CARDIOVASCULAR SYSTEM

Khaleel Alyahya, PhD, MEd
King Saud University
School of Medicine
@khaleelya

Khaleel Alyahya @khaleelya · Sep 4

#أحياناً .. لا يكون الجمال في #الصورة ، بل في الإطار الذي يحيط بها..!!

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OBJECTIVES

At the end of the lecture, students should be able to:

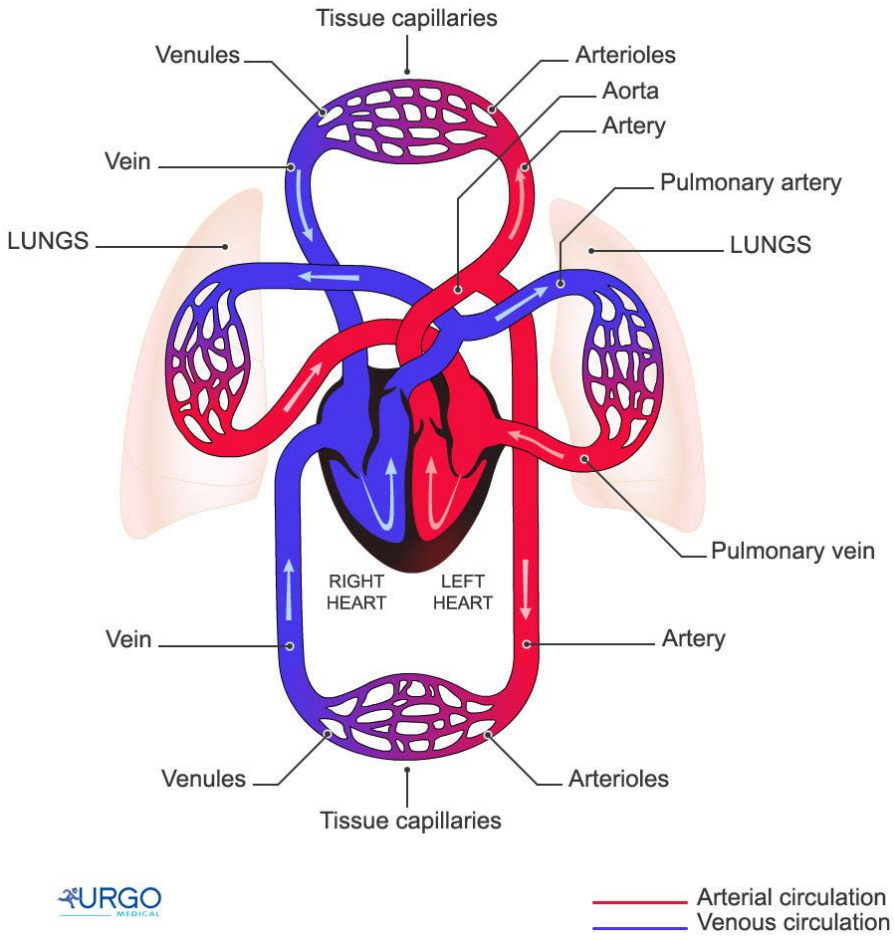
- **Identify the components of the cardiovascular system.**
- **Describe the Heart in regard to (position, chambers and valves).**
- **Describe the Blood vessels (Arteries, Veins and Capillaries).**
- **Describe the Portal System.**
- **Describe the Functional and Anatomical end arteries.**
- **Describe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

CONTENT

- **Pump:** HEART
- **Network of Tubes:** BLOOD VESSELS

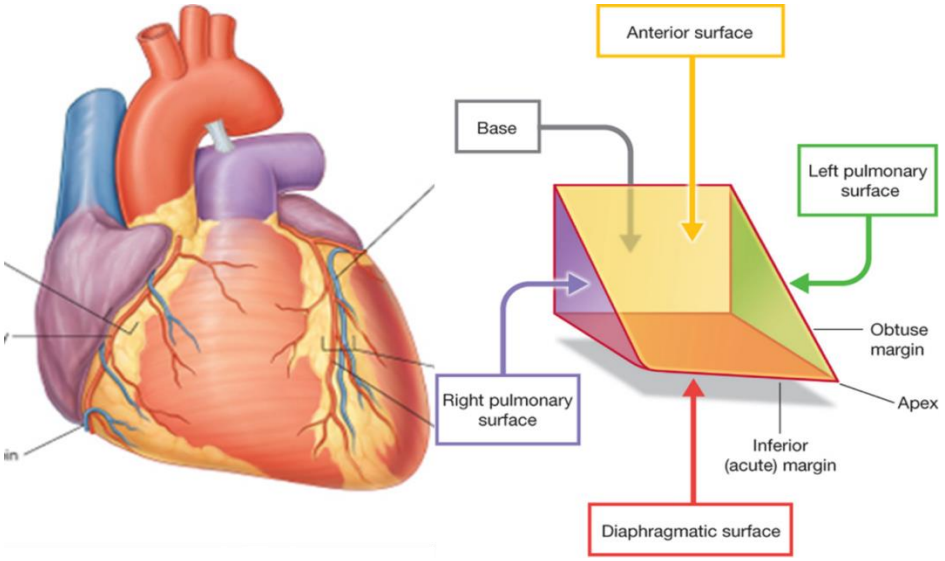
FUNCTIONS

- It is a transportation system which uses the blood as the transport vehicle.
- It carries oxygen, nutrients, cell wastes, hormones and many other substances vital for body homeostasis.
- It provides forces to move the blood around the body by the beating Heart.



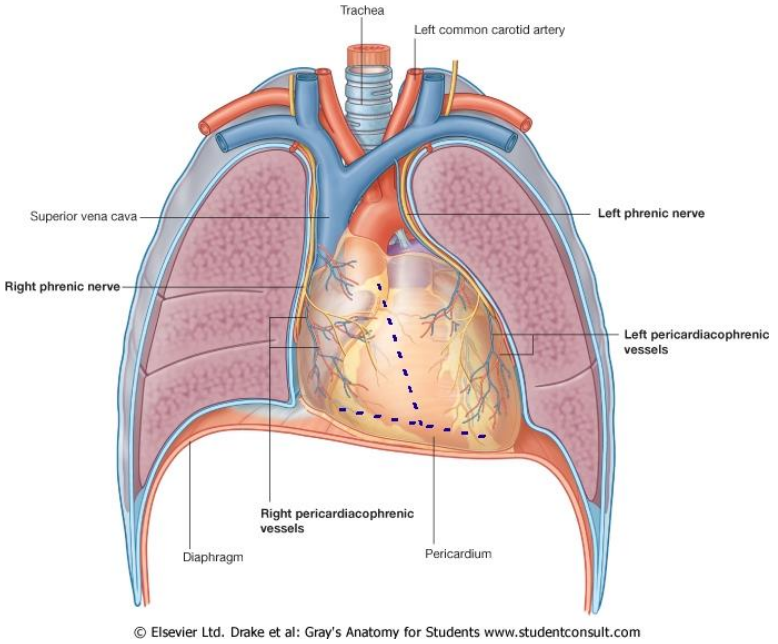
THE HEART

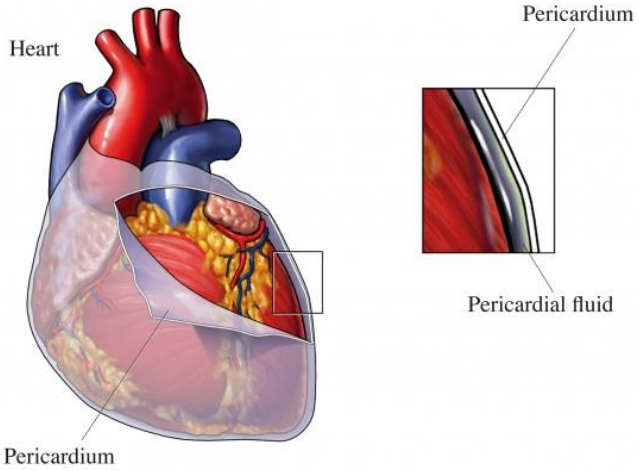
- It is a hollow, cone shaped muscular pump that keeps circulation going on.
- It is the size of hand's fist of the same person.
- It has:
  - Apex
  - Base
  - Surfaces:
    - ✓ Diaphragmatic & Sternocostal
  - Borders:
    - ✓ Right, Left, Inferior.



LOCATION OF THE HEART

- It is located in the thoracic cavity in a place known as the **Middle Mediastinum** between the two pleural sacs.
- Enclosed by a double sac of serous membrane (**Pericardium**).
- 2/3 of the heart lies to the left of median plane.
- The outer wall of the heart is made up of three layers:
  - **Epicardium.**
  - **Myocardium (muscle of the heart).**
  - **Endocardium.**

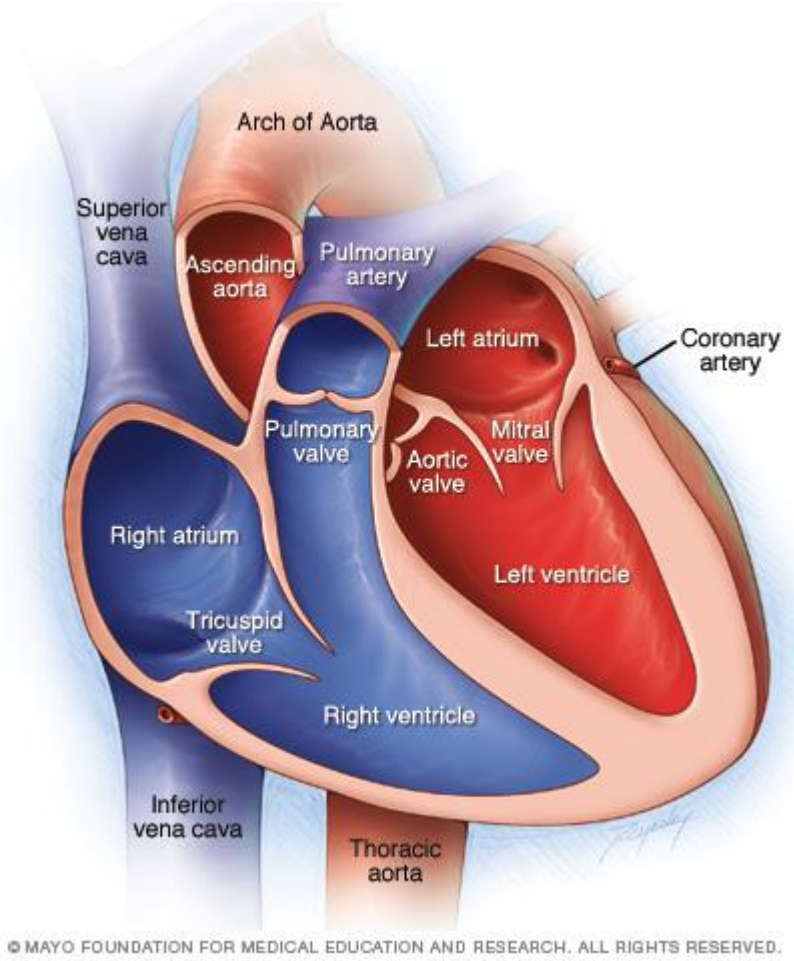




CHAMBERS OF THE HEART

ATRIA:

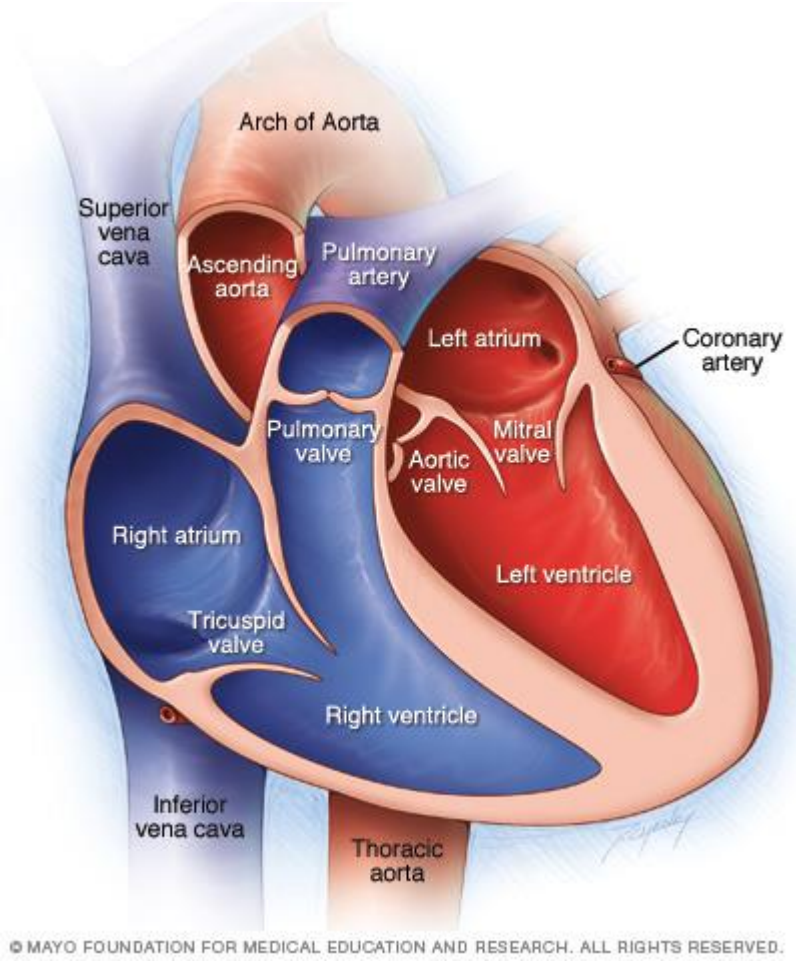
- They are two (Right & Left).
- Superior in position.
- They are the receiving chambers.
- They have thin walls.
- The upper part of each atrium is the Auricle.
- The Right Atrium receives the venous blood coming to the heart.
- Left Atrium receives arterial blood coming from the lungs.



CHAMBERS OF THE HEART

VENTRICLES:

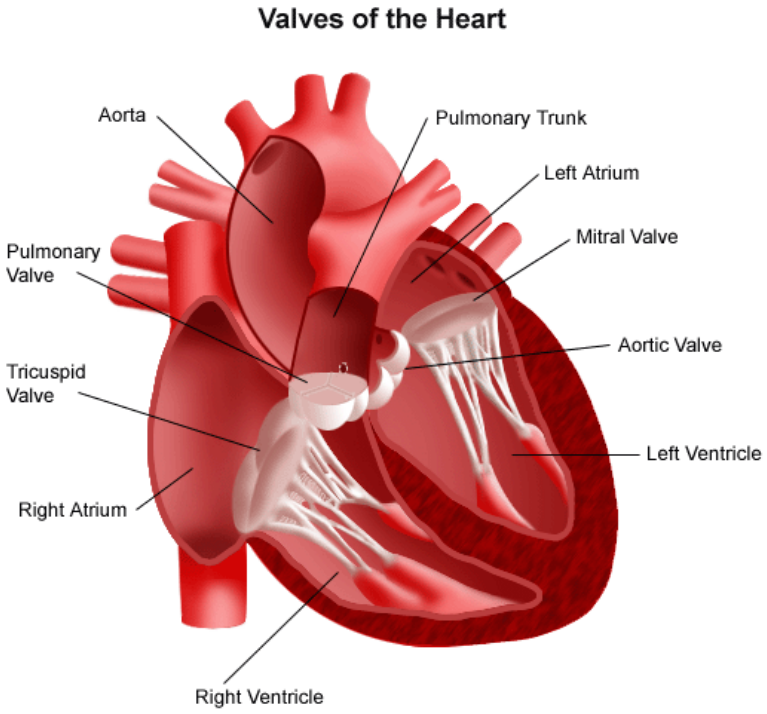
- The inferior chambers.
- They are two (right & left).
- They have thick walls.
- They are the discharging chambers (actual pumps).
- Their contraction propels blood out of the heart into the circulation.



VALVES OF THE HEART

The heart has FOUR VALVES:

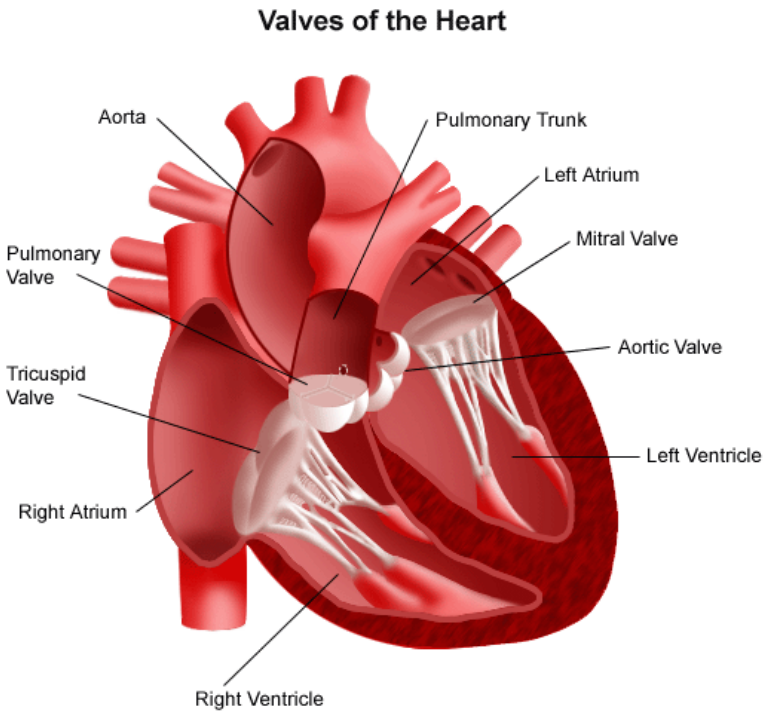
- Two Atrio-Ventricular valves.
- One Aortic Semilunar valve.
- One Pulmonary Semilunar valve.



VALVES OF THE HEART

Atrioventricular Valves:

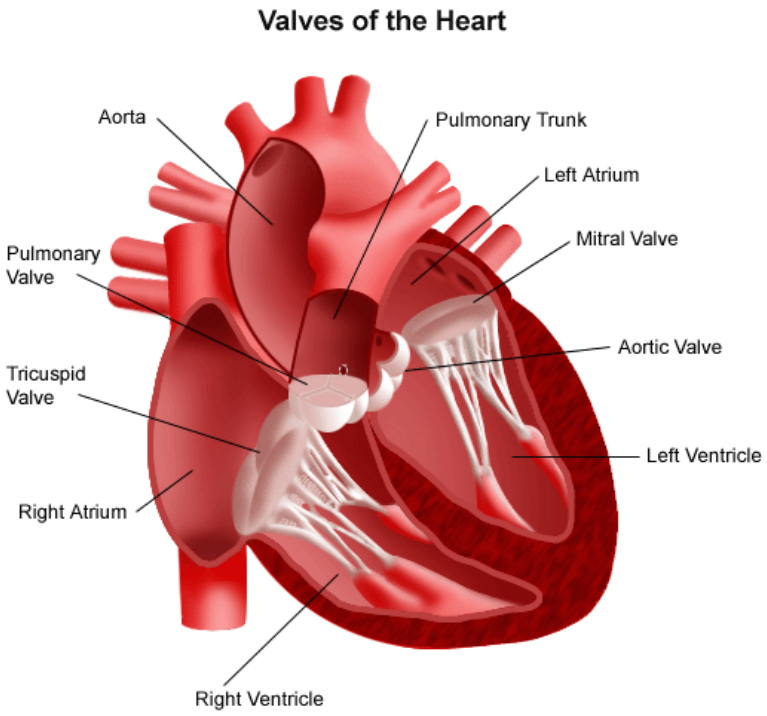
- Valves between atria & ventricles.
- They allow the blood to flow in one direction from the atria to the ventricles.
- Right AVV (Tricuspid).
- Left AVV (Bicuspid).



VALVES OF THE HEART

Semilunar Valves (Aortic & Pulmonary):

- Between the right and left ventricles and the great arteries leaving the heart.
  - **Aortic Semilunar Valve**
  - **Pulmonary Semilunar Valve**
- They allow the flow of blood from the ventricles to these arteries.



BLOOD VESSELS

Arteries:

- Thick walls.
- Do not have valves.
- The smallest arteries are arterioles.

Veins:

- Thin walls.
- Many of them possess valves.
- The smallest veins are venules.

Capillaries

- Connect arterioles and venules.
- Help to enable the exchange of water, oxygen and other nutrients between blood and the tissues.

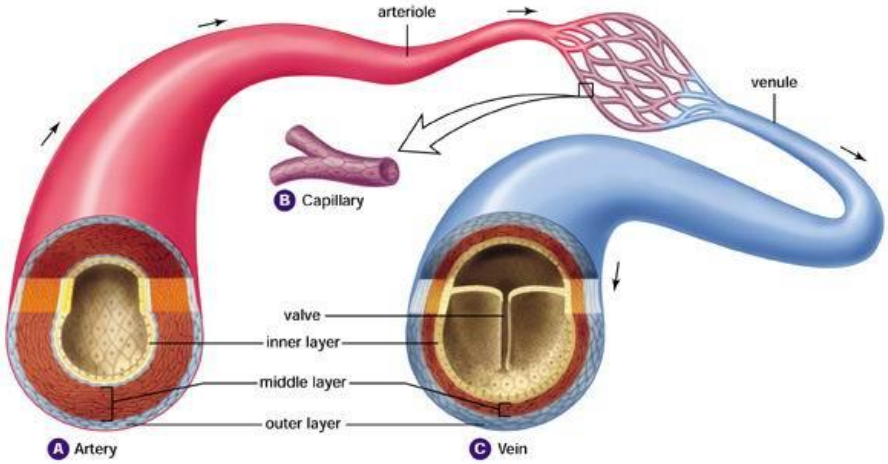


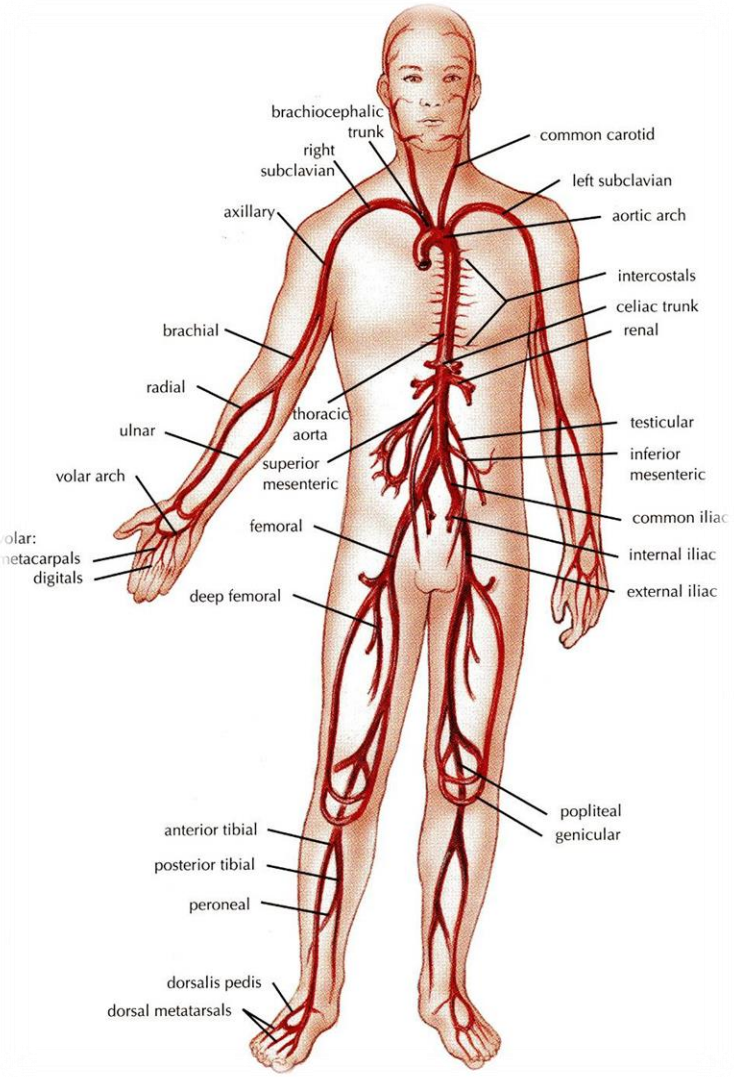
Figure 9.12. Sections through an artery, capillary, and vein. At any given moment, about 30% of the blood in your systemic circulation will be found in the arteries, 5% in the capillaries, and 65% in the veins.

ARTERIES

- **They transport blood from the heart and distribute it to the various tissues of the body through their branches.**
- **Carry oxygenated blood away from the heart.**
  - **Two Exceptions:**
    - **The pulmonary arteries.**

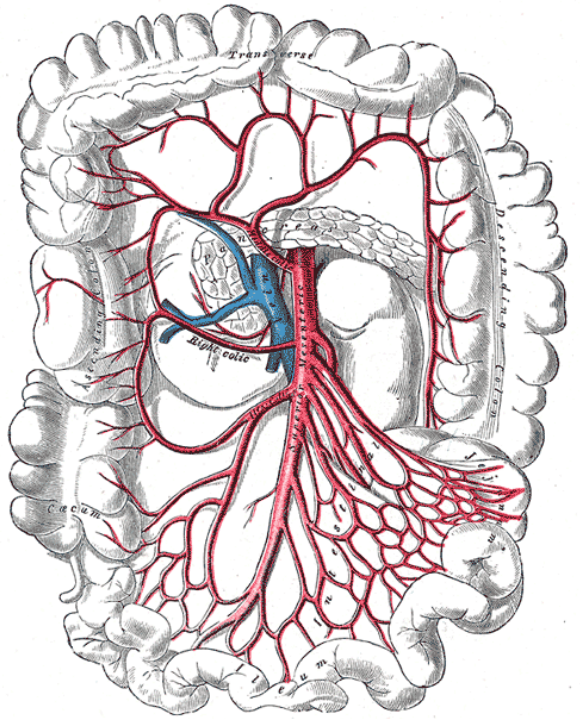
      Carries deoxygenated blood from the heart to the lungs.
    - **The umbilical arteries.**

      Supplies deoxygenated blood from the fetus to the placenta in the umbilical cord.



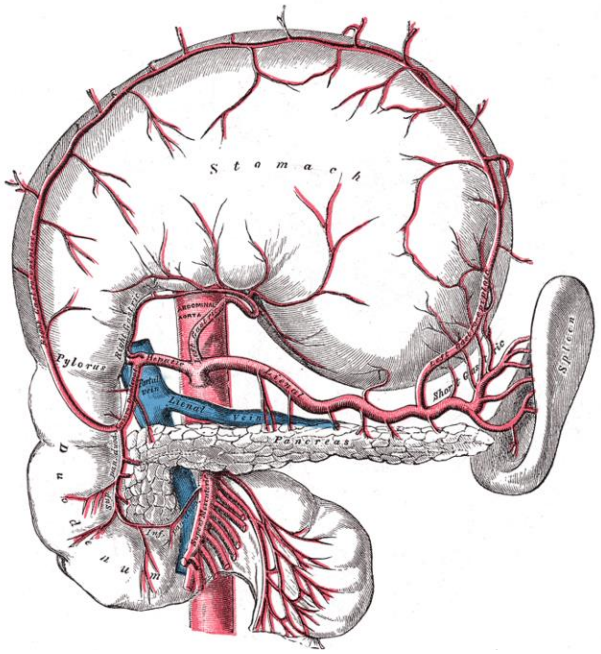
ANASTOMOSIS

- It is the connection of two structures.
- It is the joining of terminal branches of the arteries.



END ARTERIES

- It is the artery that is the only supply of oxygenated blood to a portion of tissue.
- Arteries which do not anastomose with their neighbors are called end arteries.
- Examples:
  - ✓ Splenic artery.
  - ✓ Renal artery.

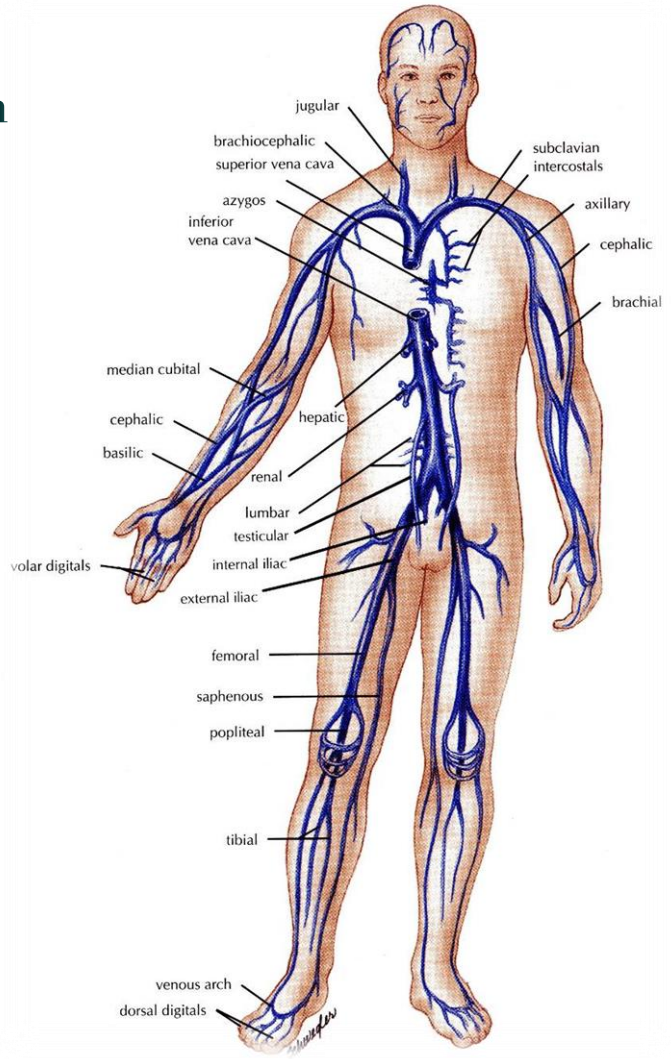


VEINS

- They transport blood back to the heart.
- The smaller veins (Tributries) unite to form larger veins which commonly join with one another to form Venous Plexuses.
- Carry deoxygenated blood toward the heart.
  - **Two Exceptions:**
    - ✓ the pulmonary veins.

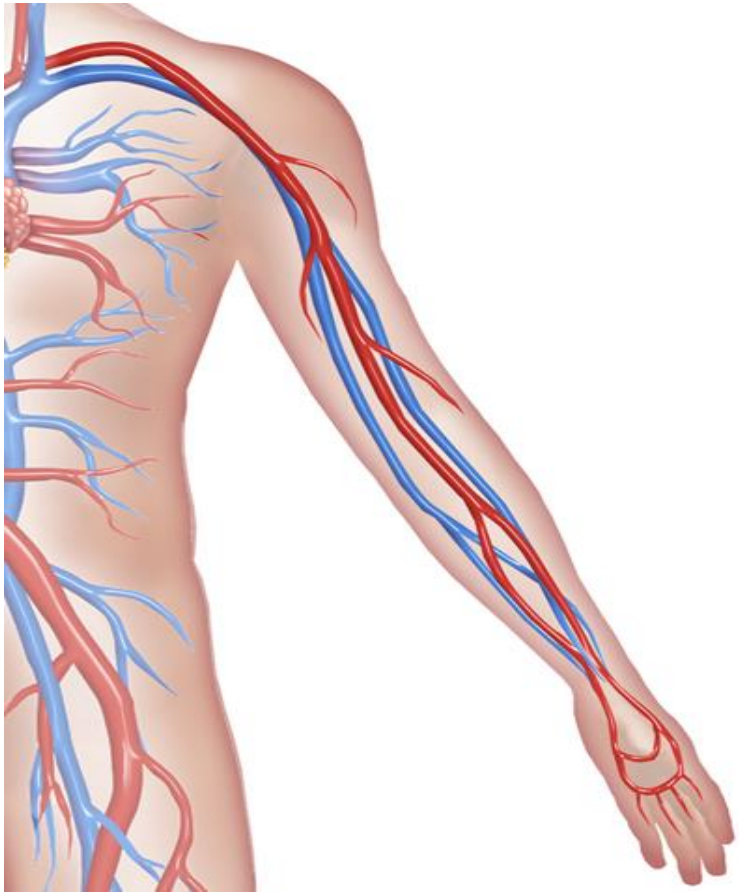
      receive oxygenated blood from the lungs and drain into the left atrium of the heart.
    - ✓ the umbilical veins.

      carry oxygenated blood from the placenta to the growing fetus.



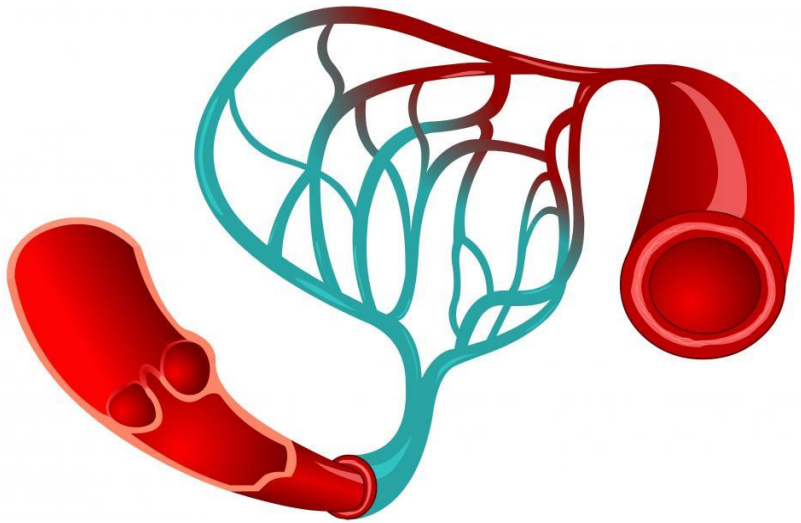
DEEP VEINS (VENAE COMITANTES)

- Two veins that accompany medium sized deep arteries
- Vena comitans is Latin for accompanying vein.
- They are found in close to arteries so that the pulsations of the artery aid venous return.
- Venae comitantes are usually found with smaller arteries, especially those in the limbs.
  - Larger arteries do not have venae comitantes. They usually have a single, similarly sized vein.



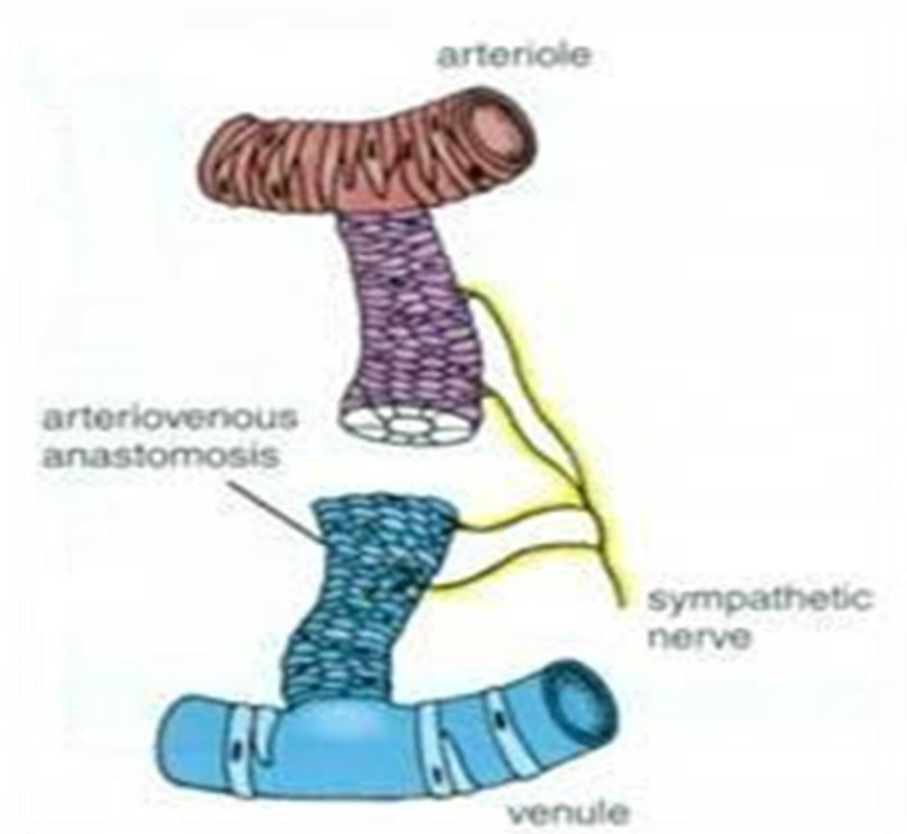
CAPILLARIES

- **Microscopic vessels in the form of a network.**
- **They connect the Arterioles to the Venules.**
- **They help to enable the exchange of water, oxygen and many.**
  other nutrients between blood and the tissues.



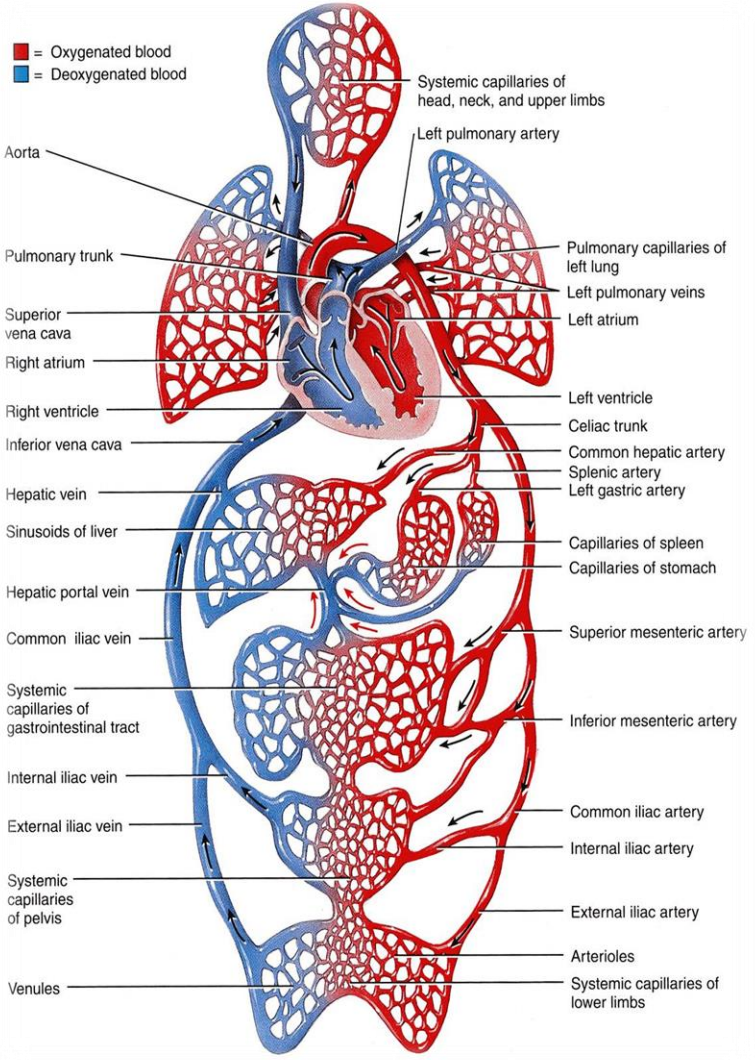
ARTERIOVENOUS ANASTOMOSIS

- **Direct connections between the arteries and veins without the intervention of capillaries.**
- **Found in tips of the fingers and toes.**



PORTAL CIRCULATION SYSTEM

- **Portal Venous System occurs when a capillary bed pools into another capillary bed through veins, without first going through the heart.**
- **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 again into veins of diminishing size which ultimately join capillary like vessels (Sinusoids).**



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 are 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 connect the arteries to the veins.
- The portal system is composed of two sets of capillaries.
- The veins from the GIT go first to the liver through the portal vein.

Review Question # 1

- **Which one of the following is NOT true?**

1. Right atria receive blood from the body.
2. The valve between right atrium and right ventricle called "Bicuspid".
3. Left ventricle discharging blood to the body.
4. Right ventricle receives blood from right atrium.
5. Valves allow blood to move one way only.

Review Question # 2

- **Which statement of the following is TRUE?**

1. Arteries transport blood from the heart to the body.
2. Arteriovanous anastomosis found in tips of the fingers and toes.
3. Capillaries connect the Arterioles to the Venules.
4. Anastomosis is the joining of terminal branches of the arteries.
5. Veins leaving the gastrointestinal tract do not go direct to the heart.

Questions!