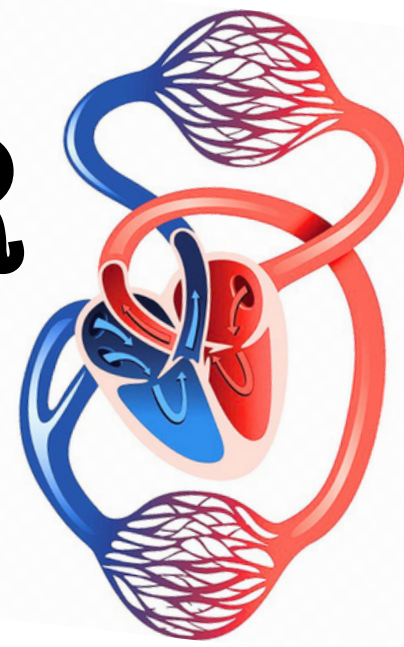


Lecture 5

CARDIOVASCULAR SYSTEM



Color Index:

- Main text
- Boys' Slides
- Girls' Slides
- Important
- Dr's Notes
- Extra

 [Editing File](#)

OBJECTIVES

- Identify the components of the cardiovascular system.
- Describe the Heart as regards (position, chambers and valves).
- Describe the Blood vessels (Arteries, Veins and Capillaries).
- Describe the Portal System.
- Describe the Sinusoids.
- Describe the Functional and Anatomical end arteries.
- Describe the Arteriovenous Anastomosis.

Functions of CVS

transportation by blood as a vehicle

◆ Water, O₂, Nutrients, Wastes (CO₂)

◆ it is vital for Homeostasis

Maintain a constant body temperature

The force to move the blood around the body is provided by the beating heart.

The parts of the cardiovascular system

the heart

Arteries: carry the blood away from the heart

Veins: carry the blood to the heart.

Capillaries: very small vessels that lie between arteries and veins, and take part in gas exchange

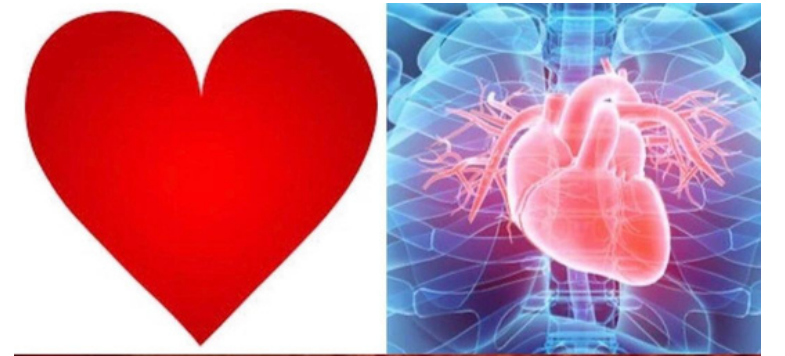
blood vessels

The Heart

Is a muscular **pump** responsible for circulation.

Is a hollow, cone shaped muscular pump that keeps circulation going on.

Is usually the size of fist of the same person.



It has:

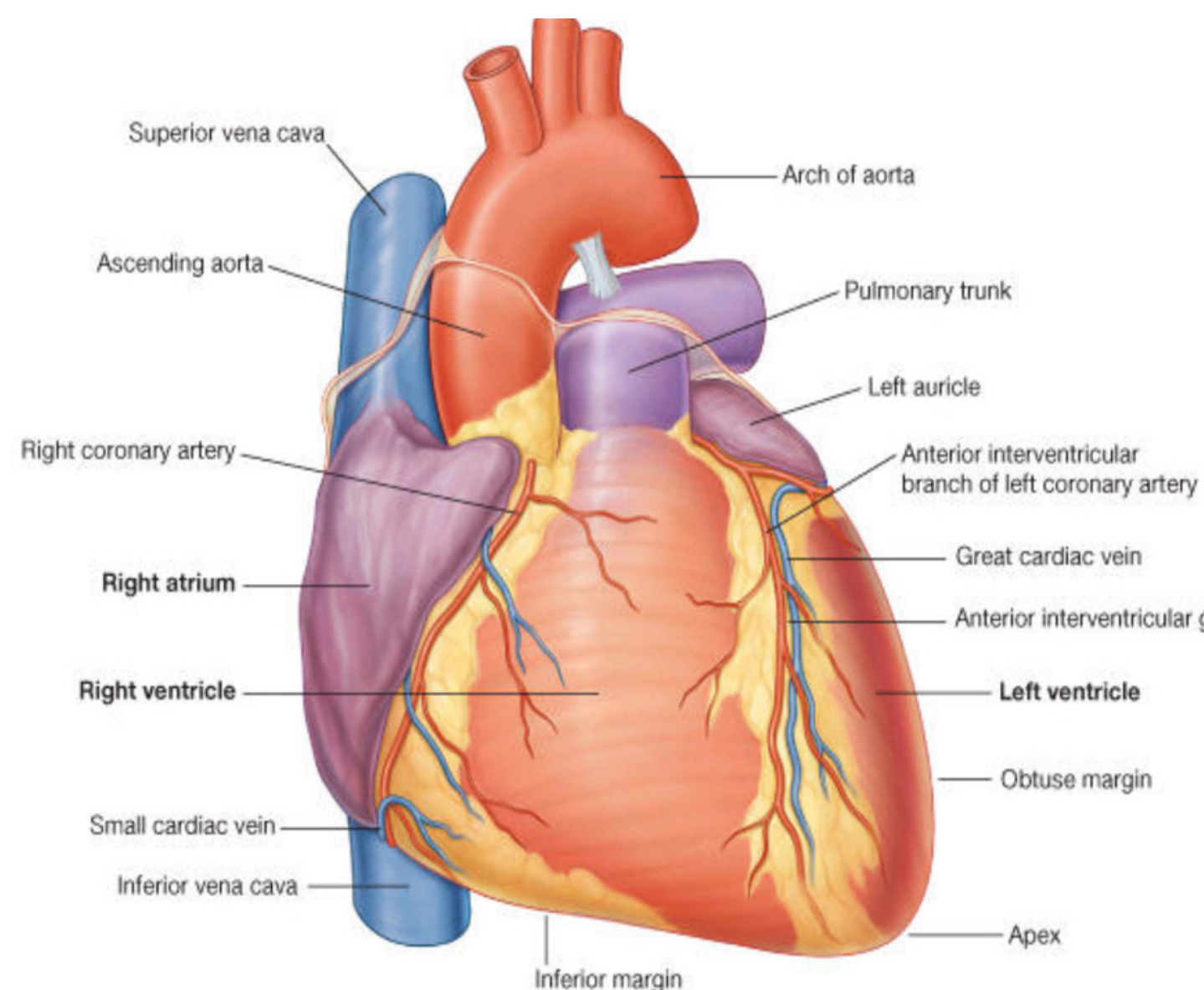
- 1 • Apex (formed of the Left ventricle)
• Base

- 2 Two Surfaces:
Diaphragmatic & Sternocostal.

- 3 Three borders: Right, Left, Inferior.



the Sternocostal is the anterior, while the Diaphragmatic is the inferior (because it lies on the diaphragm)



Anterior surface of the heart.

Position/Location of the heart

Lies obliquely in the thorax between the pleural sacs.

specifically located in a portion called **Middle Mediastinum**

2/3 of the heart lies to the left of the median plane

enclosed by a double sac of serous membrane (**pericardium**)



Helpful Video

IMPORTANT!

Chambers of the Heart

Ventricles

Two Ventricles (Right & Left)

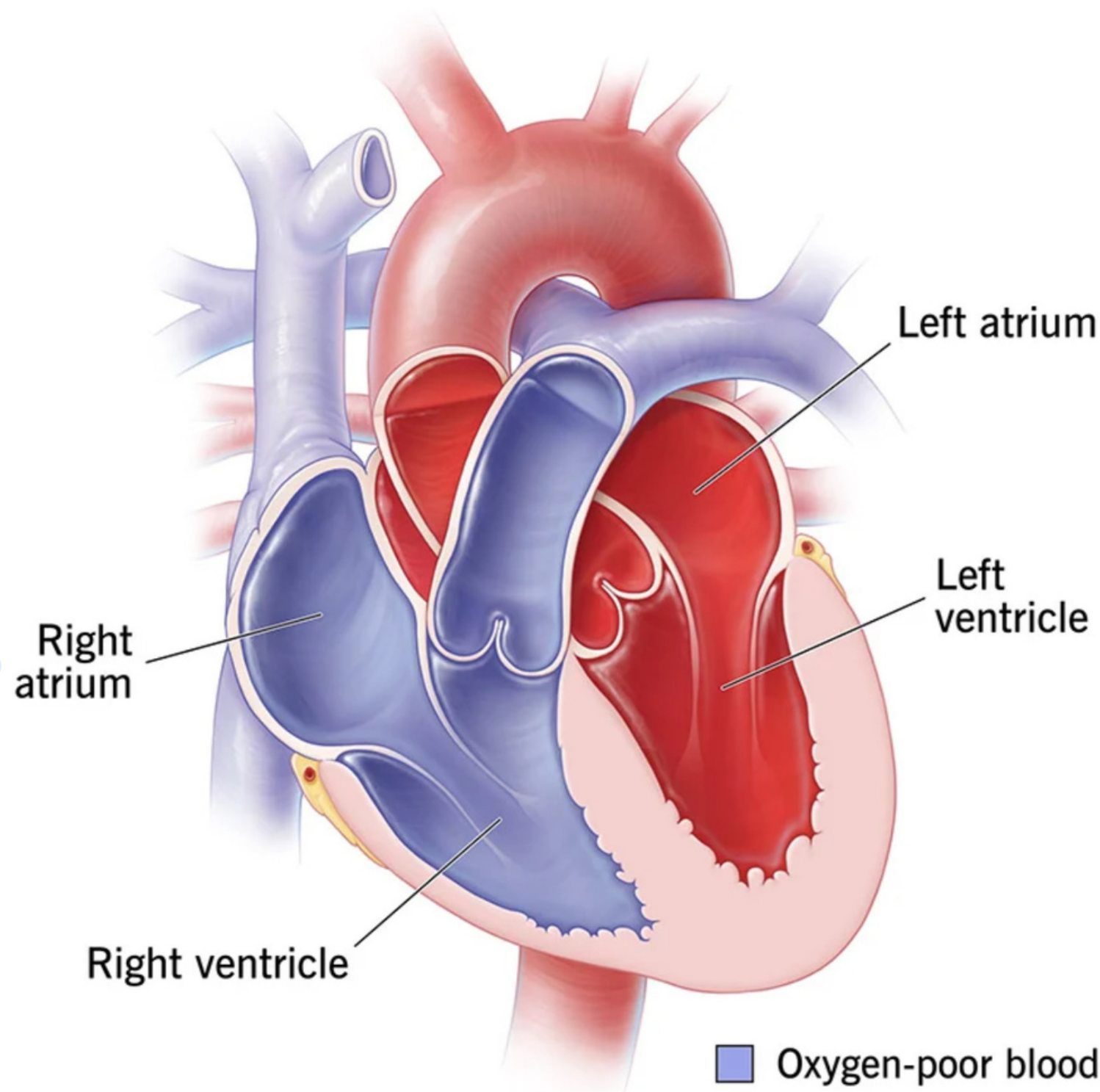
- Are **inferior** chambers.
- have **thick** walls.
- Are **discharging** chambers (Actual Pump).
- Their contraction propels blood out of the heart into the circulation.

Atria

Two Atria (Right & Left)

- Are **Superior** in position.
- the **receiving** chambers.
- have **thin** walls.
- The upper part of each atrium is the Auricle.

Heart Chambers



is the first chamber that receives the **venous** blood entering to the heart.

Right atrium

Right ventricle

Left atrium

Left ventricle

receives **arterial** blood coming from the lungs.

The left ventricle forms the **APEX** of the heart

■ Oxygen-poor blood

■ Oxygen-rich blood

Heart Valves



✦ 4 Valves

Two Atrioventricular

1 Right AVV : **Tricuspid**

2 Left AVV : **Bicuspid (Mitral)**

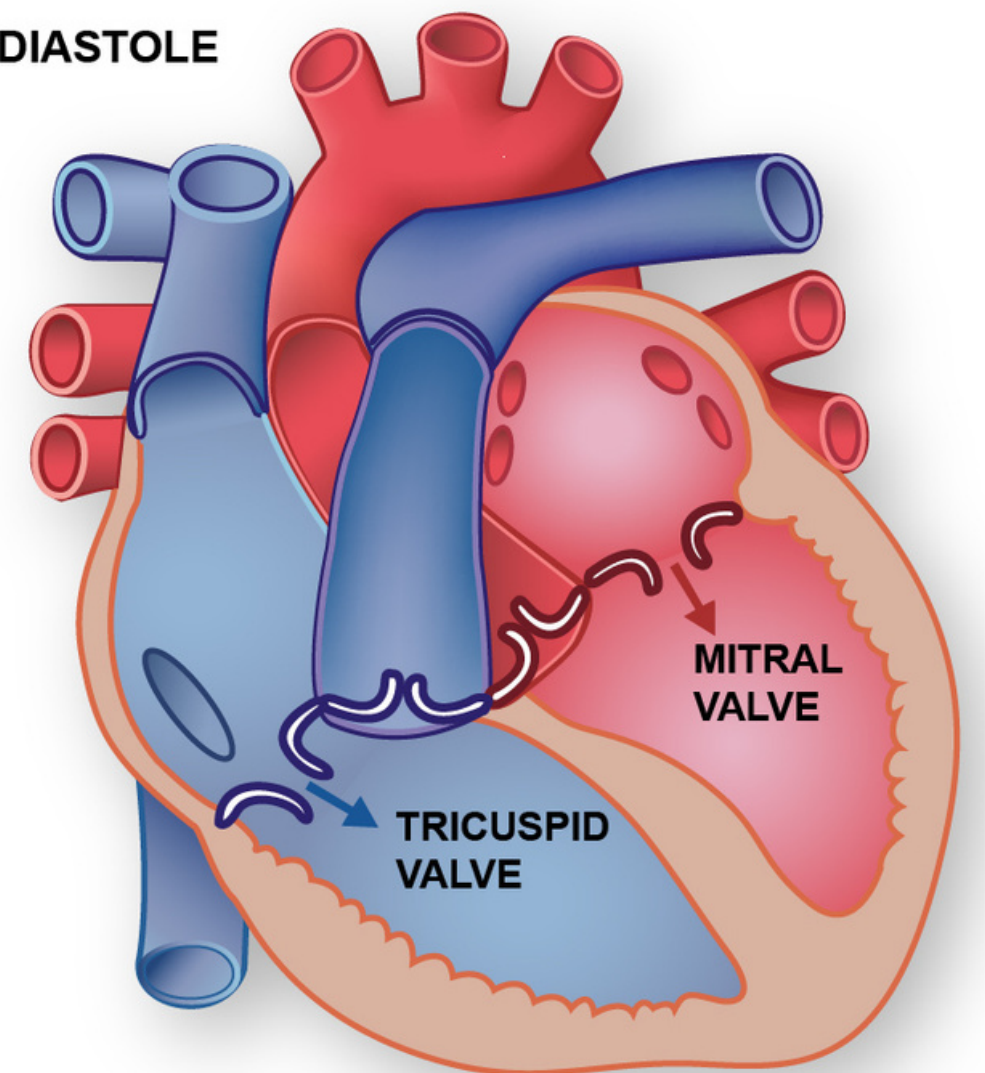
✦ Allow the blood to flow in one direction from the atria to the ventricles.

Two Semilunar (aortic & Pulmonary)

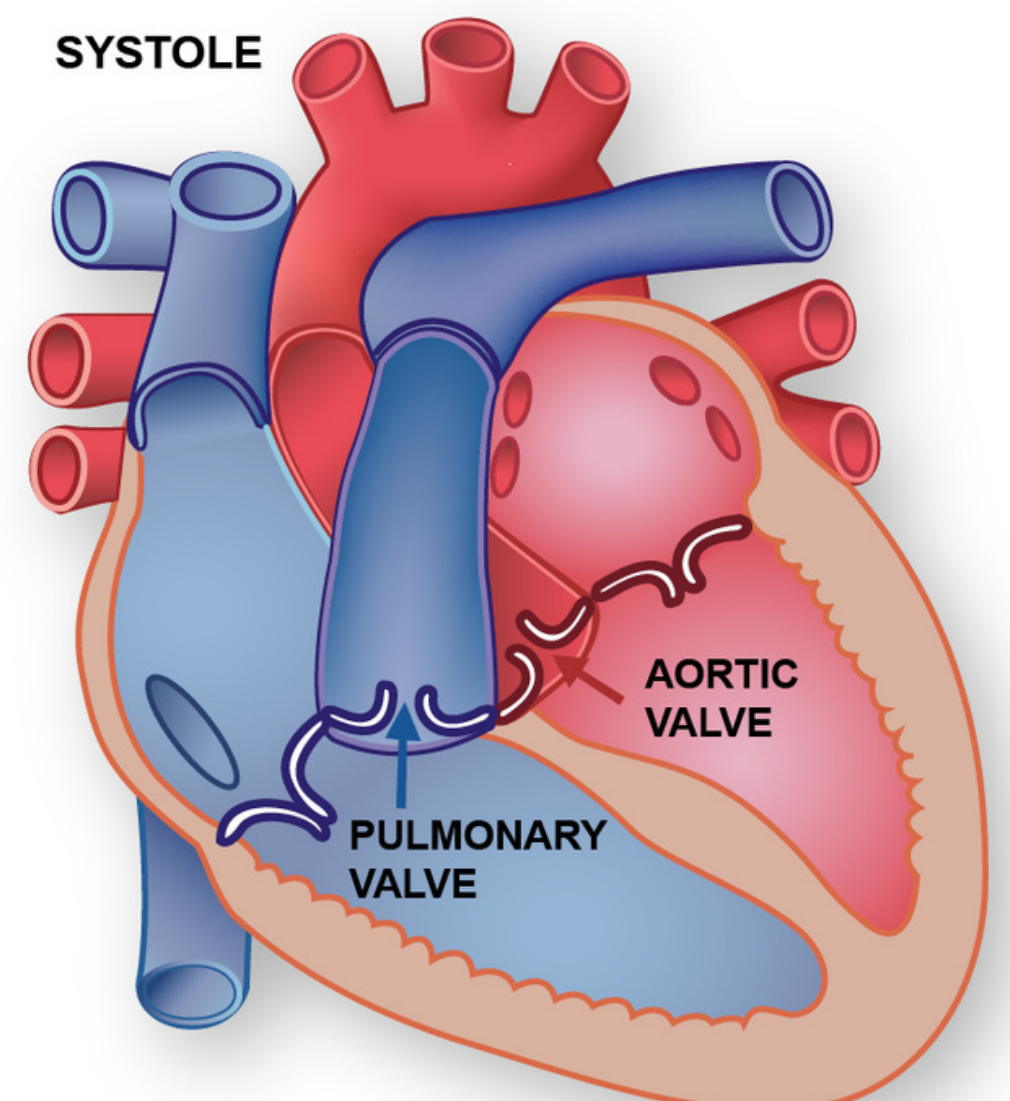
✦ Found between the right and left ventricles and the great arteries leaving the heart (Aorta & Pulmonary trunk respectively).

✦ They allow the flow of blood from the ventricles to these arteries.

DIASTOLE



SYSTOLE



Blood Vessels

Arteries

- Thick walled
- Lack valves
- The smallest arteries are called arterioles

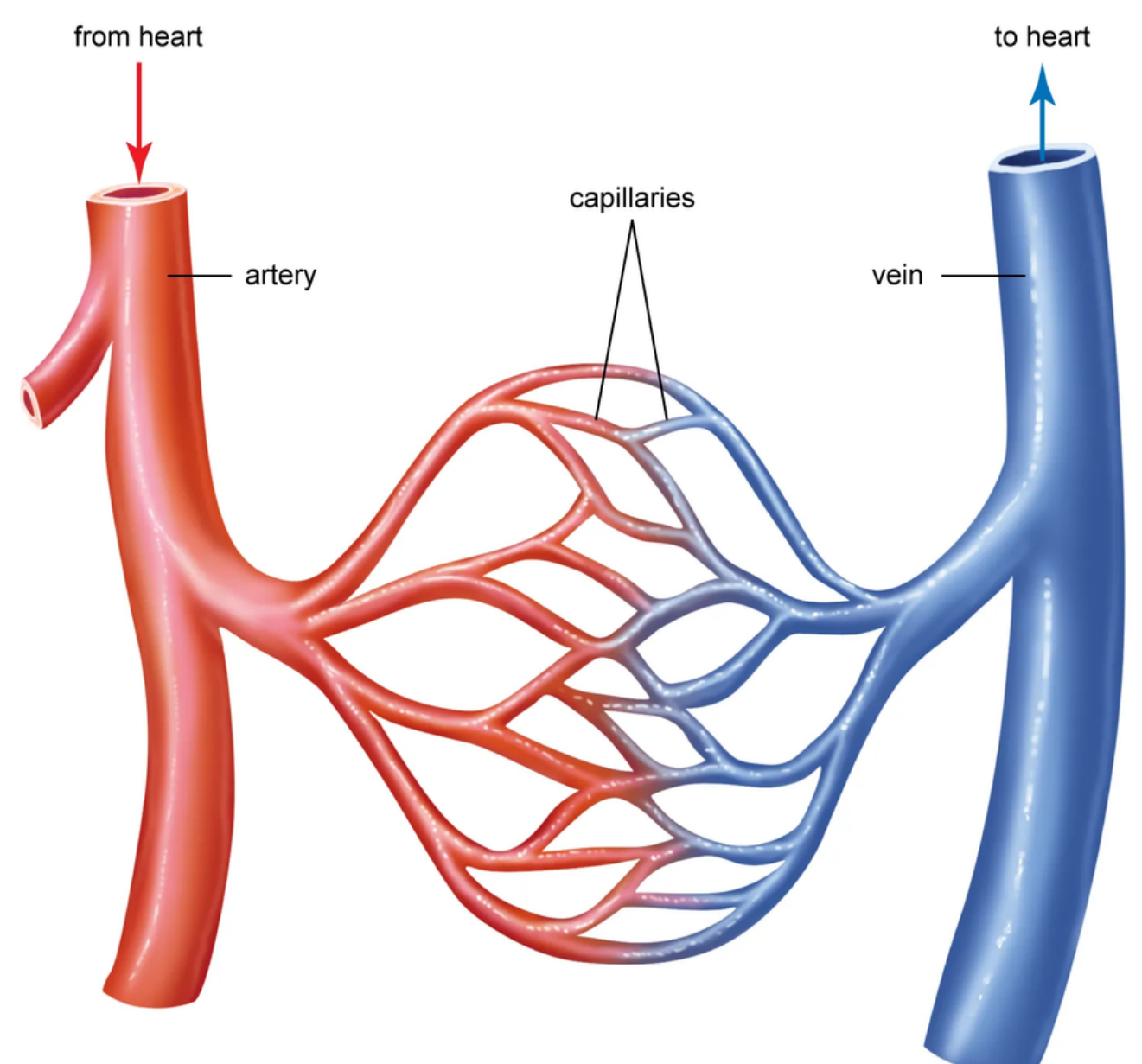
Veins

- Thin walled
- Many contain valves (Large veins)
- Smallest veins are called Venules

Capillaries

- Microscopic vessels
- Connect arterioles to venules
- Site of exchange between tissue and blood
- Wall is a **single** layered endothelium

- Some tissue lack capillaries:
 - 1- **Hyaline cartilage.**
 - 2- **Cornea of the eye.**



Sinusoids

Wide capillaries with **discontinuous endothelium** and **an irregular cross diameter**.

Numerous in the following:

Liver

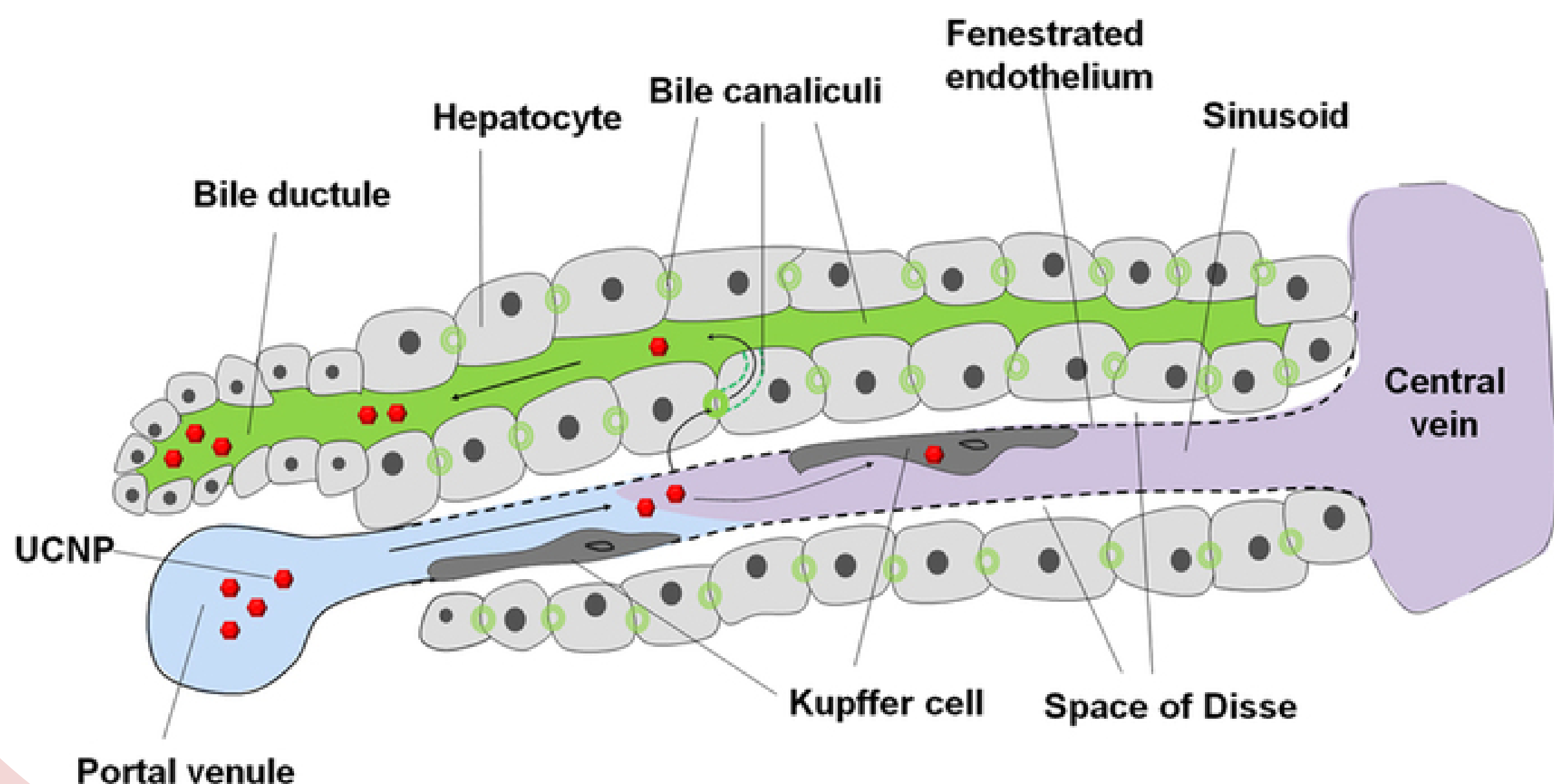
Spleen

Bone Marrow

Pituitary Gland

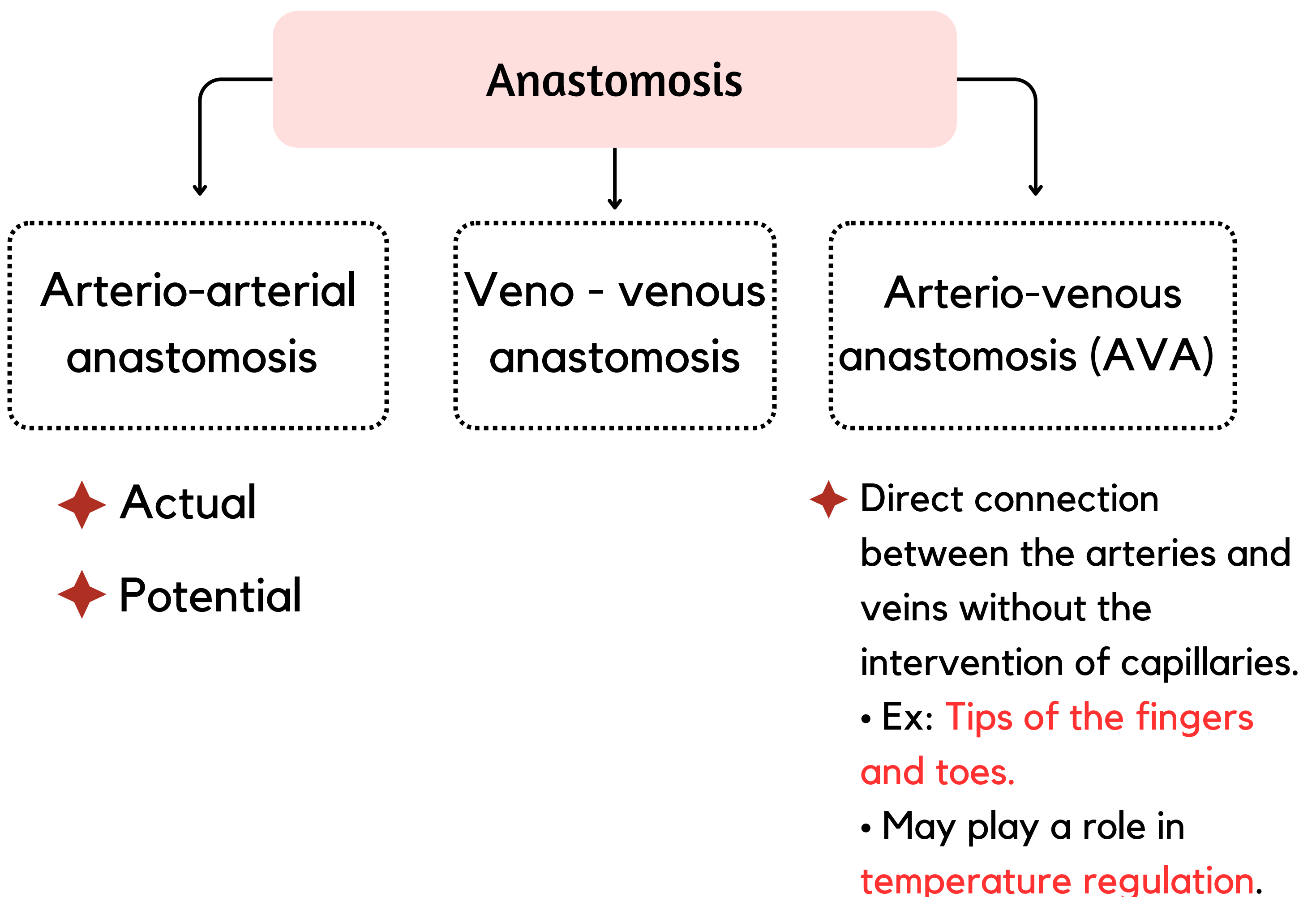
Dr's Note

Kuffer Cells:
phagocytic cell
that helps in the
breakdown of red
blood cells



Anastomosis

A circulatory anastomosis is a **direct connection between two blood vessels**.
(Could be achieved surgically: Vascular anastomosis).



Arteries

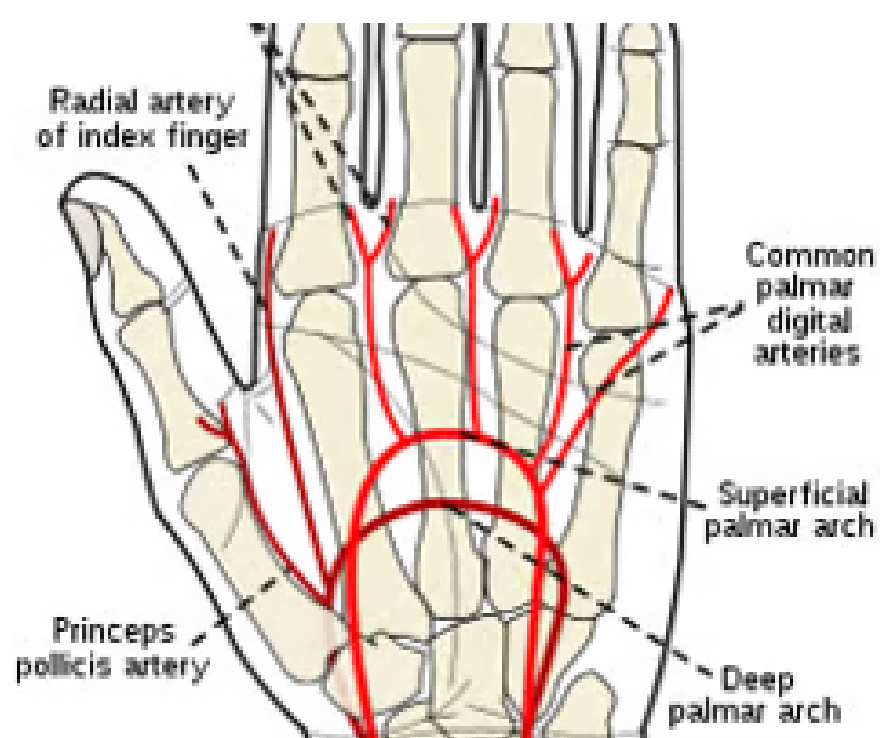
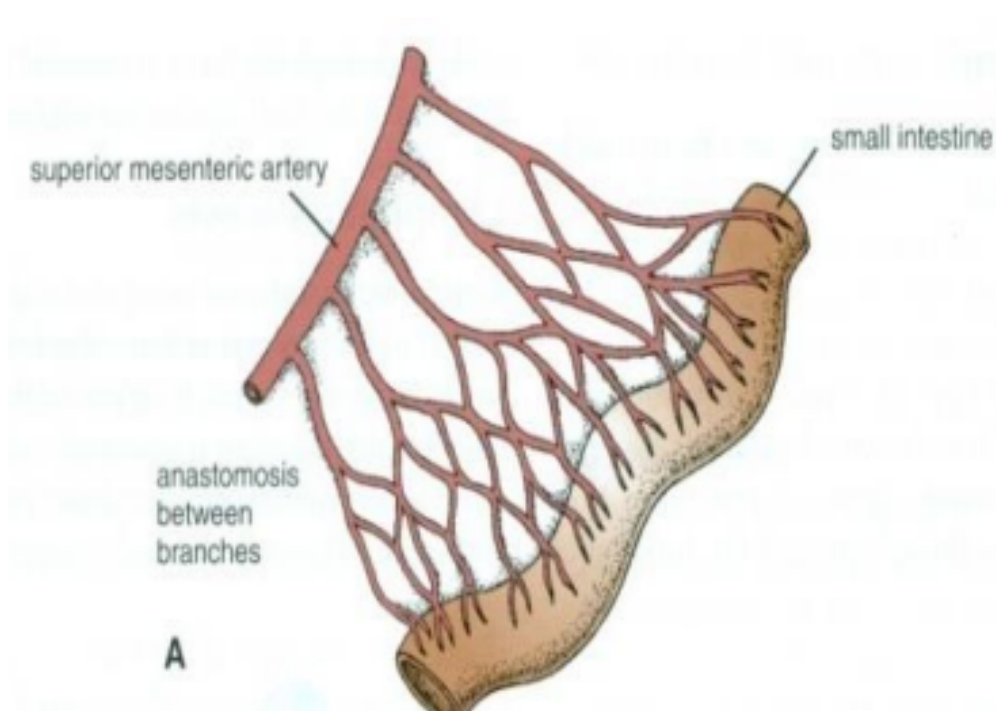
- ◆ Transport blood from the heart and distribute it to the various tissues of the body through their branches.

Arterial anastomosis

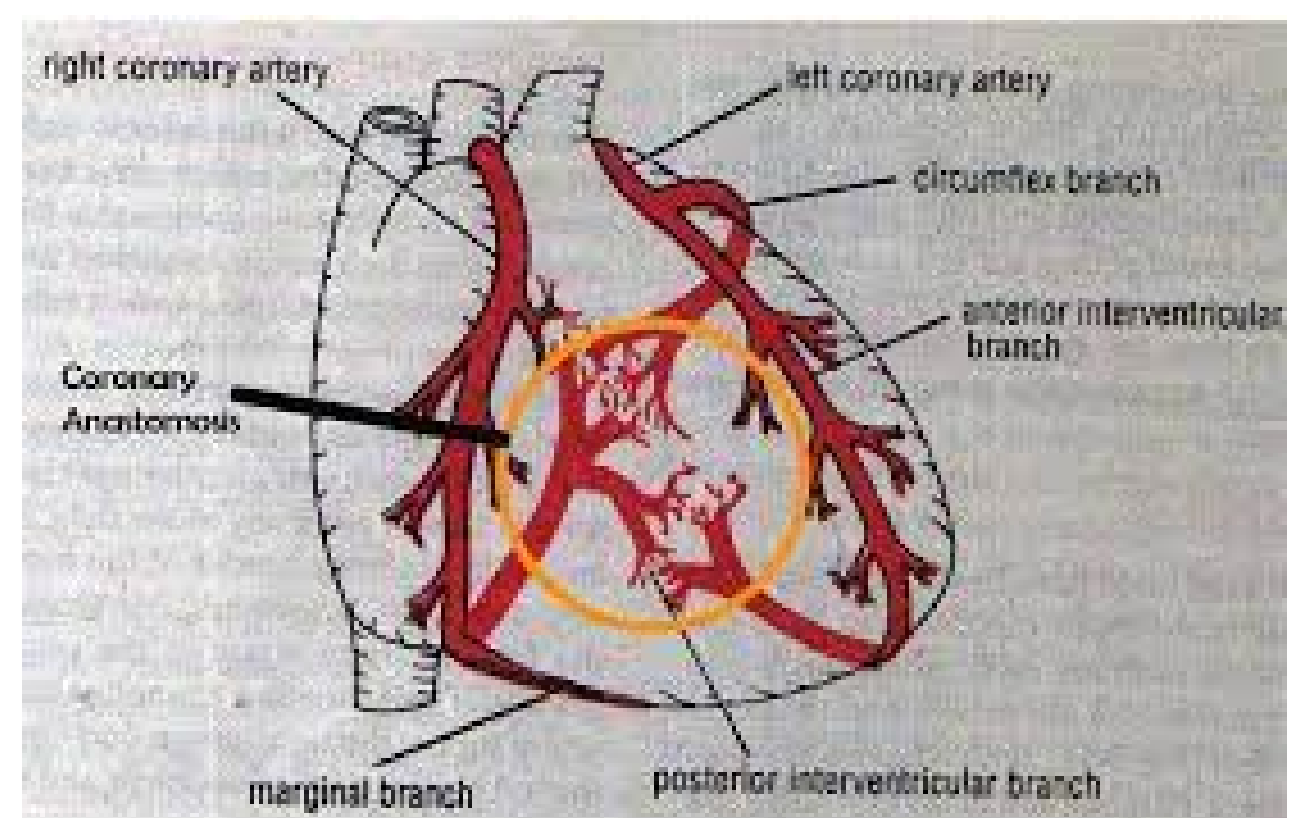
A connection between two arteries, i.e., arteries meet **END to END** (Arterio-arterial anastomosis).

1- Potential 2- Actual

◆ Actual



◆ Potential



Try Allen's test for a better understanding.

End Arteries

No precapillary anastomosis between adjacent arteries, interruption of arterial blood flow: **INFARCTION/GANGRENE**.

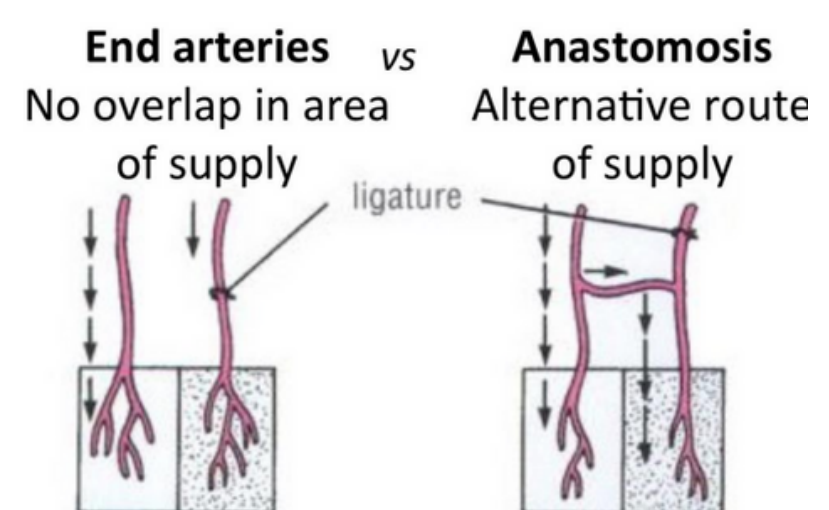
Examples:

Liver **1**

2 Spleen

Kidney **3**

4 Retina



End Arteries

Anatomical End

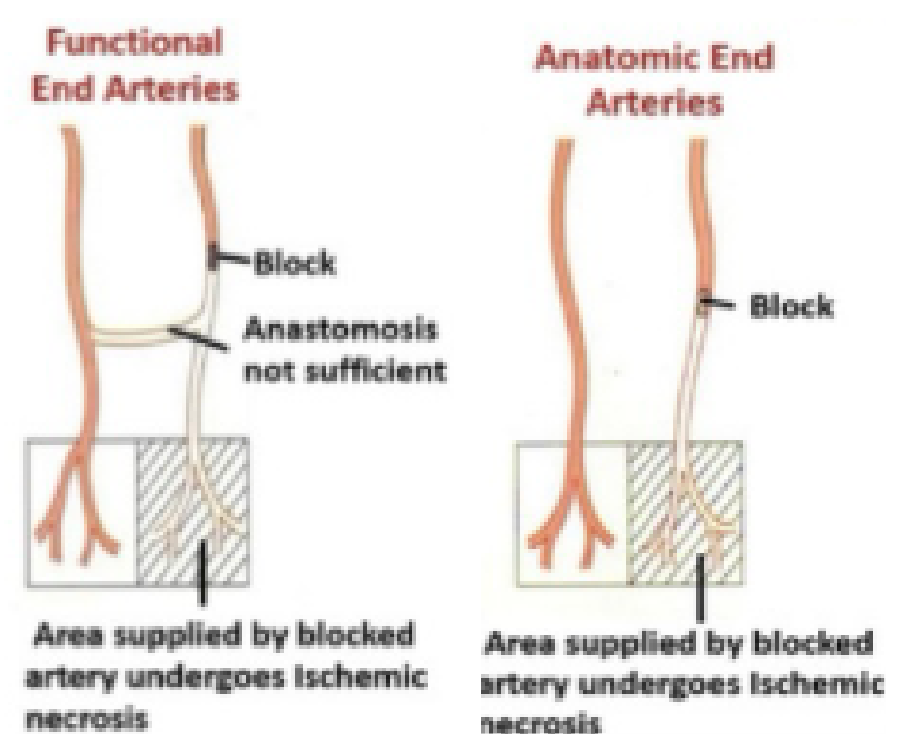
Vessels whose terminal branches **do not anastomose** with branches of arteries supplying adjacent areas.

Example:

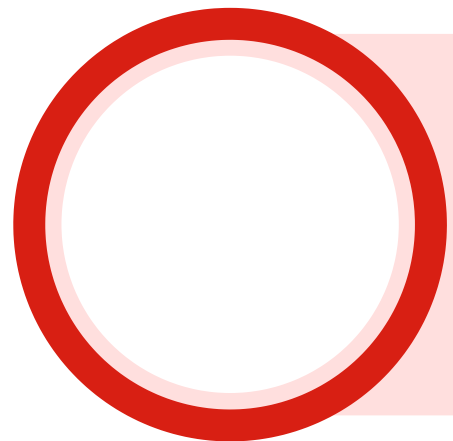
- ✦ Central artery of Retina > Blindness
- ✦ Branches of cerebral arteries in the brain > infarct/stroke

Functional End

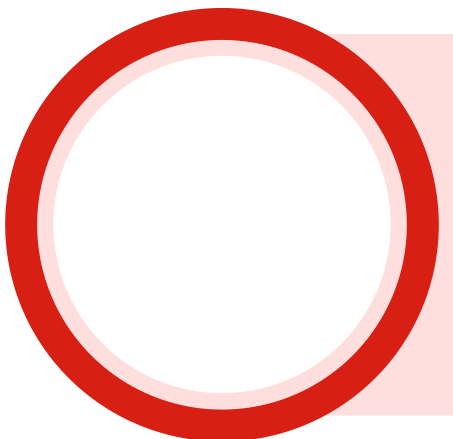
The terminal branches **do anastomose** with those of adjacent arteries but the **anastomosis is insufficient** to keep the tissue alive if one of the arteries is occluded.



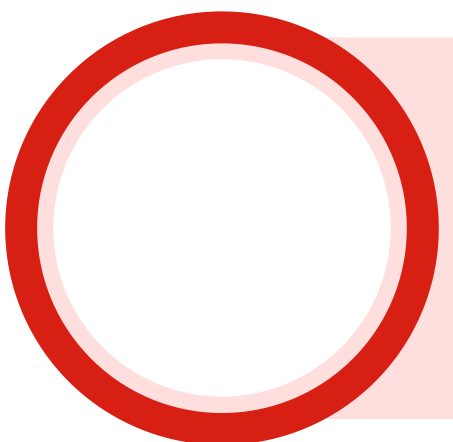
Veins



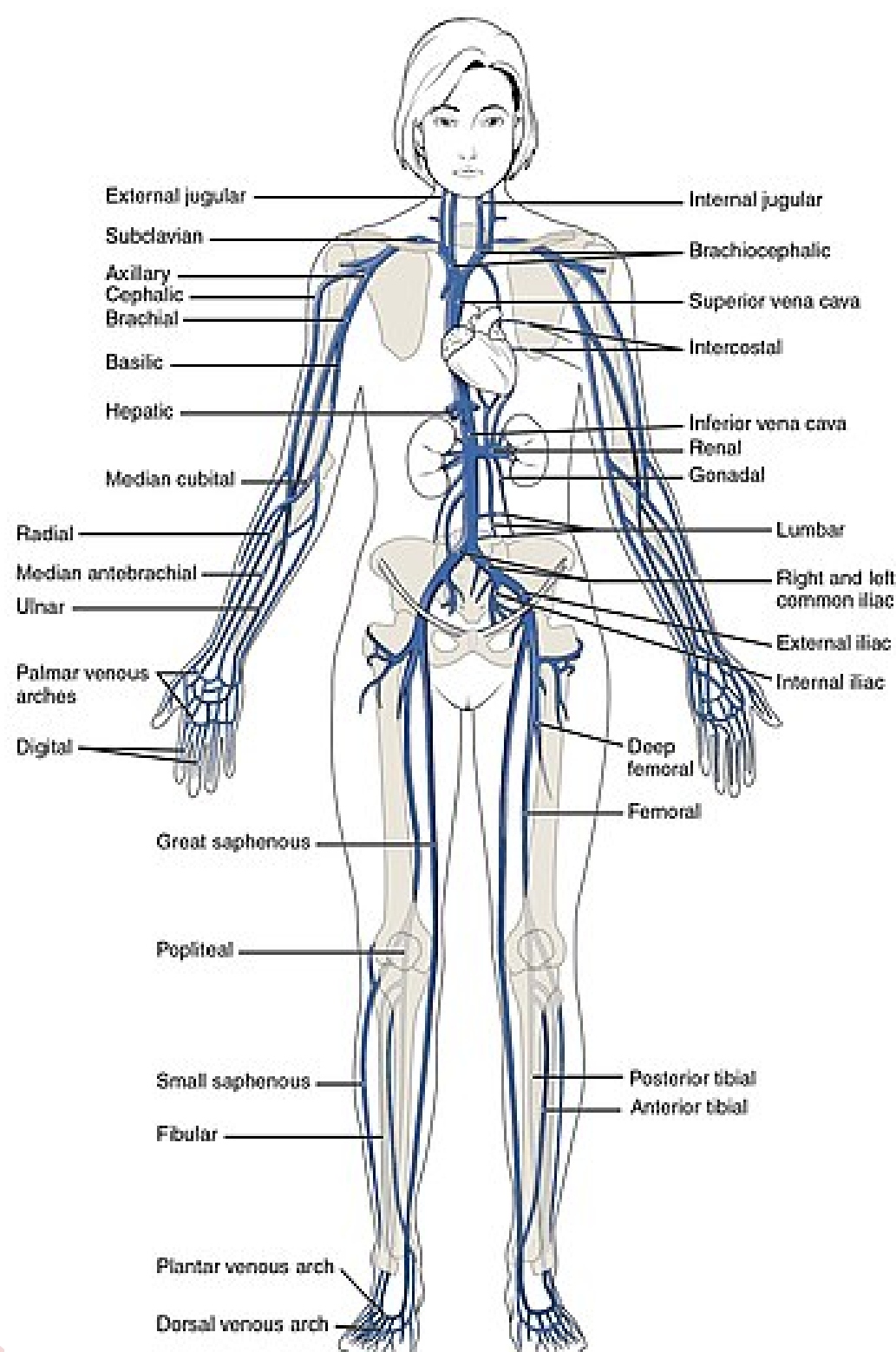
They transport blood back to the heart. They carry deoxygenated blood except 4 Pulmonary veins opening in the left atrium carry oxygenated blood.



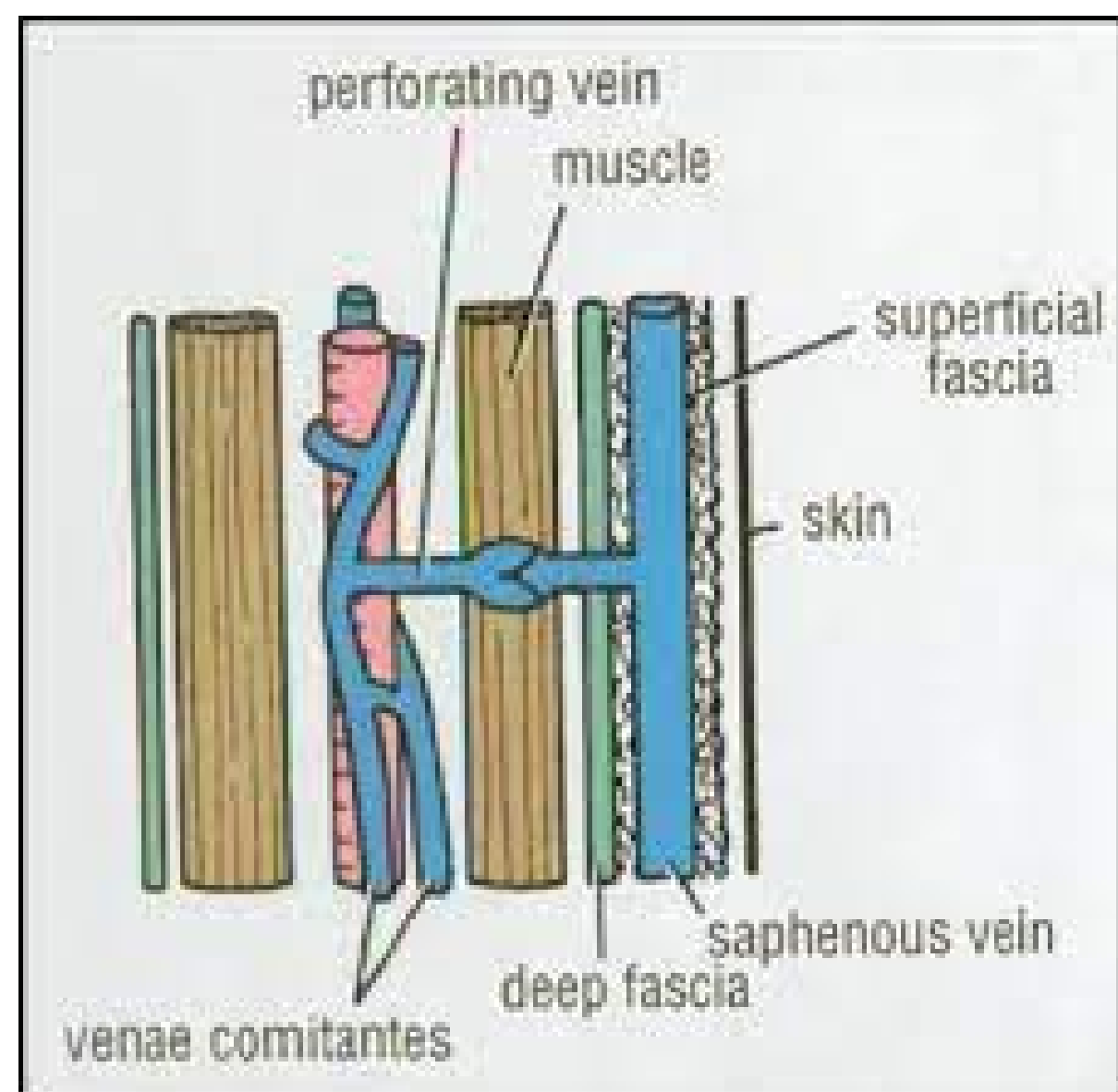
The smaller venules (tributaries) unite to form larger veins which commonly join with one another to form Venous Plexuses.



Types of veins:
 1- Venae Comitantes: It's deep veins accompanying the arteries, usually two.
 2- Superficial Veins



Venae comitantes



Blood Circulation

Cardiopulmonary:

Takes place between the **heart** and **lungs**

The right side of the heart (right atrium/ventricle) receives oxygen poor blood (**Deoxygenated blood**)

This blood is pumped from the heart through the **Pulmonary Trunk** to the lungs

It **returns** to the **left side** of the heart (left atrium/ventricle) through **4 pulmonary veins**

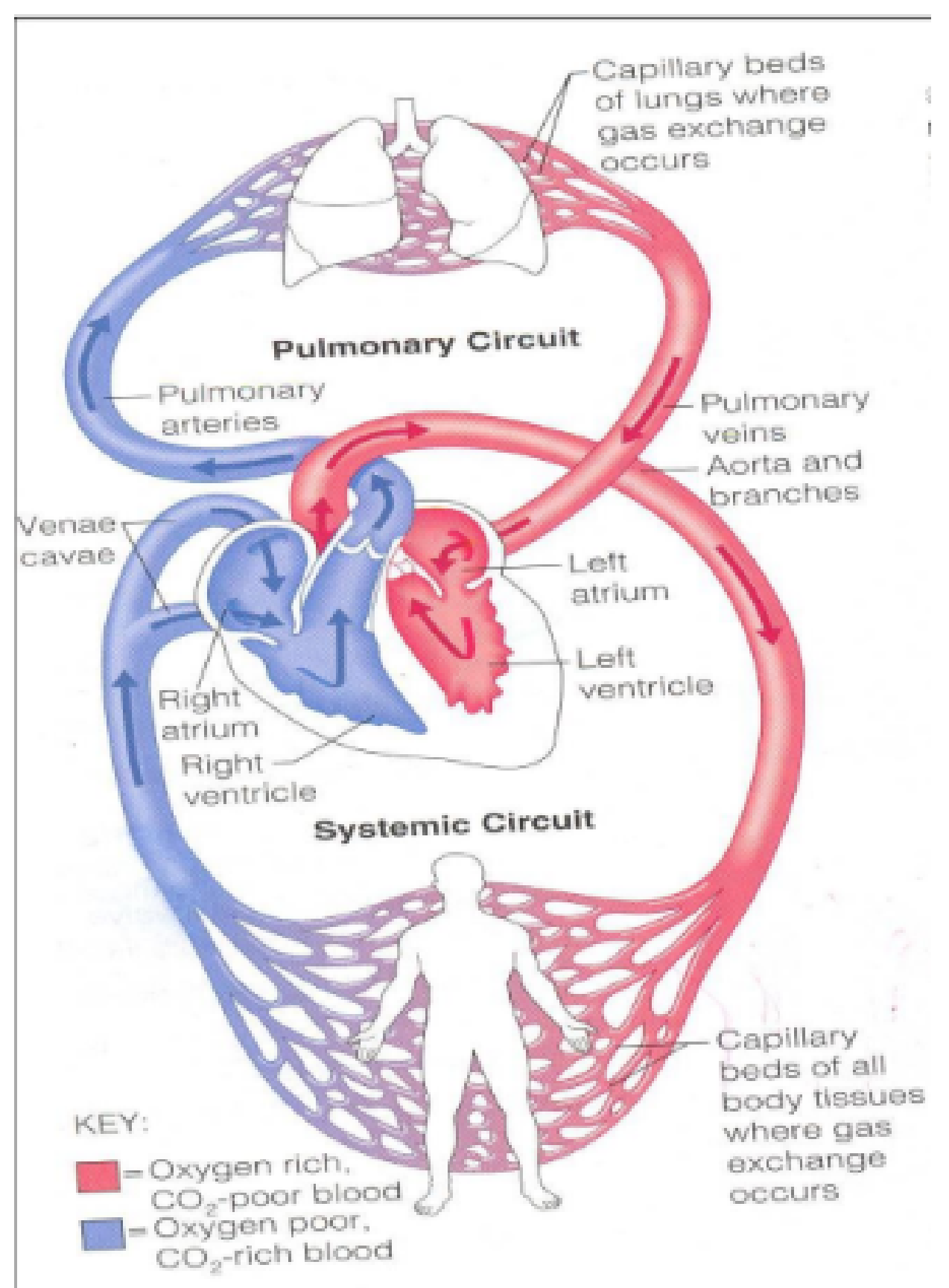
Gas exchange takes place in the **lungs**.

Systemic:

Takes place between the **heart** and each **cell of the body**

This blood is pumped from the **left ventricle** to all **body tissues** through the **aorta** and its **systemic arteries** which ultimately terminates in capillaries.

Oxygen poor blood circulates from the **tissues** to the **capillaries, venules & veins** back to the right atrium through the Systemic Veins.



Portal Circulation

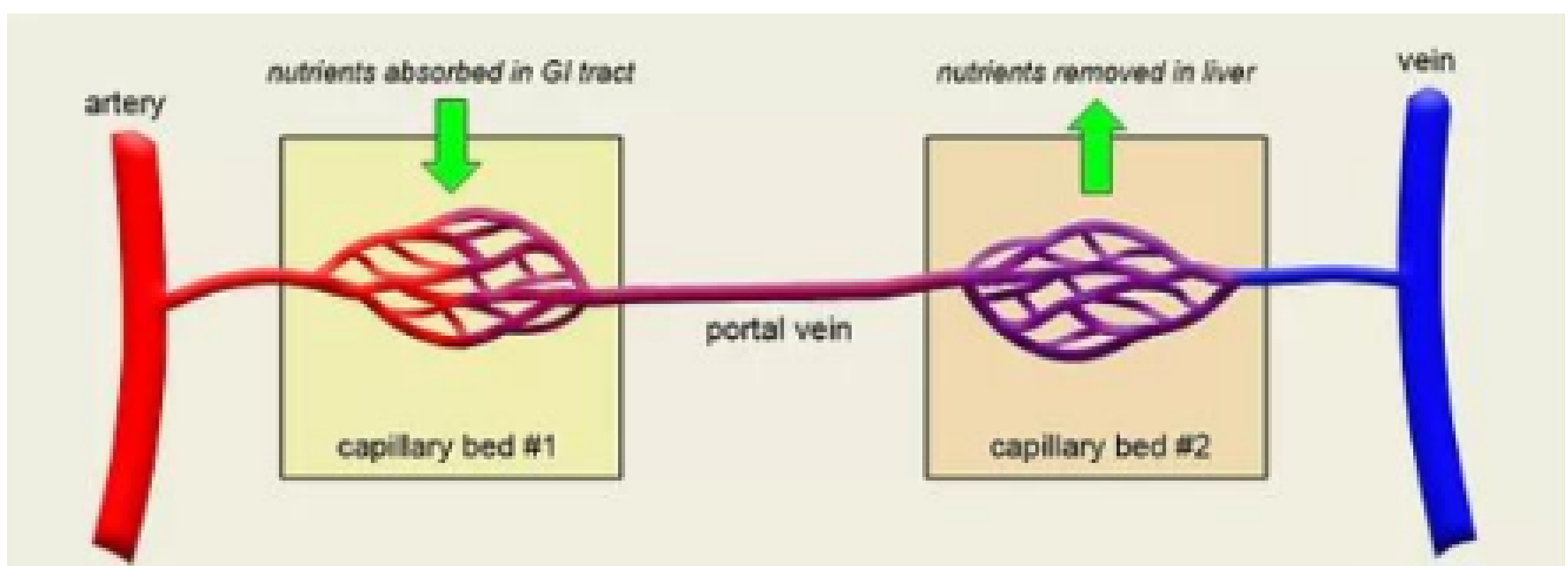
- ✦ It is a system of vessels interposed between **Two Capillary Beds**.
- ✦ It takes place in the **liver** and some endocrine glands (**Pituitary gland**).

Veins leaving the gastrointestinal tract do not go direct to the heart.

They pass to the **Portal Vein**.

This vein enters the liver and breaks up into veins of diminishing size which ultimately join capillary like vessels (**Sinusoids**); 2nd capillary bed.

Venous blood enter **2nd capillary** bed then to smaller veins that leave the liver through hepatic veins.



Lymphatics

Not all blood entering a part returns by the way of veins.

Much of it becomes **tissue fluid** (lymph) returns by the way of vessels called **Lymphatic Vessels**.

Lymph is a clear-to-white fluid made of: White blood cells, especially lymphocytes.

The lymphatic system is unique, in that it is a **ONE-WAY** system that returns lymph fluid via vessels to the cardiovascular system.

Lymph vessel have more valves than veins.

In general superficial lymphatics follow veins, while deep lymphatics follow arteries

Summary

- The cardiovascular system is a transporting system.
- It is composed of the heart and blood vessels.
- The heart is cone-shaped, covered by pericardium, and composed of four chambers.
- The blood vessels include the arteries, veins, and capillaries.
- Arteries transport the blood from the heart.
- The terminal branches of the arteries can anastomose with each other freely or be anatomic or functional end arteries.
- Veins transport blood back to the heart.
- Capillaries are the smallest vessels, connecting the arteries to the veins.
- Sinusoids are a special type of capillaries.
- The portal system is composed of two sets of capillaries and is found in the liver & and pituitary gland.

MCQs

1

Which chamber forms the apex of the heart?

A- Left Atrium

B- Right Atrium

C-Left Ventricle

D- Right Ventricle

2

Which of the following chambers receives the arterial blood?

A- Left Atrium

B- Right Atrium

C-Left Ventricle

D- Right Ventricle

3

Which of the following valves lies between the left atrium and left ventricle?

A- Tricuspid

B- Bicuspid

C- Pulmonary

D- Aortic

4

Which of the following is a semilunar valve?

A- Mitral valve

B- Bicuspid

C- Tricuspid

D- Aortic valve

5

Which of the following is not a border of the heart?

A- Superior

B- Inferior

C- Right

D- Left

1-C, 2-A, 3-B, 4-D, 5-A



LEADERS

Nisreen Alotaibi

Omar Alattas

MEMBERS

- Shaden Alotaibi

- Danah Khallaf

- Elaf Alshamlan

- Jana Alahaideb

- Dana Alotaibi

- Noorah Alkhilaiwi

- Orjwan Alharthi

- Lana Alfouzan

- Abdulhadi Alqahtani

- Turki Alanzi

- Talal Alrobaian

- Abdulmalik Aldafs

- Ahmad Addas

- Salman AlHakeem

- Ziyad Bukhari