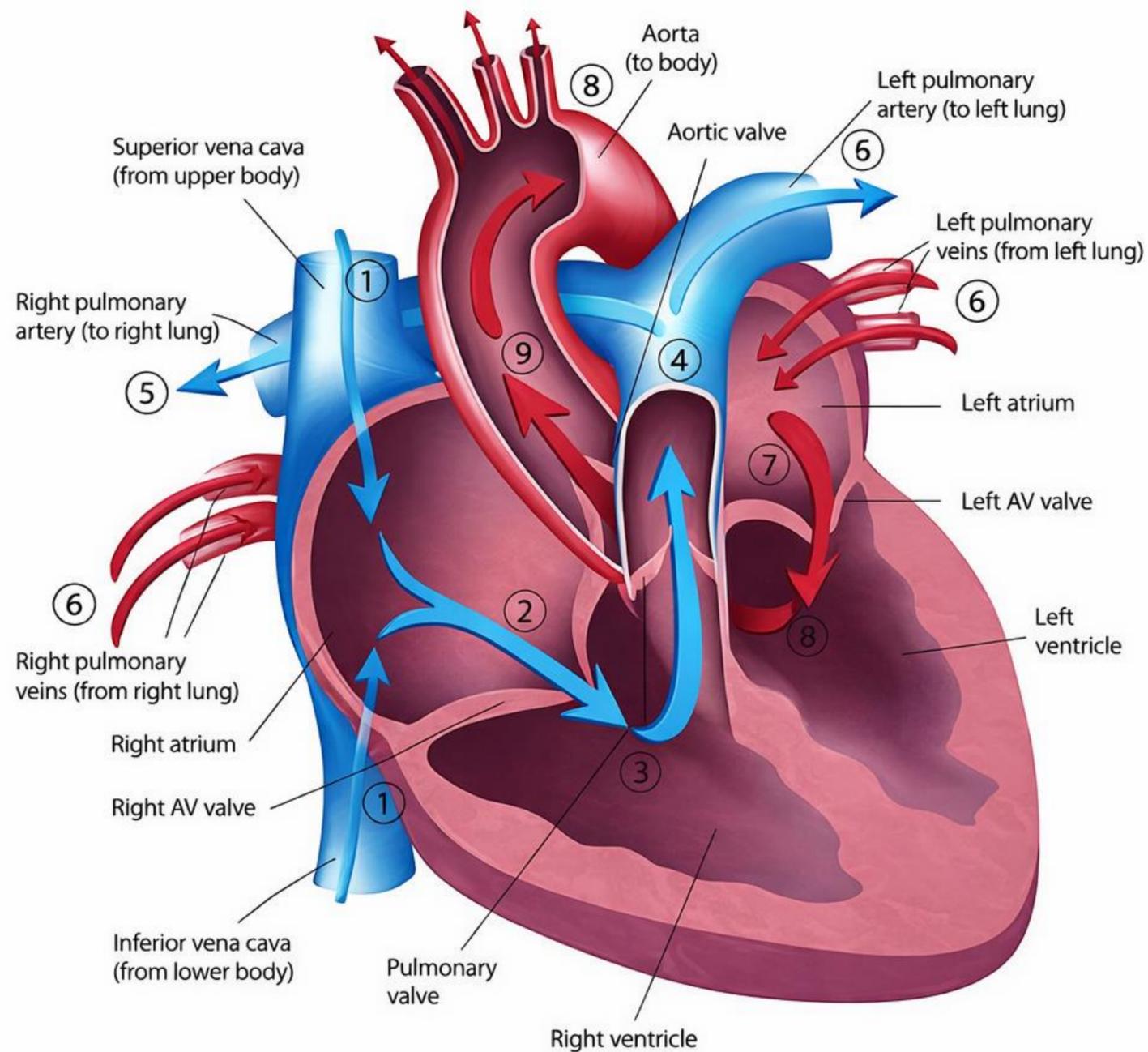
- When an AV valve is open, the cusps project into the ventricle, and blood moves from a region of higher pressure in the atria to a region of lower pressure in the ventricles through the open AV valves.
- When the ventricles contract, the rising blood pressure drives the cusps upward until their edges meet and close the opening, preventing backflow into the atria.

➤ Semilunar Valves:

- When the ventricles contract, pressure builds up within the chambers.
- The semilunar valves open when the pressure in the ventricles exceeds the pressure in the arteries, permitting ejection of blood into the pulmonary trunk and aorta.
- As the ventricles relax, blood begins to flow back toward the heart.
- This backflow fills the valve cusps, causing their free edges to meet tightly and close the opening between the ventricle and the artery.

3.2 Cardiovascular System-Heart

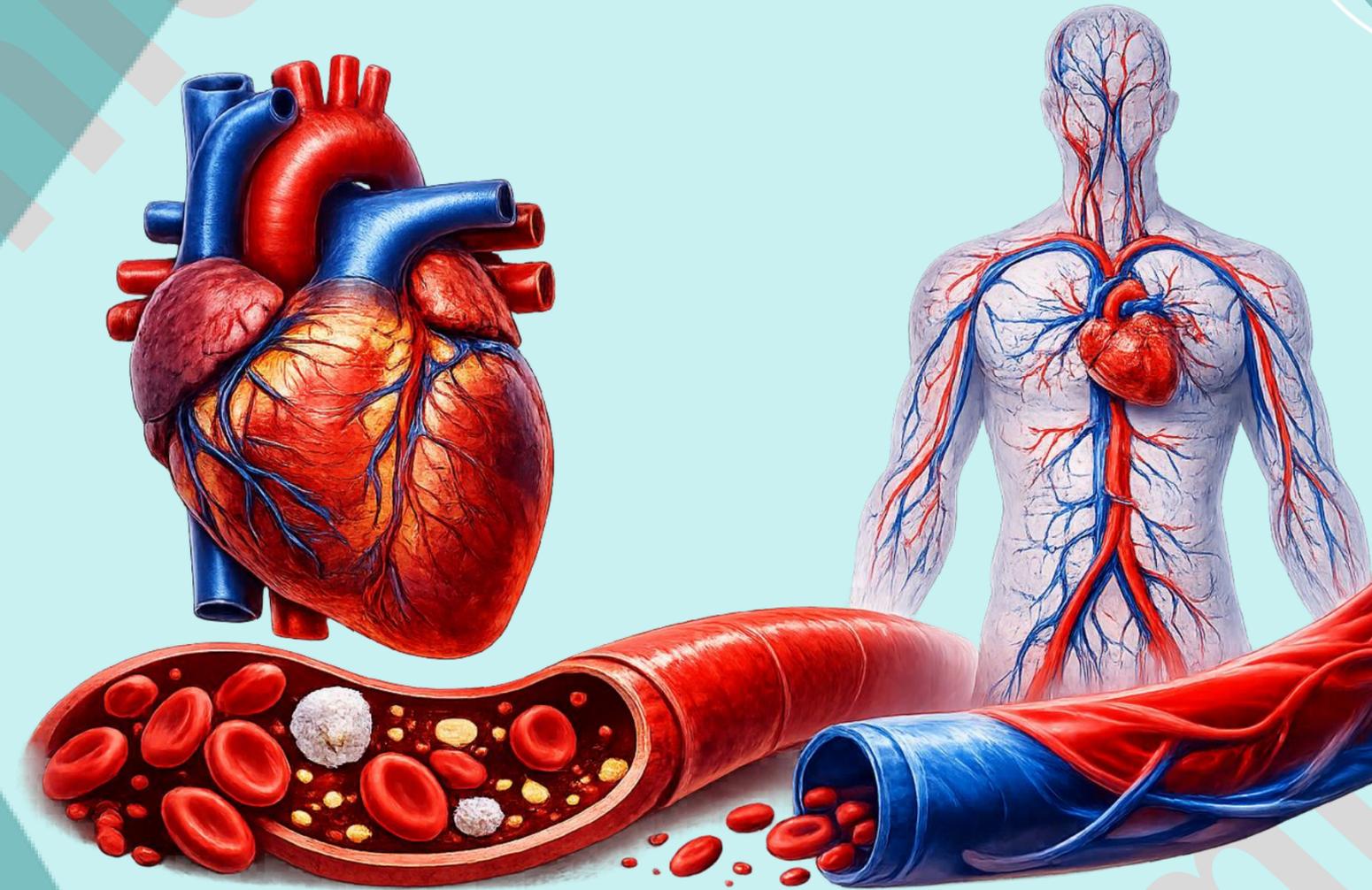
The pathway of blood flow through the heart



3

Cardiovascular System

3. Blood Vessels

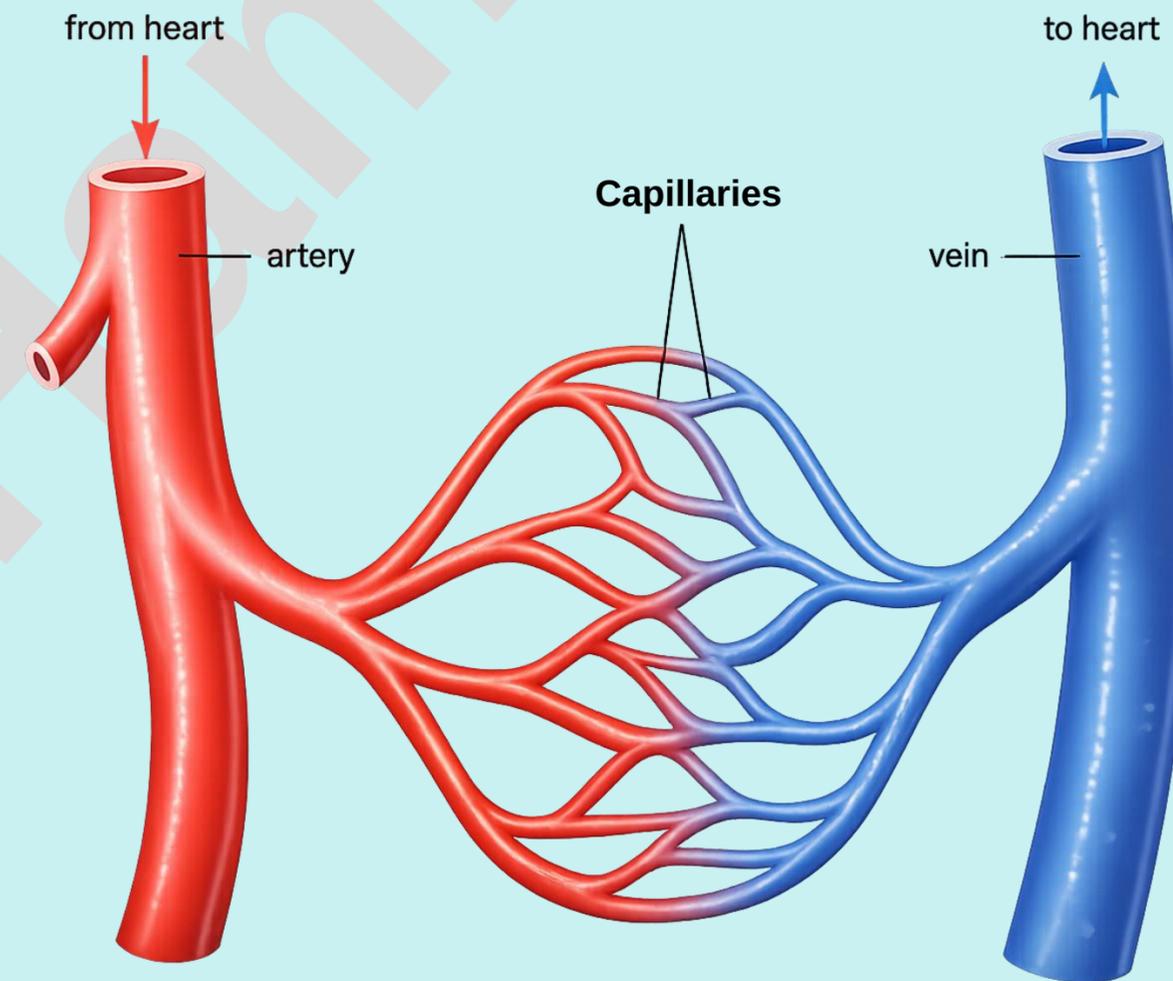


3.3 Cardiovascular System-Blood Vessels

➤ The blood vessels form a closed system of tubes that carry blood away from the heart to the tissues of the body and then return it back to the heart.

➤ The blood vessels include:

1. Arteries
2. Capillaries
3. Veins



3.3 Cardiovascular System-Blood Vessels

Outline:

3.3.1

Arteries

3.3.2

Veins

3.3.3

Capillaries

3.3.4

Major Arteries Leaving the Heart

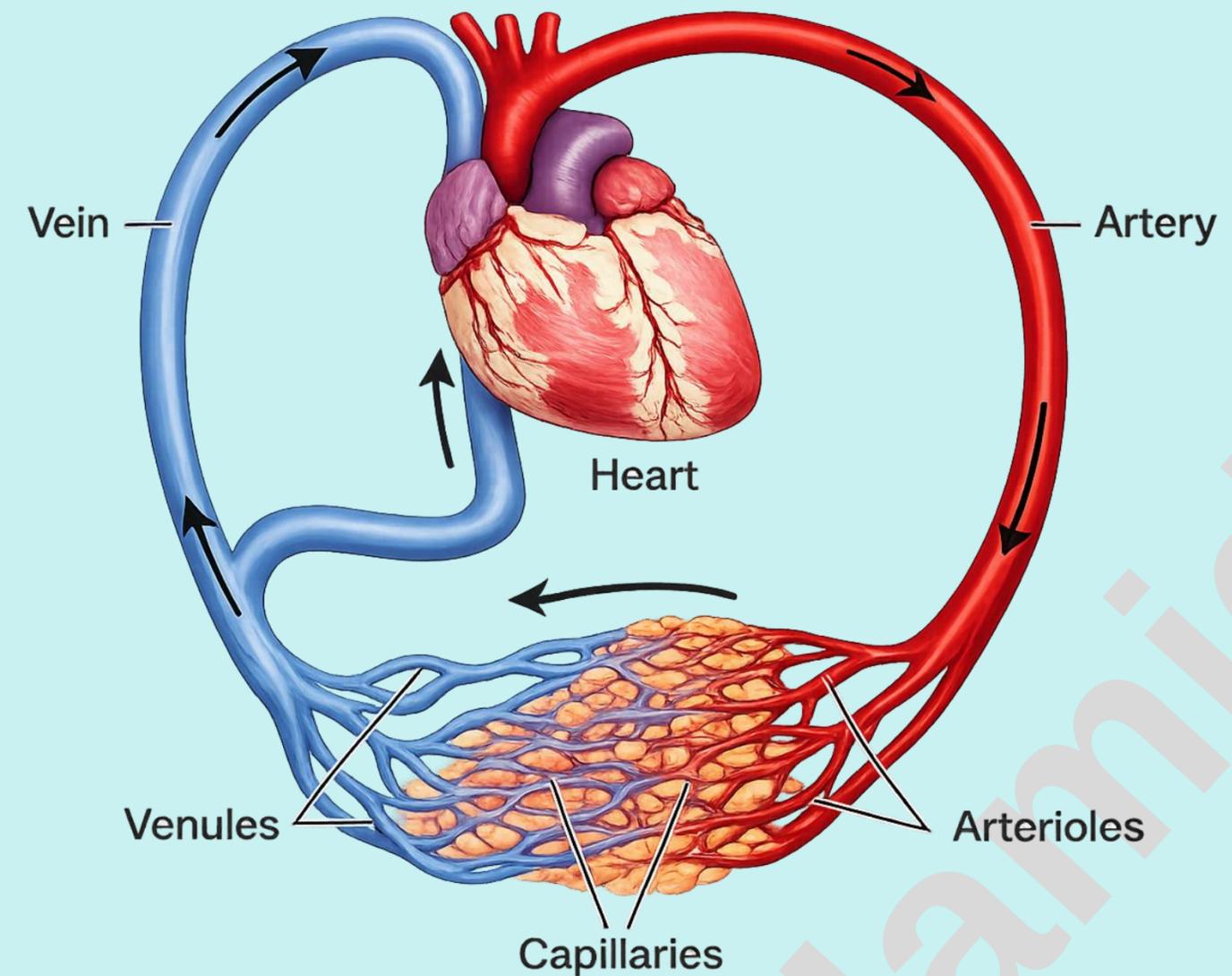
3.3.5

Major Veines Entering the Heart

Arteries

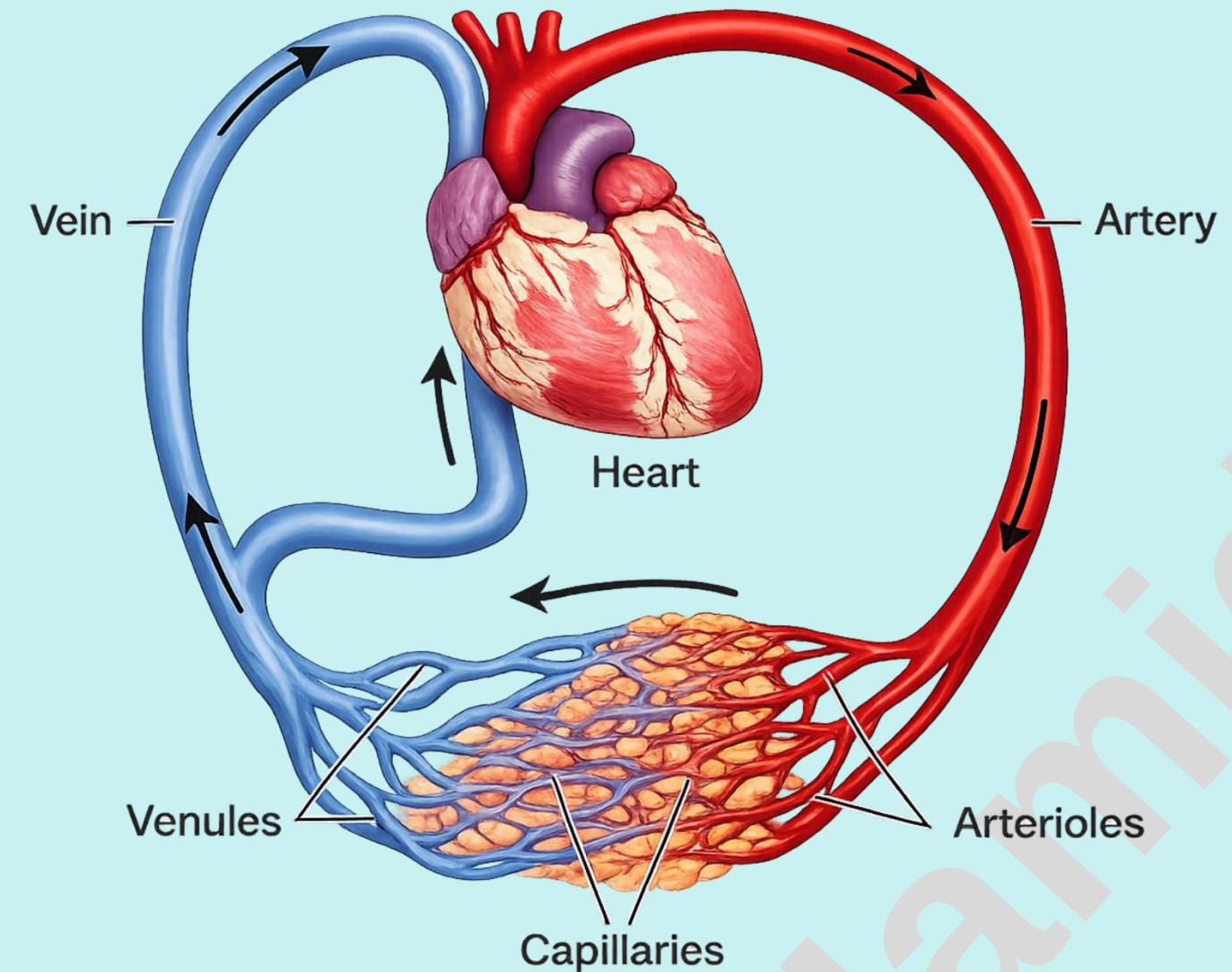
- They are thick-walled tubes that carry blood away from the heart to other organs.
- They divide repeatedly like a branch of a tree and gradually become smaller in size.

- Large elastic arteries leave the heart and divide into medium-sized arteries.
- These then divide into small arteries, which in turn divide into still smaller arteries called arterioles.
- As the arterioles enter a tissue, they branch into numerous tiny vessels called capillaries.
- The thin walls of capillaries allow the exchange of substances between the blood and body tissues.



Venes

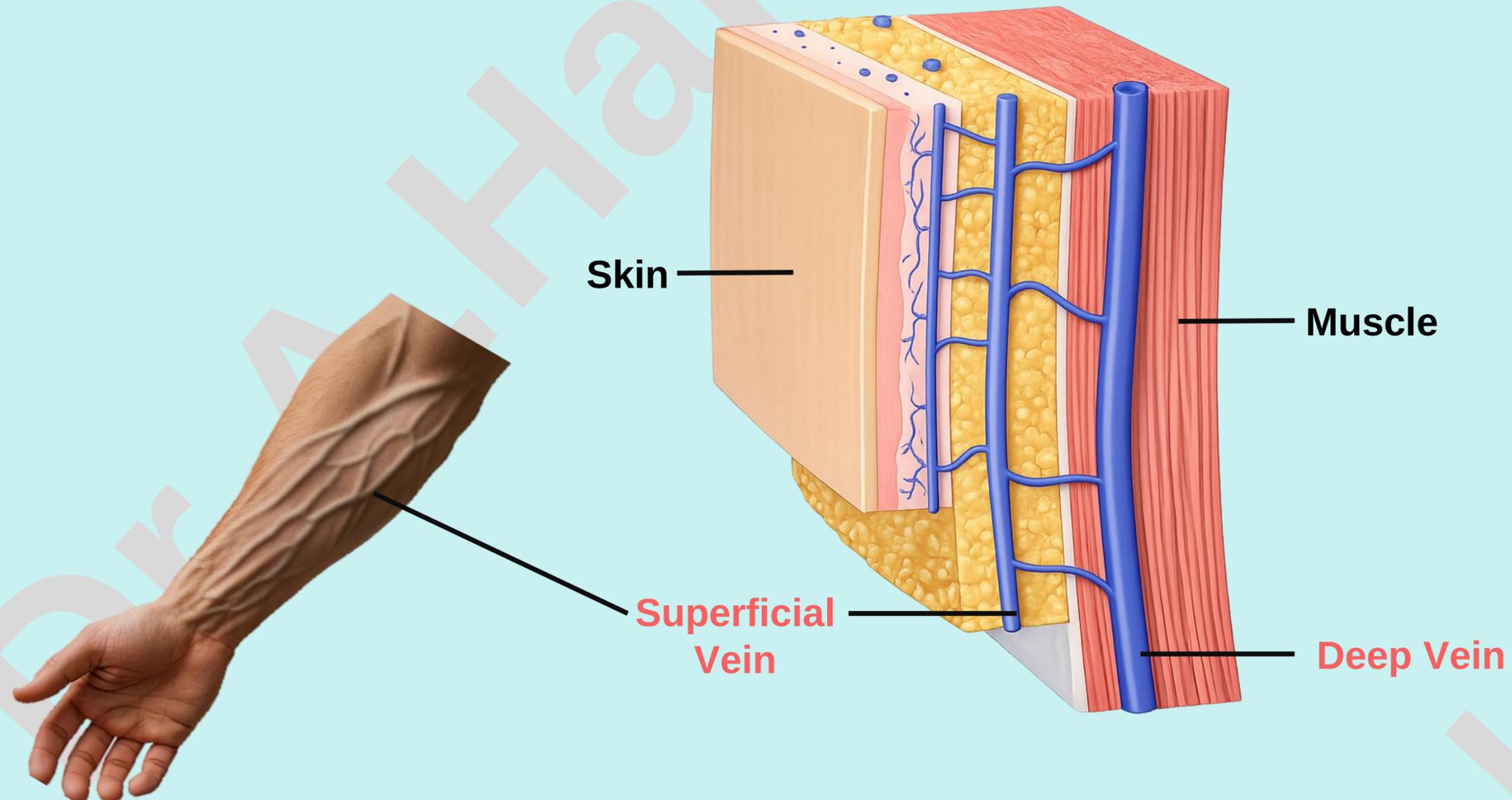
- They are thin-walled tubes that carry blood from tissues of different parts of the body back to the heart.
 - Large veins are formed by the union of smaller veins, like tributaries of a river.
- Groups of capillaries within a tissue reunite to form small veins called venules.
 - These, in turn, merge to form progressively larger blood vessels called veins.



Venes

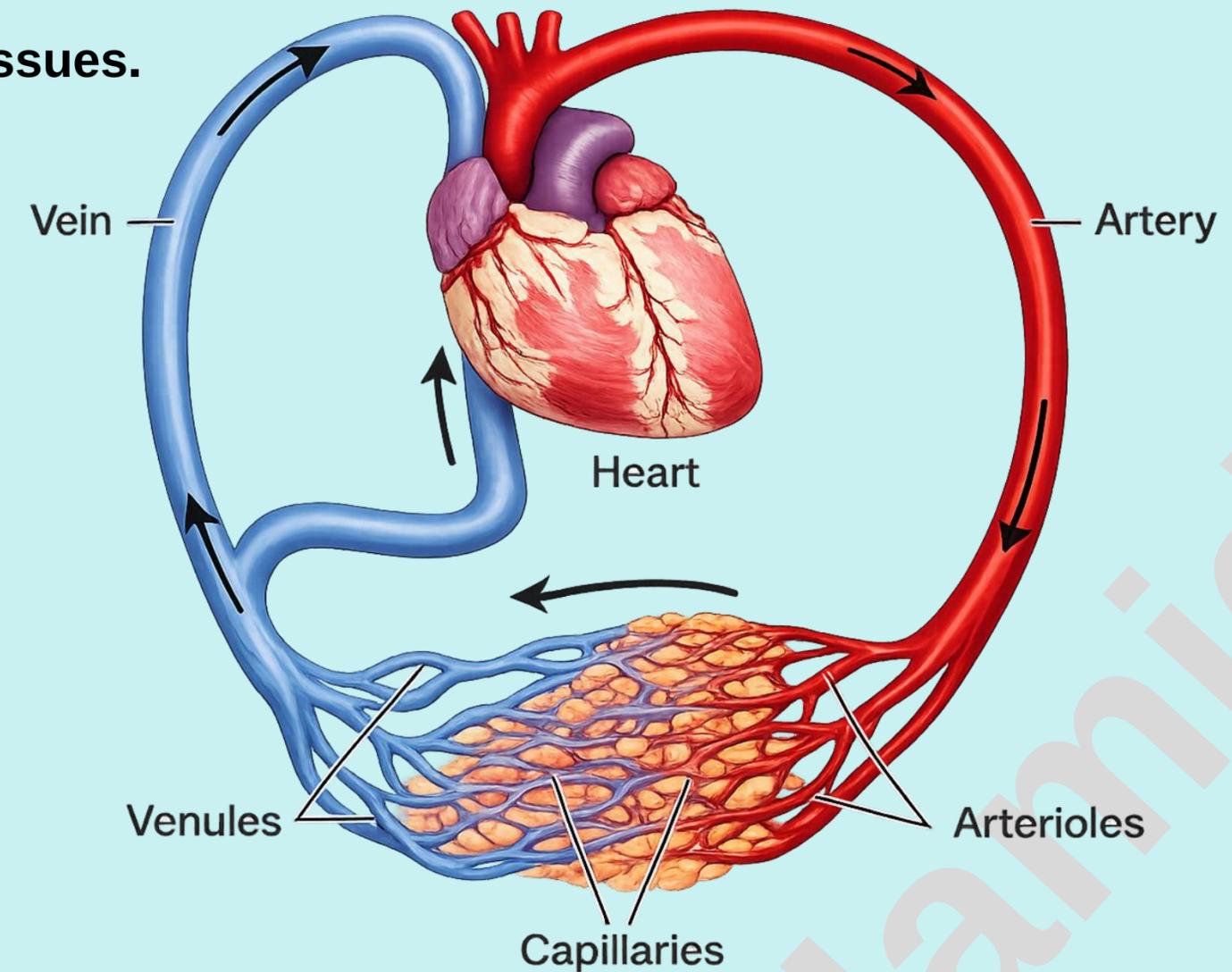
➤ **Veins may be superficial or deep.**

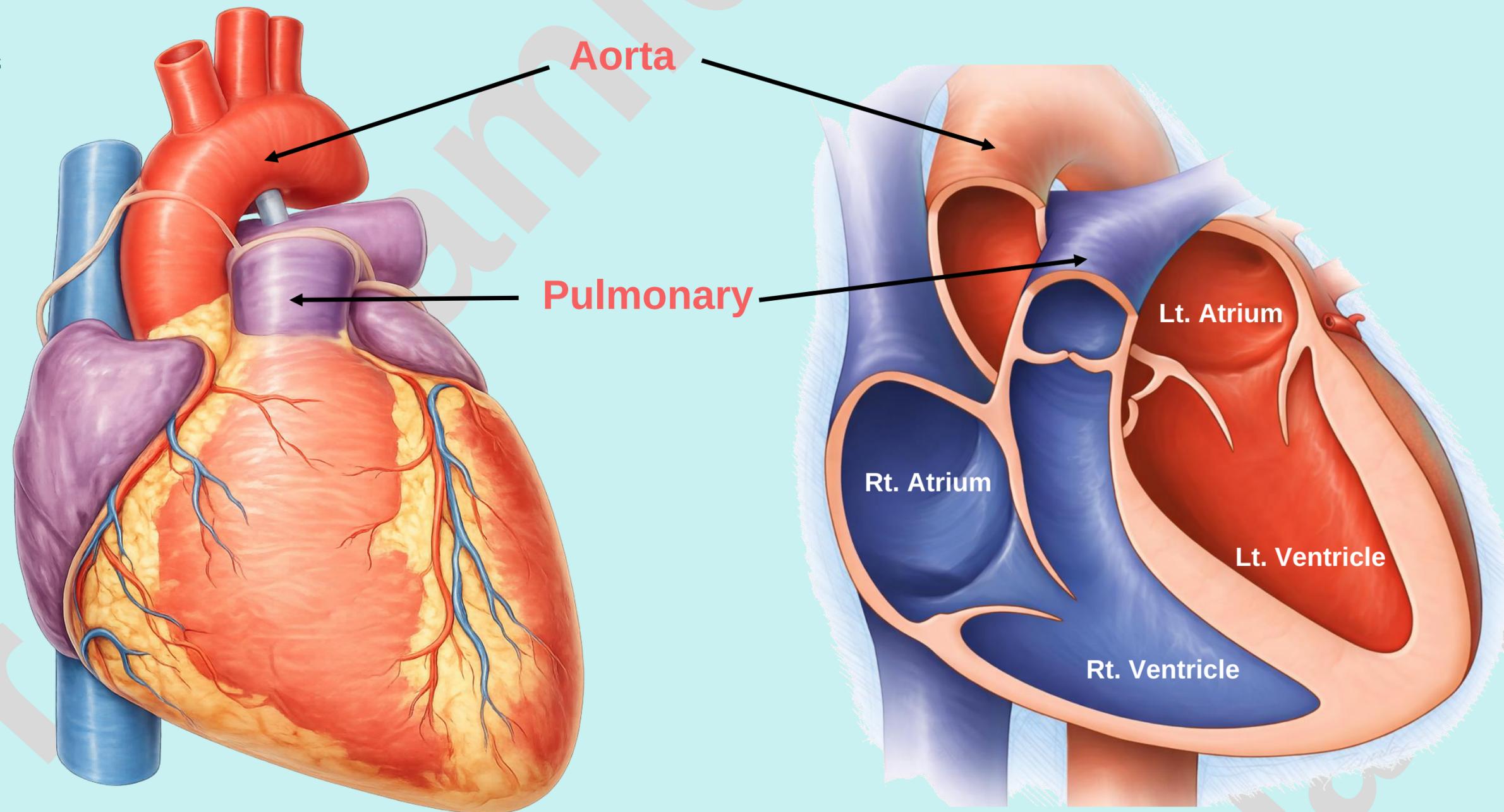
- Superficial veins are located just beneath the skin and can be seen easily.
- They are clinically important as sites for withdrawing blood or administering intravenous injections.
- Deep veins generally travel alongside arteries and usually bear the same name as the corresponding artery.



Capillaries

- They are microscopic, thin-walled blood vessels that connect arterioles to venules.
- Capillaries are the primary sites of exchange between the blood and body cells
 - Their walls consist of a single layer of endothelial cells, which allows the exchange of oxygen, carbon dioxide, nutrients, hormones, and waste products between the blood and the tissues.

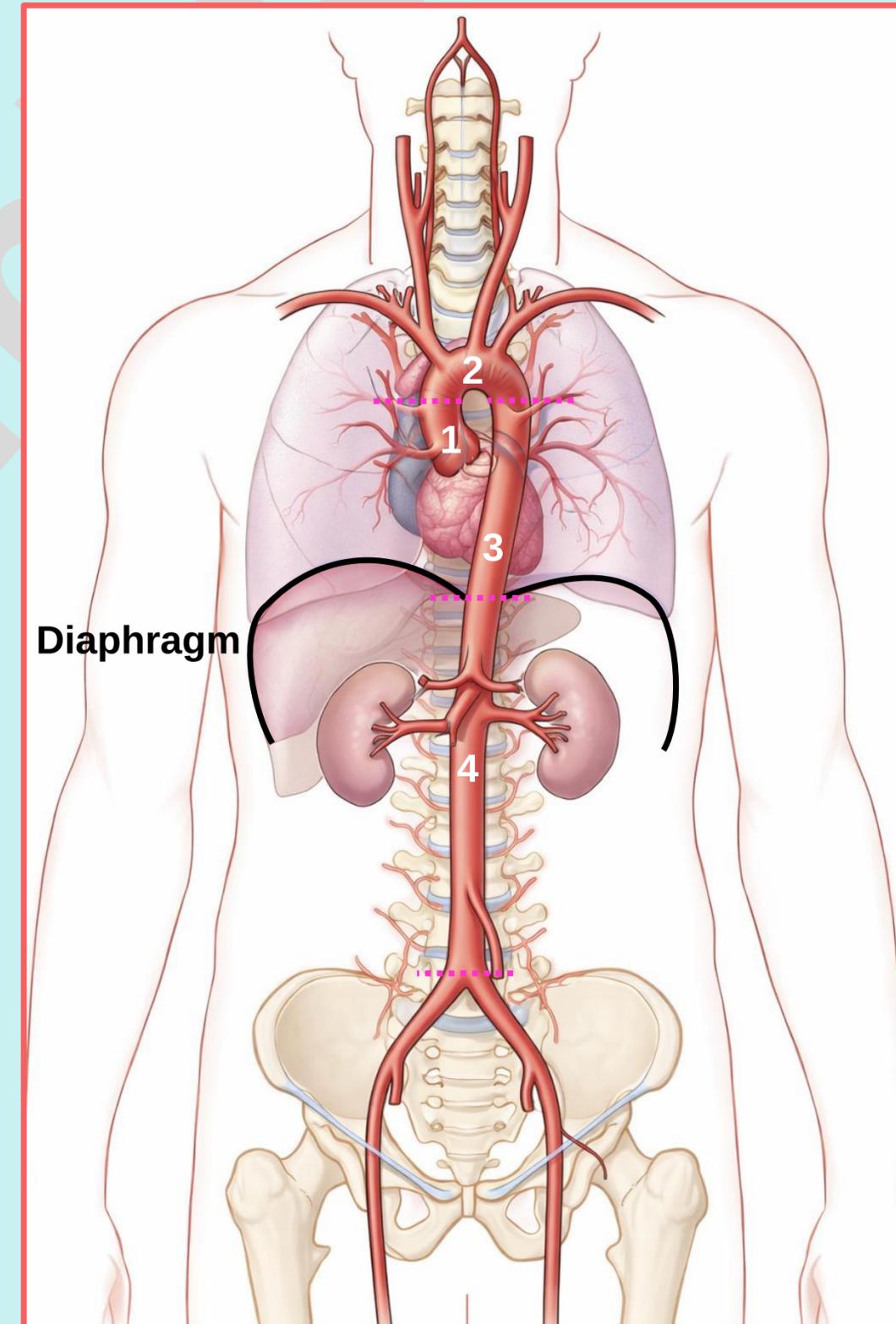


1. Aorta**2. Pulmonary Trunk**

Major Arteries Leaving the Heart

1. Aorta

- The aorta is the largest artery of the body, with a diameter of 2–3 cm (about 1 in.).
- It conveys oxygenated blood from the left ventricle of the heart to all organs throughout the body.
- It consists of four main parts:
 1. Ascending aorta
 2. Arch of the aorta
 3. Descending thoracic aorta
 4. Abdominal aorta

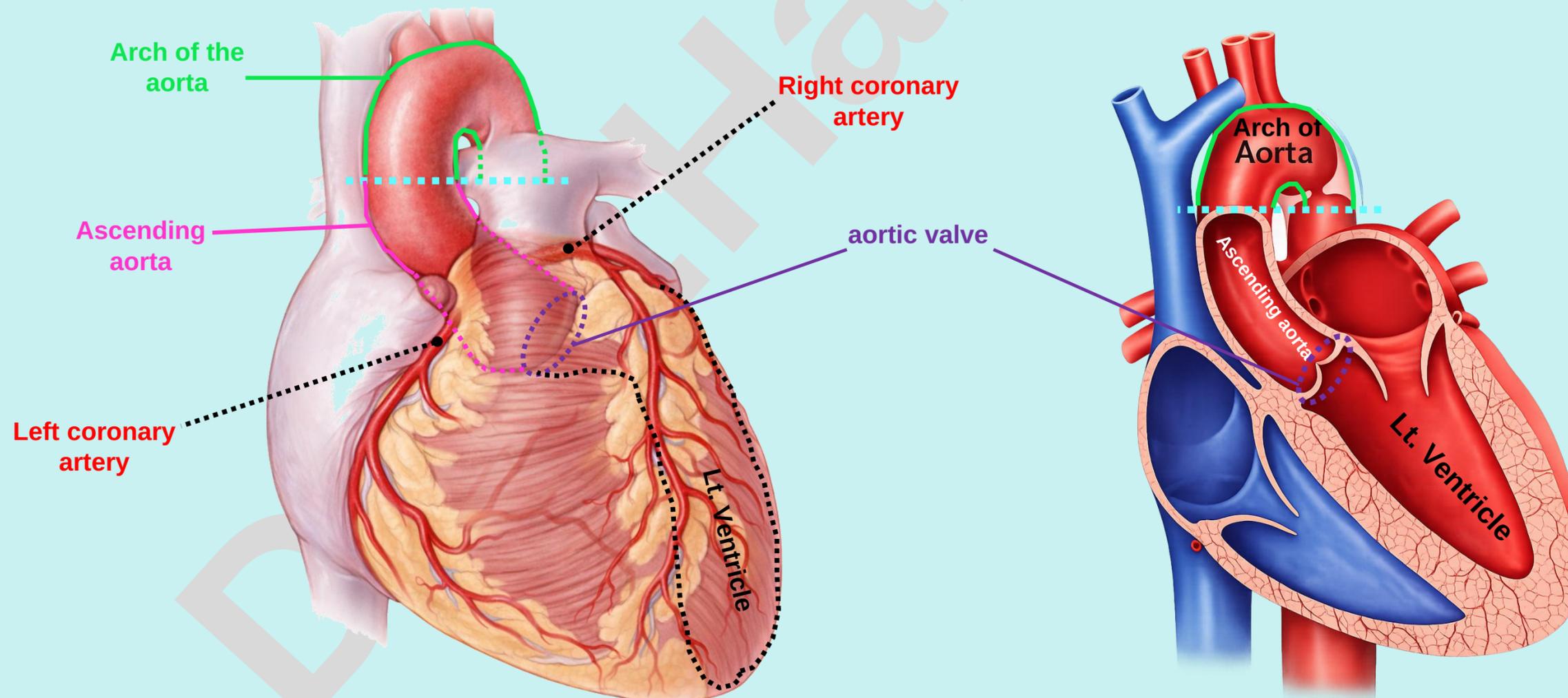


Major Arteries Leaving the Heart

1. Aorta

1. Ascending aorta

- The ascending aorta emerges from the left ventricle and runs upward and forward.
- It begins at the aortic valve and ends at the level of the sternal angle, where it becomes the arch of the aorta.
- The ascending aorta gives off two coronary arteries (right and left coronary arteries) that supply the myocardium of the heart.

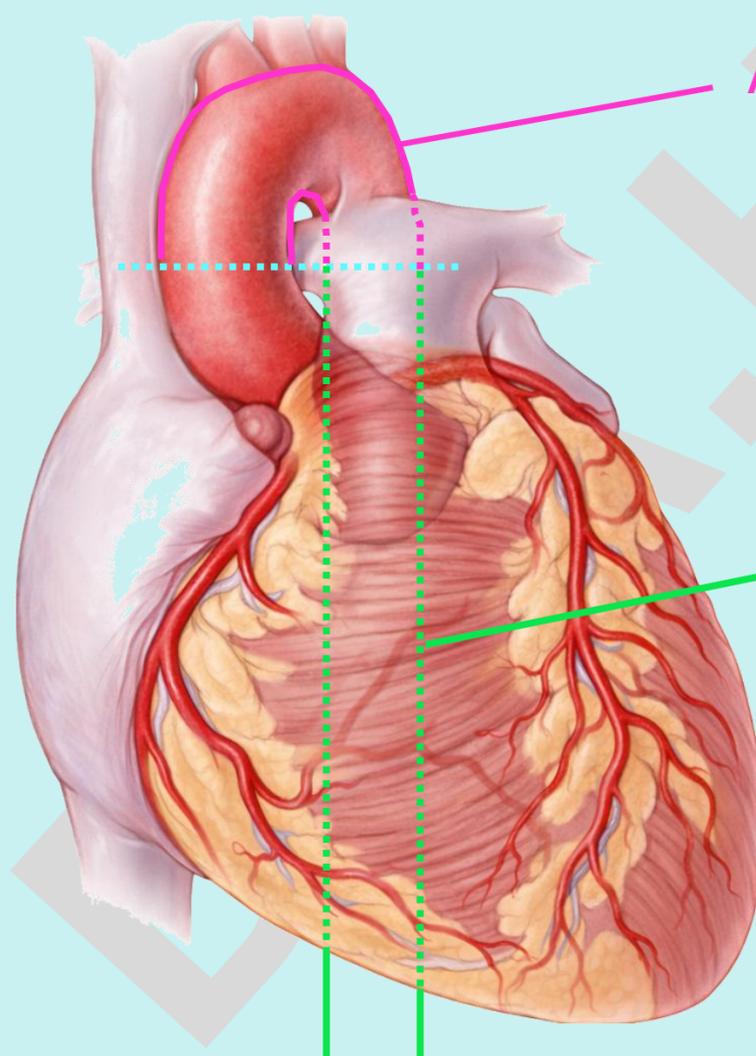


3.3.4 Major Arteries Leaving the Heart

1. Aorta

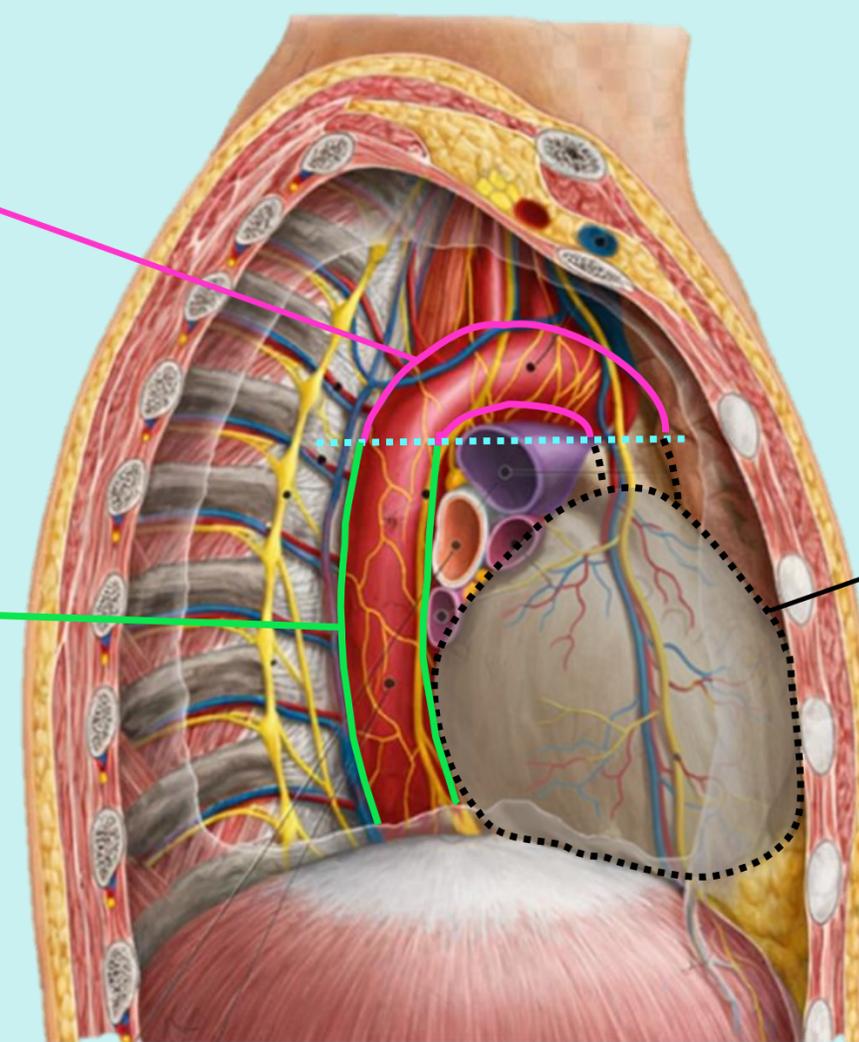
2. Arch of the aorta

- It is the continuation of the ascending aorta.
- It arches upward, backward, and to the left
- It then passes downward and ends at the level of the sternal angle, where it becomes the descending thoracic aorta.



Arch of the aorta

Descending thoracic aorta



Heart

Lateral view

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3.3.4 Major Arteries Leaving the Heart

1. Aorta

2. Arch of the aorta

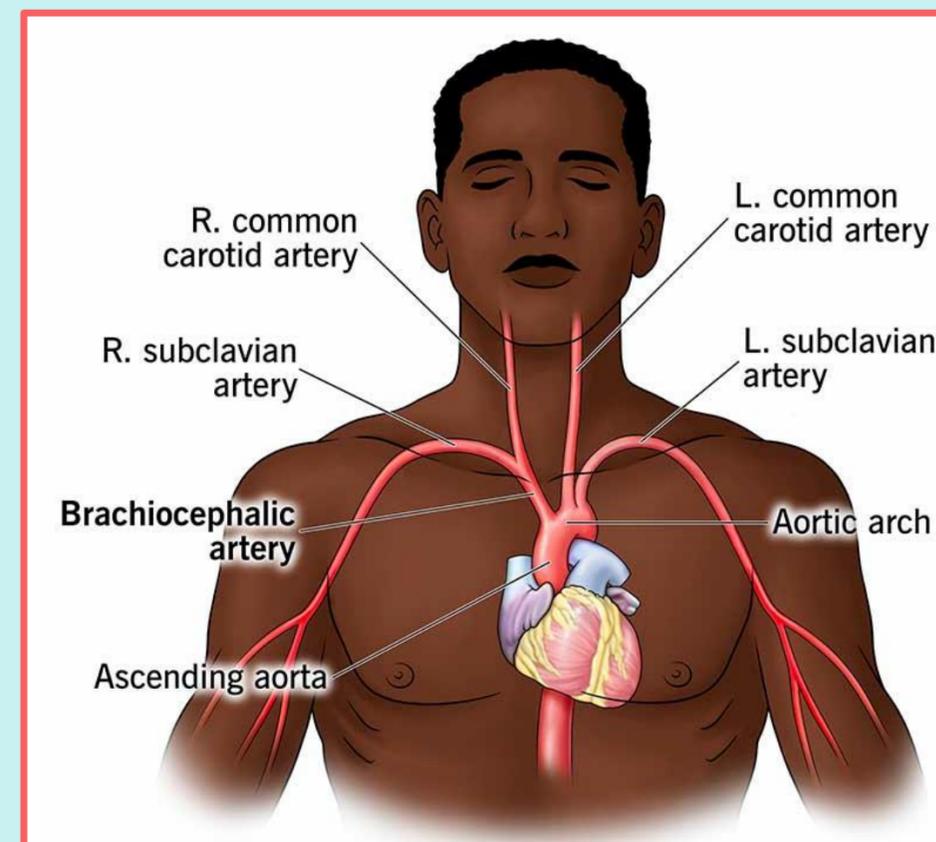
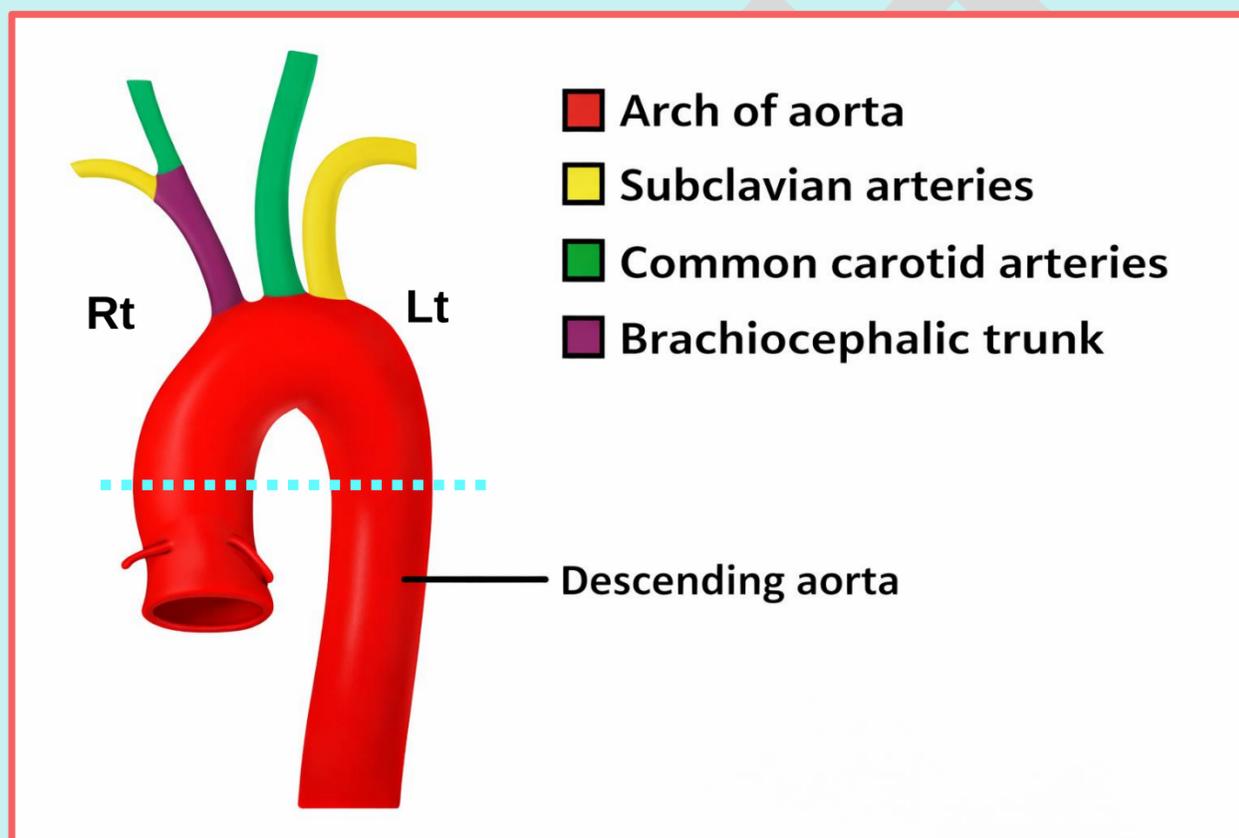
- The arch of the aorta gives rise to three major arteries from its superior (convex) surface:

i. Brachiocephalic trunk

- Divides into the right subclavian artery and right common carotid artery.

ii. Left common carotid artery

iii. Left subclavian artery



Major Arteries Leaving the Heart

1. Aorta

2. Arch of the aorta

- The arch of the aorta gives rise to three major arteries from its superior (convex) surface:

i. Brachiocephalic trunk

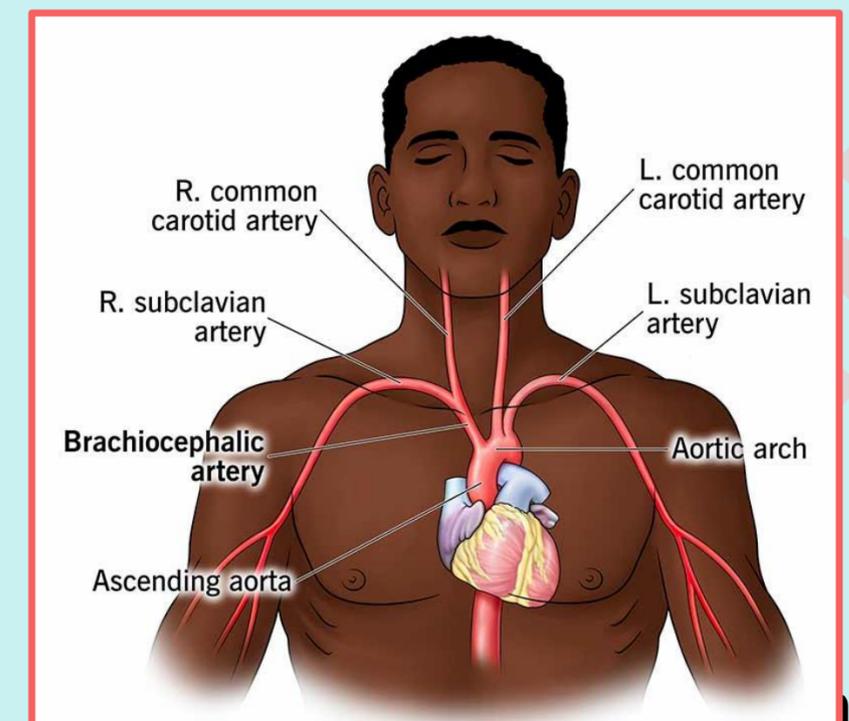
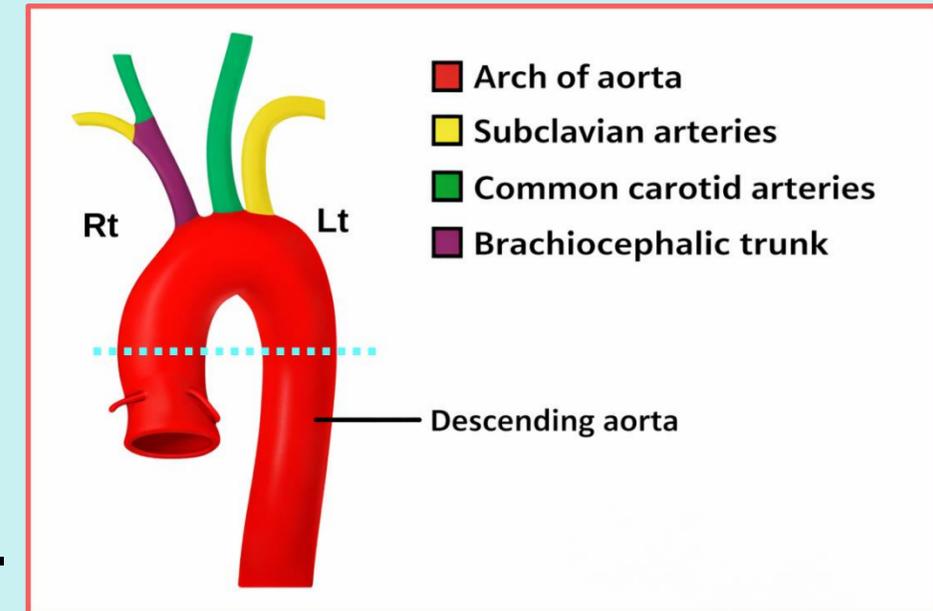
- The first and largest branch, passes upward and to the right and divides into the right subclavian artery and right common carotid artery.

ii. Left common carotid artery

- The second branch, arises on the left side of the brachiocephalic artery.
- It runs upward and to the left of the trachea and enters the neck
- It gives off branches that supply the head and neck structures.

iii. Left subclavian artery

- The third branch, arises posterior to the left common carotid artery.
- It runs upward along the left side of the trachea and the esophagus to enter the root of the neck and continues toward the left upper limb.
- It gives off branches that supply the upper limb structures.

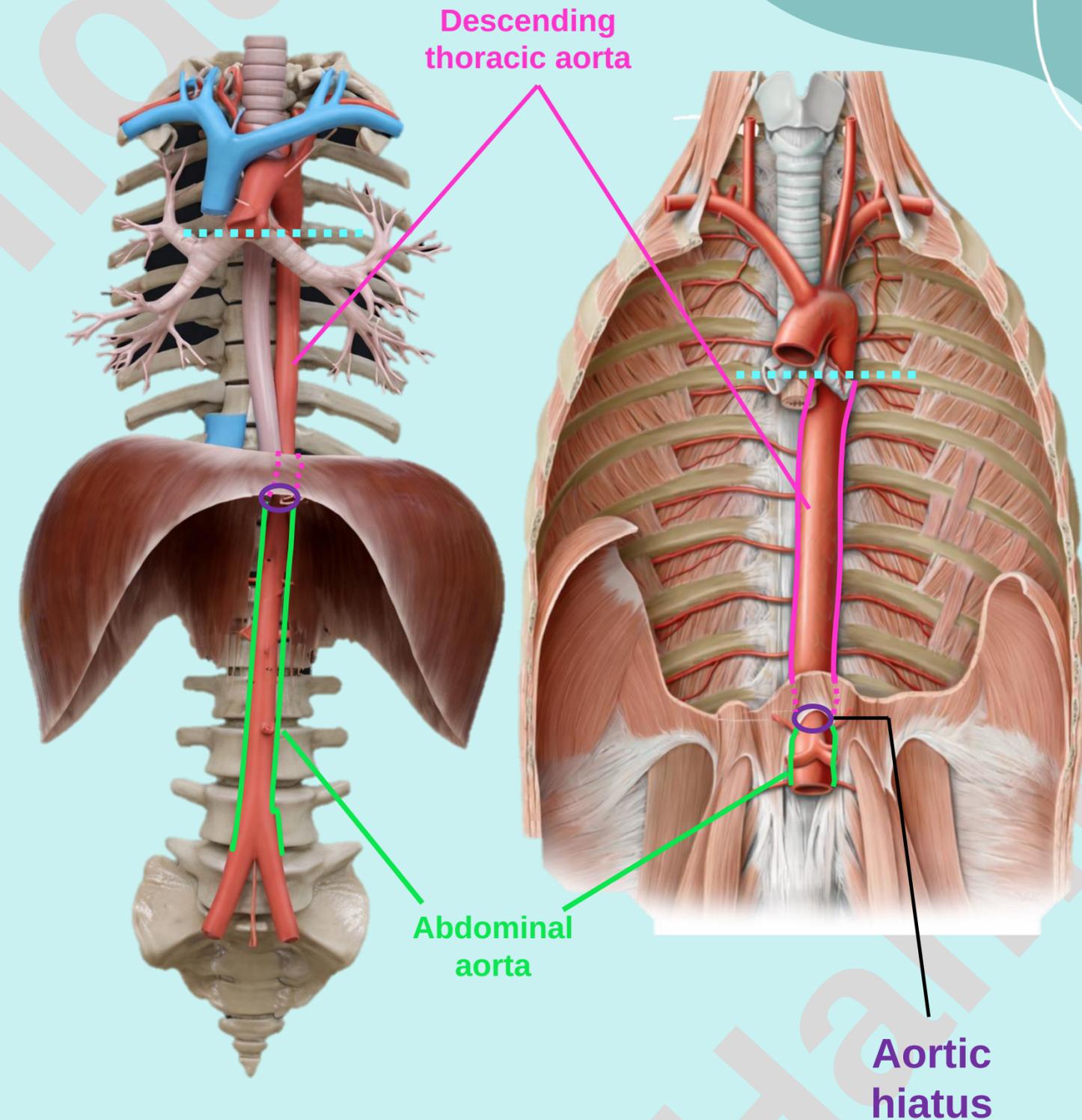


Major Arteries Leaving the Heart

1. Aorta

3. Descending thoracic aorta

- It begins as the continuation of the arch of the aorta at the level of the **sternal angle**.
- It runs downward along the left side of the vertebral column.
- At the level of the 12th thoracic vertebra (T12), it passes through the **aortic hiatus of the diaphragm** and becomes continuous with the **abdominal aorta**.
- It gives off branches that supply most structures of the chest cavity.

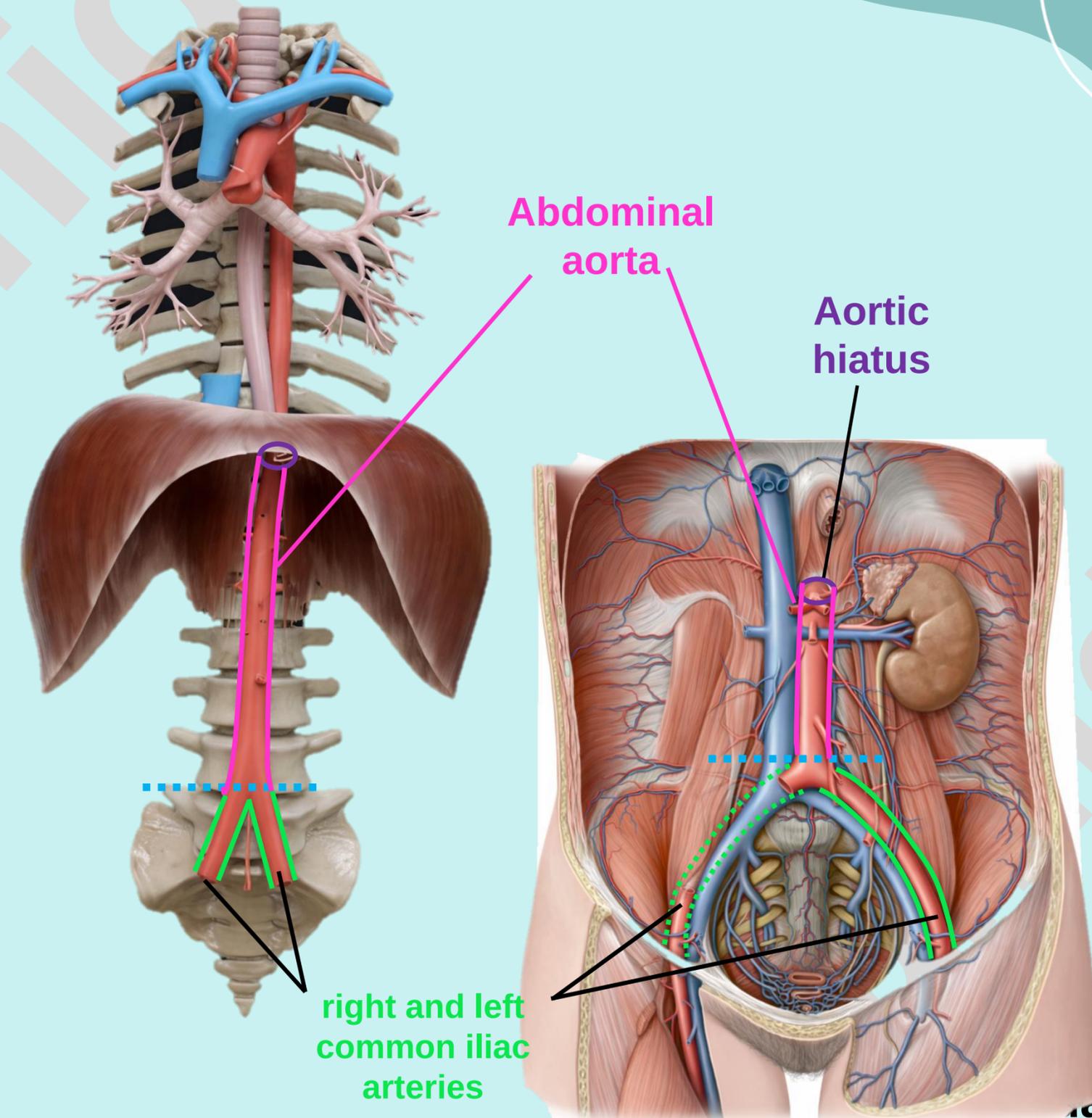


Major Arteries Leaving the Heart

1. Aorta

4. Abdominal aorta

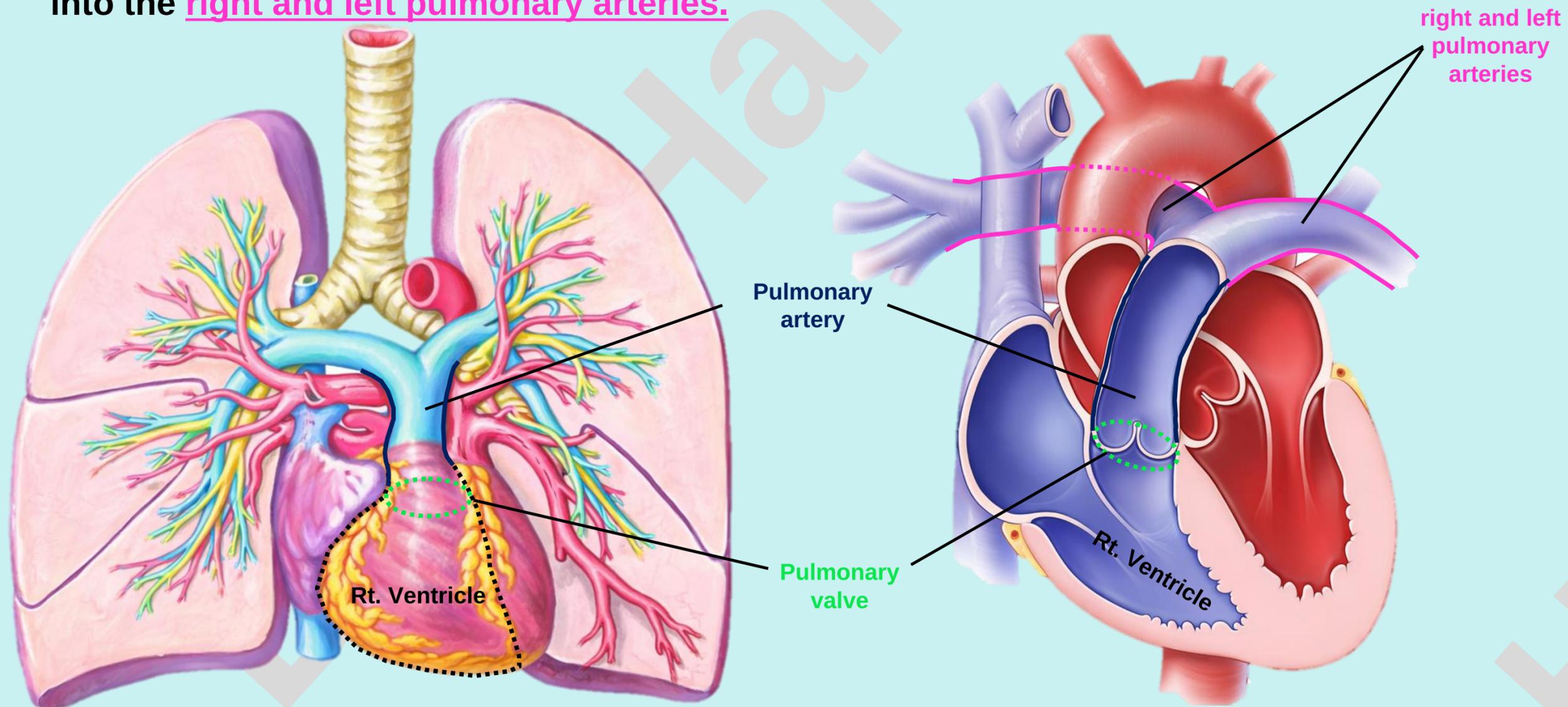
- It is the continuation of the thoracic aorta after it passes through the diaphragm.
- It begins at the aortic hiatus in the diaphragm and ends at about the level of the fourth lumbar vertebra (L4), where it divides into the right and left common iliac arteries.
- It gives off visceral and parietal branches that supply most structures in the abdominal cavity.



Major Arteries Leaving the Heart

2. Pulmonary Trunk (artery)

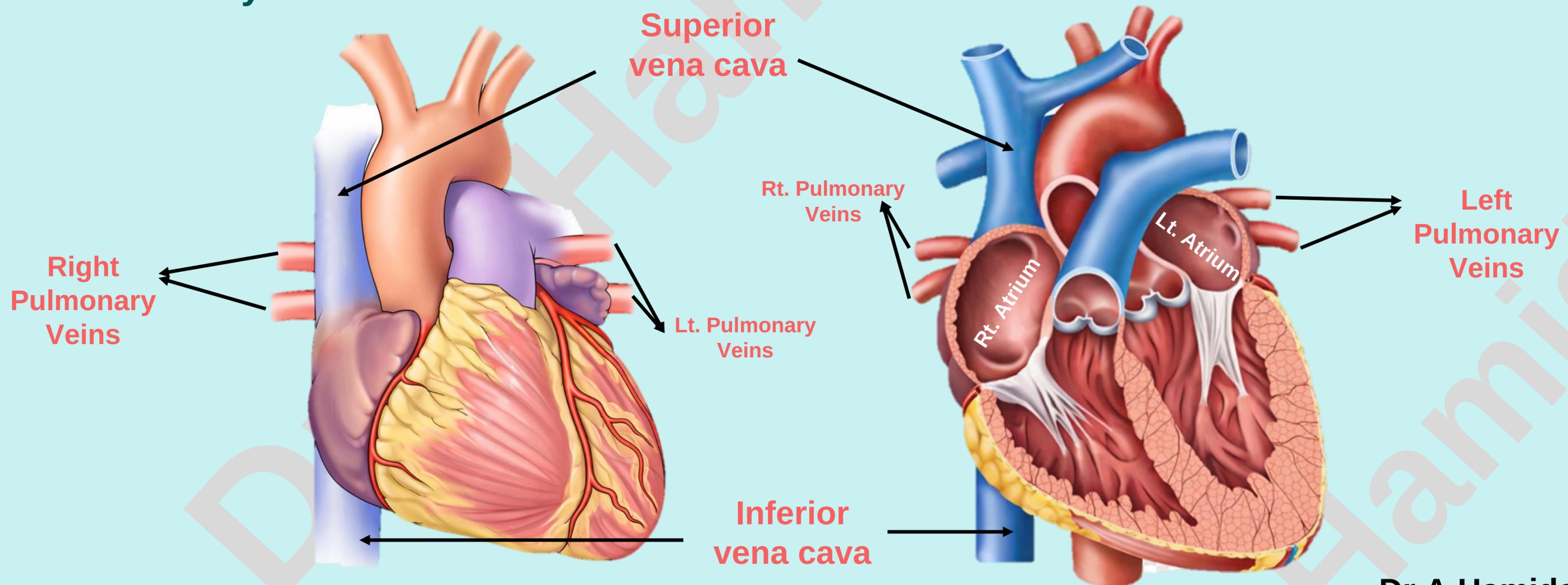
- It conveys deoxygenated blood from the right ventricle of the heart to the lungs.
- It leaves the right ventricle and runs upward, backward, and to the left.
- It begins at the pulmonary valve
- It is about 5 cm (2 inches) long and terminates inferior to the arch of the aorta by dividing into the right and left pulmonary arteries.



Major Veines Entering the Heart

➤ Veins drain blood away from the various parts and return the blood to the heart.

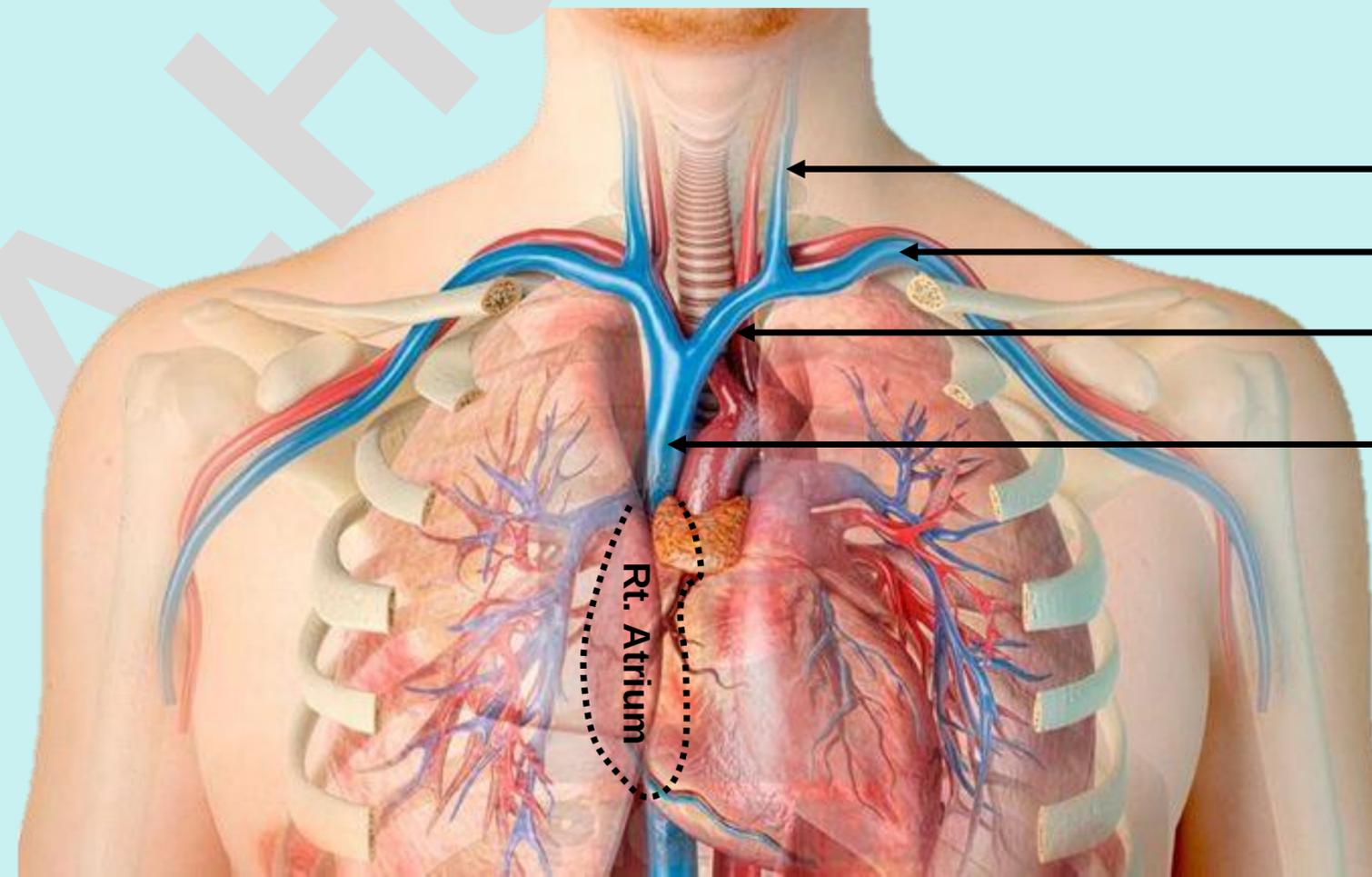
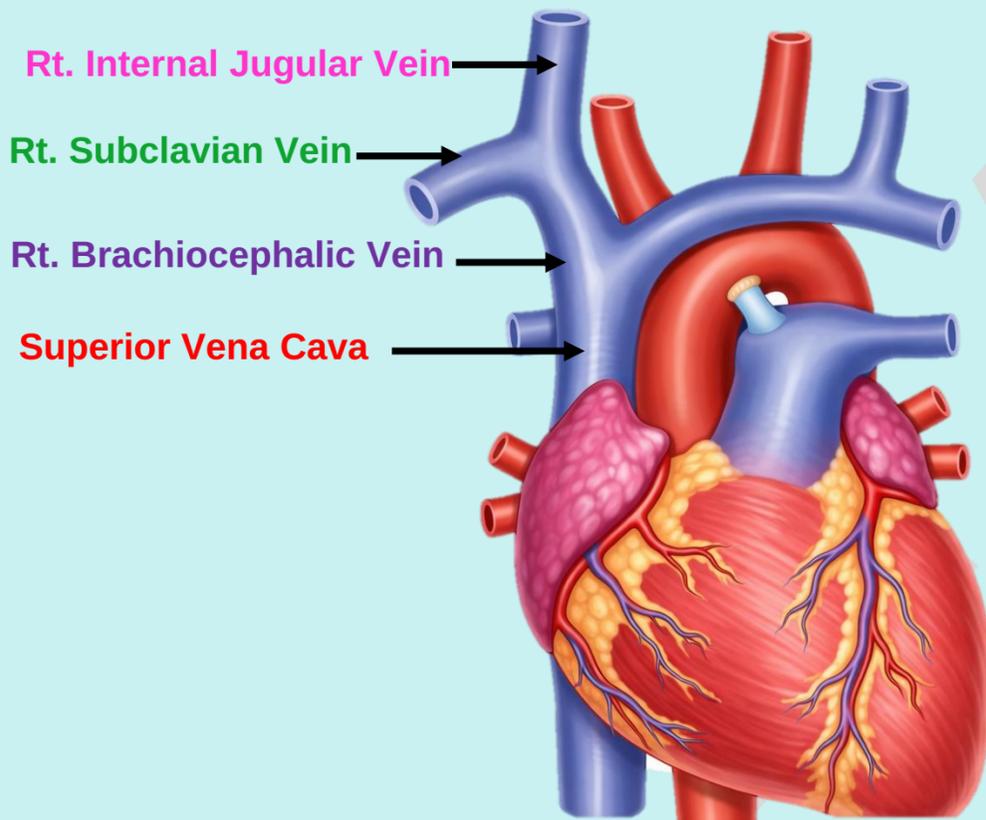
1. Superior vena cava (SVC)
2. Inferior vena cava (IVC)
3. Pulmonary Veins



Major Veines Entering the Heart

1. Superior Vena Cava (SVC)

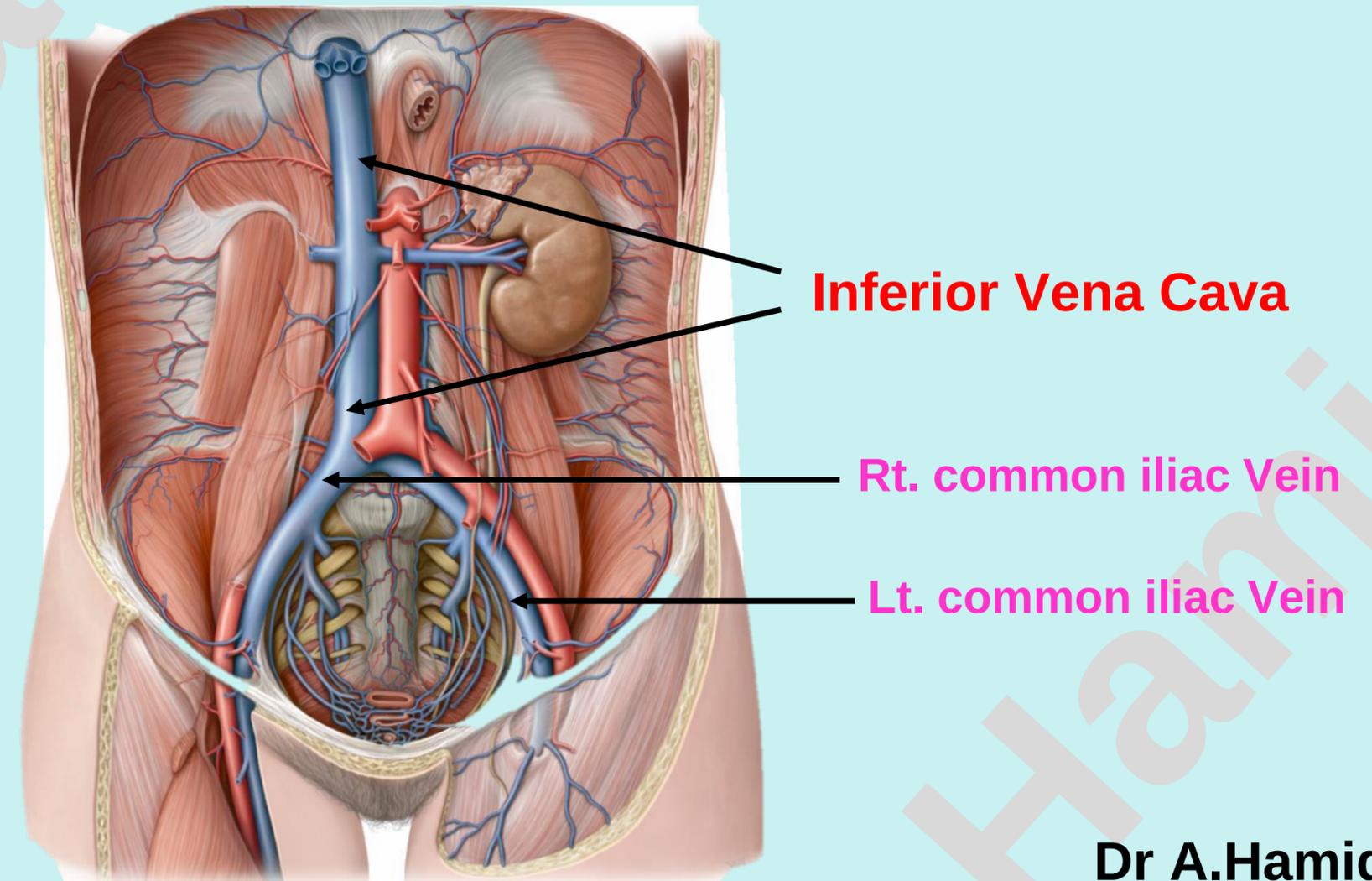
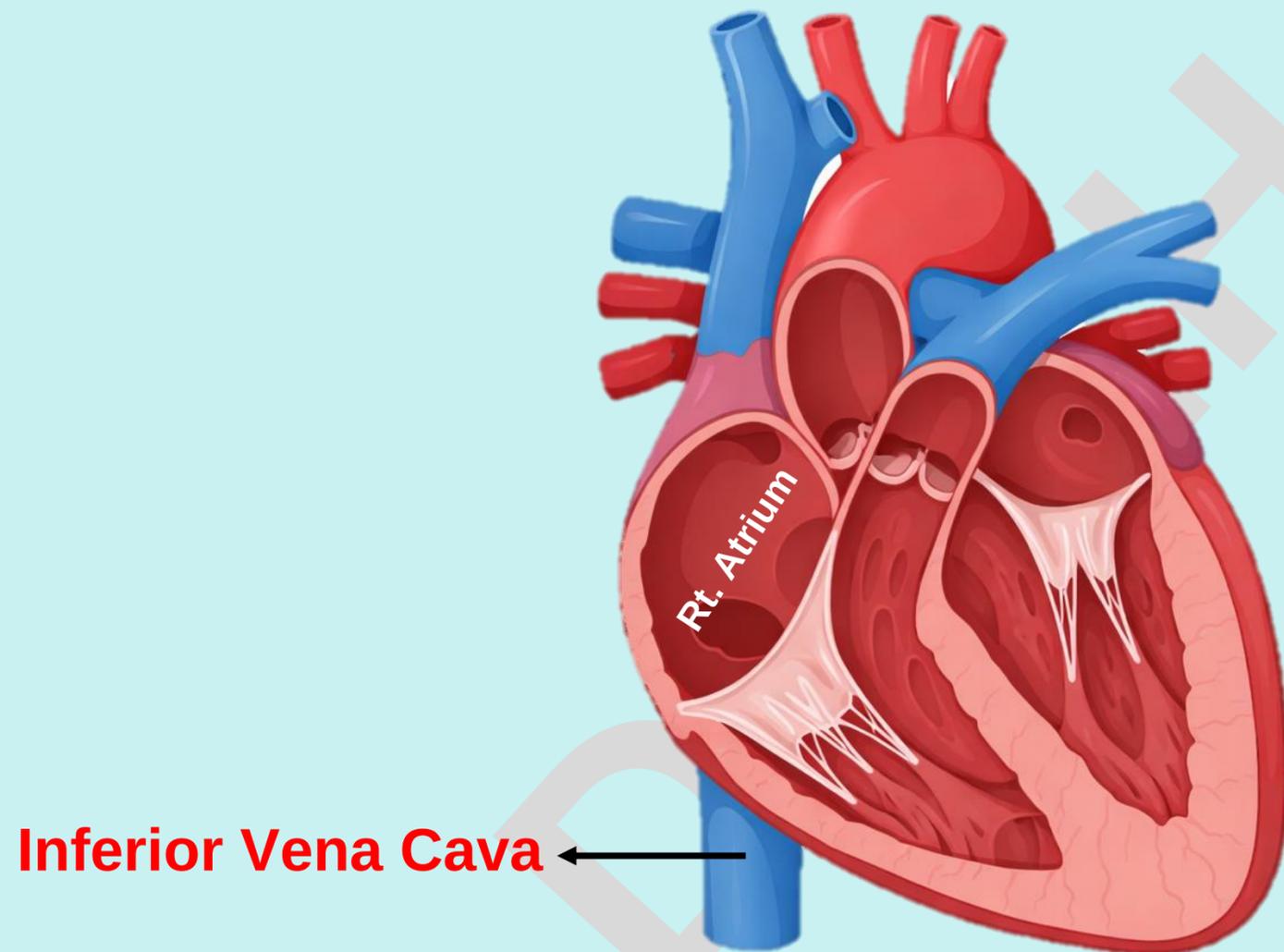
- It receives venous blood from the head, neck, thorax (above the diaphragm), and both upper limbs.
- The internal jugular veins convey venous blood from the head and neck.
- The subclavian veins convey venous blood from the upper limbs.
- Each internal jugular vein joins with a subclavian vein to form the right and left brachiocephalic veins.
- The two brachiocephalic veins unite to form the superior vena cava.
- The SVC then passes downward and opens into the upper part of the right atrium.



Major Veines Entering the Heart

2. Inferior Vena Cava

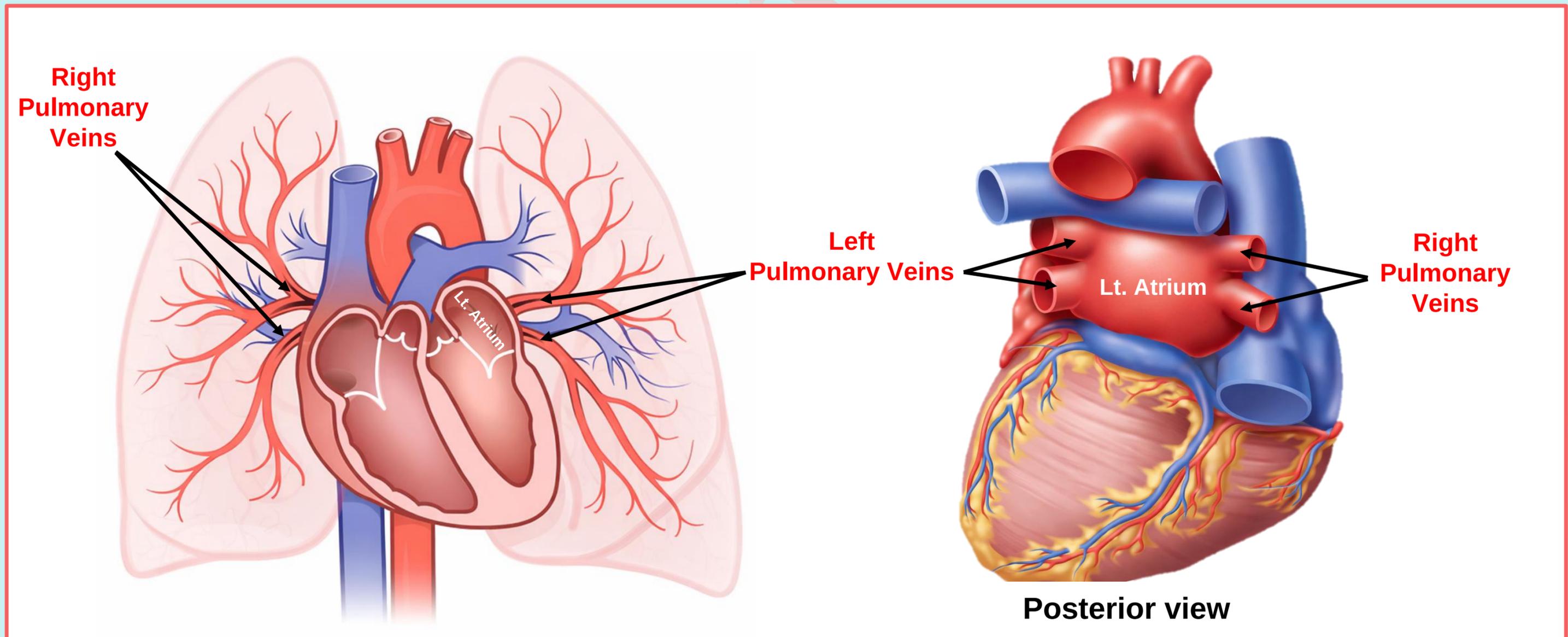
- It receives venous blood from the abdomen, pelvis, and both lower limbs.
- It begins anterior to the fifth lumbar vertebra (L5) by the union of the right and left common iliac veins.
- It ascends upward, pierces the central tendon of the diaphragm at the level of the eighth thoracic vertebra (T8), and almost immediately enters the lower part of the right atrium.



Major Veines Entering the Heart

3. Pulmonary Veins

- They carry oxygenated blood from the lungs to the left atrium.
 - Two pulmonary veins leave each lung carrying oxygenated blood and open into the left atrium of the heart.

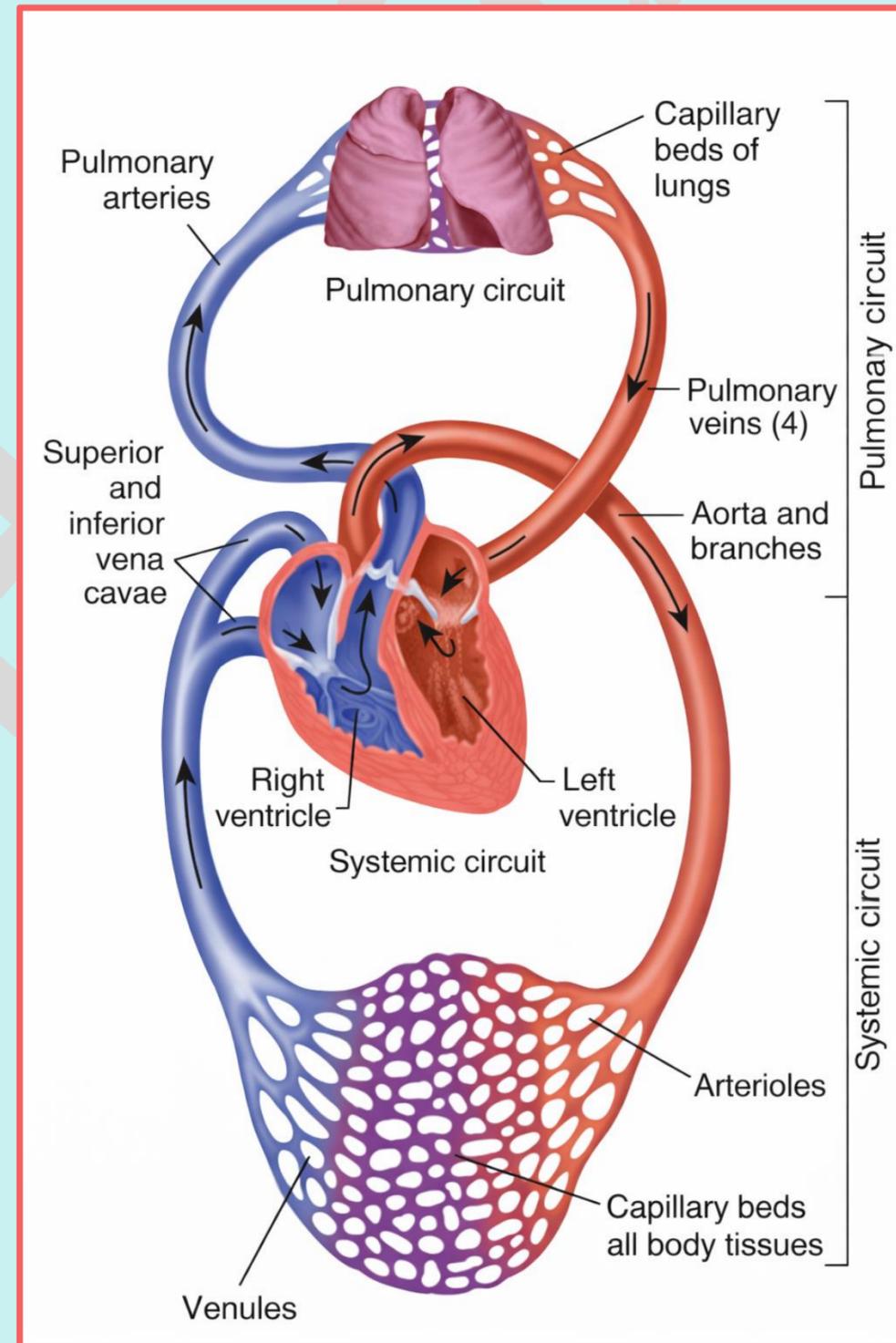


Blood Circulation

➤ Blood circulation in the body can be categorized into the following two types:

1. Pulmonary circulation

2. Systemic circulation

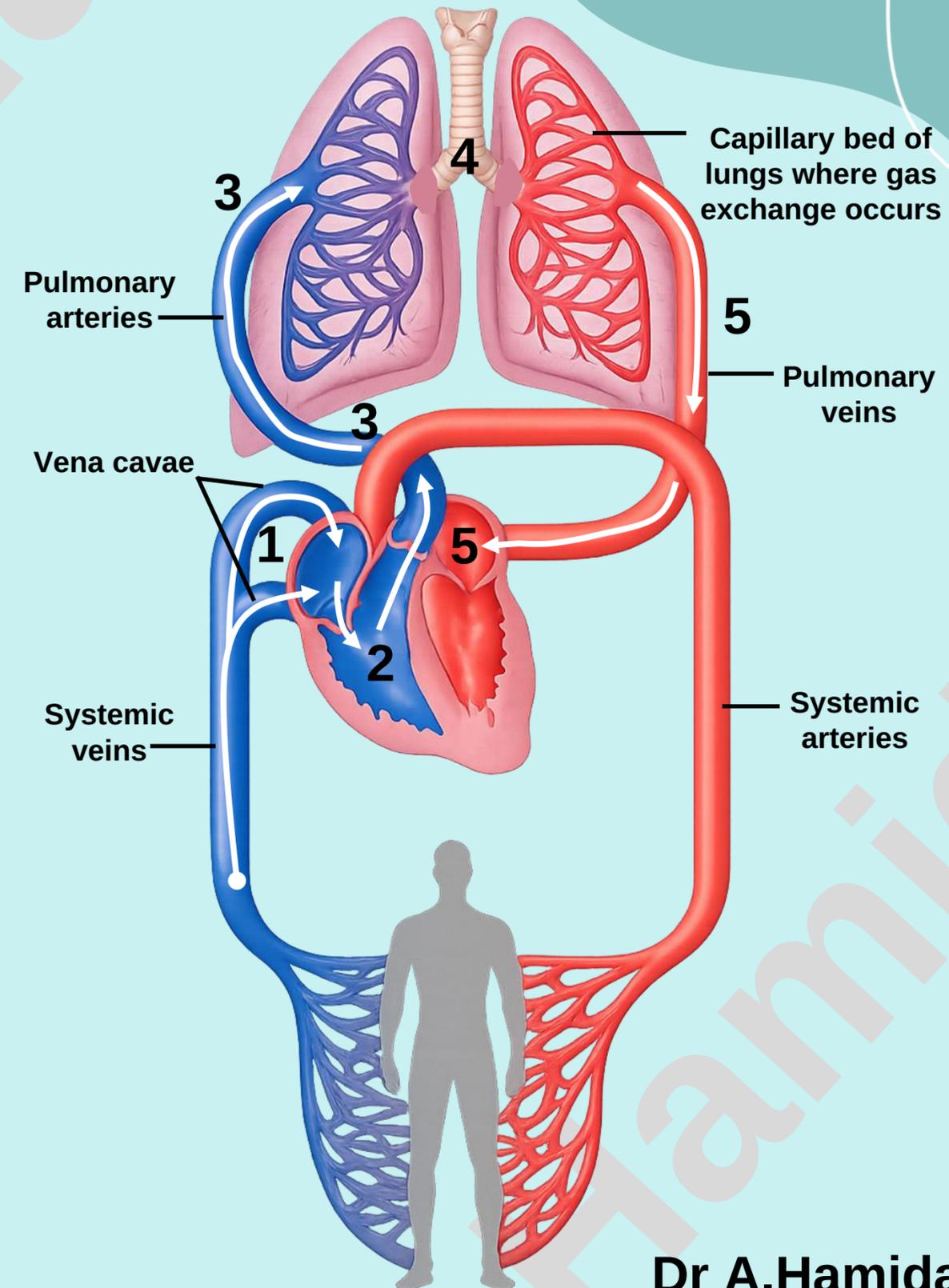


The two circuits are arranged in series, the output of one becomes the input of the other.

1. Pulmonary circulation

➤ **The right side of the heart is the pump for pulmonary circulation:**

1. The right atrium receives all the deoxygenated blood returning from the systemic circulation.
2. Then passes to the right ventricle.
3. Blood then ejected from the right ventricle into the pulmonary trunk, which branches into the right and left pulmonary arteries that carry blood to the lungs.
4. In the lungs, the blood unloads CO_2 (carbon dioxide), which is exhaled, and picks up O_2 (oxygen) from inhaled air.
5. The freshly oxygenated blood then flows into the pulmonary veins and returns to the left atrium.



2. Systemic circulation

- **The left side of the heart is the pump for systemic circulation:**
1. The left atrium receives oxygenated blood from the lungs.
 2. Then passes it to the left ventricle.
 3. The left ventricle ejects blood into the aorta, which branches into progressively smaller systemic arteries that carry blood to all organs throughout the body.
 4. In the systemic tissues, arteries give rise to smaller-diameter arterioles, which lead into extensive beds of systemic capillaries.
 5. Exchange of nutrients and gases occurs across the thin capillary walls. Blood unloads O_2 and picks up CO_2 .
 6. The deoxygenated blood then returns through systemic veins to the right atrium.

