


Histology team 438  
King Saud University



# HISTOLOGY OF THE BLOOD VESSELS

Editing file 

- ▣ **Important**
- ▣ **Doctor notes /extra**

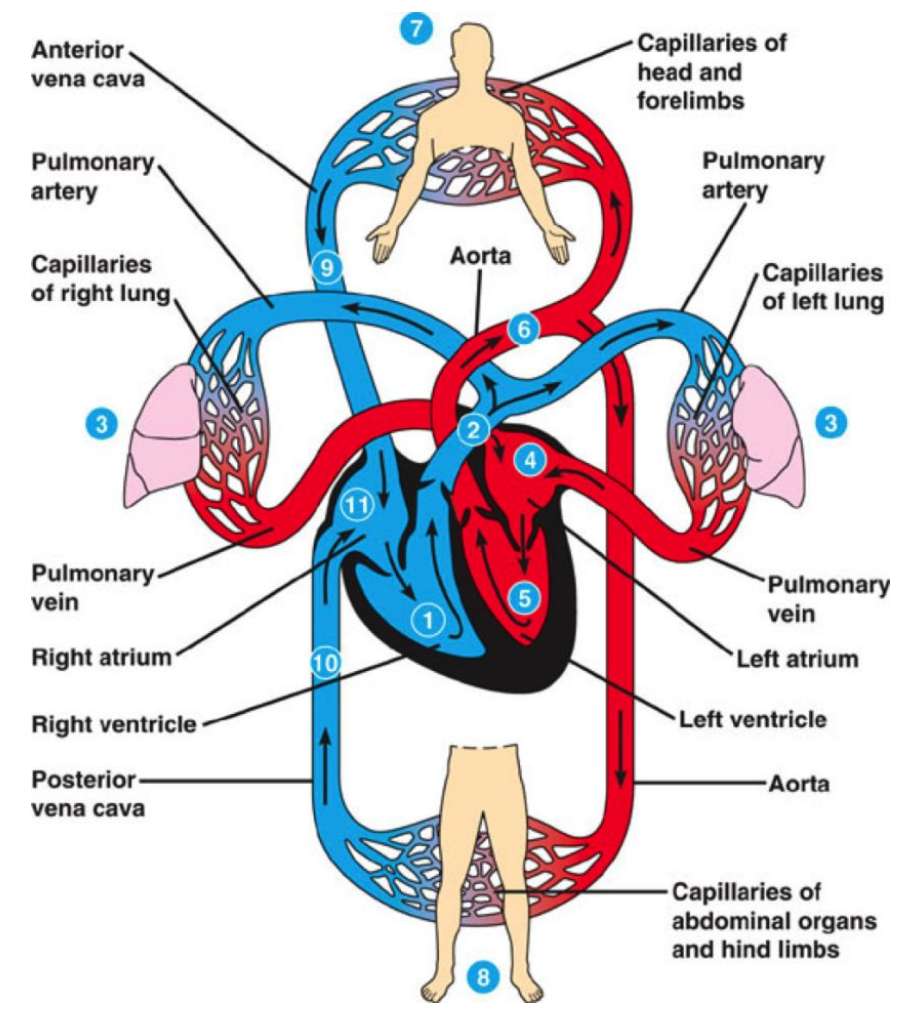
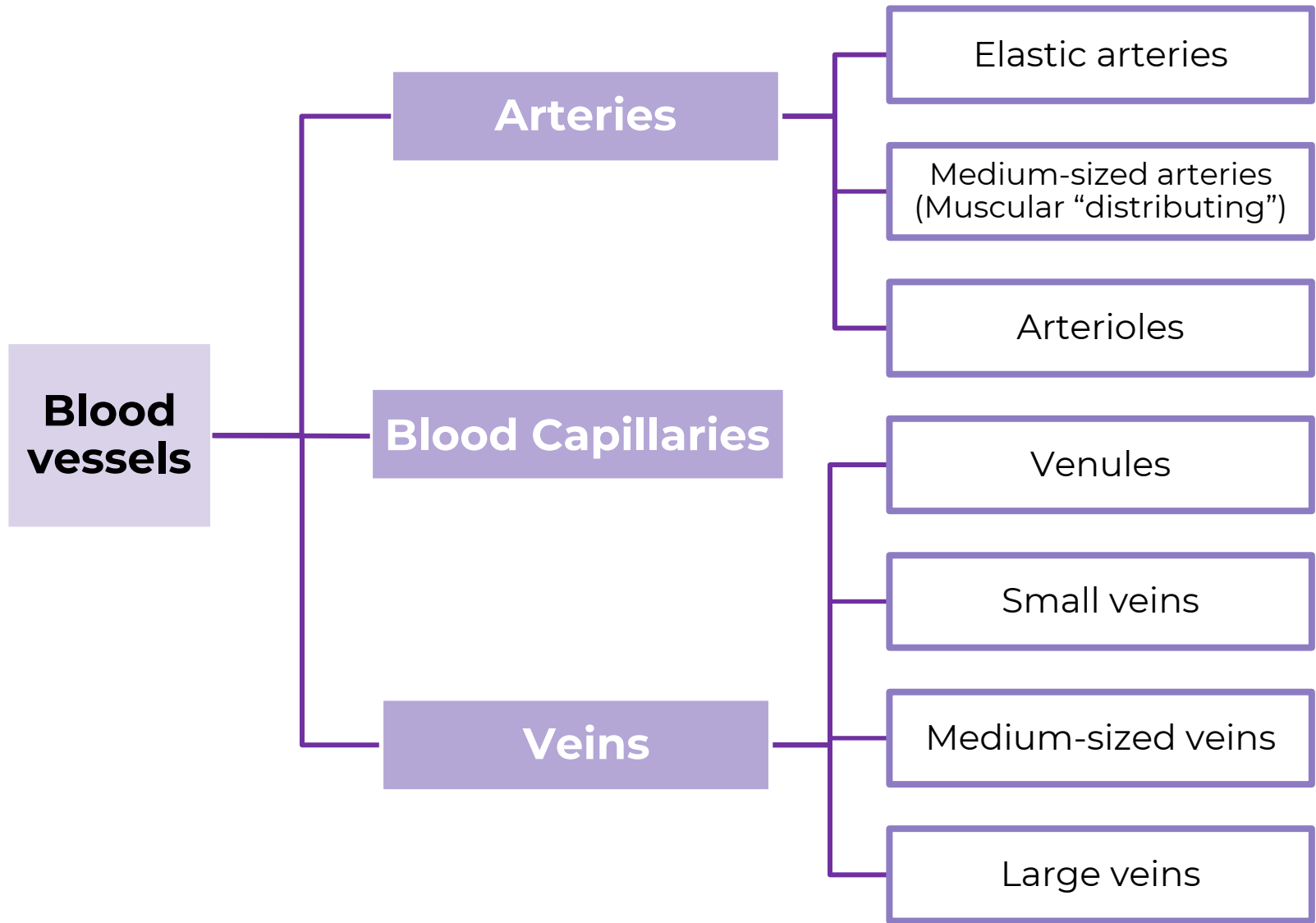


## Objectives:

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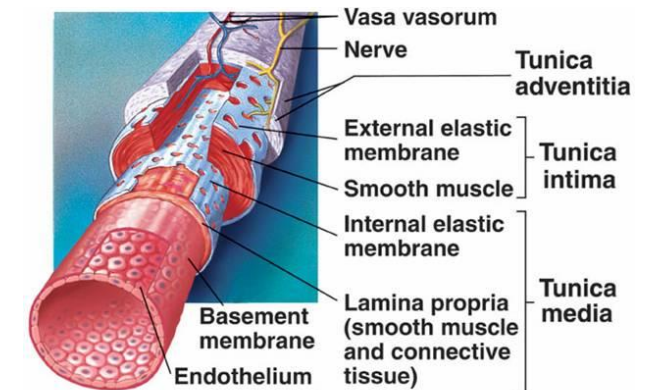
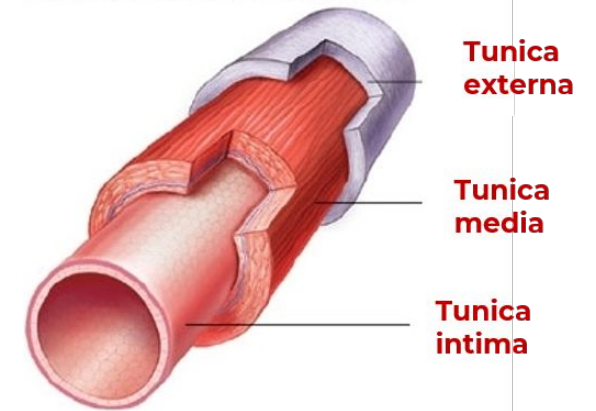
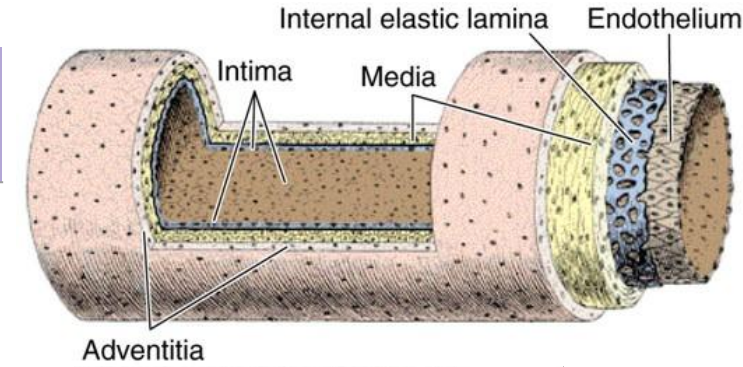
By the end of this lecture, the student should be able to identify and describe the microscopic structure of the wall of the blood vessels including:

1. **Elastic arteries.**
2. **Muscular (medium-sized) arteries.**
3. **Medium-sized veins.**
4. **Blood capillaries.**



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

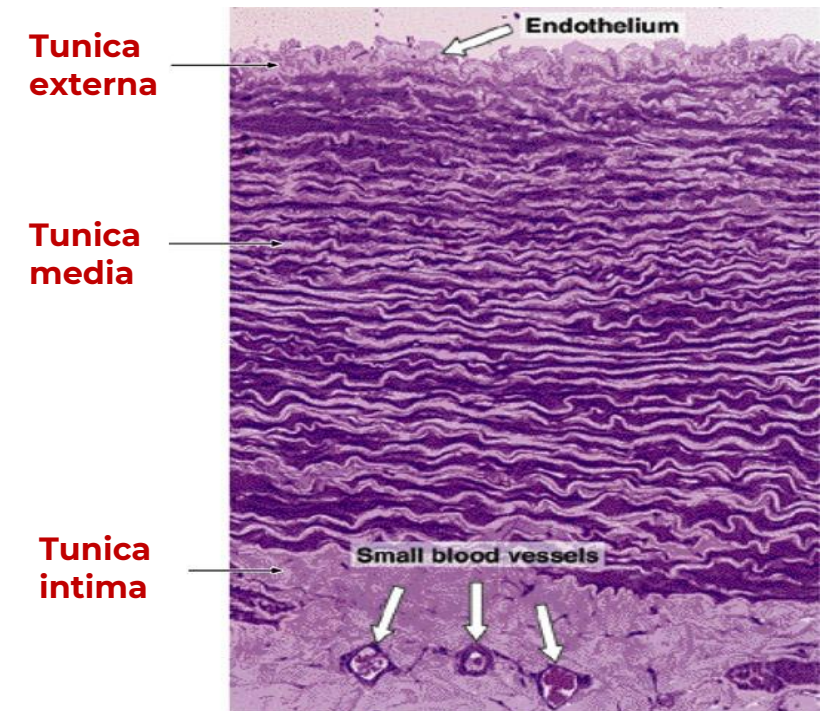
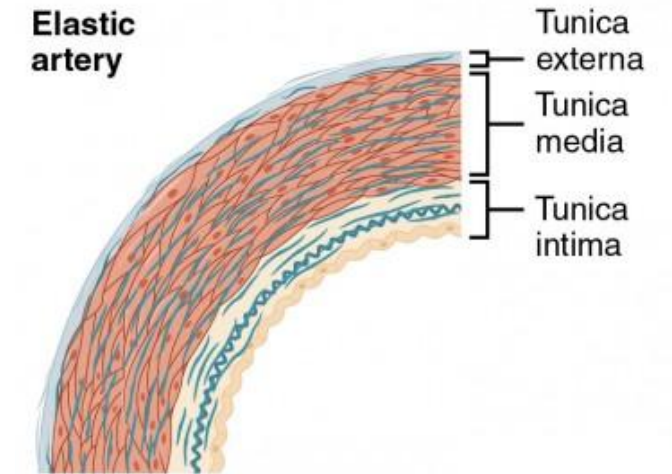
Tunica intima (interna)	Tunica media	Tunica adventitia (externa)
<p>Is the <b>innermost layer</b> Composed of:</p> <ul style="list-style-type: none"> <li>❖ <b>Endothelial cells:</b> Simple squamous epithelium</li> <li>❖ <b>Subendothelial layer:</b> loose C.T.</li> <li>❖ <b>Internal elastic lamina:</b> fenestrated elastic sheet. For the diffusion of nutrients from the blood to the vessel</li> </ul>	<p><b>Intermediate layer</b> Composed of:</p> <ol style="list-style-type: none"> <li>1. Mainly Smooth muscles Arranged helically</li> <li>2. Elastic fibers.</li> <li>3. Type III collagen (reticular fibers).</li> <li>4. Type I collagen.</li> </ol> <p><b>NB:</b> Large muscular arteries have external elastic lamina, separating the tunica media from the tunica adventitia</p>	<p><b>Outermost layer</b> Composed of connective tissue containing <b>Vasa vasorum:</b></p> <ul style="list-style-type: none"> <li>❖ They are small arterioles in tunica adventitia and the outer part of tunica media.</li> <li>❖ They are more prevalent in the walls of veins than arteries</li> </ul> <p><b>why?</b> Venous blood contains less oxygen and nutrients than arterial blood.</p>



# ARTERIES

## Elastic arteries (Large artery)

Example	<b>Aorta</b> , common carotid artery, subclavian artery, common iliac artery, <b>pulmonary Trunk</b>
Tunica intima (interna)	<ul style="list-style-type: none"> <li>• <b>Endothelium</b></li> <li>• Subendothelial C.T.</li> <li>• Internal elastic lamina: <b>not prominent</b> “not clear” &amp; <b>indistinct</b></li> </ul>
Tunica media	<p><b>It consists of:</b></p> <p><b>A.</b> Fenestrated elastic membranes: sheets &amp; lamellae “main component of T.M.”</p> <p><b>B.</b> In between, there are:</p> <ol style="list-style-type: none"> <li>1- <b>Elastic fibers</b> “predominant (main) component= 90%”</li> <li>2- Collagen fibers (type I collagen)</li> <li>3- Reticular fibers (type III collagen)</li> <li>4- Smooth muscle cells</li> </ol> <p>Much thicker than T.I and T.A</p>
Tunica adventitia (externa)	<ul style="list-style-type: none"> <li>• Much <b>thinner</b> than T.M.</li> <li>• It is composed of loose connective tissue</li> <li>• Contains vasa vasorum → <b>send branches</b> to the <u>outer part of T.M.</u></li> </ul>

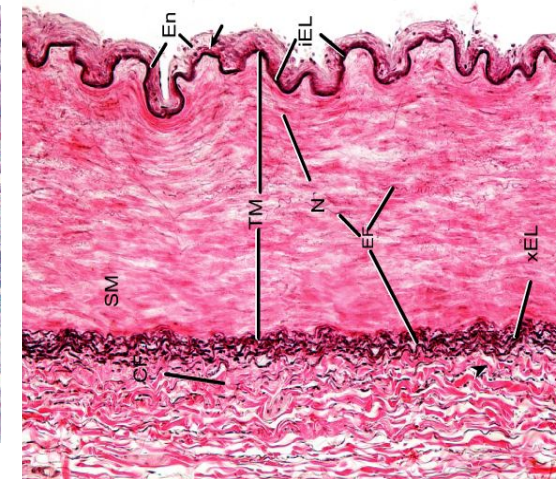
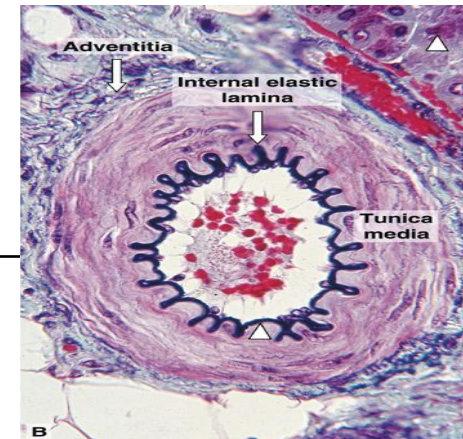
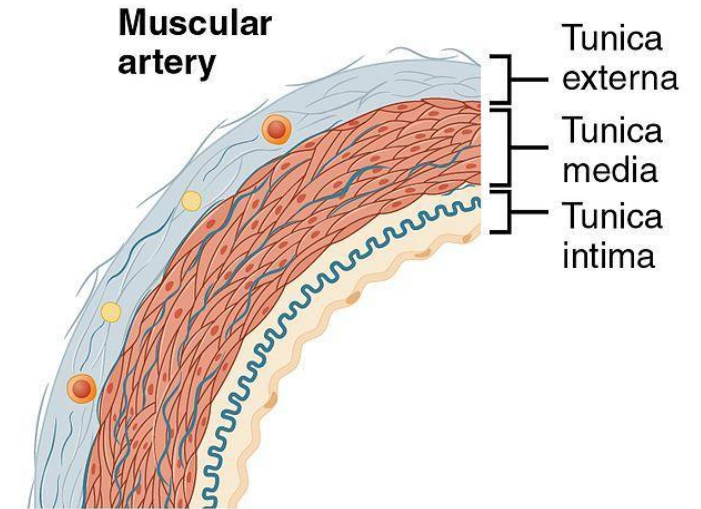




# ARTERIES

## Muscular arteries (Medium-sized artery)

Example	, brachial, ulnar, renal. Femoral
Tunica intima (interna)	<ul style="list-style-type: none"> <li>• Endothelium.</li> <li>• Subendothelial C.T. layer.</li> <li>• Internal elastic lamina : <b>Is prominent and Displays an undulating surface.</b></li> </ul>
Tunica media	<p><u>(Thicker than T. Adventitia or similar in thickness).</u></p> <p><b>Components:</b></p> <p>A. Smooth muscle cell (SMCs) “predominant component”</p> <p>B. In between the smooth muscle, there are:</p> <ol style="list-style-type: none"> <li>1- Elastic fibers</li> <li>2- Collagen fibers (type I collagen)</li> <li>3- Reticular fibers (type III collagen)</li> </ol> <p>C. External elastic lamina: may be identifiable.</p>
Tunica adventitia (externa)	<ul style="list-style-type: none"> <li>• loose C.T.</li> </ul>



# VEINS

## MEDIUM-SIZED VEIN

### Thickness of the wall:

thinner than the accompanying artery. wide lumen , thin wall

### Tunica intima (interna)

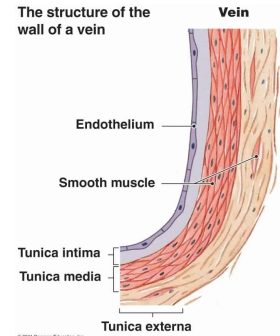
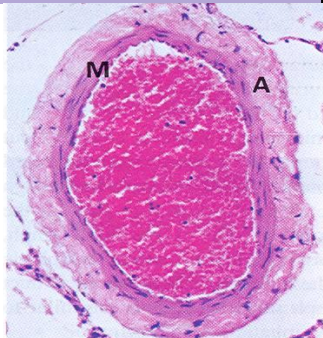
- usually forms **valves**.
- **no internal elastic lamina**
- endothelium

### Tunica media

- Thinner than T. Adventitia**  
Consists of:
1. Fewer SMCs.
  2. Types I & III Collagen fibers
- No elastic fiber

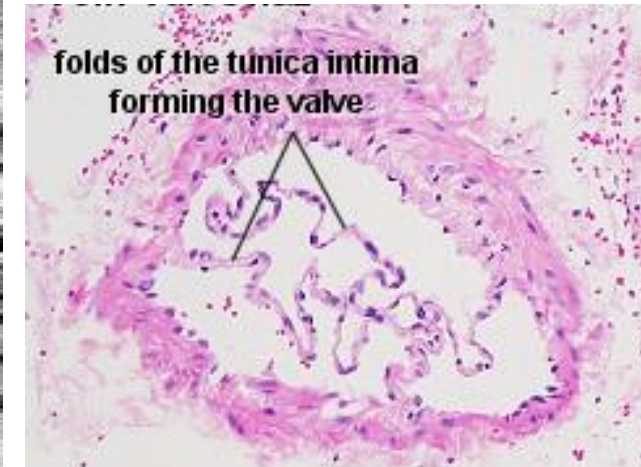
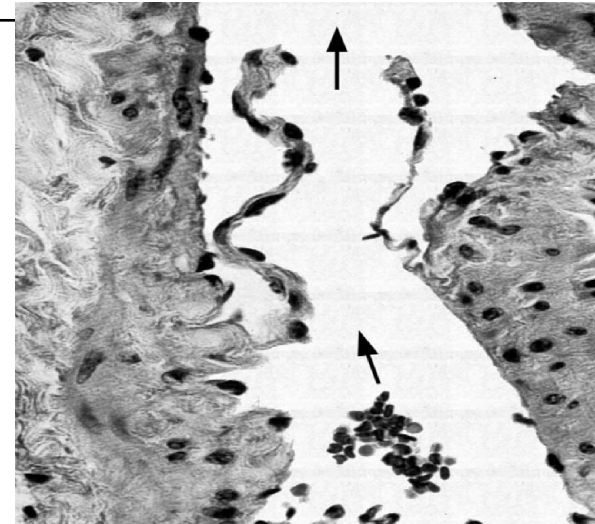
### Tunica adventitia (externa)

- thicker than T. Media



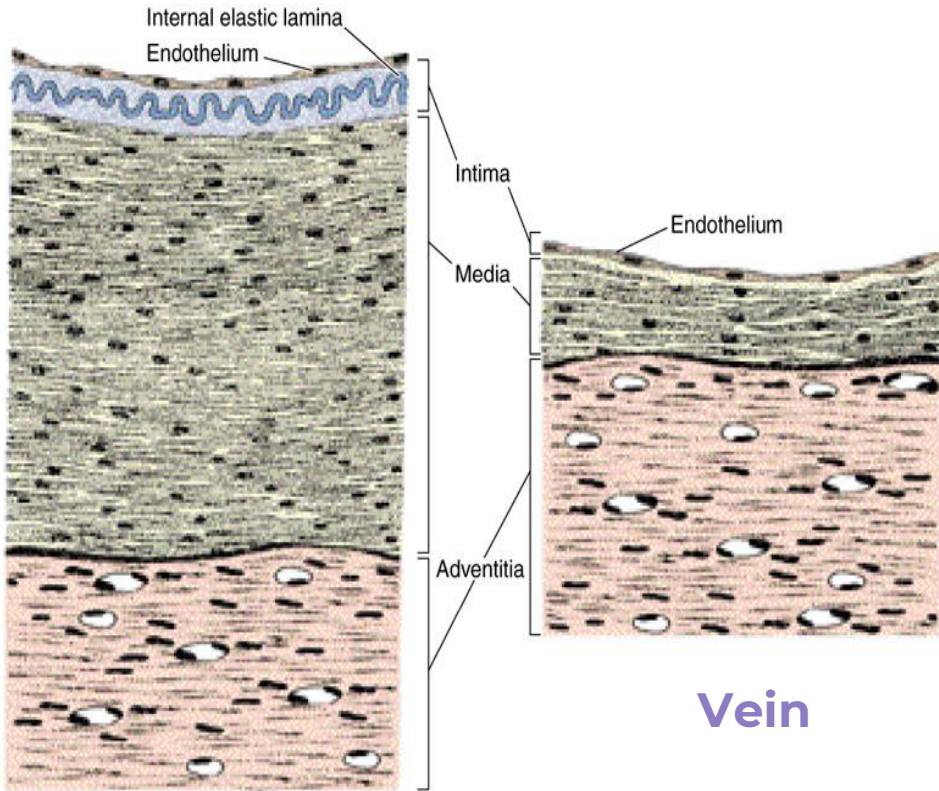
## ◆ VALVES OF VEINS

- 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.



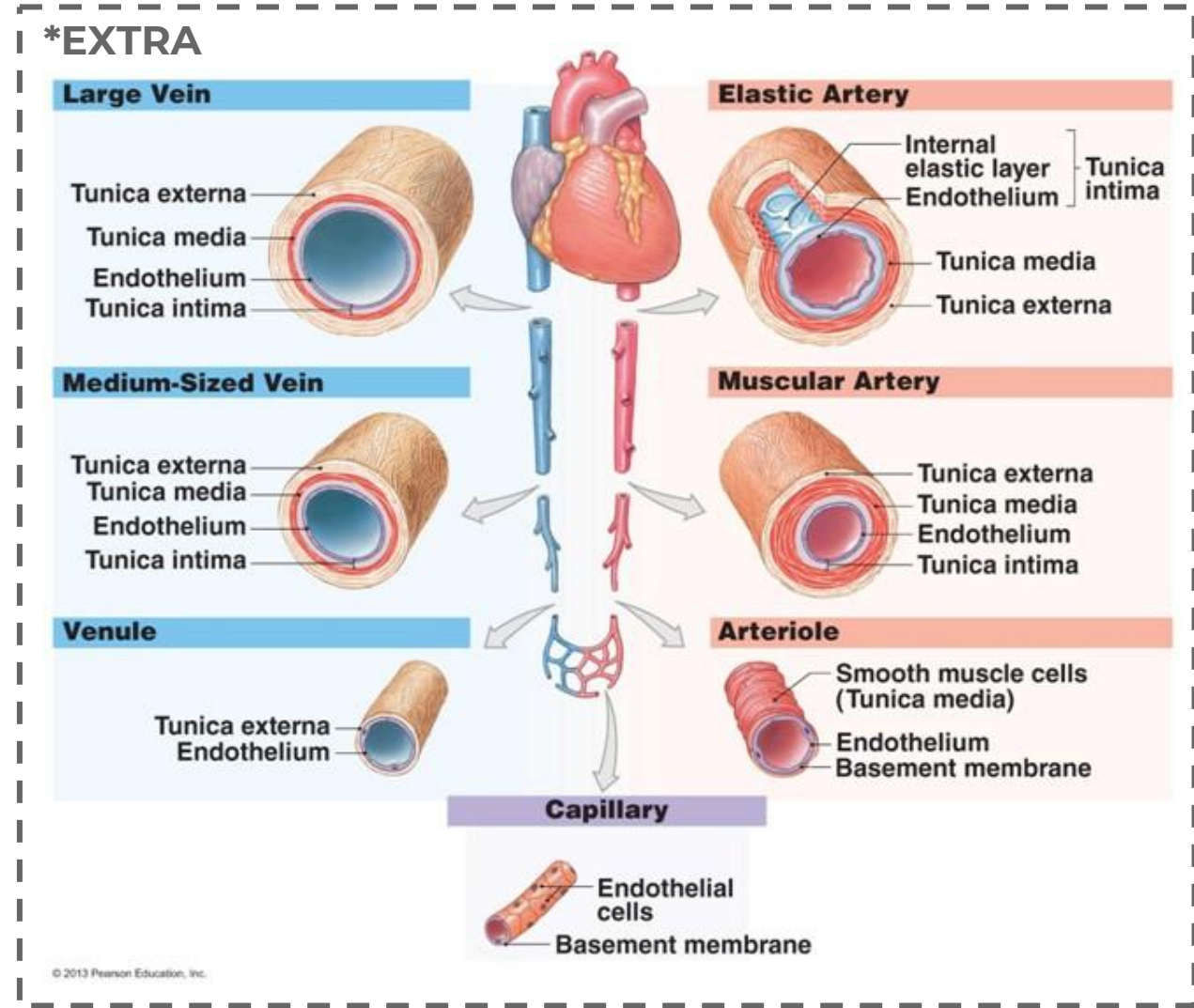


# ◆ Medium-sized artery and vein



Artery

Vein





# BLOOD CAPILLARIES

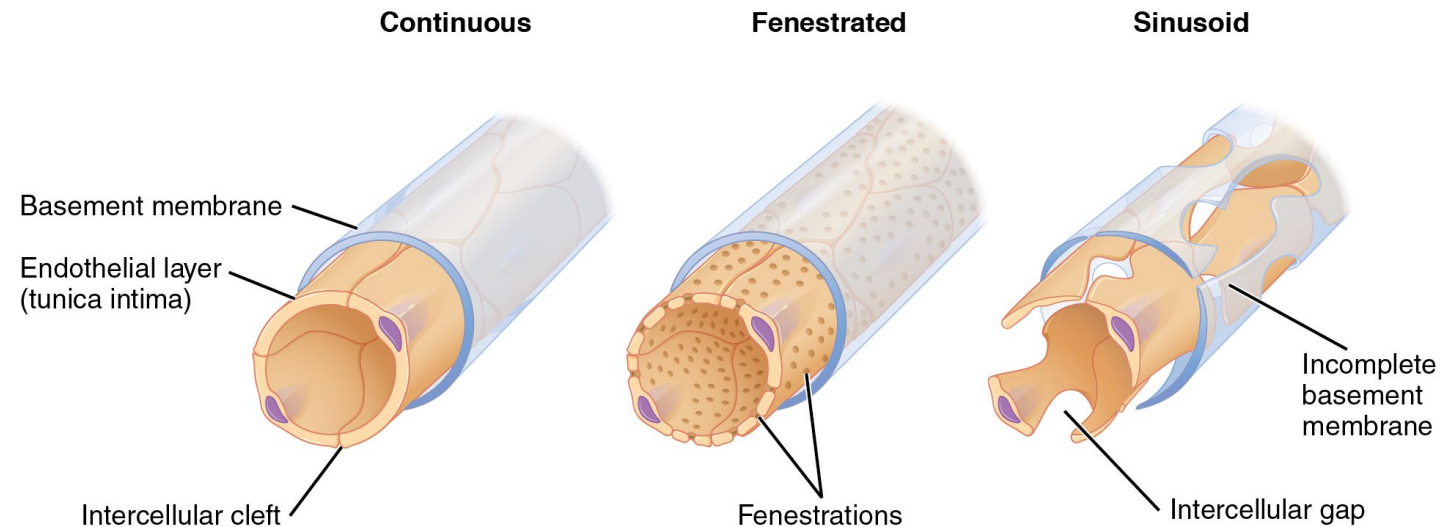
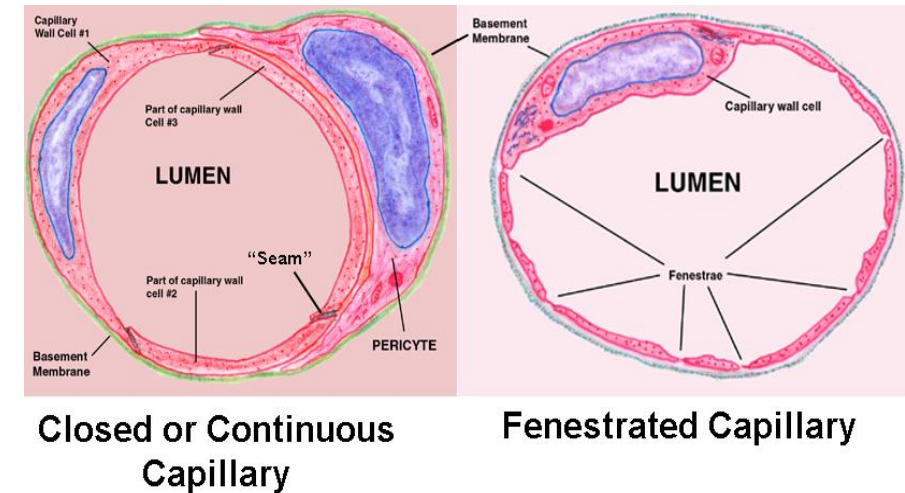
**Diameter: usually 8-10  $\mu\text{m}$ .**

## Microscopic structure:

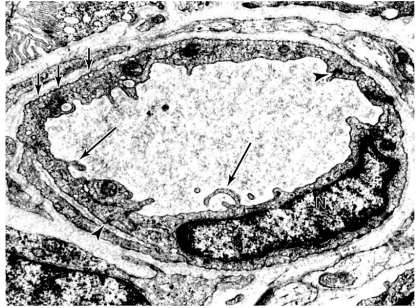
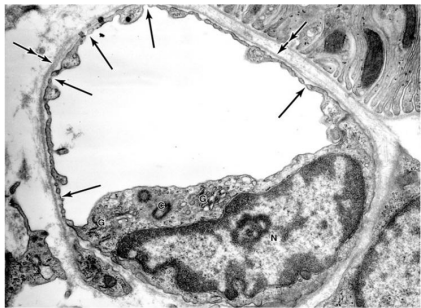
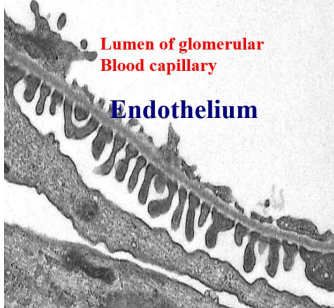
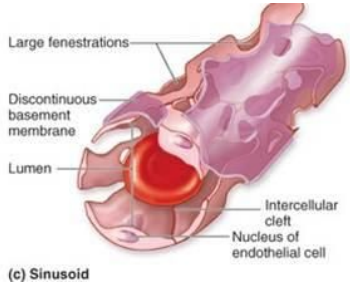
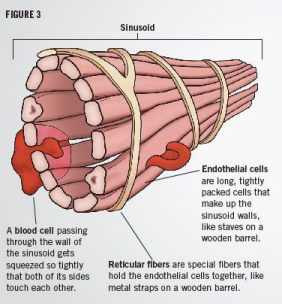
1. Single layer of squamous endothelial cells.
2. Basal lamina: surrounds the external surface of the endothelial cells.
3. Pericytes: Have processes, Share the basal lamina of the endothelial cells.

## Types:

- 1- Continuous blood capillaries
  - a- with diaphragms
  - b- without diaphragms
- 2- Fenestrated blood capillaries
- 3- Sinusoidal blood capillaries



# BLOOD CAPILLARIES

Type	Continuous blood capillaries	Fenestrated blood capillaries		Sinusoidal blood capillaries
		with diaphragm	without diaphragm	
Microscope structure	No pores or fenestrae in their walls	<ul style="list-style-type: none"> <li>The walls of their endothelial cells <b>have pores (fenestrae) These pores are covered by diaphragm.</b></li> </ul>	<ul style="list-style-type: none"> <li>The walls of their endothelial cells <b>have pores (fenestrae) These pores are <u>NOT</u> covered By diaphragm.</b></li> </ul>	<ul style="list-style-type: none"> <li>Their endothelial cells <b>have “large” fenestrae without diaphragms.</b></li> <li>They possess <u>discontinuous</u> endothelial cells.</li> <li>They possess <u>discontinuous</u> basal lamina.</li> <li>Macrophages may be located in or along the outside of the endothelial wall.</li> </ul>
Distribution	In muscles, nervous tissue, C.T. <b>Pulmonary capillaries</b>	In intestine, pancreas and endocrine glands	In renal glomerulus	Red bone marrow, liver, spleen and certain endocrine glands  <b>Diameter: irregular (30-40 μm).</b>
Picture				 

# Quiz

**1. Which one of the following is an example of large artery :**

- A. brachial
- B. renal
- C. femoral
- D. subclavian

**2. What is the thickest layer in the arteries:**

- A. Tunica interna
- B. Tunica media
- C. Tunica adventitia
- D. Tunica intima

**3. What is Vasa vasorum:**

- A. small arterioles in tunica adventitia and the outer part of tunica media
- B. small arterioles in tunica adventitia and the outer part of tunica interna
- C. small venules in tunica adventitia and the outer part of tunica media
- D. small venules in tunica adventitia

**4. In which one of the following the Internal elastic lamina is prominent and Displays an undulating surface.**

- A. Medium-sized vein
- B. Elastic arteries
- C. Muscular arteries
- D. B & C

**5. What type of collagen is found in the tunica media?**

- A. Type 1 & 2
- B. Type 2 & 4
- C. Type 1 & 4
- D. Type 1 & 3

**6. Which one of the following types of Blood capillaries Found in the pancreas :**

- A. Fenestrated capillaries with diaphragm
- B. Fenestrated capillaries without diaphragm
- C. Sinusoidal capillaries
- D. Continuous blood capillaries



 [Histology438.sarahah.com](https://Histology438.sarahah.com)

 [Histology438@gmail.com](mailto:Histology438@gmail.com)

## Done by :

- Abdullah shadid

## Team Members

- Alhanouf Alhaloli
- Rawan Alzayed
- Renad Alkanaaan
- Roaa Aljohani

## Team Leaders

- Abdullah shadid
- Sarah Alflaij

See you in the last block 