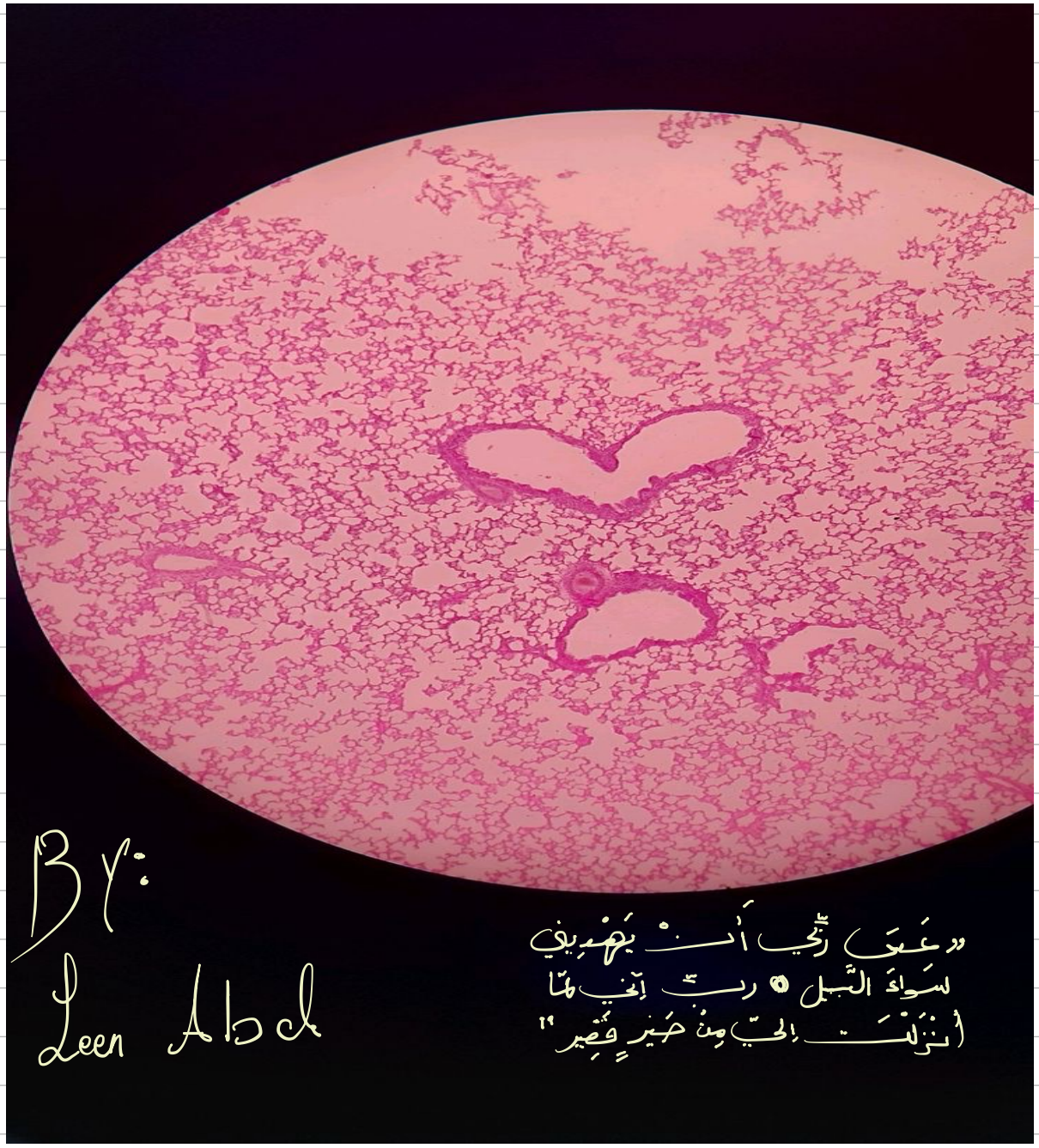
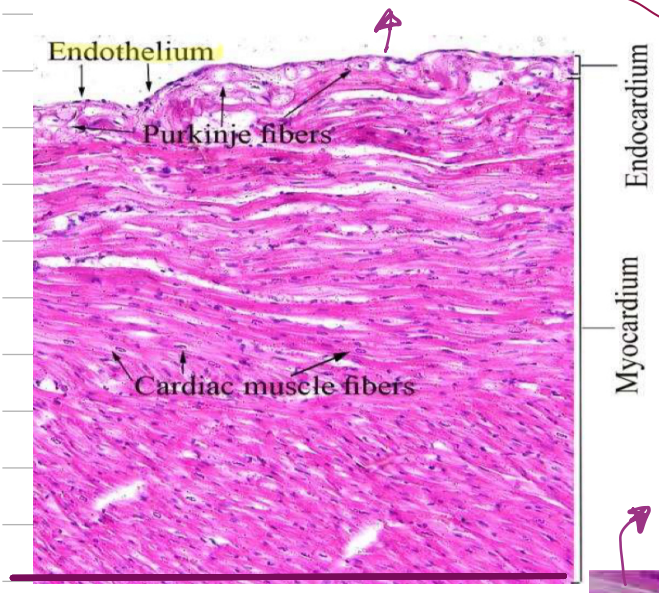
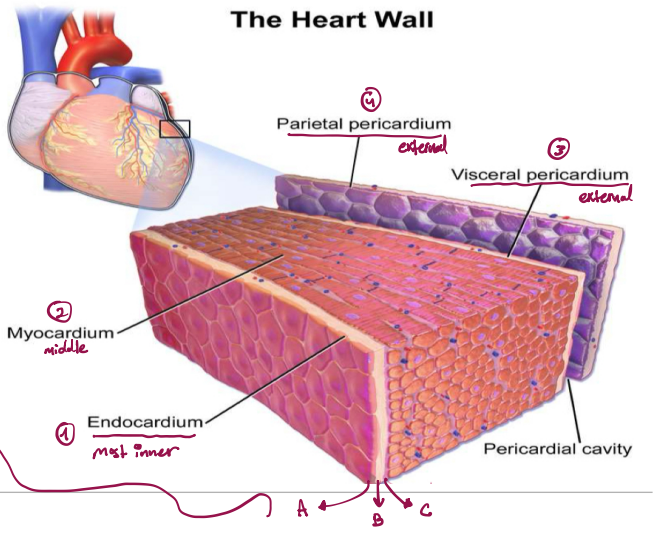

By:
Leen Abdl
"عسى ربي أن يهديني
لسواء السبيل ٥ رب إني لما
أنزلت إلي من خير فقير"

Histology of CVS

- Layers of wall of heart chambers :-

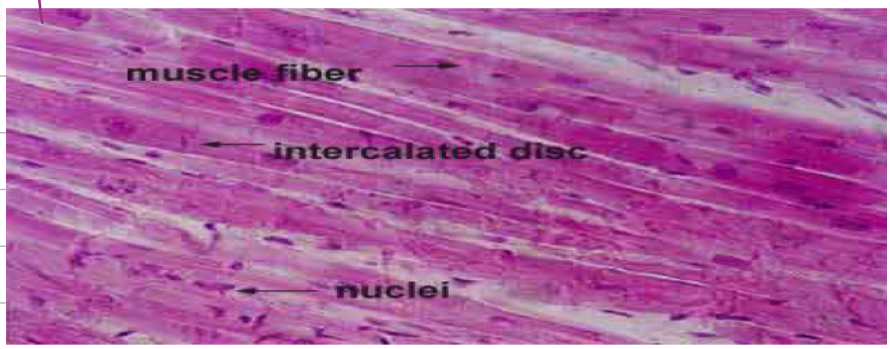
1) Endocardium has :- (A): thin layer of endothelium
   - Myo: smooth muscle fibers
   - elastic: Connective tissue
(B) Myoelastic layer:
(C) subendocardial layer: deep layer of connective tissue. + branches of conducting system of the heart.





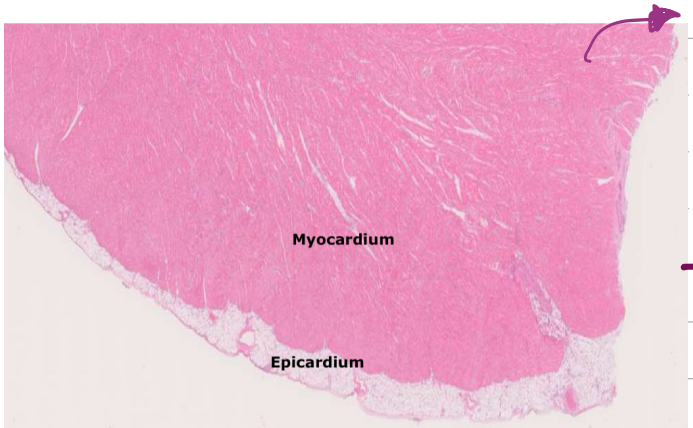
2) Myocardium :-

- → thickest layer
- → Consists mainly of cardiac muscles with its fiber arranged spirally.
- → Ventricles have thicker walls, especially the left.. because strong force requiered to pump blood ;)



★ Cardiac muscle functions :-

1- Contraction (ordinary fibers)
2- Conduction (Conducting system)
3- Secretion (ANP) ⇒ main function is to cause ↓ in expanded (ECF) by ↑ Renal sodium excretion.



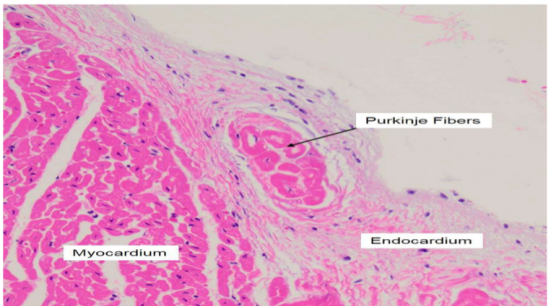
Epicardium :- → simple squamous mesothelium.

- The epicardium corresponds to the **visceral layer of the pericardium**.
- Where the large vessels enter and leave the heart, the epicardium is reflected back as the **parietal layer** lining the pericardium.
- Friction within the pericardium is prevented by lubricant fluid produced by both layers of serous mesothelial cells.

Purkinje fibers

Purkinje fibers are pale-staining fibers, larger than the adjacent contractile muscle fibers, with sparse, peripheral myofibrils and much glycogen.

Purkinje fibers mingle distally with contractile fibers of both ventricles and trigger waves of contraction through both ventricles simultaneously.



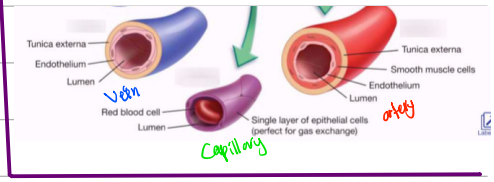
Classification of Blood vessels :-

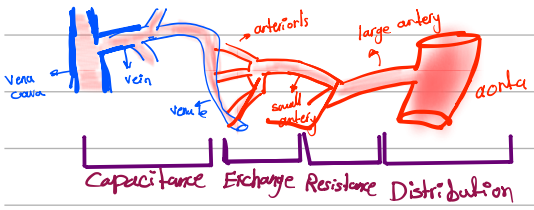
- Arteries : blood away from heart.
- Veins : blood toward heart
- Capillaries: deliver + absorb (O_2 + nutrients)

→ Contains smooth muscles + Connective tissue + endothelial lining EXCPT capillaries

→ amount + arrangment influenced by:

1) Mechanical factors 2) etabolic factors

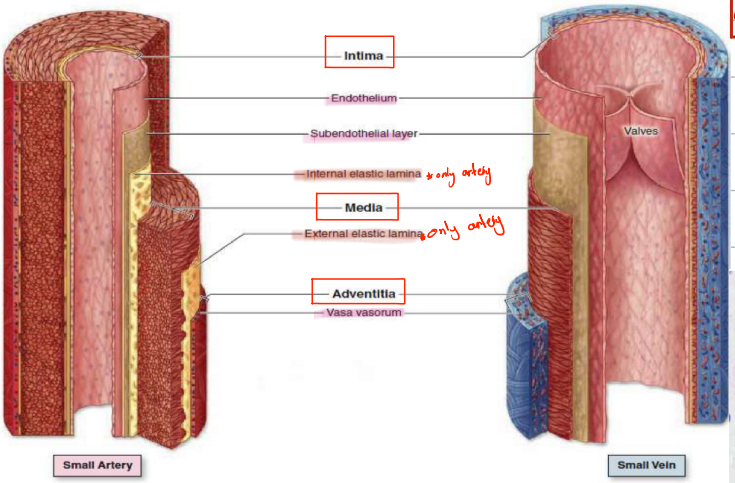




→ wall of Blood vessels consists of:

1. Tunica intima
2. Tunica media
3. Tunica adventitia

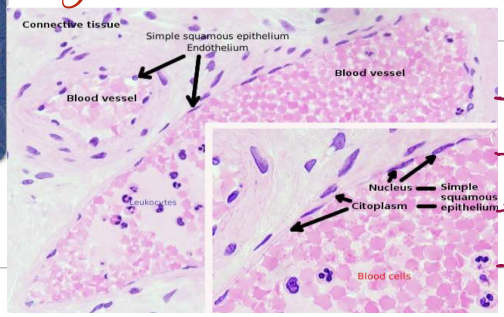
* Histological structures of B.V :-



1) Tunica intima :- Most inner and has:

a- Endothelium :- simple squamous epithelium, acts as semipermeable barrier and is highly differentiated to mediate bidirectional exchange.

→ endothelial cells are squamous, polygonal and elongated with direction of Blood flow.



Functions :-

- → selective permeability barrier
- → anti thrombogenic barrier (Past Q ① Check last Page :)
- → secretion of paracrine factors
- → Determine when/where WBCs leave circulation to Interstitial fluid.

B- Subendothelial layer :- loose CT

C- Internal elastic lamina :- Most external, composed of elastin with holes for diffusion. it prevents complete occlusions during Contraction.

2) Tunica Media :- middle coat .. has :-

a- Smooth muscles fibers (circularly arranged)

b- elastin, collagen, proteoglycans and glycoprotein

c- External elastic lamina. (In Arteries only)!!

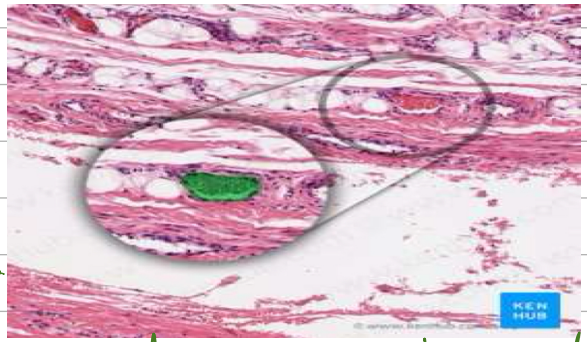
→ Note: external elastic lamina in Tunica Media, while internal elastic lamina in Tunica intimia.

3) Tunica adventitia :- the outermost and has :-

a- few elastic fibers

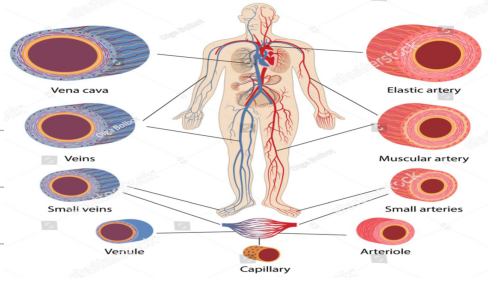
b- becomes continuous with connective tissue

c- Contains Vasa Vasorum (Vessels of the vessels)



Vasa Vasorum :- usually in large vessels, more in large veins as it carries deoxygenated blood than arteries. it provides metabolites to cells, because the thickness of the wall, so it can't be nourished to lumen by diffusion.

Blood vessels types:-



→ Arteries
→ Veins
→ Capillaries

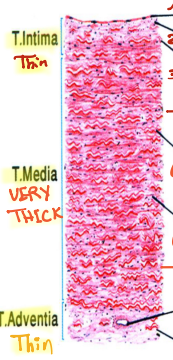
→ Arteries:

Classified into:- 1) Large (elastic)
2) Medium (Muscular) 3) small (arteriole)

1 Large (elastic) or Conducting arteries:-

→ Conducting because they carry blood to smaller arteries.
→ elastic because of large amount of elastic lamina in Media. so they can stretch, and Recoil to maintain B.P and moving the blood whe Ventricles are Relaxed.
→ Thick walls + wide lumen.
→ Examples: Aorta, Common → Carotid art. / Iliac art.

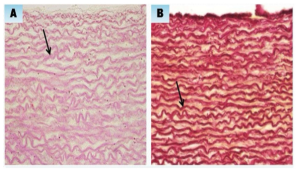
* Aorta:-



1- Endothelium
2- Subendoth → Contains smooth muscles, elastic + collagen fibers
3- Int. elastic lamina → indistinct (appears so), it merges with elastic membrane in tunica media * past Q ②
④ Elastic membranes (Main component of tunica media) → 40-60 distinct, concentrically and arranged elastic laminae.
② Smooth muscle f. → Between elastic lamina, fibroblast + elastic fibers + collagen and few smooth muscle cells.
Vasa vasorum → mainly collagen fibers + Vasa Vasorum + Nerves + elastic fibers + fibroblasts.
C.T.

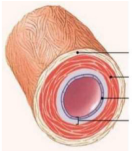
Aorta

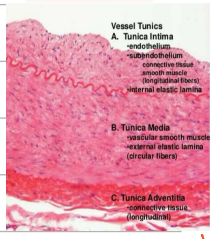
Structure of the Aorta

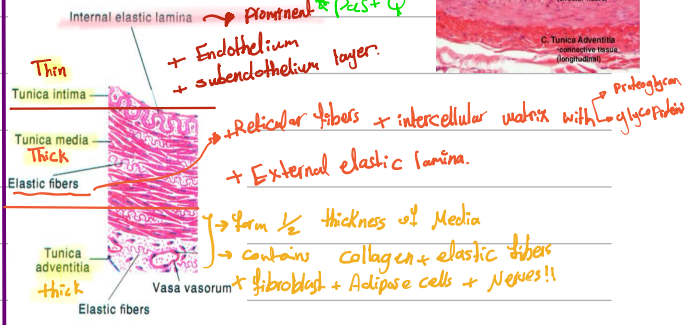


2 Medium (Muscular) or distributing art:-

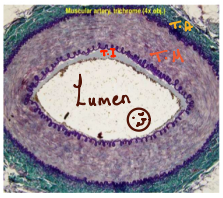
→ Distributing art because they distribute blood to organs + Regulating B.P by contracting.
→ Muscular because they consist of smooth muscle in T. media.
→ Thick wall and narrow lumen.
↳ To be able to maintain arterial Blood Pressure (B.P).
→ Examples:- ulnar + Radial art.







Medium sized artery (T.S.) H&E&

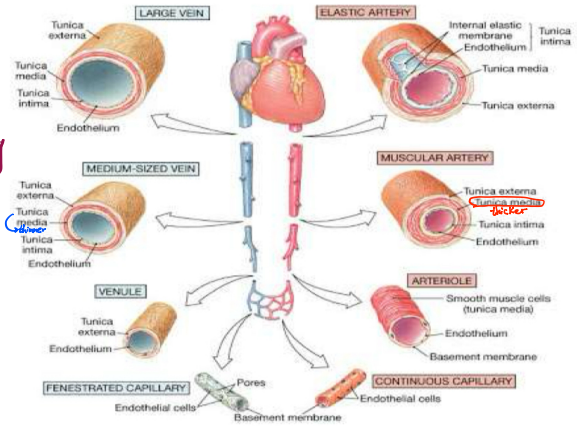


لا تنسى أن تبقى الخاتمة

3 Arterioles:- → sorry for this ☹

→ smallest branch, one or two smooth muscle layers, indicating beginning of organ's microvasculature.
→ Diameter < 0.1 mm, lumen is wide as ≈ thickness of the walls
→ subendothelial layer is very thin.
→ Media has circularly arranged smooth muscle.
→ Elastic lamina is absent!!
→ Adventitia is very thin!
→ Arterioles are Major determinants of systemic B.P!

Medium sized A & V

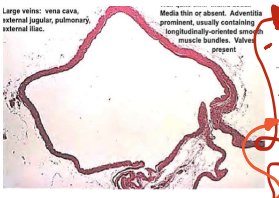


Basic Years ..

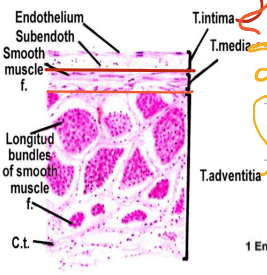
Veins :-

Inferior Vena Cava :-

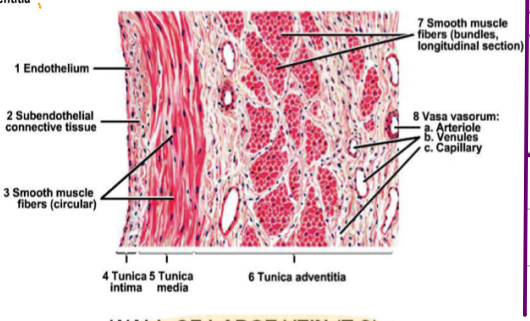
→ Wide lumen + many valves.



- endothelium Resting on basal lamina +
- Subendothelium : Thick + Contains collagenous and elastic fibers.
- Internal elastic lamina: absent.
- Thin, few smooth muscles + abundant
- No external elastic lamina. C.T



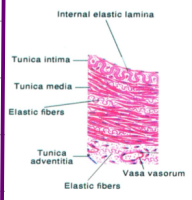
- longitudinal smooth muscle bundles.
- abundant vasa vasorum + lymphatics
- Valves (endothelium + core of ct).



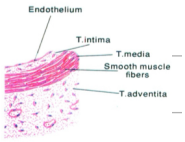
INFERIOR VENA CAVA (T.S.)

WALL OF LARGE VEIN (T.S)

Comparsion :-

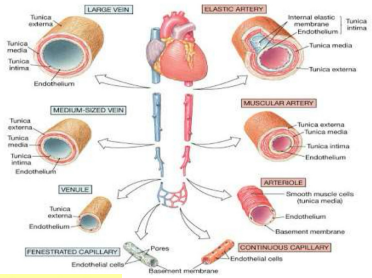


Medium sized artery (T.S.) H&E&



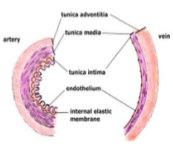
Medium sized vein (T.S.) H&E

Medium sized A & V



Medium sized A

- Thick wall
- Narrow lumen
- T intima: thicker
- T media: thicker
- Internal elastic L: present
- T adventitia: thinner
- Valves: absent



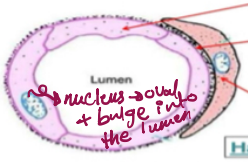
Medium sized V

- Thin wall
- Wide lumen
- T intima: thinner
- T media: thinner
- Internal elastic L: absent
- T adventitia: thicker
- Valves: present

Structure of Capillaries

The capillary wall is formed by

- Single layer of endothelial cells → surrounded by basement membrane.
- Glycoprotein layer of Basal lamina



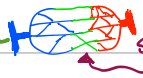
Out side the basal lamina- **Contractile cells** wrapped around the capillaries

- Pericytes → Cells present at intervals along the walls of capillaries.

Has only Tunica Intima

Lacks T Media and therefore no smooth muscle cells

Capillaries :-

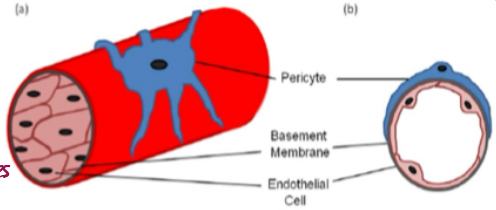


smallest blood vessels.

→ Diameter ≃ 8 µm, thin wall, form plexus with → small arteriole / → small venule

* → Site of exchange gases, nutrients & metabolic wastes.

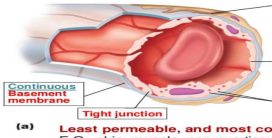
So, → Abundant in high-metabolic tissues :- kidneys + liver + cardiac muscles



→ Diameter ≃ 4-10 µm → transit blood only one at a time.

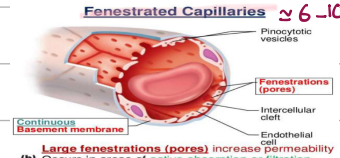
☆ Capillaries according to appearance under EM (The continuity of endothelial cells & basement membrane) Classified into 3 histological types :-

1



* Most common type, found in :- muscles + CT + lungs + exocrine glands + nervous tissues.
* have many tight, well-developed occluding junctions → provide continuity & well-regulated metabolic exchange.
* numerous vesicles indicating transcytosis of macromolecules in both direction.

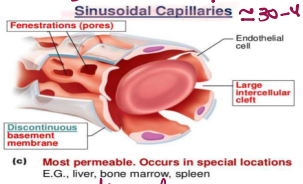
2



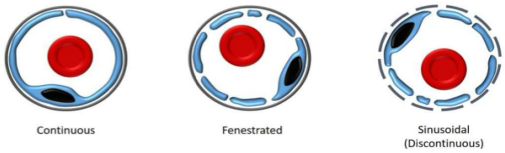
* Sieve-like structure (غربال) → more molecular exchange, endothelial cells are penetrated
* Some fenestrations are covered by very thin diaphragms of proteoglycans, basement membrane is continuous and covers fenestrations.
* found in organs with Rapid interchange :- kidneys + intestines + endocrine glands.

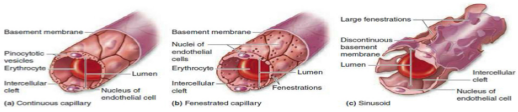
* Past Q

3



* Maximal exchange + easier movement of cells (Tissues ⇄ blood)
* large perforations in endothelium without Diaphragms.
* highly discontinuous basement membrane.
* larger diameter → slows blood flow.
* found in liver + spleen + bone marrow.





Past Questions :-

1- Which of the following components prevents vessel coagulation?
A. Endothelium
B. Tunica adventitia
C. Tunica media
D. Platelets

2- The aorta is characterized by which of the following features?
A. Thickened tunica adventitia with many vasa vasorum
B. Tunica media with many layers of smooth muscle
C. Indistinct internal lamina
D. Thick wall and narrow lumen
E. Presence of valves throughout its length

3-Fenestrated capillaries in:
A. Kidney
B. Spleen
C. Liver
D. Bone

4-Internal elastic lamina is prominent in:
A. Arterioles
B. Common carotid artery
C. Descending thoracic aorta
D. Radial artery

5-Which of the following layers of the heart contains smooth muscle cells?
A) Myocardium
B) Epicardium
C) Endocardium

اليوم اللي بتزرع فيه البذرة
مش هو اليوم اللي بتاكل فيه
الثمرة .. خليك
هادي وكمّل .

*Answers :-

A
C
A
D
C

Good Luck Drs