Histology Team 431

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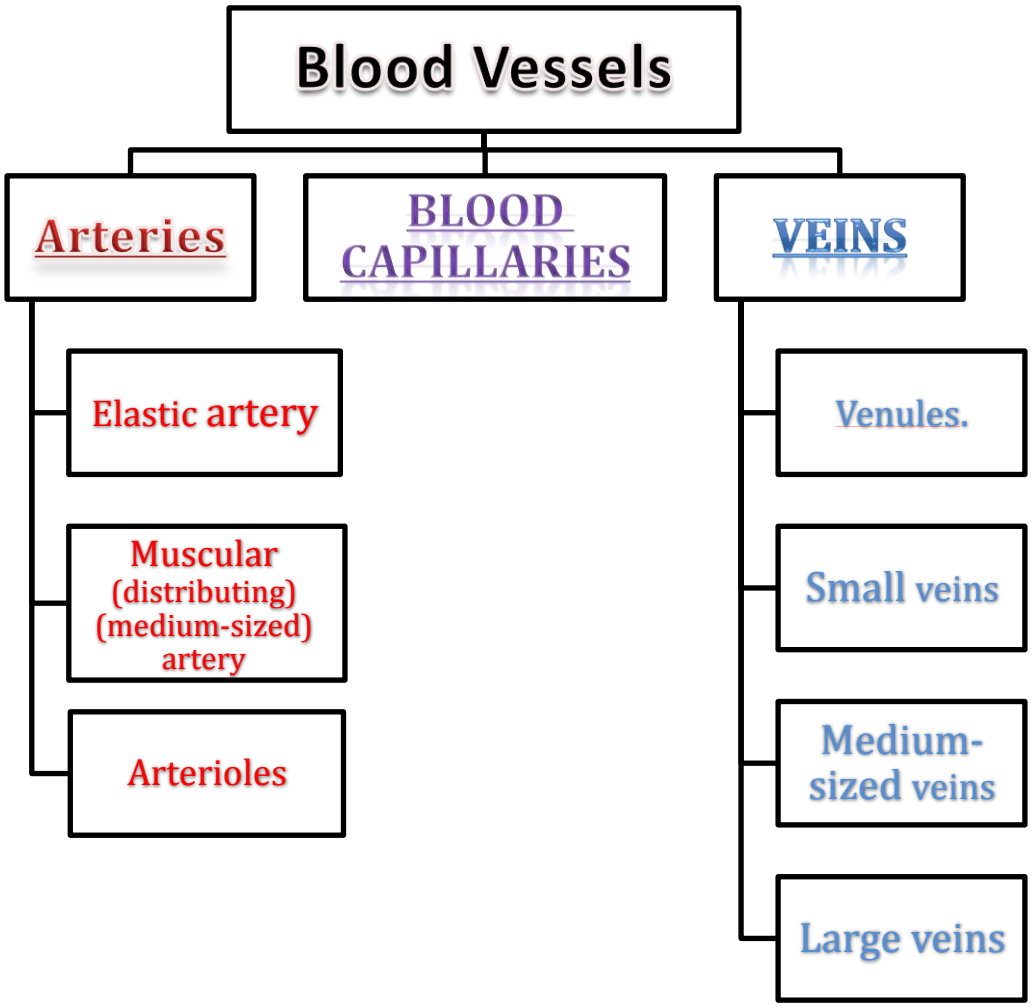
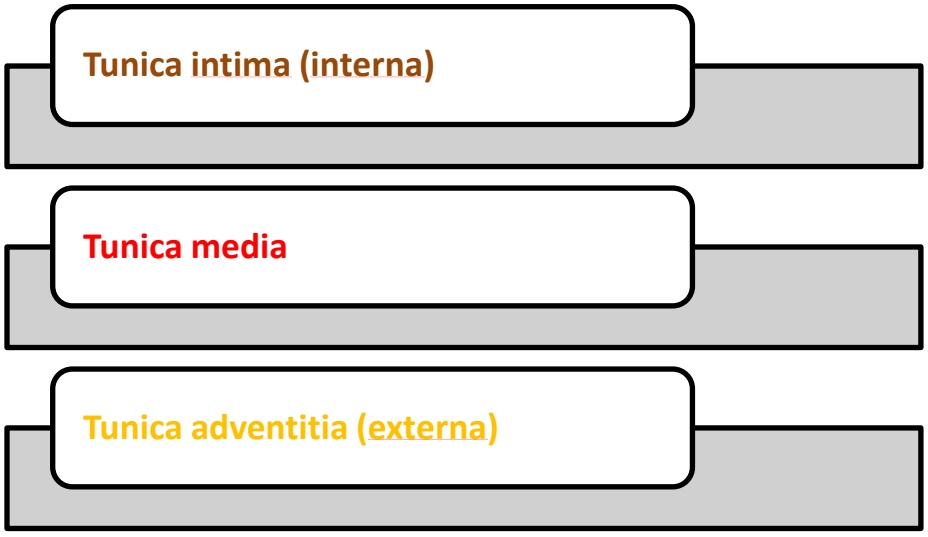
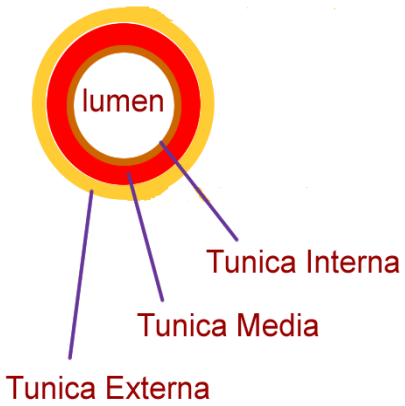


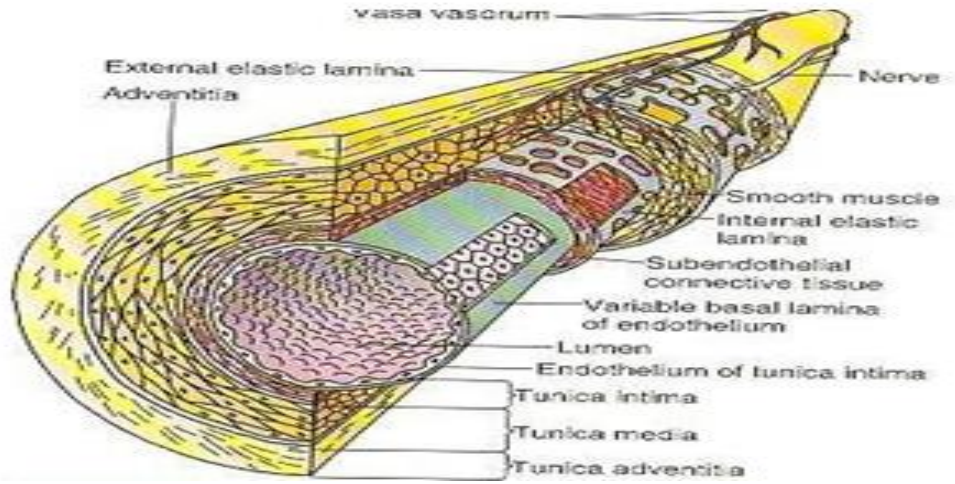
General Structure of Blood Vessels

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





Tunica Intima	**Single layer of flattened endothelial cells (resting on the basal lamina) lining the lumen of the vessel**	**Subendothelial layer made up of loose connective tissue. May have few longitudinally arranged smooth muscle fibers**	**Beneath the subendothelial layer is an internal elastic lamina, composed of elastin (fenestrated elastic sheet), separating the tunica intima from the tunica media**
Tunica Media	Composed of smooth muscles, some elastic fibers, type III collagen (reticular fibers) and type I collagen.	Large muscular arteries have external elastic lamina, separating the tunica media from the tunica adventitia. Capillaries and postcapillary venules do not have a tunica media, however, **pericytes** replace the tunica media.	
Tunica Adventitia "Outermost layer"	- Composed of connective tissue containing types I & III collagen, fibroblasts and longitudinal elastic fibers - Blends into the surrounding connective tissue.	**N.B. Vasa vasorum**: 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**.	



ELASTIC ARTERIES

e.g: Aorta, Common carotid a., Subclavian a., Common iliac aa, Pulmonary Trunk.

T. Intima

*Endothelium.

*Subendothelial C.T.

*Internal elastic lamina:
(not prominent)
(indistinct)

T. Media

Fenestrated elastic membranes (sheets) (lamellae)

In between, there are:

1. **Smooth muscle cells**: less abundant & secrete all other components in T.M.
2. **Collagen fibers (type I collagen).**
3. **Reticular fibers (type III collagen).**
4. **Elastic fibers**.

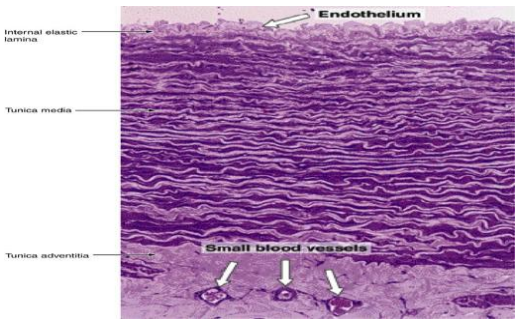
C. External elastic lamina

T. Adventitia

Much thinner than T.M

loose C.T

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



MUSCULAR ARTERIES

(Medium-sized artery)

e.G : brachial, ulnar, renal.

T. Intima

Endothelium

Subendothelial C.T. layer.

Internal elastic lamina

Is prominent.

Displays an undulating surface.

Occasionally it is duplicated (bifid internal elastic lamina

T. Media

Thicker than T. Adventitia

Or **similar** in thickness

Smooth muscle cells (SMCs):

are the **predominant** component

In between there are:

Elastic fibers.

Type III collagen fibers.

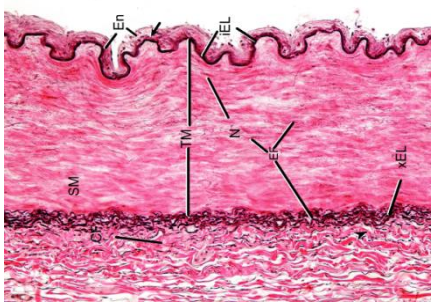
Type I collagen fibers

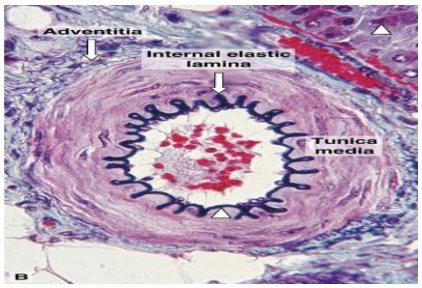
. External elastic lamina:

may be identifiable

T. Adventitia

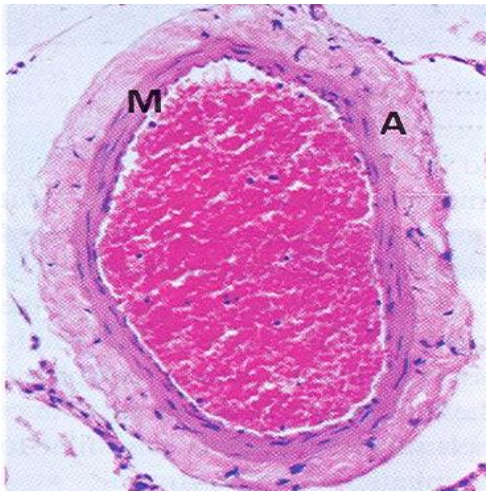
loose C.T.





MEDIUM-SIZED VEIN

Thickness of the wall: thinner than the accompanying artery.



T. Intima: no internal elastic lamina

T. Media: Thinner than T. Adventitia

Consists of:

Fewer SMCs.

Types I & III Collagen fibers.

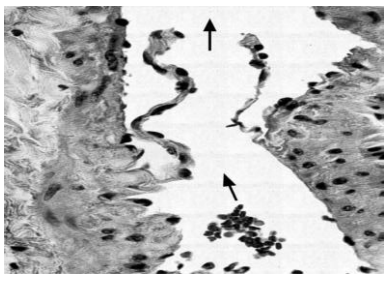
T. Adventitia: thicker than T. Media.

VALVES OF VEINS

Valve of a vein is composed of 2 leaflets, Each leaflet has a thin fold of the T. Intima.

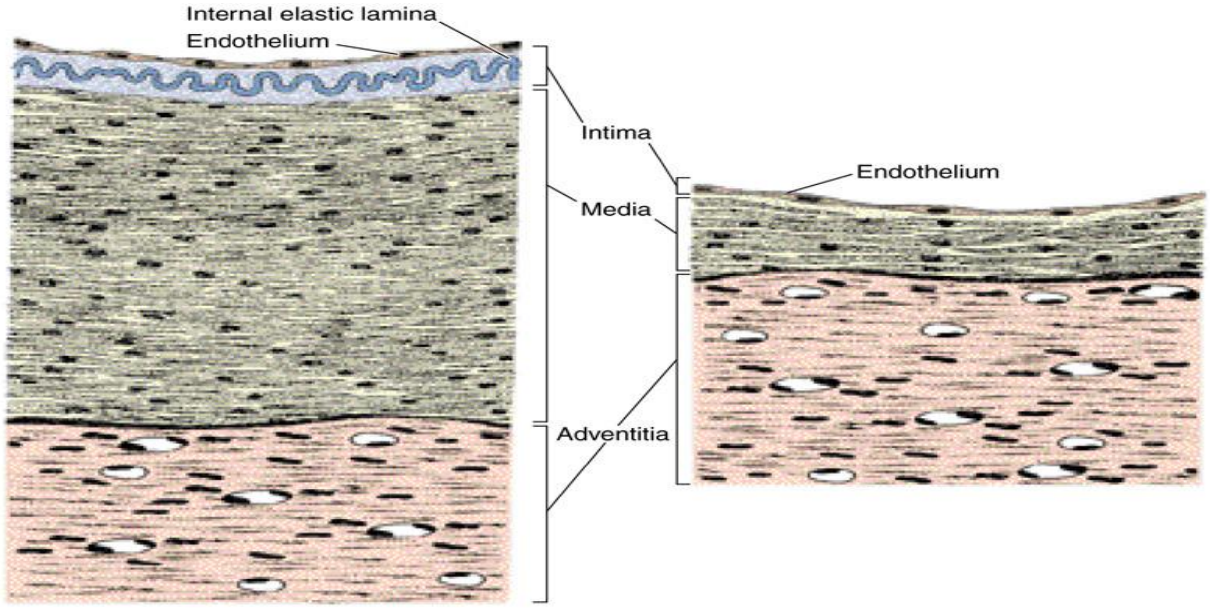
Components

Endothelium



Core of C.T

MEDIUM-SIZED ARTERY AND VEIN



BLOOD CAPILLARIES

Diameter: usually 8-10 µm.

Microscopic structure:

Single layer of squamous endothelial cells.

Basal lamina:

surrounds the external surface of the endothelial cells.

Pericytes:

Have processes.

Share the basal lamina of the endothelial cells.

BLOOD CAPILLARIES

Types:

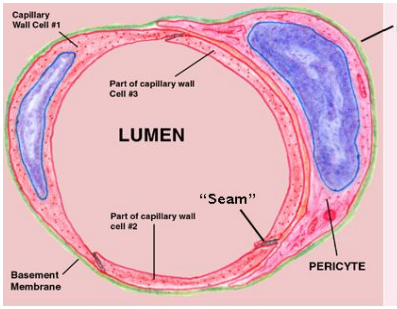
1- <u>Continuous blood capillaries</u>

2- <u>Fenestrated blood capillaries:</u>

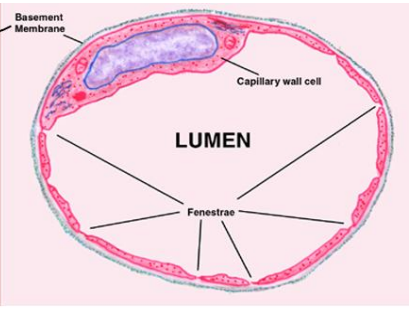
a- with diaphragms

b- without diaphragms

3- <u>Sinusoidal blood capillaries</u>



Closed or Continuous Capillary

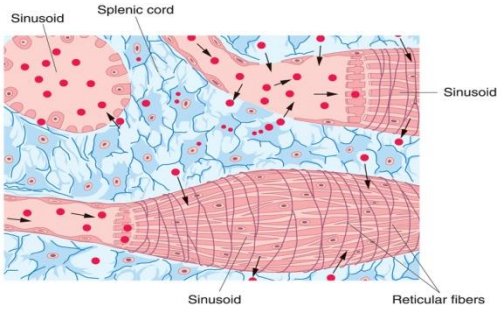


Fenestrated Capillary

	Microscopic structure	**Distribution**
Continuous Blood Capillaries	No pores or fenestrae in their walls.	In muscles, nervous T., C.T
Fenestrated Blood Capillaries <u>with</u> Diaphragms	Their walls have pores (fenestrae). These pores are covered by a pore diaphragm.	In intestine, pancreas and endocrine glands.
Fenestrated Blood Capillaries <u>without</u> Diaphragms		In renal glomerulus.

SINUSOIDAL CAPILLARIES

Diameter: 30-40 µm.



Microscopic features:

They possess many large fenestrae without diaphragms.

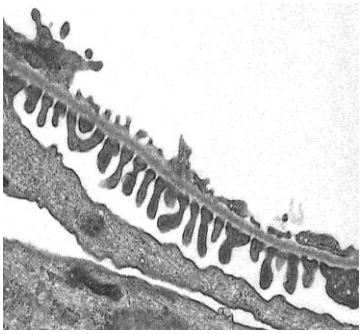
They possess discontinuous endothelial cells.

They possess discontinuous basal lamina.

Macrophages may be located in or along the outside of the endothelial wall.

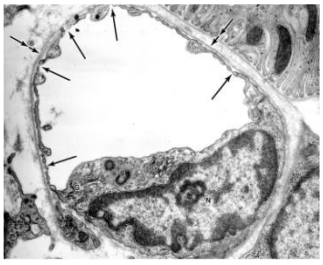
Distribution:

Red bone marrow, liver, spleen and certain endocrine glands.



Continous Blood Capillary

FENESTRATED CAPILLARY WITHOUT DIAPHRAGMS



FENESTRATED CAPILLARY WITH DIAPHRAMS

Questions:

1.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

2.Which layer in an elastic artery is the largest thickest?

a. Tunica intima
b. Tunica albuginea
c. Tunica externa
d. Tunica vaculosa
e. Tunica media

3.What are vasa vasorum?

a. Vasoactive material
b. Valves
c. Vasopressin secreting cells
d. Nerves
e. Blood vessels

4.Which structure has one or two layers of muscle in the tunica media?

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

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 of the following is NOT a distinguishing feature between larger veins and arteries?
a. Veins have valves whereas arteries do not have valves
b. The tunics in veins are not as clearly delimited as are the tunics in arteries
c. The walls in veins are thinner than the walls in arteries
d. The lumen of a vein is smaller than the lumen of an artery
e. None. All of the above are true

7- Internal elastic lamina is clearly seen in?
A- Elastic arteries
B- Mascular arteries
C- Veins

8- The difference between the microscopic structure of veins and arteries is?
A- The vein's wall are thicker than arterie's wall
b- No internal elastic lamina
C- The adventitia is thicker
D- Both b & c

9-The type of blood capillary in renal glomerulus is
A- Fenestrated capillary without diaphragm
B- Fenestrated capillary with diaphragm
C- Continuous blood capillary

Answers:

1. b 2.e 3.e 4.b 5.a 6.d 7.b 8.d 9.a