

## + Motivational Corner:

Mistakes are proof  
that you are trying.



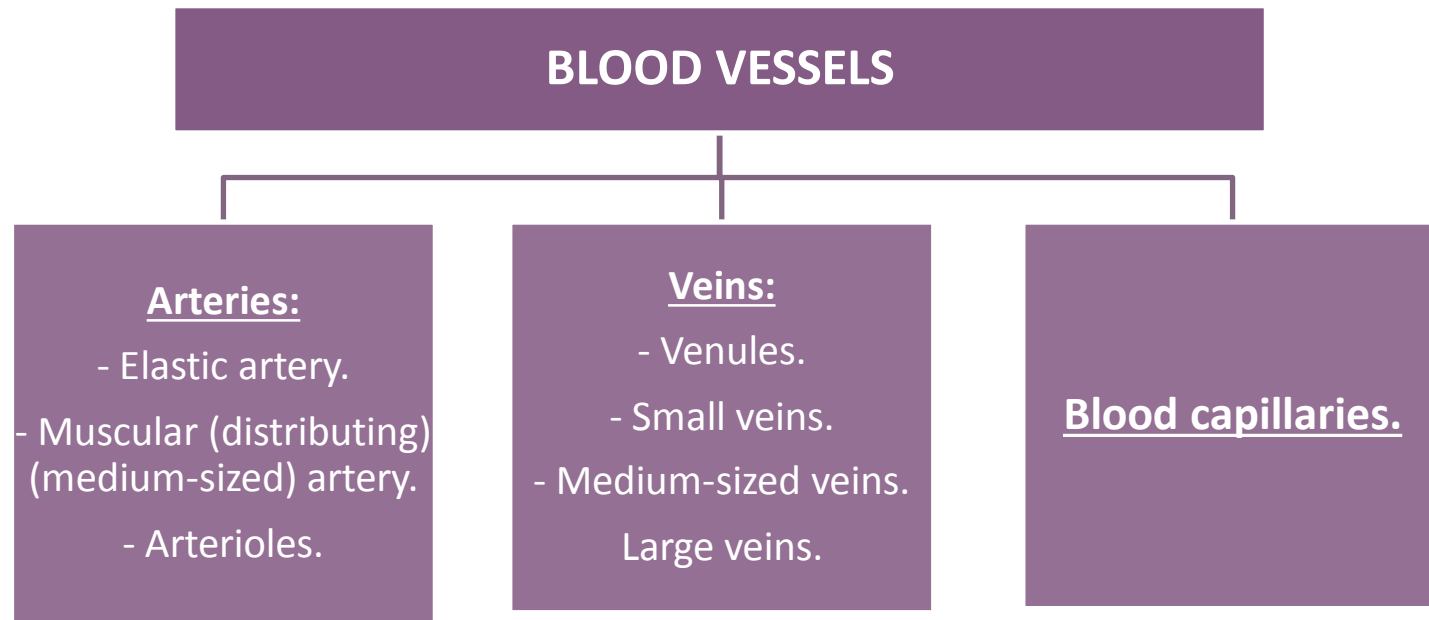
## Objectives:

By the end of this lecture, the student should be able to identify and describe the microscopic structure of the wall of the blood vessels including:

- Elastic arteries.
- Muscular (medium-sized) arteries.
- Medium-sized veins.
- Blood capillaries.

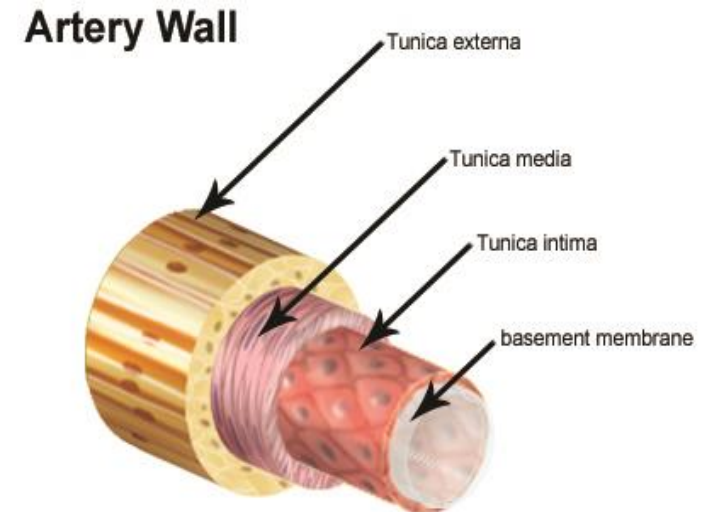
## Histology of the blood vessels

Extra notes: Gray  
Important notes: Red



## STRUCTURE OF BLOOD VESSELS

The wall of blood vessel is formed of three concentric layers:





# GENERAL STRUCTURE OF BLOOD VESSELS

wall of blood vessels

## Tunica Intima

Is the innermost layer  
(3 layers)

Composed of:

- **ENDOTHELIAL CELLS:**
  - Simple squamous epithelium
- **SUBENDOTHELIAL LAYER:**
  - loose C.T.
- **INTERNAL ELASTIC LAMINA:** fenestrated elastic sheet.

## Tunica Media

Intermediate layer  
*The thickest layer (4 layers)*

Composed of:

- 1- Smooth muscles.
- 2- Elastic fibers.
- 3- Type III collagen (reticular fibers).
- 4- Type I collagen.

NB: Large muscular arteries have **external elastic lamina**, separating the tunica media from the tunica adventitia

## Tunica Adventitia

Outermost layer

Composed of **connective tissue** containing

### VASA VASORUM:

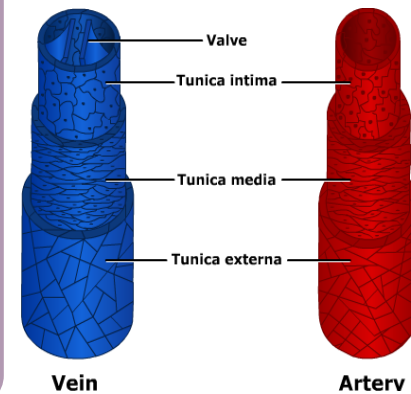
*(blood vessels supplying other blood vessels)*

Arteries, supplies TM and TA, Veins = large veins from the arteries, small veins from anastomoses

They are small arterioles in tunica adventitia and the outer part of tunica media.

They are more prevalent in the walls of veins than arteries – why? Venous blood contains less oxygen and nutrients than arterial blood.

**NOTE:**  
**Tunica:** a general term for a membrane and other structures that line and cover



Vein

Artery

# + ELASTIC ARTERIES

Examples: **aorta**, common carotid a., subclavian a., common iliac a, pulmonary Trunk.

## MICROSCOPIC STRUCTURE:

### T. Intima

- Endothelium.
- Subendothelial C.T.
- Internal elastic lamina:  
(not prominent)  
(indistinct)

### T. Media

it consists of:

A. Fenestrated (openings for nutrition) **elastic membranes** (sheets) (lamellae):

It is the main component of T.M.

B. In between, there are:

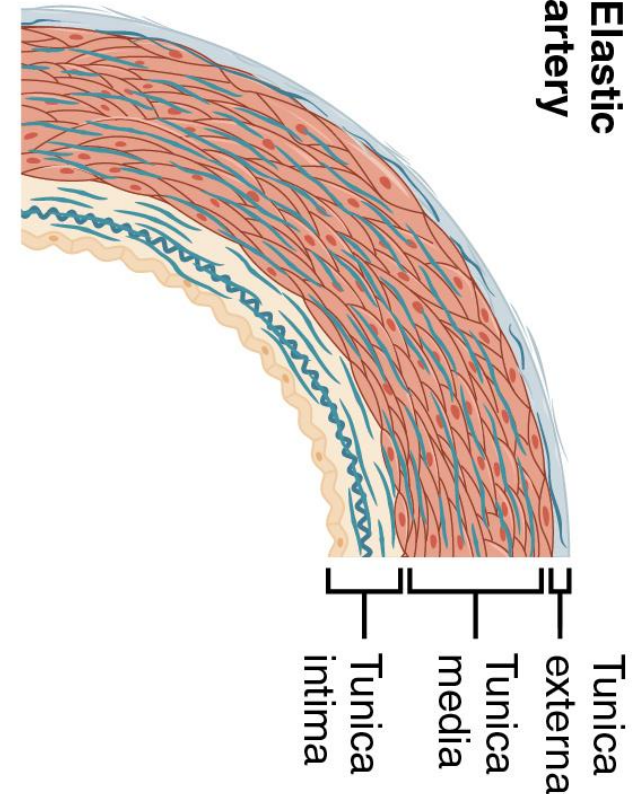
1. Smooth muscle cells.
2. Collagen fibers (type I collagen).
3. Reticular fibers (type III collagen).
4. **Elastic fibers.**

### T. Adventitia

Much thinner than T.M.

It is composed of loose C.T.

Contains vasa vasorum → send branches to the outer part of T.M.



# + MUSCULAR ARTERIES (Medium-sized artery)

Examples: brachial, ulnar, renal.

## MICROSCOPIC STRUCTURE:

### T. Intima

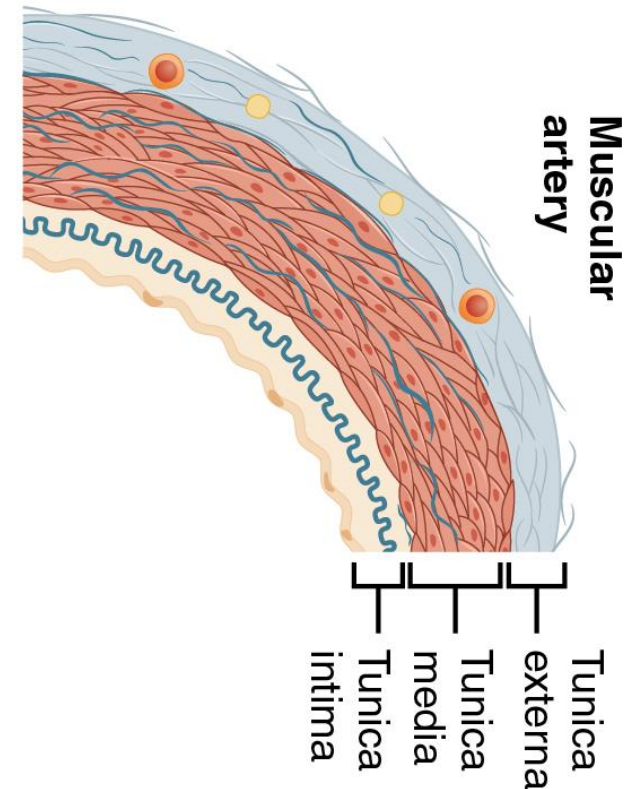
- Endothelium.
- Subendothelial C.T. layer.
- **Internal elastic lamina:**  
Is prominent.  
Displays an undulating surface.

### T. Media

- (Thicker than T. Adventitia or similar in thickness).
- Components:**
- A- **Smooth muscle** cells (SMC): are the *predominant component*.
  - B- In between there are:
    - Elastic fibers.
    - Type III collagen fibers.
    - Type I collagen fibers.
  - C -External elastic lamina:** may be identifiable.

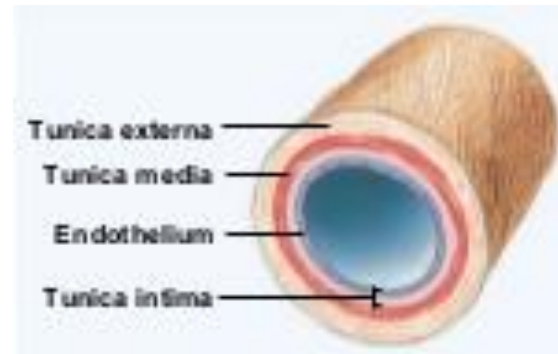
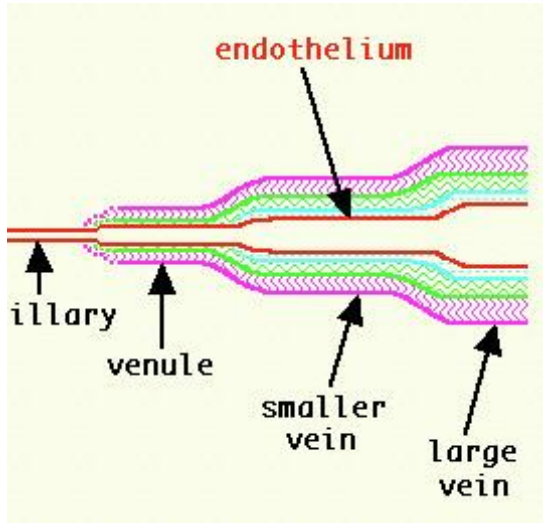
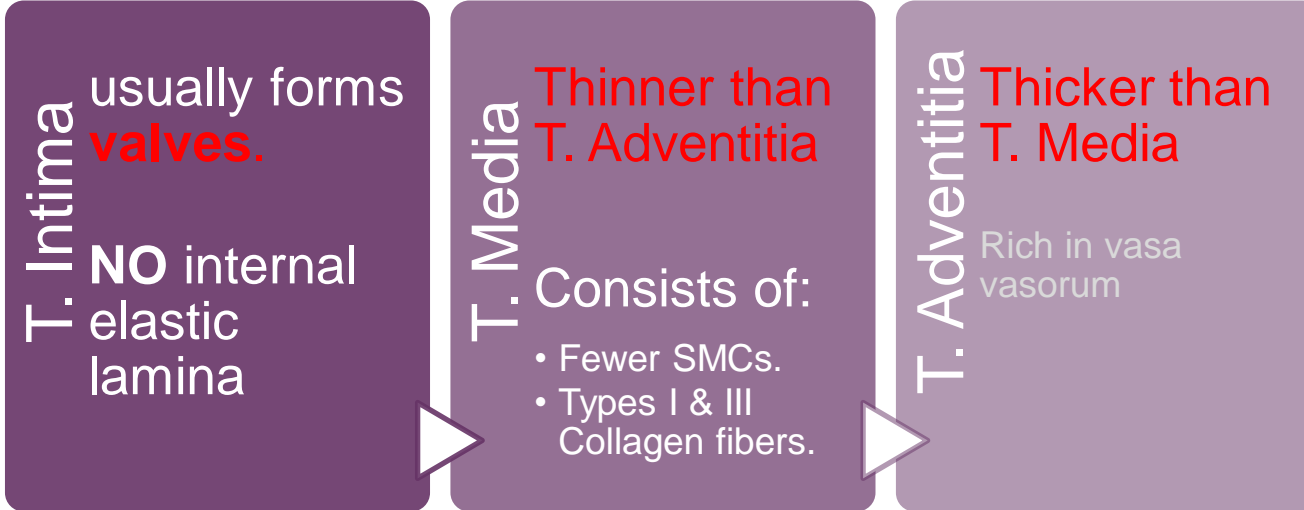
### T. Adventitia

Loose CT



# + MEDIUM-SIZED VEIN

Thickness of the wall: thinner than the accompanying artery.



## VALVES OF VEINS

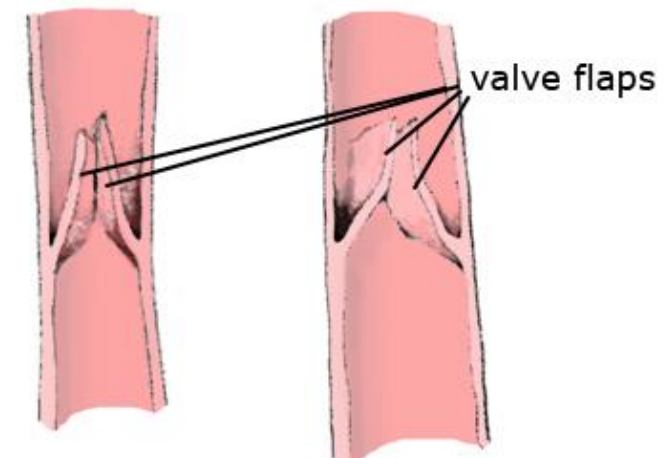
Valve of a vein is composed of 2 leaflets

Each leaflet has a thin fold of the **T. Intima**.

## COMPONENTS:

- Endothelium
- Core of C.T.

## Valves in veins

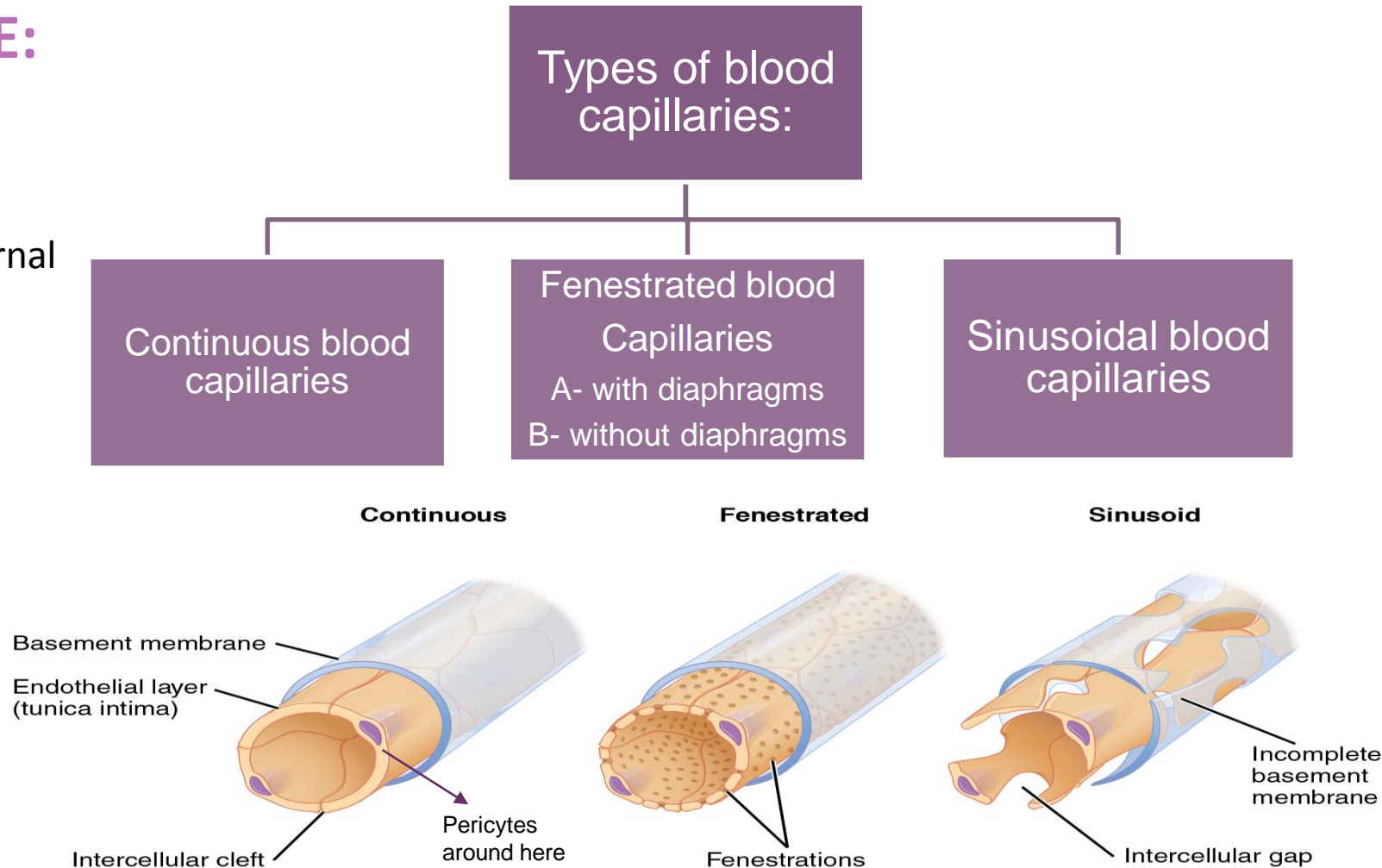


# + BLOOD CAPILLARIES

Diameter: usually 8-10  $\mu\text{m}$ .

## MICROSCOPIC STRUCTURE:

1. Single layer of **squamous endothelial cells**.
2. **Basal lamina**: surrounds the external surface of the endothelial cells.
3. **Pericytes**: (protective cells)
  - Have processes.
  - Share the basal lamina of the endothelial cells.





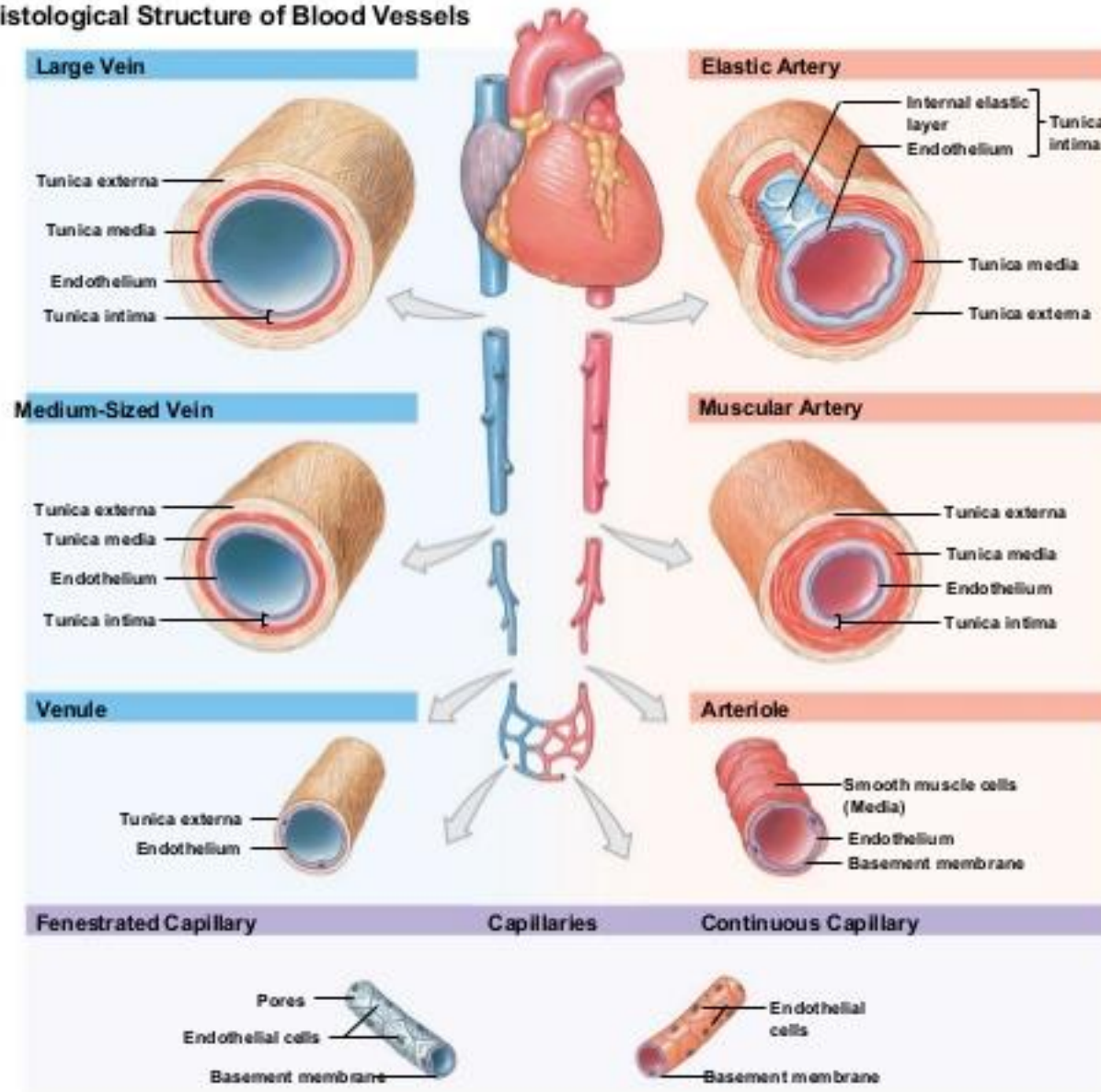
# + TYPES OF BLOOD CAPILLARIES:

	CONTINUOUS BLOOD CAPILLARIES	FENESTRATED BLOOD CAPILLARIES WITH DIAPHRAGMS	FENESTRATED BLOOD CAPILLARIES WITHOUT DIAPHRAGMS	SINUSOIDAL CAPILLARIES DIAMETER: IRREGULAR (30-40 μM). (DICONTINUOUS)
<b>MICROSCOPIC STRUCTURE:</b>	<p>No pores or fenestrae in their walls.</p> <p><b>NO GAPS</b></p>	<p>The walls of their endothelial cells have pores (fenestrae).</p> <p>These pores are covered by diaphragm. <i>(diaphragm acts like a valve)</i></p>	<p>The walls of their endothelial cells have pores (fenestrae).</p> <p>These pores are <b>NOT</b> covered by diaphragm.</p>	<ul style="list-style-type: none"> <li>- Their endothelial cells have fenestrae (<b>wide</b>) <b>without</b> diaphragms.</li> <li>- They possess discontinuous endothelial cells.</li> <li>- They possess discontinuous basal lamina.</li> <li>- Macrophages may be located in or along the outside of the endothelial wall. <i>(Reticular fibers hold the cells together)</i></li> </ul>
<b>DISTRIBUTION:</b>	In muscles, nervous T., C.T.	In intestine, pancreas and endocrine glands.	In renal glomerulus.	<b>Red bone marrow, liver</b> <i>(to discharge macrophages and dead cells etc)</i> , spleen and certain endocrine glands.





Figure 21-2 Histological Structure of Blood Vessels





**1- Which of the following is a distinct structure found specifically in the liver, spleen, and bone marrow?**

- a. Continuous capillaries
- b. Fenestrated capillaries
- c. Sinusoidal capillaries
- d. AV anastomoses
- e. Venous sinus

**2- What do you call the simple squamous epithelium that lines the blood vessels?**

- a. Epithelioid tissue
- b. Mesothelium
- c. Endothelium
- d. Transitional
- e. Pseudostratified

**3- What is a thoroughfare which is an intermediate between an arteriole and capillary?**

- a. Metcapillary
- b. Metartery
- c. Metvenule
- d. Metarteriole
- e. None of the above

**4- In which structure are things moved across the epithelium via pinocytotic vesicles?**

- a. Continuous capillaries
- b. Fenestrated capillaries
- c. Sinusoidal capillaries
- d. AV anastomoses
- e. Venous sinus

**5- At what level of the vascular tree does gas exchange occur?**

- a. Capillary
- b. Arteriole
- c. Venule
- d. Elastic artery
- e. Muscular artery

# MCQs

**5- At what level of the vascular tree does gas exchange occur?**

- a. Capillary
- b. Arteriole
- c. Venule
- d. Elastic artery
- e. Muscular artery

**6- Which layer in an artery is primarily smooth muscle?**

- a. Tunica intima
- b. Tunica media
- c. Tunica externa
- d. All of the above
- e. None of the above

**7- Which of the following constitutes the microvascular bed of a tissue?**

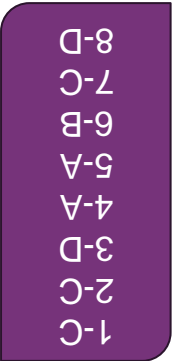
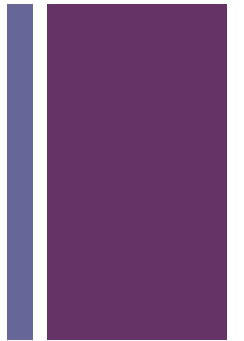
- a. Capillaries
- b. Capillaries and arterioles
- c. Capillaries, arterioles, and post capillary venules
- d. Capillaries, arterioles, post capillary venules, and veins
- e. Capillaries, arterioles, post capillary venules, veins, and arteries

**8-What is a direct route between arteries and veins called?**

- a. Continuous capillaries
- b. Fenestrated capillaries
- c. Sinusoidal capillaries
- d. AV anastomoses
- e. Venous sinus



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**Thanks for checking our work, Good luck!**

**--Team histology.**

