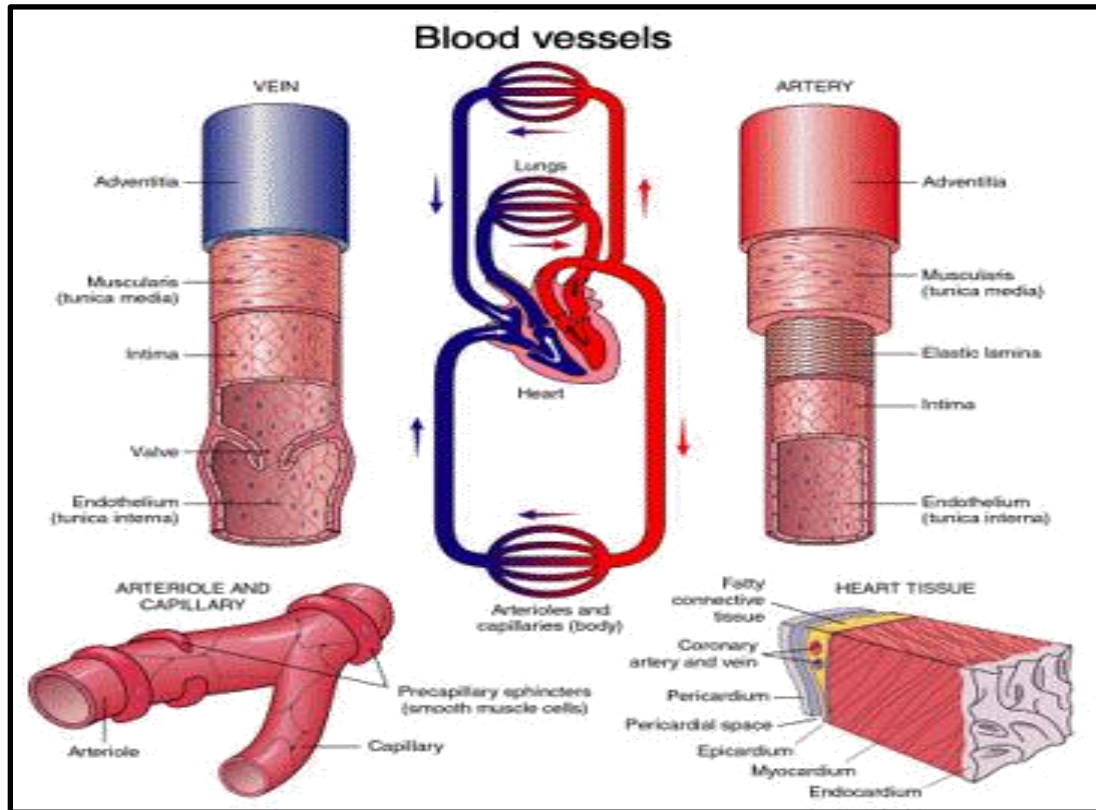


# Blood Vascular System



By

**Dr. Heba Sharaf Eldin**

Associate Professor of Histology & Cell Biology

## **The Blood vascular system is formed of:**

- Heart
- Arteries
- Veins
- Connections between arteries and veins.

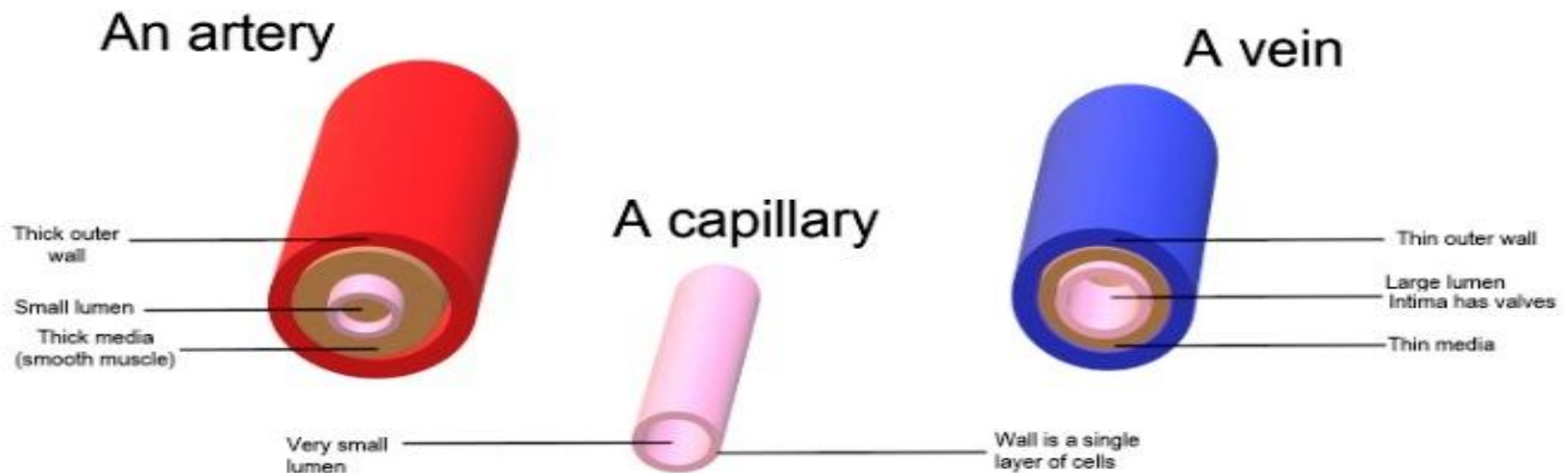
# General Structure: The wall of a blood vessel consists of 3 coats (tunica):

## 1- Tunica Intima

## 2- Tunica Media

## 3- Tunica Adventitia

tunica-=layer



# The wall of a blood vessel consists of 3 coats (tunica):

## 1- Tunica Intima formed of:

### i) Endothelium:

- It is formed of a single layer of simple squamous cells.
- It lines the blood vessel from inside.

### ii) Subendothelial:

- It consists of loose connective tissue

### iii) Internal elastic lamina:

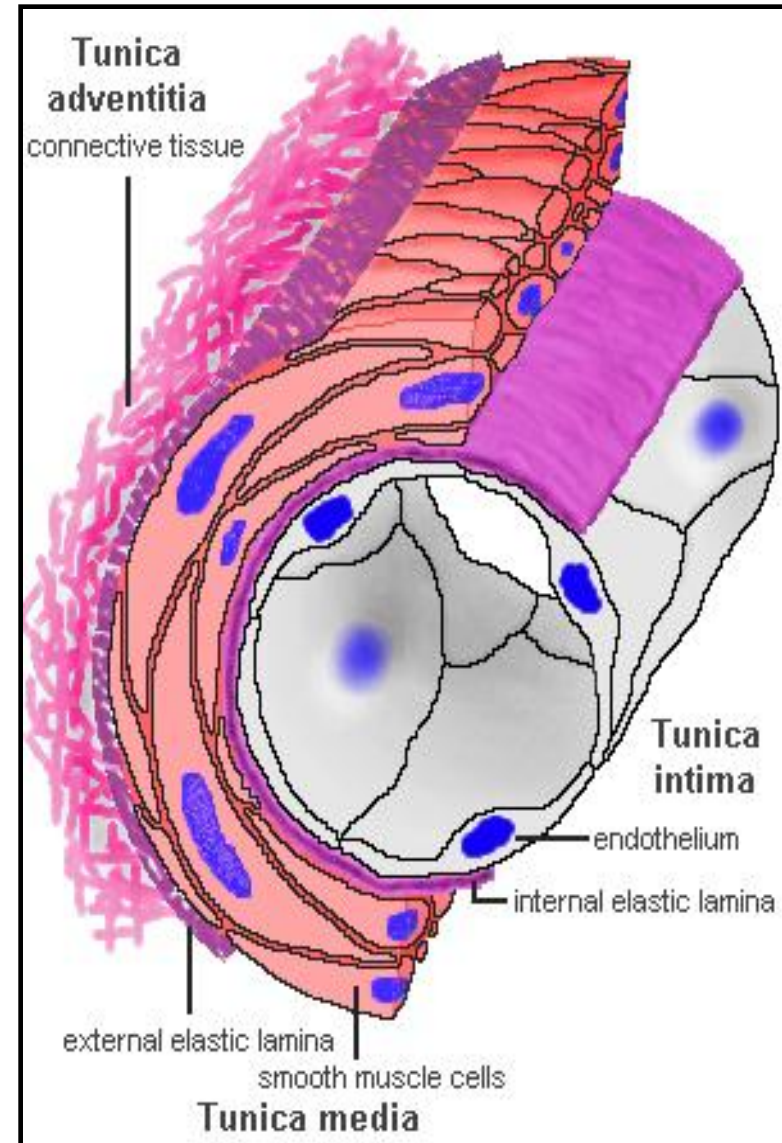
- Composed of lamina of elastin.
- It appears as a wavy pink line.

## 2- Tunica Media formed of:

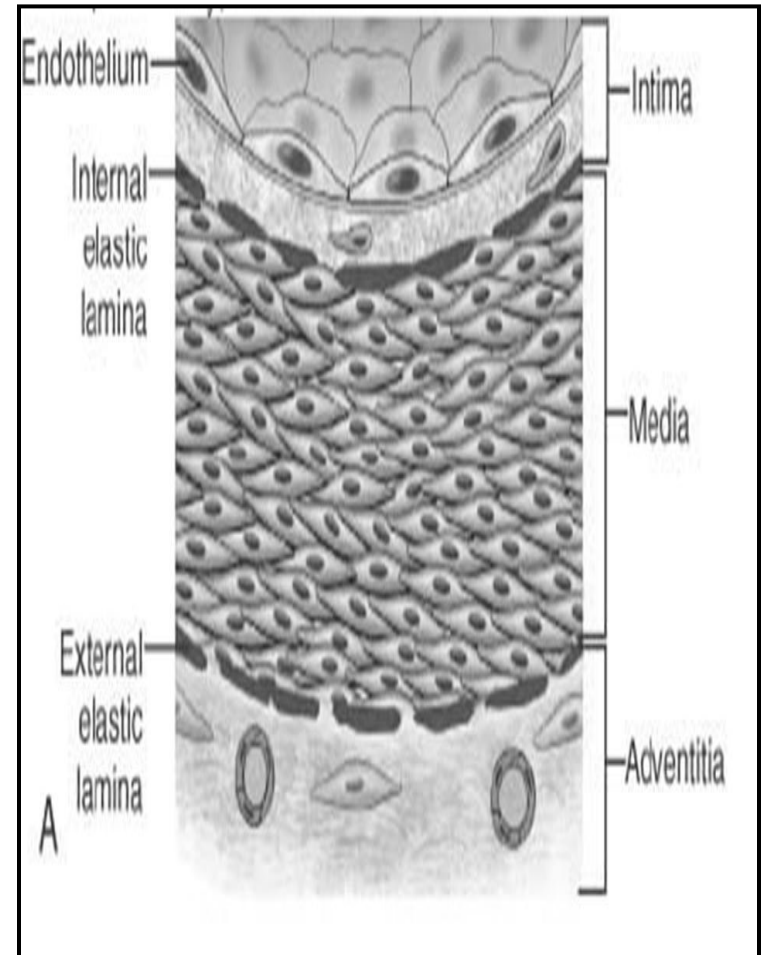
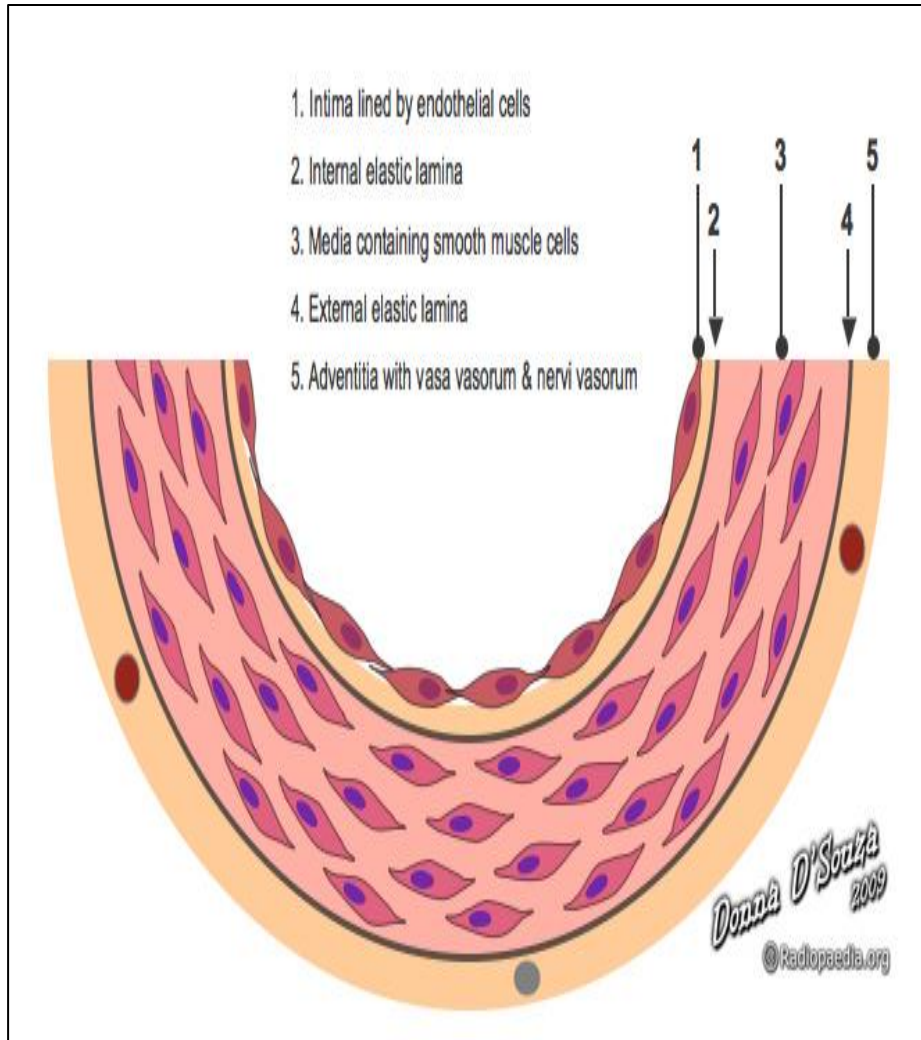
- Circularly arranged smooth muscle cells
- Variable amounts of elastic fibers.
- An external elastic lamina may be present.

## 3- Tunica Adventitia:

- It is formed of loose connective tissue
- It contains small blood vessels (vasa vasorum) to supply the outer layer of the blood vessel and vasomotor nerves.



# The wall of a blood vessel



# Arteries

They are classified according to the diameter into:

- 1- Large (elastic) arteries.
- 2- Medium sized (muscular) arteries.
- 3- Arterioles.



# Structure of large elastic artery (Aorta):

It has a **very thick elastic wall** and a **wide lumen**.

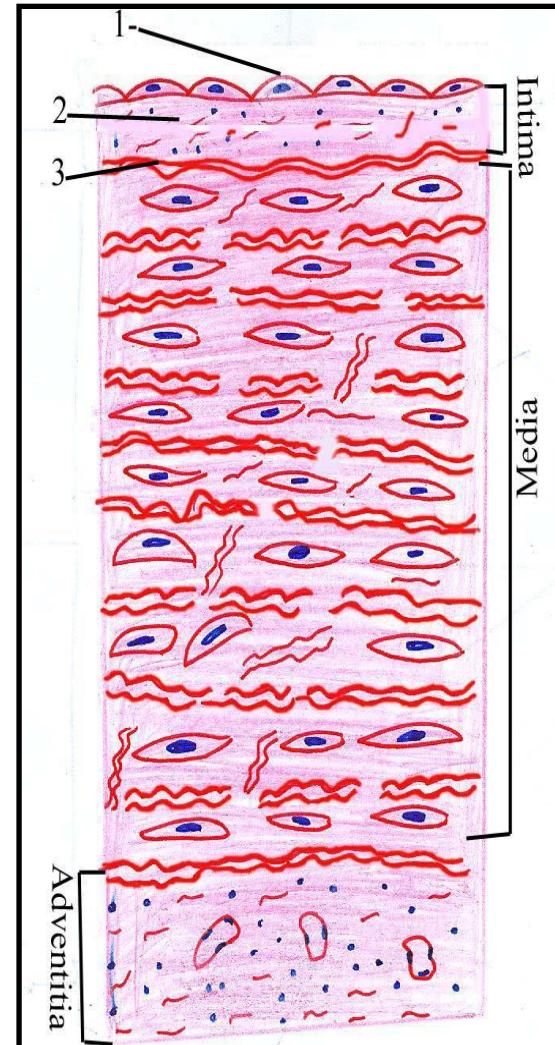
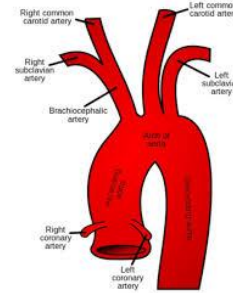
**Tunica intima**: it is formed of:

- Endothelium.
- Subendothelium.
- Internal elastic lamina (**indistinct**).

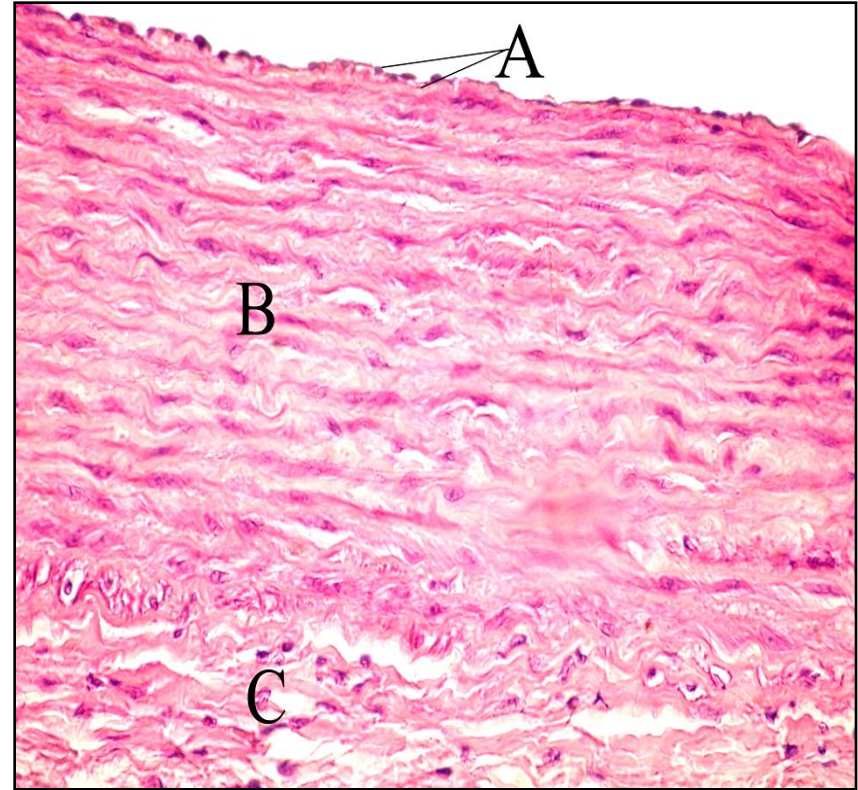
**Tunica media**:

- It is **very thick**.
- formed mainly of **fenestrated laminae of elastic fibers** separated by circularly arranged smooth muscles & collagen fibers.
- **Internal and external elastic** laminae although present, are **not distinct** as they emerge with that of tunica media.

**Tunica adventitia**: It is relatively **thin**.



# Aorta



A- Tunica Intima

B- Tunica Media

C- Tunica Adventitia



Orcein



# Structure of medium sized (muscular) artery:

It has a thick wall with narrow lumen.

## Tunica intima:

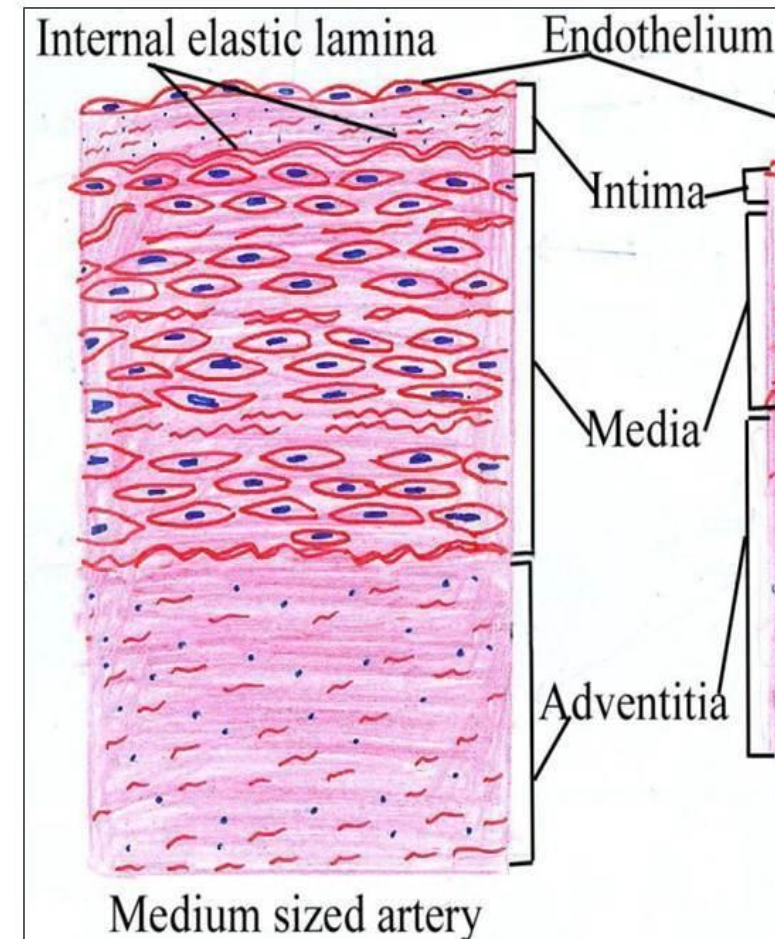
- Endothelium
- subendothelium
- prominent internal elastic lamina.

## Tunica media:

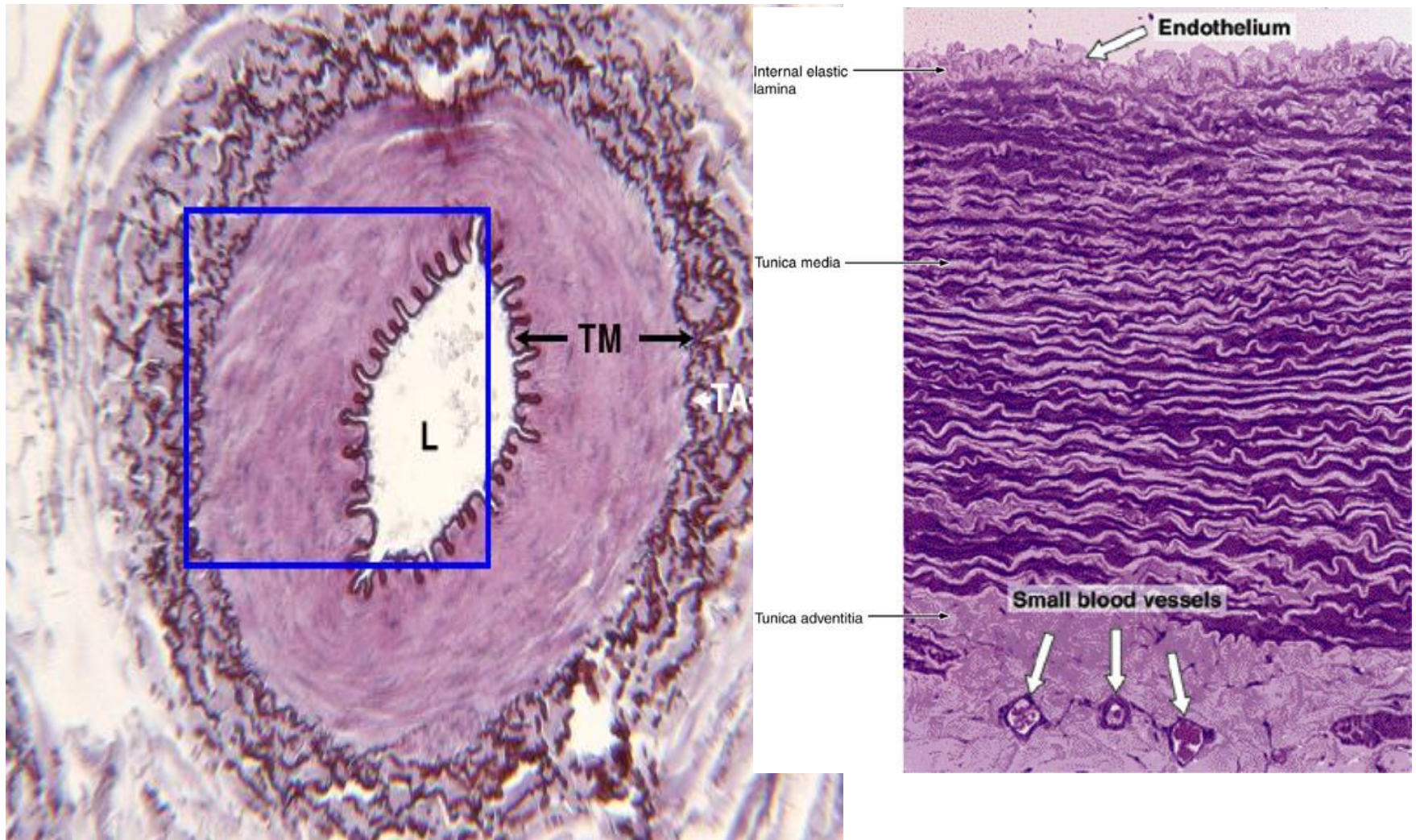
- It is formed mainly of **circularly arranged smooth muscle cells** separated by few elastic fibers and collagenous fibers.
- **External elastic lamina** is present between media and adventitia.

## Tunica adventitia:

- It is as **thick as the media**.



# Muscular Artery - TM = tunica media



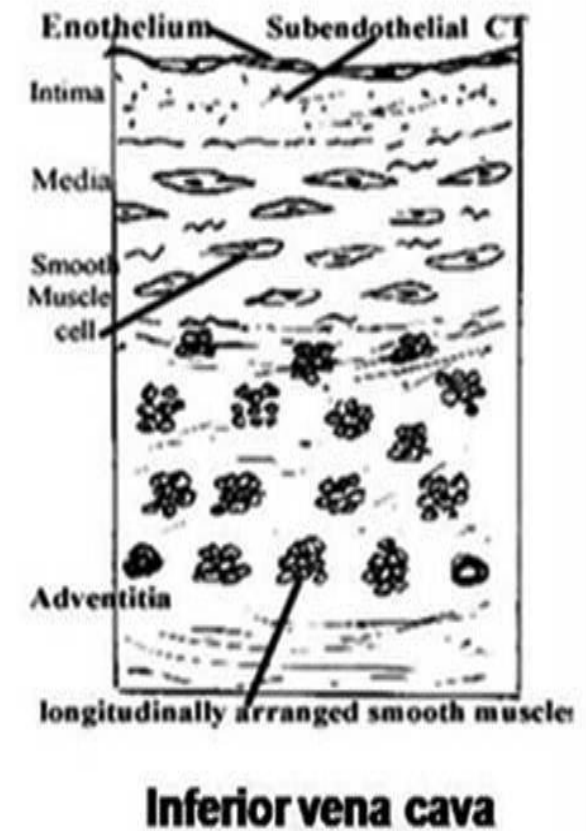


# Veins

## Structure of large veins (inferior vena cava):

It has a wide lumen, thin wall

- Tunica intima:
  - endothelium
  - subendothelial
  - poorly defined internal elastic lamina.
- Tunica media:
  - is **thin** & formed mainly of **few smooth muscle cells**.
- Tunica adventitia:
  - It is **thick** and contains longitudinal bundles of smooth muscle.



# Structures of medium sized vein:

It has a thin wall and wide lumen.

## Tunica intima:

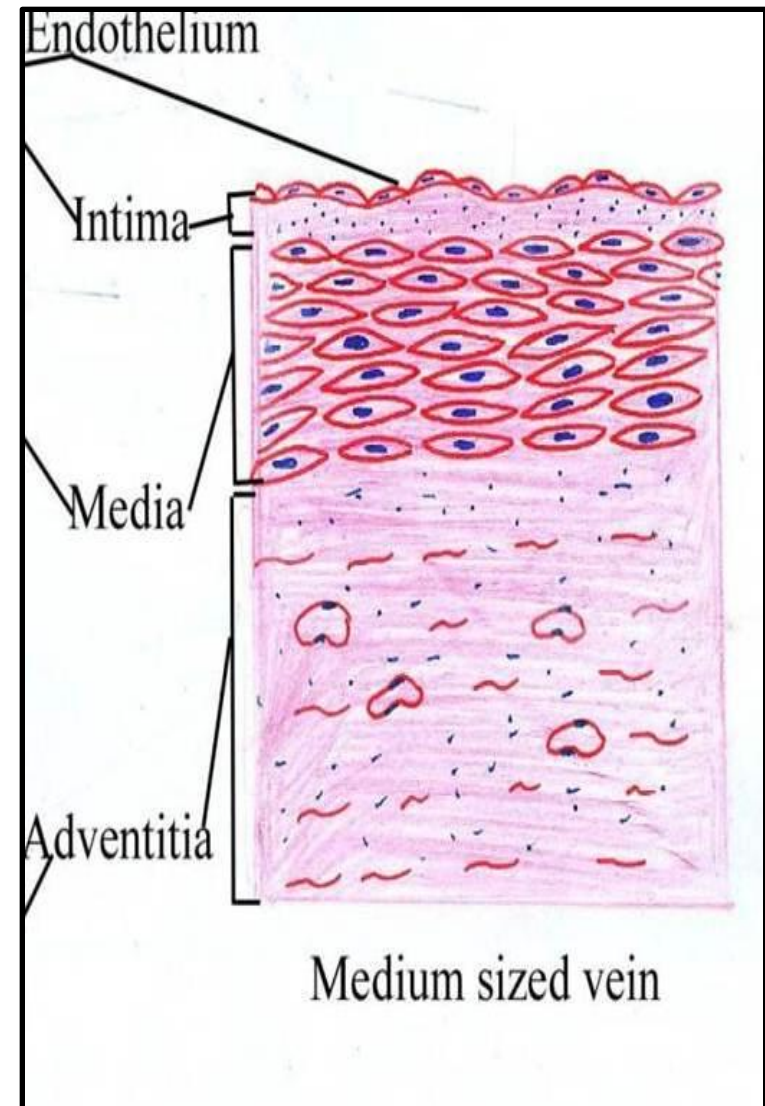
- endothelium
- subendothelium
- no internal elastic lamina.

## Tunica media:

- It is **thin**.
- formed of **few smooth muscle cells** with few elastic & collagen fibers.
- **No external elastic lamina.**

## Tunica adventitia:

It forms the **main thickness** of the wall.





Internal elastic lamina

Endothelium

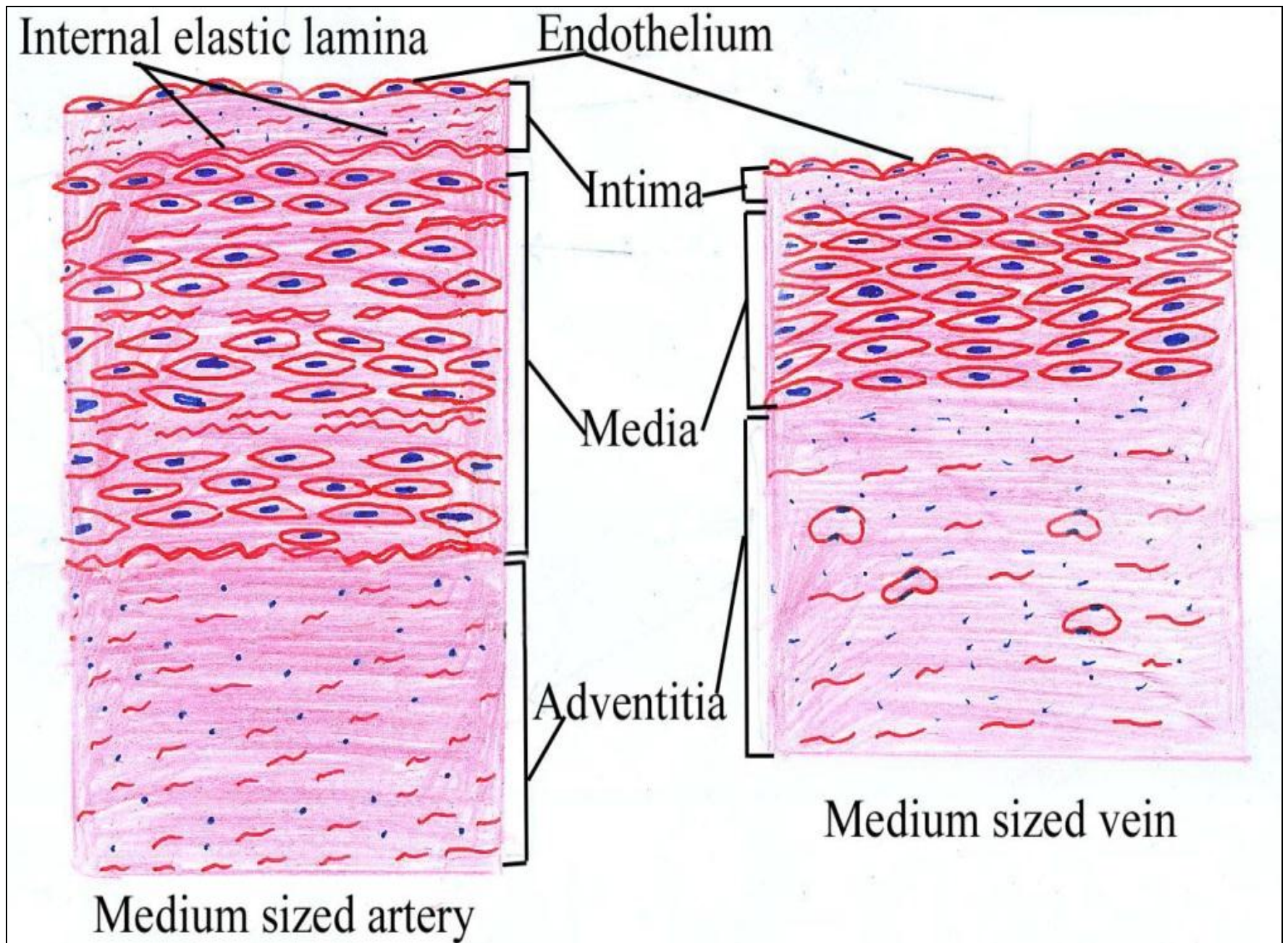
Intima

Media

Adventitia

Medium sized vein

Medium sized artery

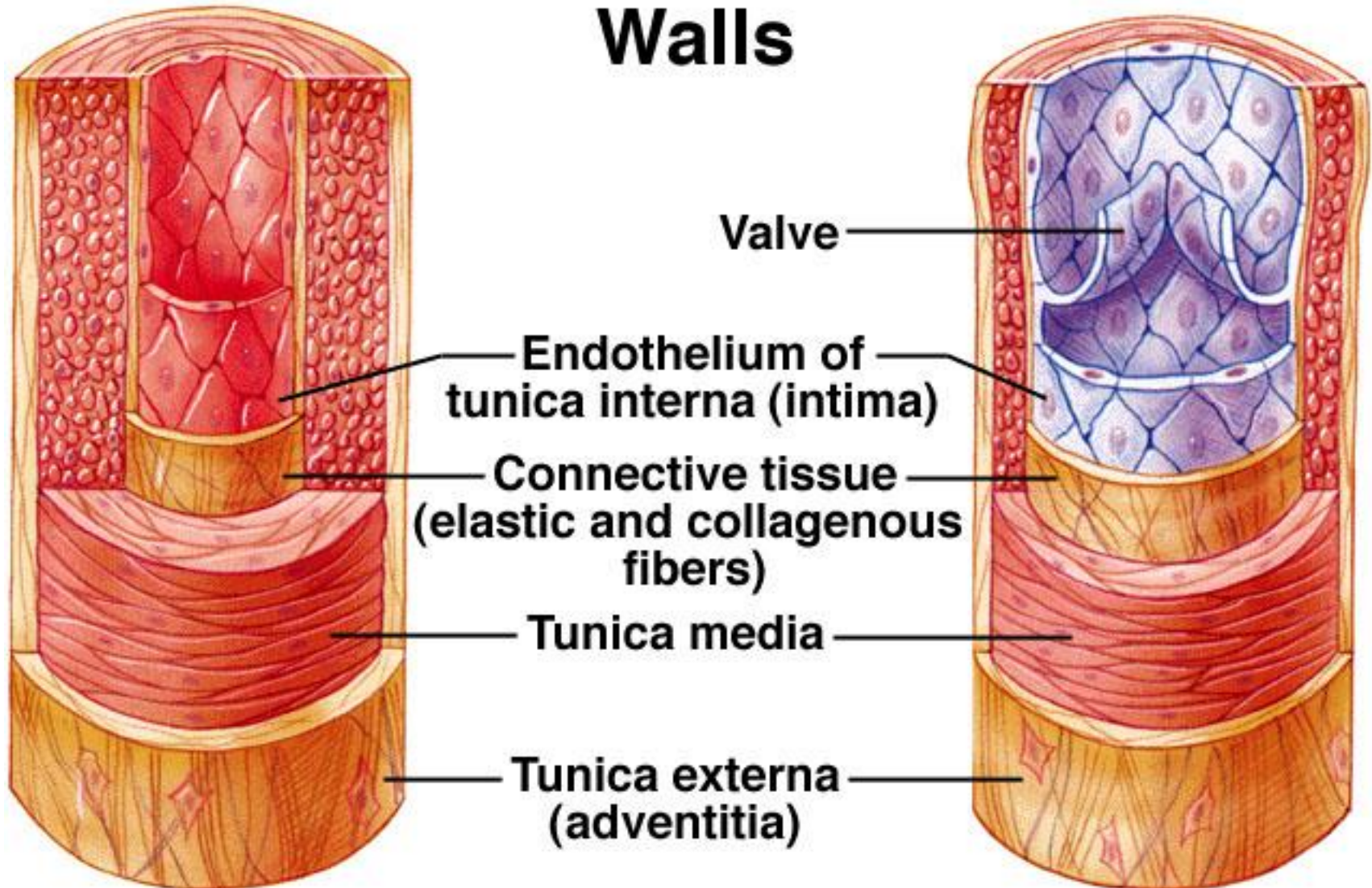




**Artery**

# Blood Vessel Walls

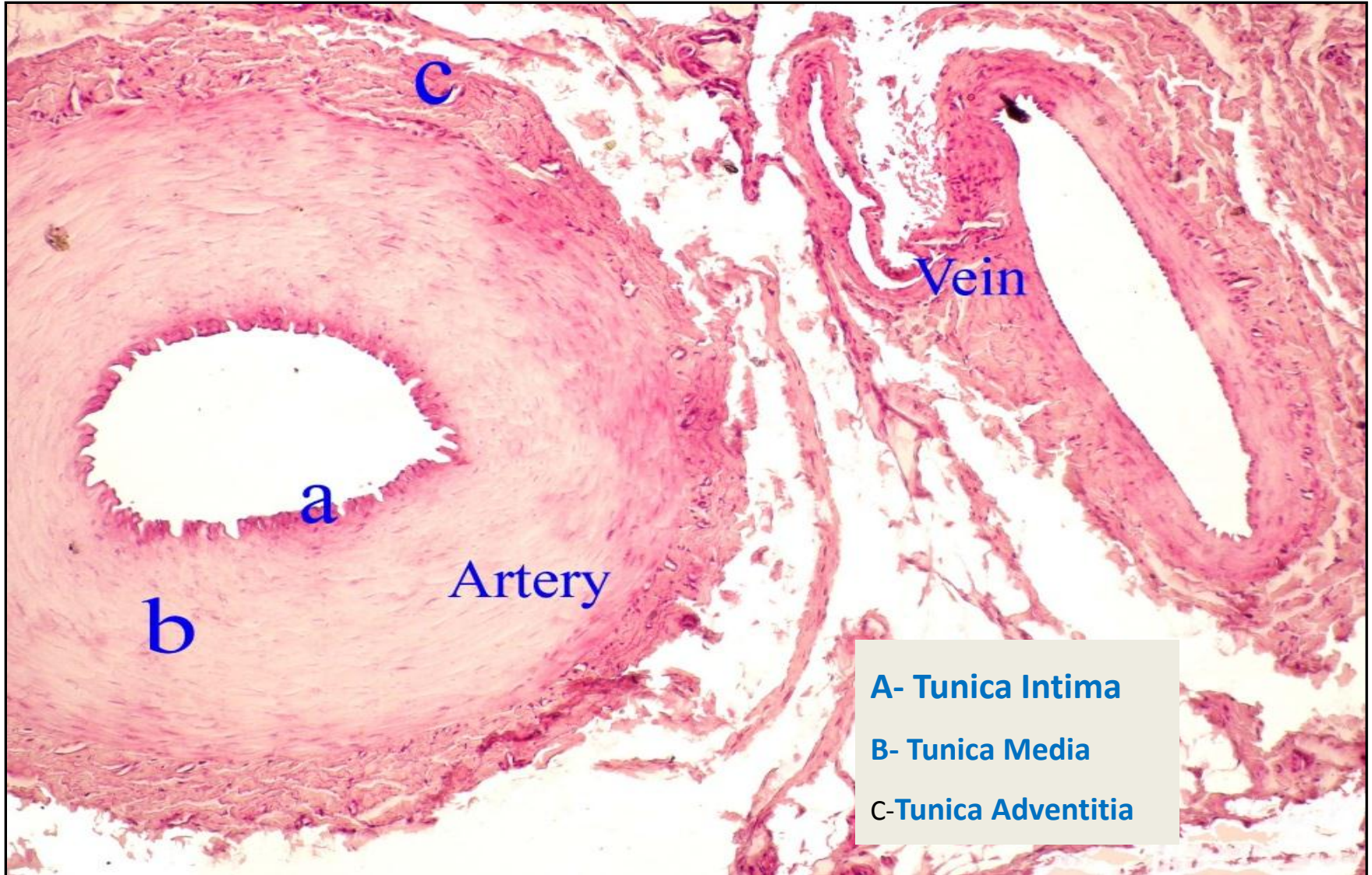
**Vein**



|            | Medium sized artery             | Medium sized artery                                   |
|------------|---------------------------------|---|
| wall       | Thick                           | Thin  |
| lumen      | Narrow                          | Wide  |
| Intima     | Thick folded                    | Thin not. folded                                      |
| Media      | Thick formed of smooth muscle   | Thin  |
| adventitia | Is almost thick <b>as</b> media | <b>Thicker</b><br>Form the main thickness of the wall |



# Medium sized artery & vein



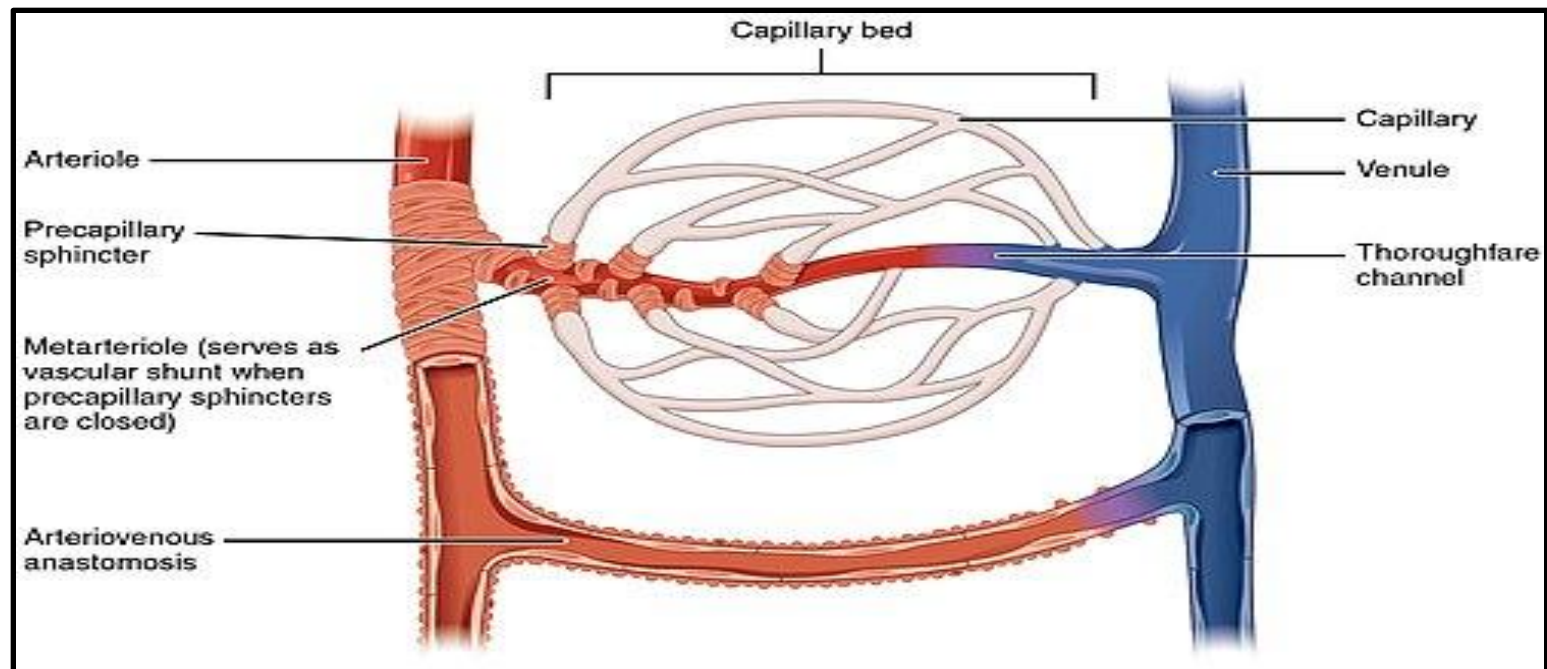


# Connections between Arteries and Veins:

## 1- Capillaries.

## 2- Arterio-venous anastomosis(A-V shunts).

These are **direct** communication between arterial and venous circulation.

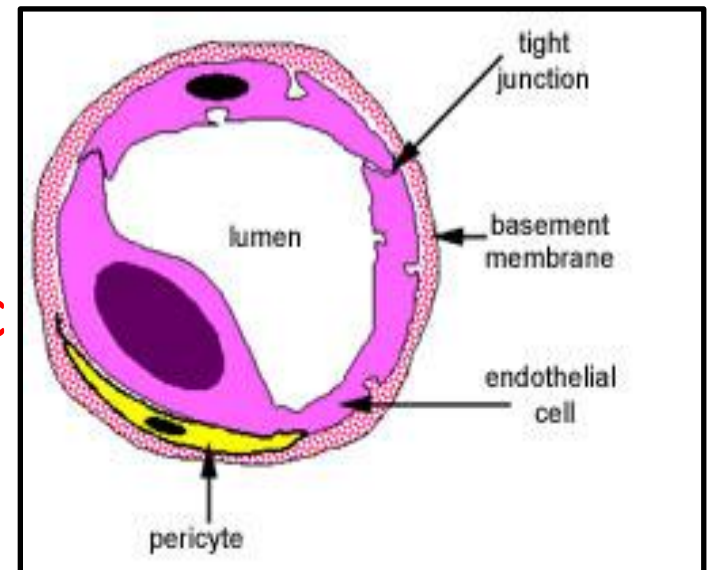


# Capillaries

They are composed of single layer of endothelium. = single layer of simple squamous cells.

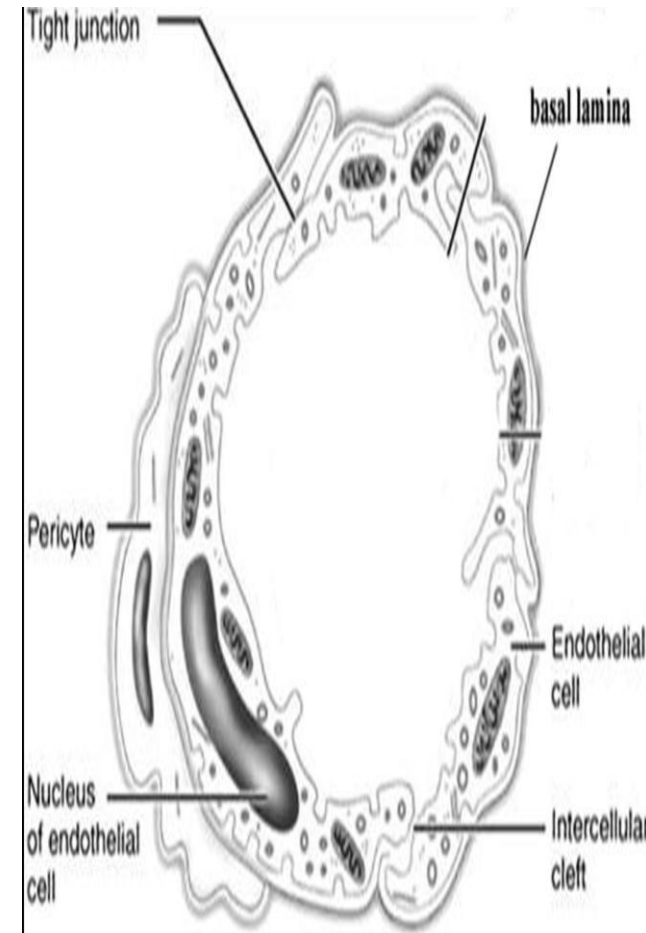
**In cross section the wall consists of:**

- 1-2 endothelial cells only.
- Endothelial cells rest on basal lamina.
- They are elongated cells
- **Nuclei:** central oval bulging
- **Cytoplasm:** contains pinocytotic vesicles, few mitochondria, ribosomes, RER, mitochondria and microfilaments.



# Pericytes:

- They surround the endothelial cells partly.
- They have long cytoplasmic processes.
- They have their own basal lamina.
- They constitute the tunica media for capillaries.
- **Cytoplasm:** actin, myosin, and tropomyosin in which help them to contract

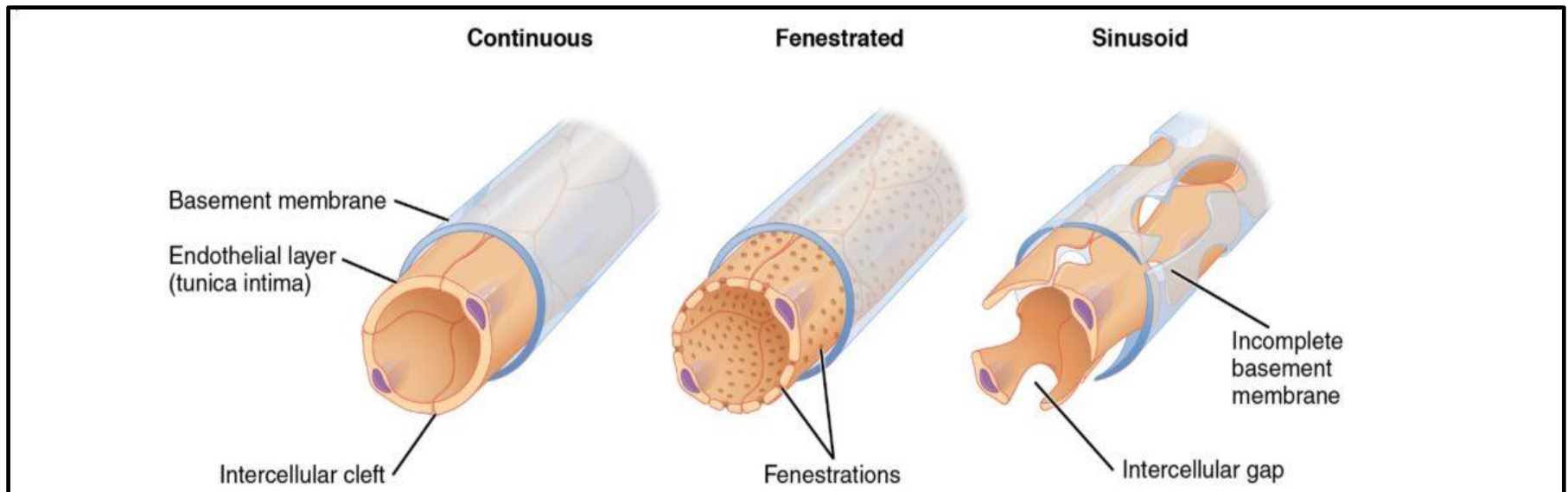


# Types of capillaries

I) *Continuous capillaries*

II) *Fenestrated capillaries*

III) *Sinusoidal capillaries*



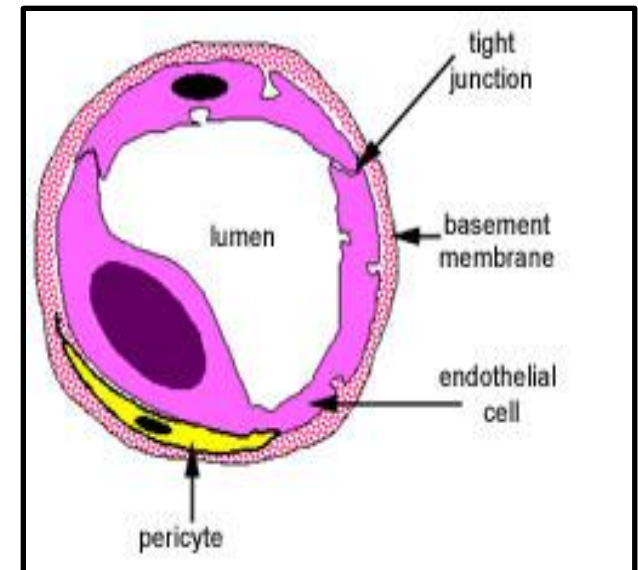
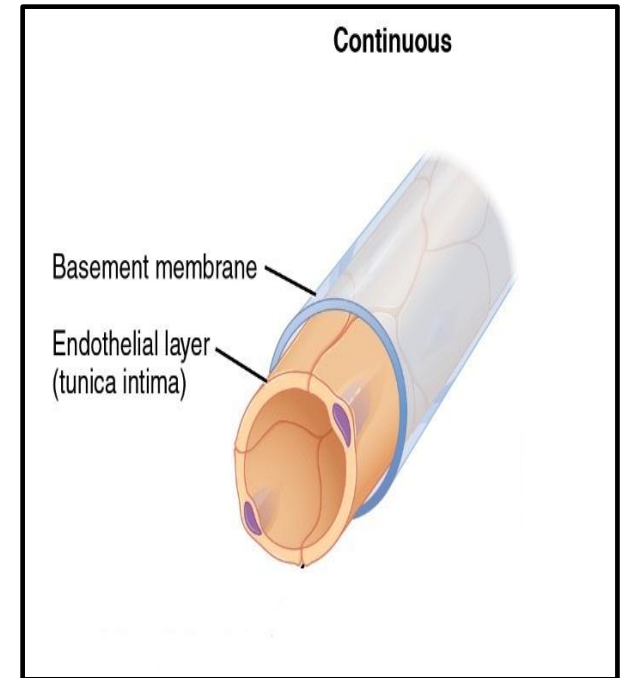


# I) Continuous capillaries

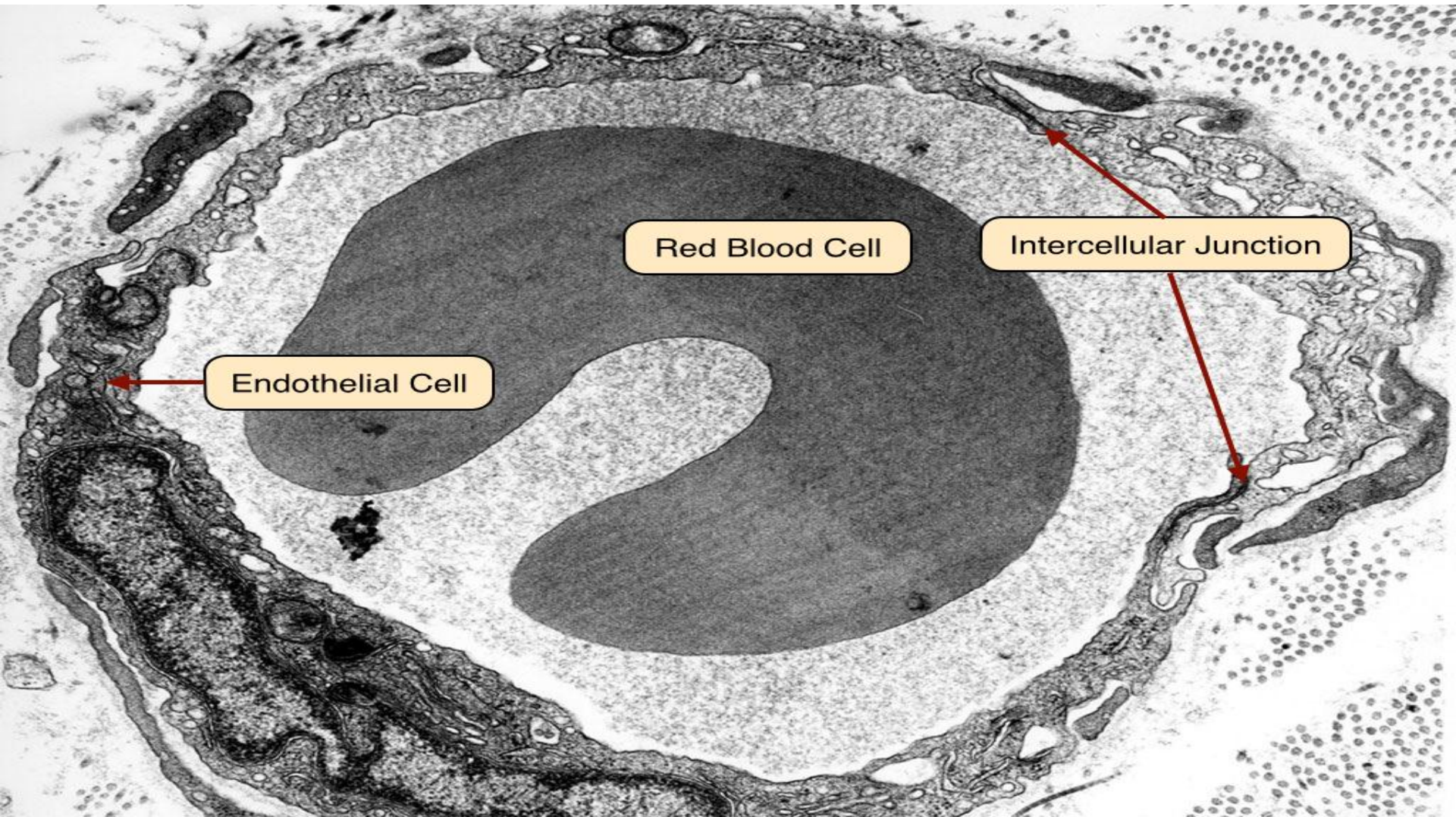
**Site:** the **brain** and cardiac muscle.

**Structure:** lined with

- Endothelium: simple squamous cells
- no fenestrae
- with **tight junction** in-between the edges of endothelium.
- completely surrounded with **very thick continuous** basement membrane.



# *Continuous capillary*

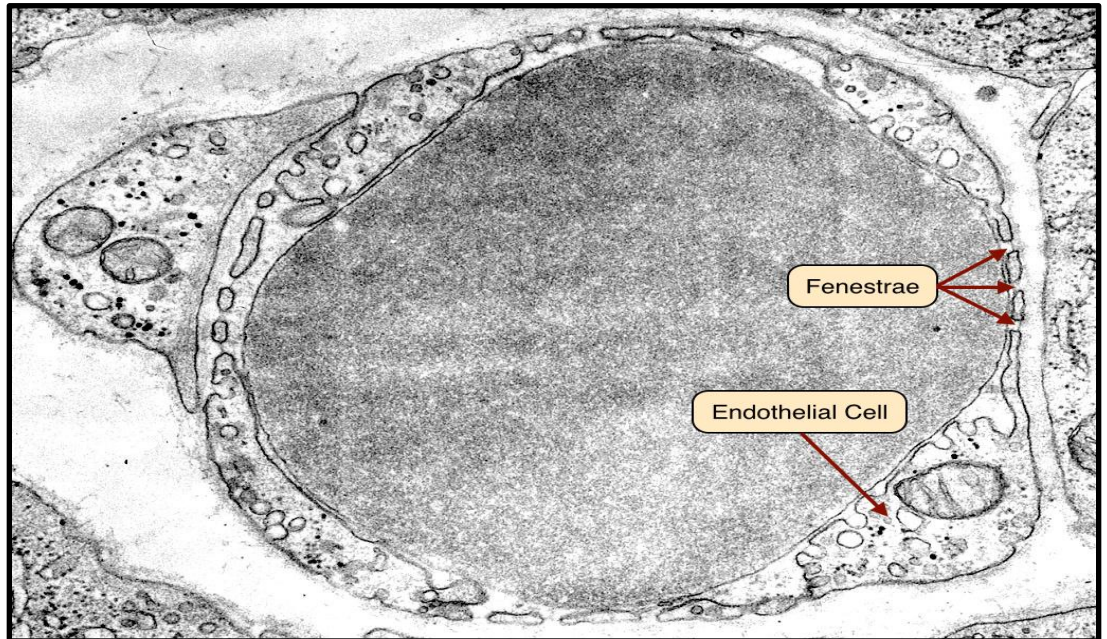
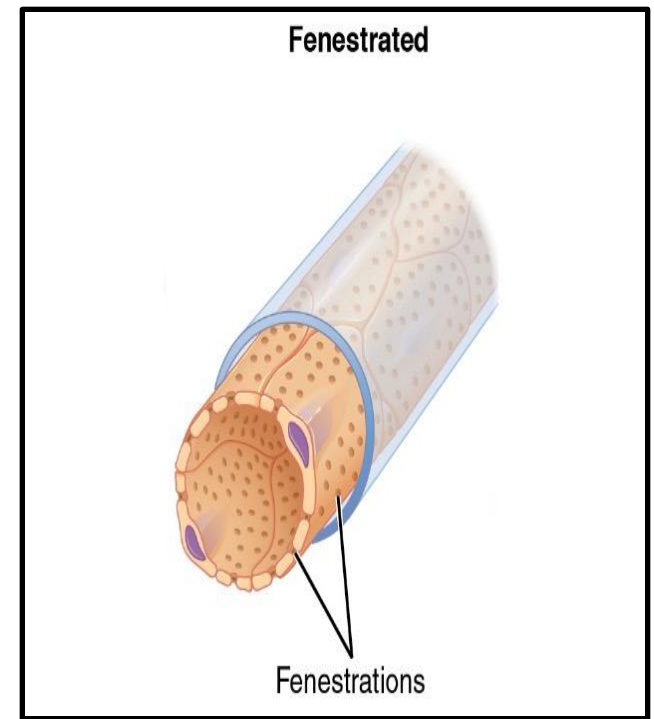




## II) Fenestrated capillaries

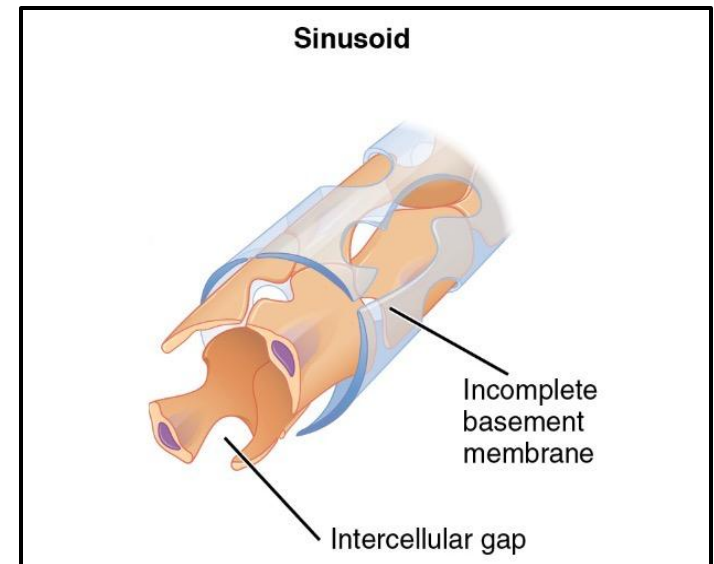
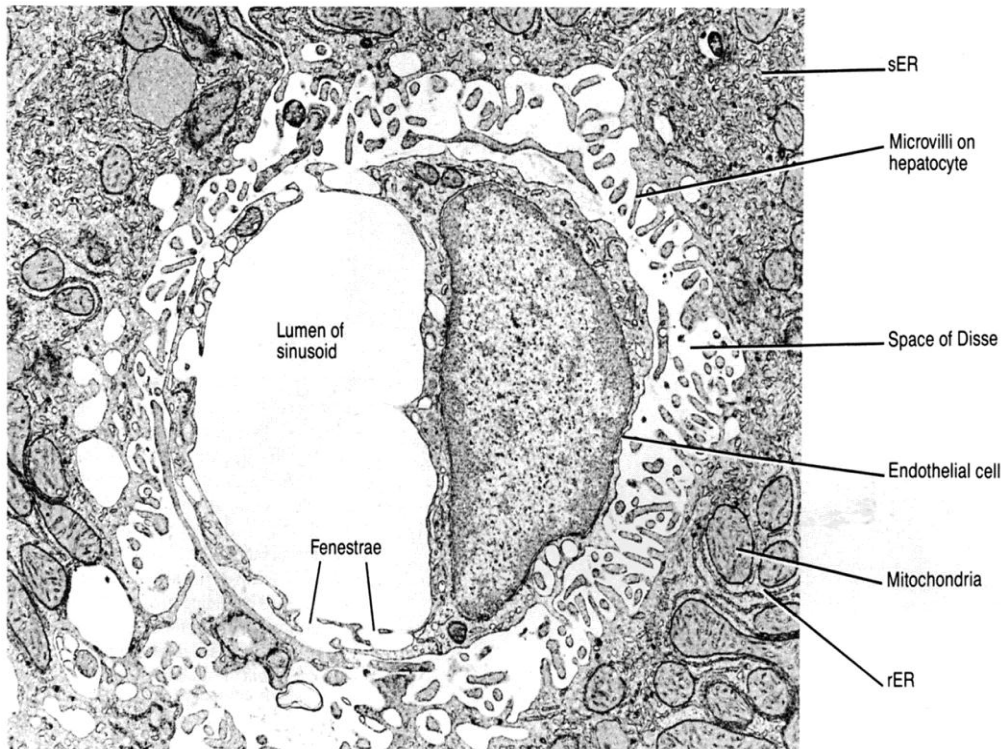
### Site:

- Kidney and endocrine glands.
- They have **pores** in their walls.
- It is surrounded with **continuous basal lamina**.



## IV) Sinusoidal capillaries

- **Site:** bone marrow and liver.
- lined with **discontinuous simple squamous endothelium** and **discontinuous basement membrane**.
- usually associated with **macrophage**.





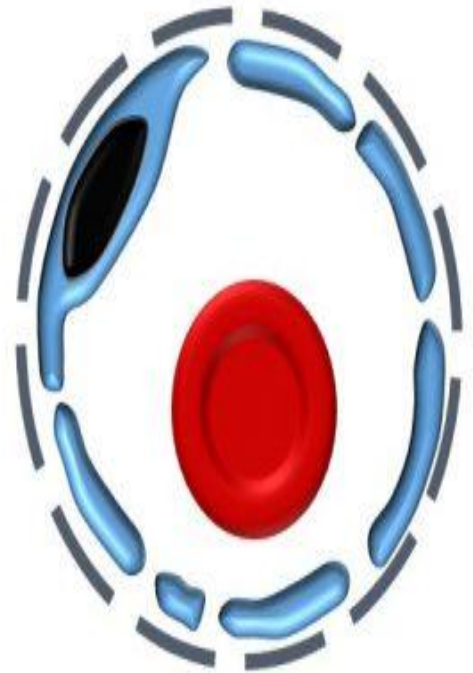
# Types of capillaries



Continuous



Fenestrated



Sinusoidal  
(Discontinuous)

*Thank you*

