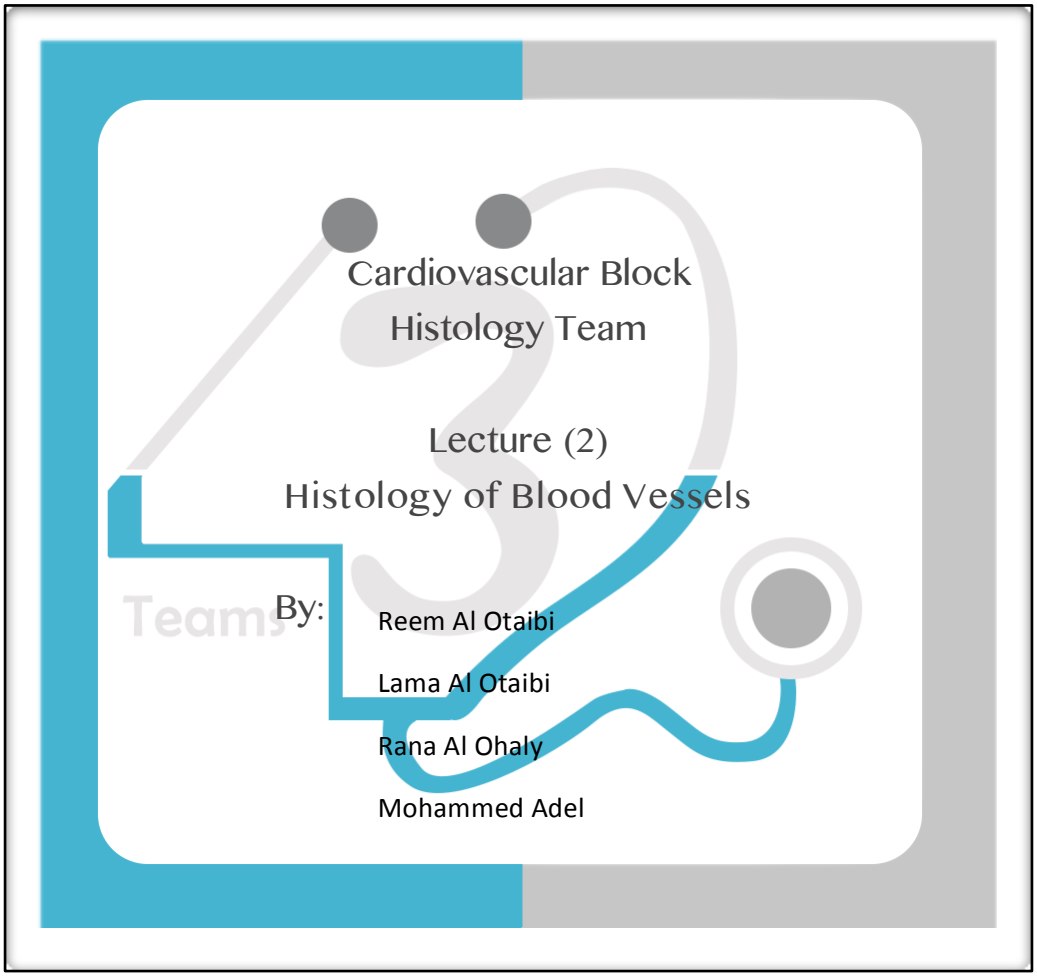


By the end of this lecture, the student should be able to identify and describe the microscopic structure of the wall of the blood vessels including:

a. Elastic arteries.

b. Muscular (medium-sized) arteries.

c. Medium-sized veins.

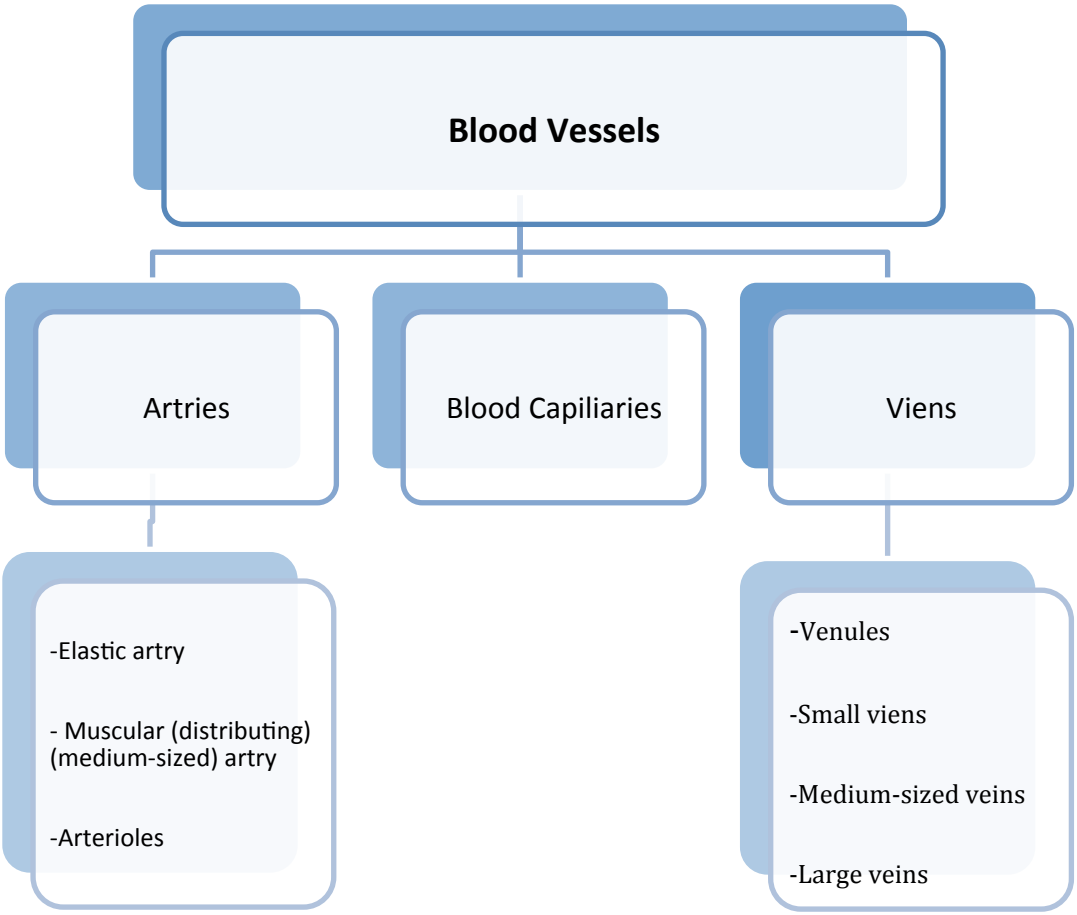
d. Blood capillaries.

Black &blue: slides

Orange: explanation

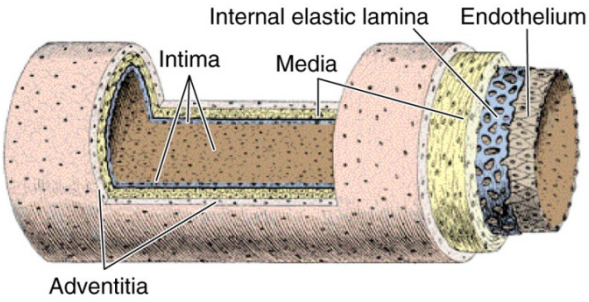
Purple : additional informations

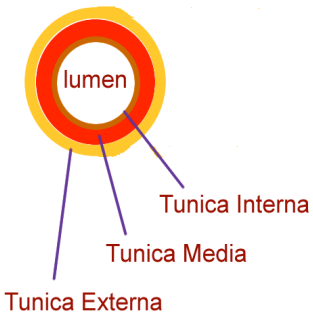
Red: important

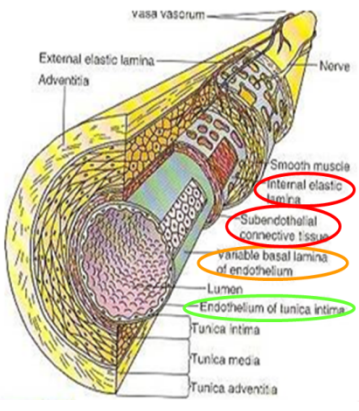
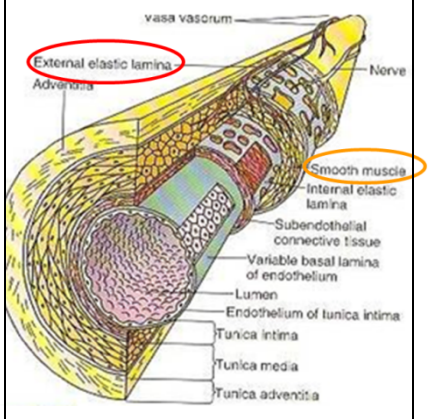
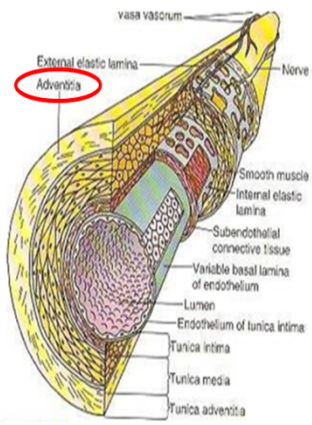


General Structure of Blood Vessels

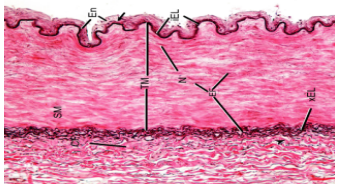
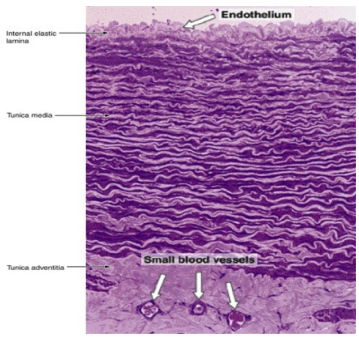
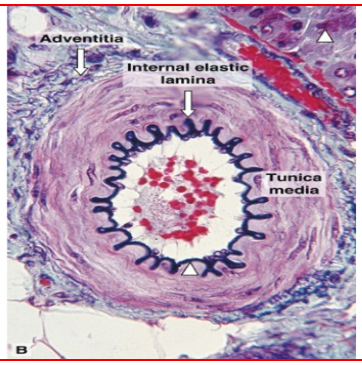
The wall of blood vessel is formed of three concentric layers:





Tunica Intima(interna)	**Tunica Media**	**Tunica Adventitia(externa)**
the innermost layer	Intermediate layer	outermost layer
Composed of: **1- Endothelial cells:** Simple squamous epithelium **2- sub endothelial layer:** Loose C.T. **3 -Internal elastic lamina:** fenestrated elastic sheet	Composed of : **1-Smooth muscle** **2-Elastic fiber** **3-Type III collagen** (reticular fibers) **4-Type I collagen**	Composed of **C.T (usually loose connective tissue)** containing: **Vasa vasorum:** 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 and nutrients than oxygen arterial blood.
lamina =layer =Tunica	NB: Large muscular arteries have external elastic lamina, separating the tunica media from the tunica adventitia	vasa vasorum: basically it's blood vessel from an artery supplying another blood vessel
		

Arteries

	ELASTIC ARTERIES	MUSCULAR medium ARTERIES
Examples	aorta, common carotid a., subclavian a., common iliac a, pulmonary Trunk	brachial, ulnar, renal.
Microscopic structure: 1-T. Intima	*Endothelium. *Subendothelial C.T. *Internal elastic lamina: (not prominent) not prominent=it is present but not clear (indistinct)	*Endothelium. *Subendothelial C.T. layer . *Internal elastic lamina: - is prominent - display an a surface
2- T. Media	it consists of: **a. Fenestrated 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. Main component is **elastic sheet** . 	(Thicker than T. Adventitia or similar in thickness). Components: **a. Smooth muscle cells (SMCs):** are the predominant component. **b. In between there are:** 1. Elastic fibers. 2. Type III collagen fibers 3. Type I collagen fibers **c-External elastic lamina:** may be identifiable. Main component is **smooth muscle** fibers , arranged spirally . 
3-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.	loose C.T.
Microscopic slide		

*In large arteries (aorta) : the fenestration (openings) in the lamina allow diffusion of blood to the Intima and the inner part of media, however the adventitia and the outer part of media is supplied by vasa vasorum.

* Arterioles doesn't have vasa vasorum because it is supplied by diffusion of blood from the lumen.

*External elastic lamina is found in large muscular arteries, internal elastic lamina is found in all muscular arteries.

*The elastic and muscular arteries are divided based on the component of media.

*Elasticity of the arteries helps in coping with the different blood pressure.

How to differentiate between artery and vein:

1- Artery: T.media is thicker than T.adventitia (Elastic artery) or similar in thickness (Muscular artery)

2- Vein: T.media is thinner than T.adventitia

MEDIUM-SIZED VEIN

-Thickness of the wall: thinner than the accompanying artery

T. Intima: *usually forms valves

*no internal elastic lamina

T. Media

Thinner than T. Adventitia

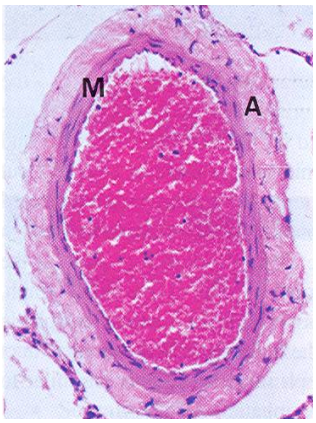
Consists of:

*Fewer SMCs

*Types I & III Collagen fibers

T. Adventitia

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.

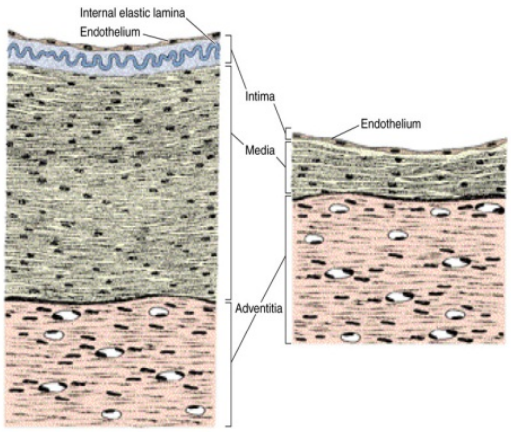
* veins are supplied by vasa vasorum .

*varicose veins happens because the veins doesn't contain a lot of elastic fibers So it will result in dilatation of the veins.

*veins contain valves because the blood pass against the gravity.

*vein lumen is large and the wall is thin.

MEDIUM-SIZED ARTERY AND VEIN



BLOOD CAPILLARIES

- Diameter: usually 8-10 µm.

the capillaries wall is thin to allow gas and nutrient exchange

-**Microscopic structure**

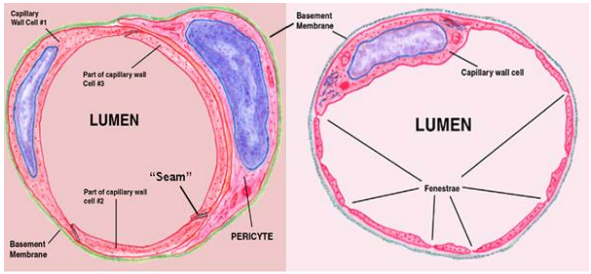
1- Single layer of squamous endothelial cells

2-Basal lamina: surrounds the external surface of the endothelial cells.

3-Pericytes(peri= around):

*Have processes.

*Share the basal lamina of the endothelial cells.



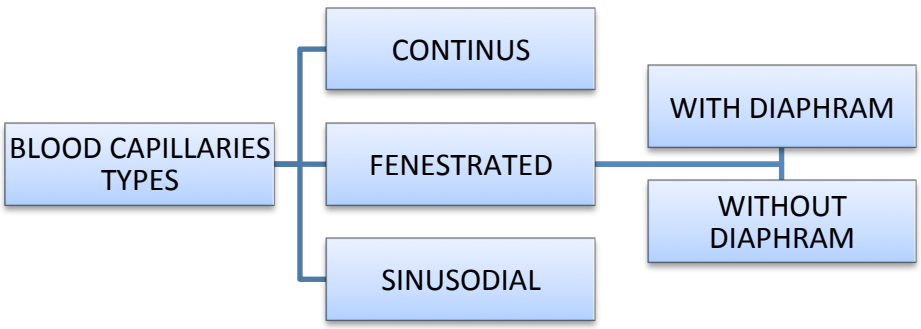
Closed or Continuous Capillary

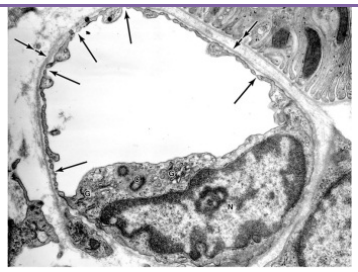
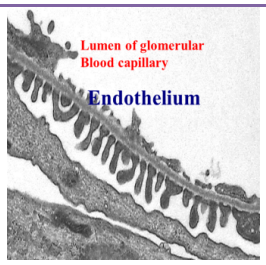
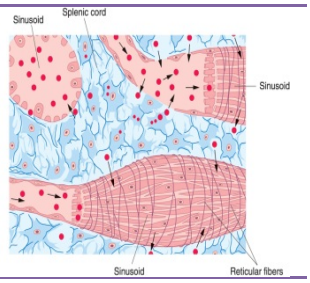
Fenestrated Capillary

the Pericytes are not part of the capillary wall

*Function of Pericytes :

1- act as massager to the blood capillary to facilitate the diffusion of materials
2- converting to smooth muscle in case of injury to nearby arteriole or venules



Types	Continuous	Fenestrated with diaphragm	Fenestrated without diaphragm	Sinusoidal
Microscopic structure	*No pores *No fenestrae in their walls.	*The walls of their endothelial cells have pores (fenestrae). *These pores are covered by diaphragm.	*The walls of their endothelial cells have pores (fenestrae). *These pores are ***NOT*** covered by diaphragm.	*Their endothelia cells have fenestrae without diaphragms. *They possess discontinuous endothelial cells. *They possess discontinuous basal lamina. *Macrophages may be located in or along the outside of the endothelial wall.
Slide				
Distribution	In muscles, Nervous T., C.T	In intestine, pancreas and endocrine glands	In renal glomerulus.	Red bone marrow, liver, spleen and certain endocrine glands.
Extra notes	It is in muscles and bain, because it's continuous to prevent toxic materials from going inside the brain.			Diameter: irregular (30-40 µm)

Fenestrated Blood Capillaries