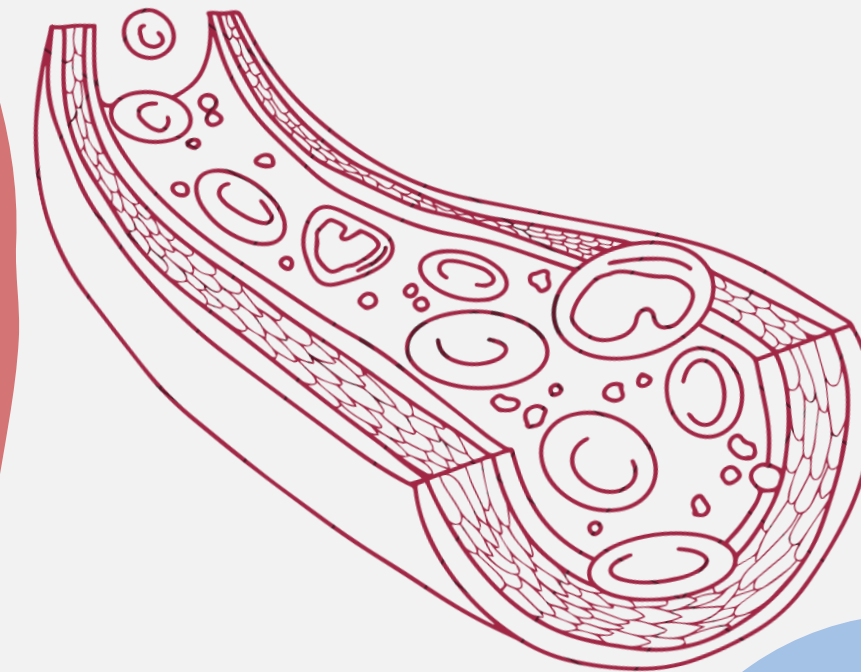


Histology of the blood vessels



Lecture no.2



Very very good vid that explain the most of the lec in 6 mins only!
no need for long vids or "فلسفة", watch this and finish the lec quickly.

Editing file

Color index:

Main text **Important**

Boys slides **Girls slides**

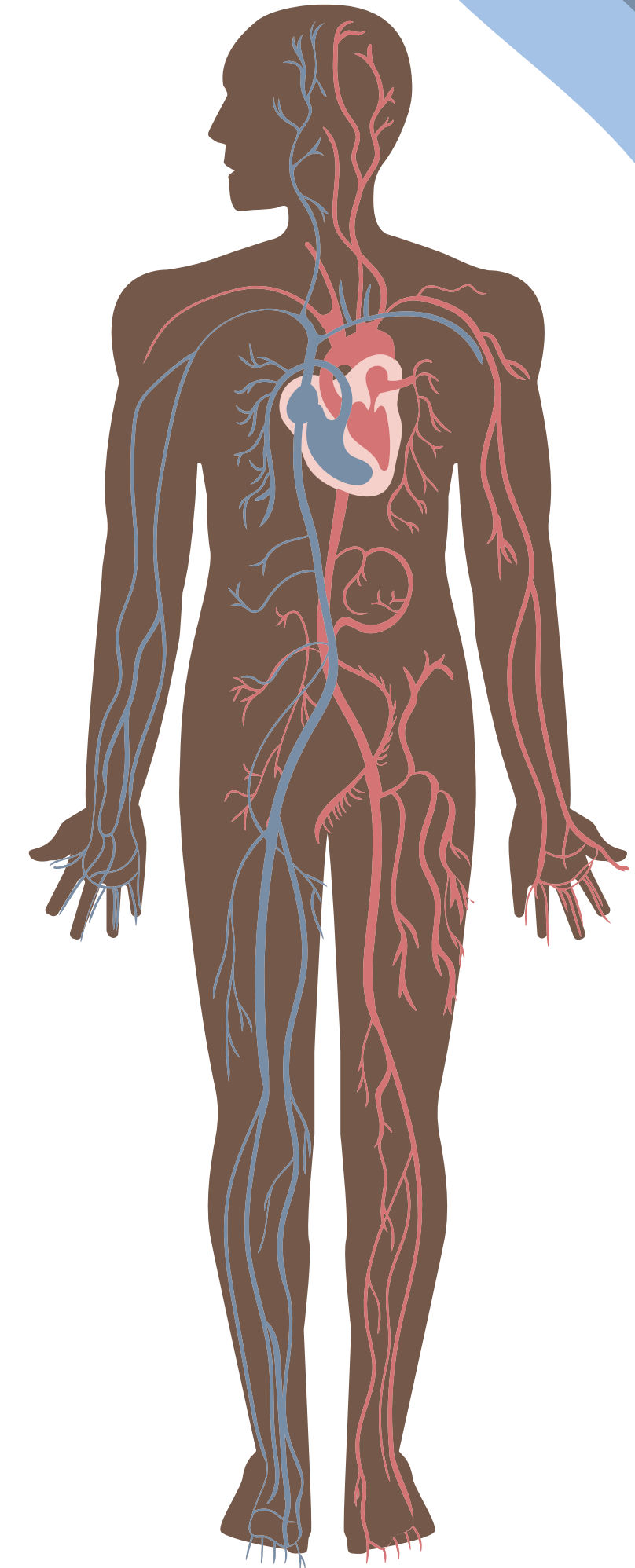
Dr's notes Extra

﴿وَقُلْ رَبِّ زِدْنِي عِلْمًا﴾

OBJECTIVES:

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

- Elastic arteries
- Muscular (medium-sized) arteries
- Medium sized veins
- Large veins
- Blood capillaries



BLOOD VESSELS

Never ever forget that!!

artery:
carry blood away from the heart

vein:
carry blood back to the heart

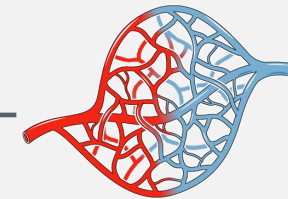


Quick recap!



Arteries:

- Elastic artery, **or large artery**
- Muscular (distributing) (medium-sized) artery
- Arterioles

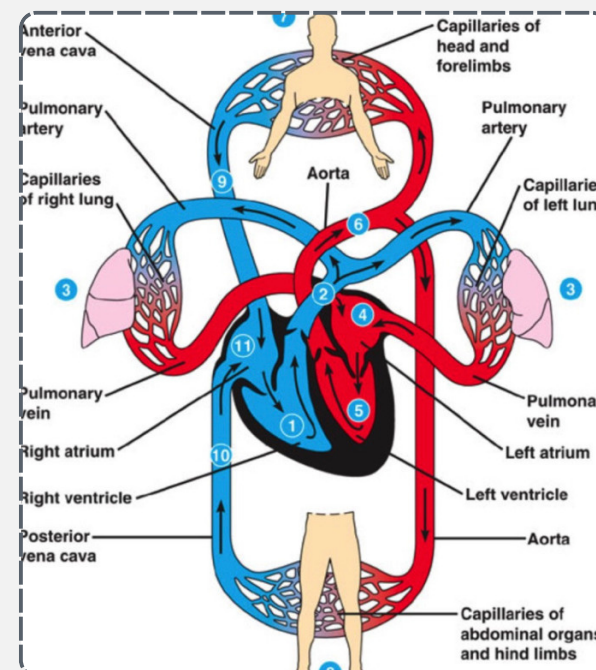


Blood capillaries



Veins:

- Venules
- Small veins
- Medium-sized veins
- Large veins





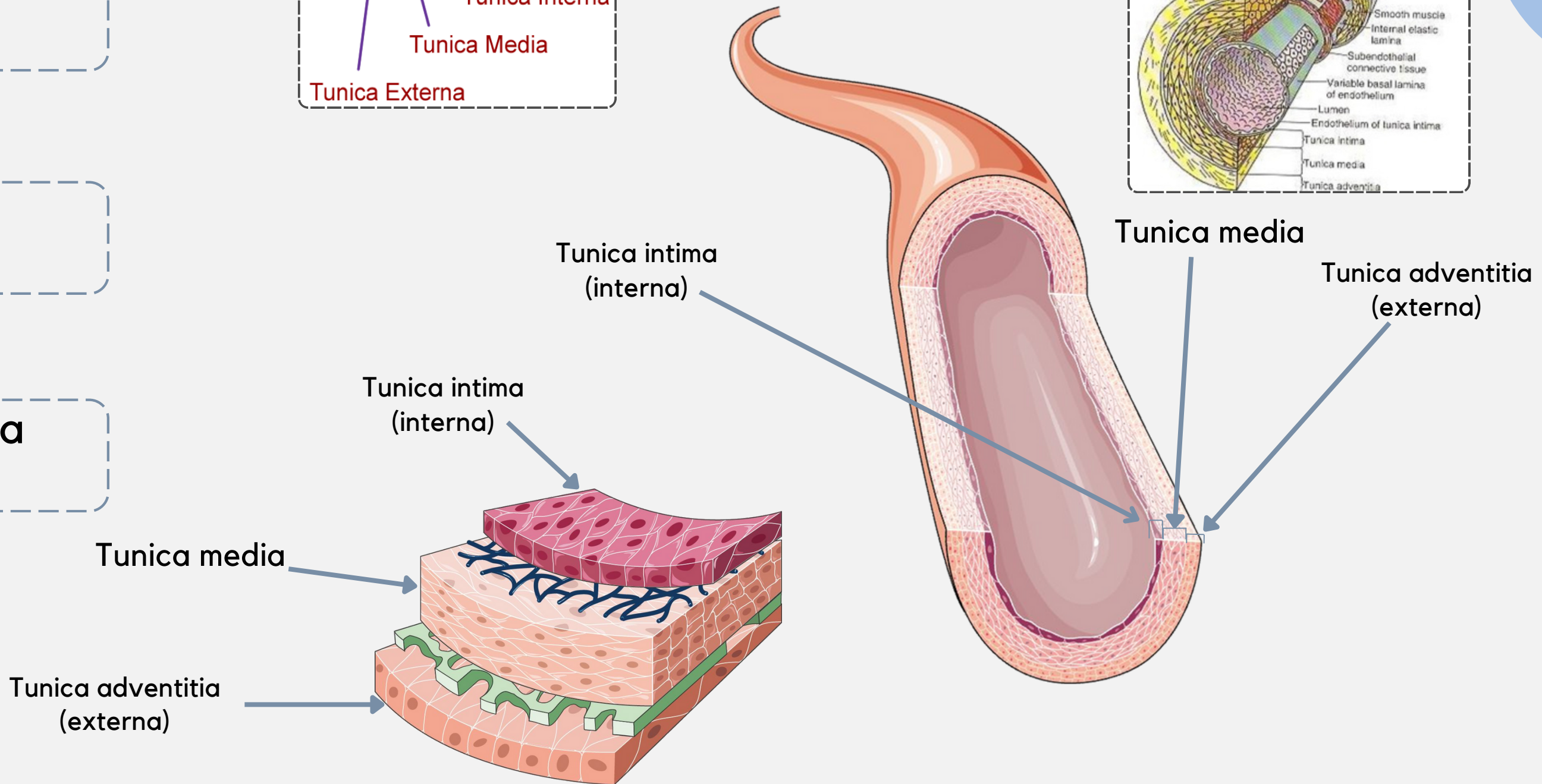
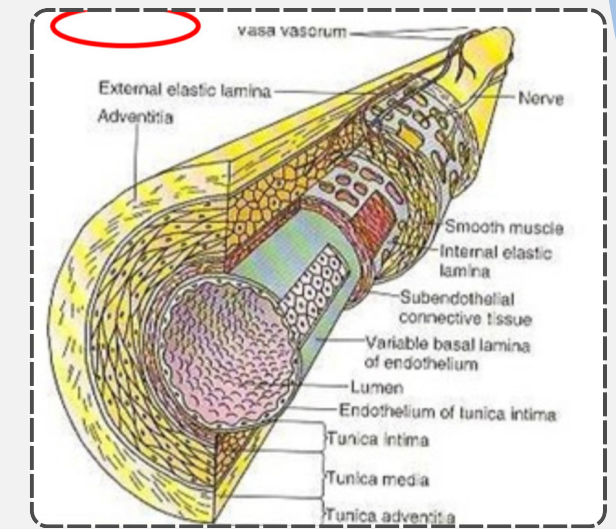
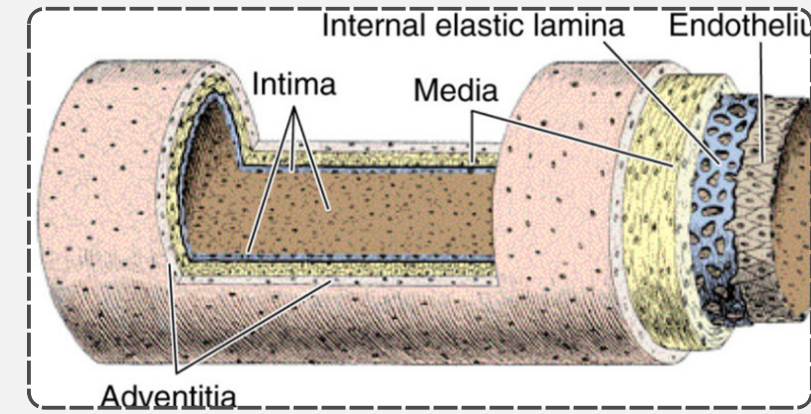
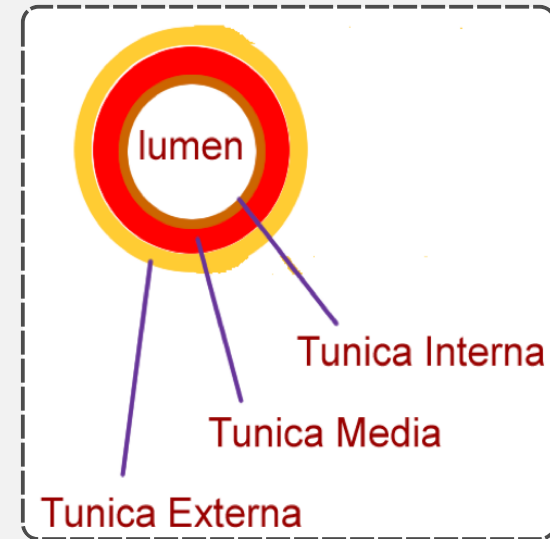
GENERAL STRUCTURE OF BLOOD VESSELS

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

Tunica intima
(interna)

Tunica media

Tunica adventitia
(externa)





GENERAL STRUCTURE OF BLOOD VESSELS CONT...

Tunica intima (interna)

innermost layer Composed of:

1- Endothelial cells:

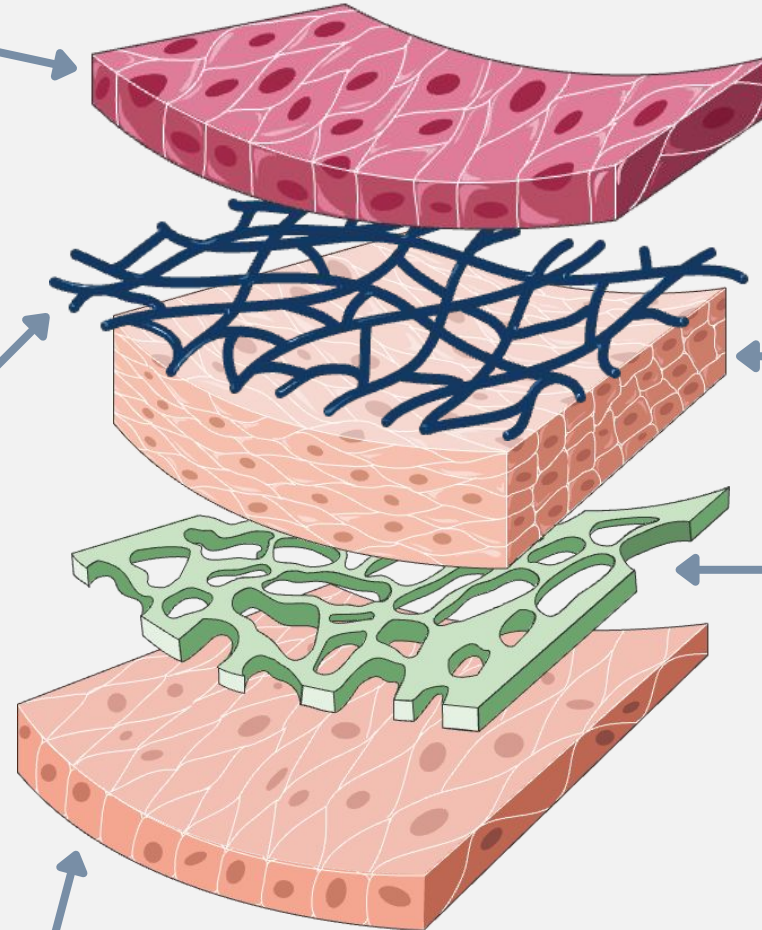
Simple squamous epithelium, **Why simple?** To make a smooth surface to prevent clot and stroke

2- Subendothelial layer:

Loose C.T. for nutrition

3- Internal elastic lamina:

fenestrated elastic sheet, to help nutrient materials to pass to the other layers



Tunica media

Intermediate layer composed of:

1-Smooth muscles:

Helically arranged

2- Elastic fibers

3- Type III collagen (reticular fibers)

What is the importance of collagen?
to prevent over-extension and limit shorting of vessels

4-Type I collagen

NB: Large muscular arteries have **external elastic lamina**, separating the tunica media from the tunica adventitia

Tunica adventitia (externa)

Outermost layer (**Capsule like**) composed of:

C.T. containing **Vasa vasorum**, which are:

- Small arterioles in tunica adventitia
- At the outer part of tunica media
- More prevalent in the walls of veins than arteries;

Because: Venous blood contains less oxygen and nutrients than arterial blood

Dr's note:

Vasa vasorum is a word comes from the word "Vessels of vessels" It refers to a network of tiny blood vessels that branched from larger blood vessels to supply the larger blood vessels themselves and this is in the walls of organs and blood vessels also

Elastic Arteries (large arteries)

Muscular Arteries (Medium-Sized Arteries)

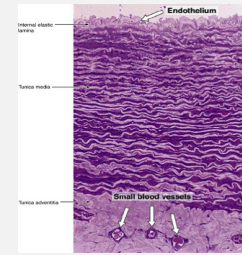
examples

Aorta, Common Carotid, Subclavian,
Common iliac, Pulmonary Trunk

Brachial, Ulnar, Renal

T. Intima

- Endothelium
- Subendothelial C.T.
- Internal elastic lamina:



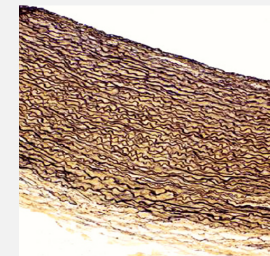
IMPORTANT Which is: (NOT prominent), (indistinct)
Elastic fibers **ماتكون واضحة بسبب أنه في كثير**

The thickest layer in an artery

It consists of:

IMPORTANT ➤ Fenestrated elastic membranes (sheets or lamellae):
It is the main component of T.M.

- In between, there are:
 - 1- Smooth muscle cells
 - 2- Collagen fibers (type I collagen)
 - 3- Reticular fibers (type III collagen)
 - 4- Elastic fibers

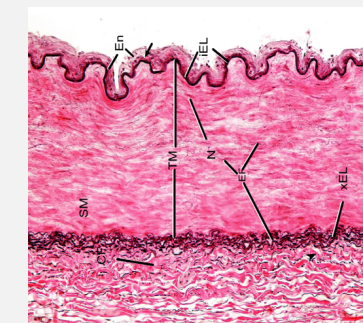


T. Media

Components:

➤ Smooth muscle cells (SMCs):
are the predominant component

- In between there are:
 - 1- Elastic fibers
 - 2- Type III collagen fibers
 - 3- Type I collagen fibers

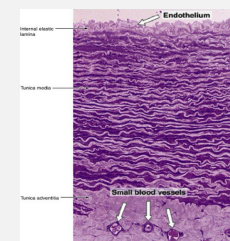


➤ External elastic lamina: may be identifiable

T.

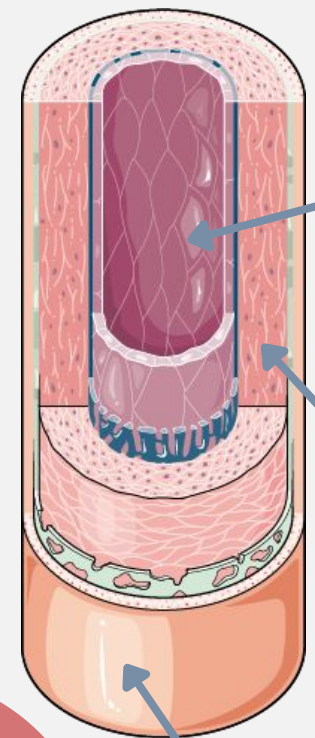
Adventitia

- 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.

➤ **Vasa vasorum**

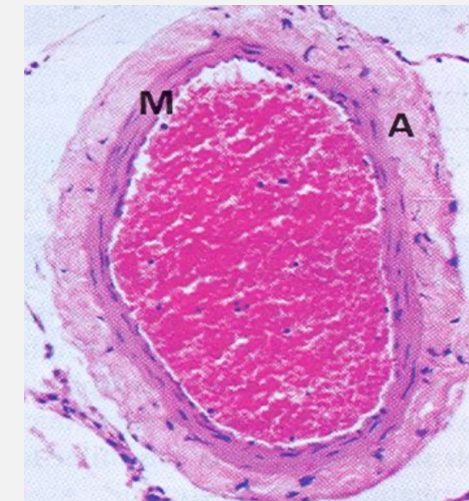


Medium-sized veins

Thickness of the wall: thinner than the accompanying artery

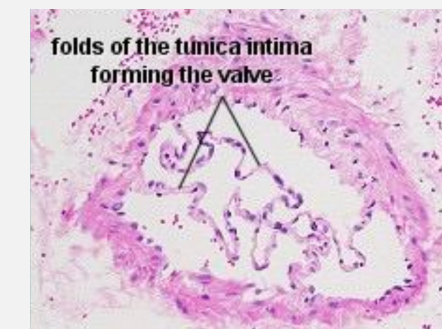
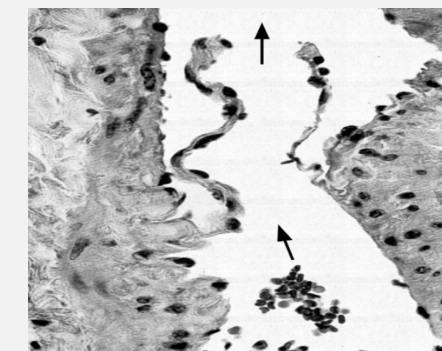
- usually forms valves
- no internal elastic lamina

- Thinner than T. Adventitia
- Consists of:
 - Fewer SMCs
 - Types I & III Collagen fibers



Thicker than T. Media, The thickest layer in a vein

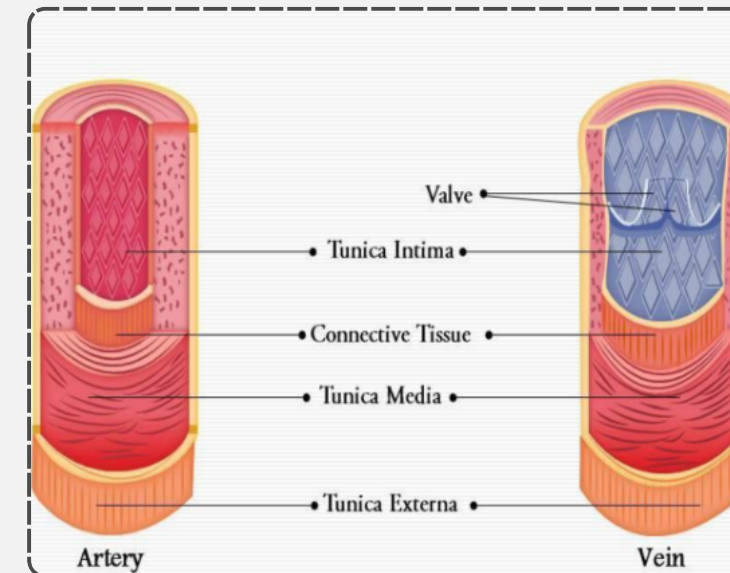
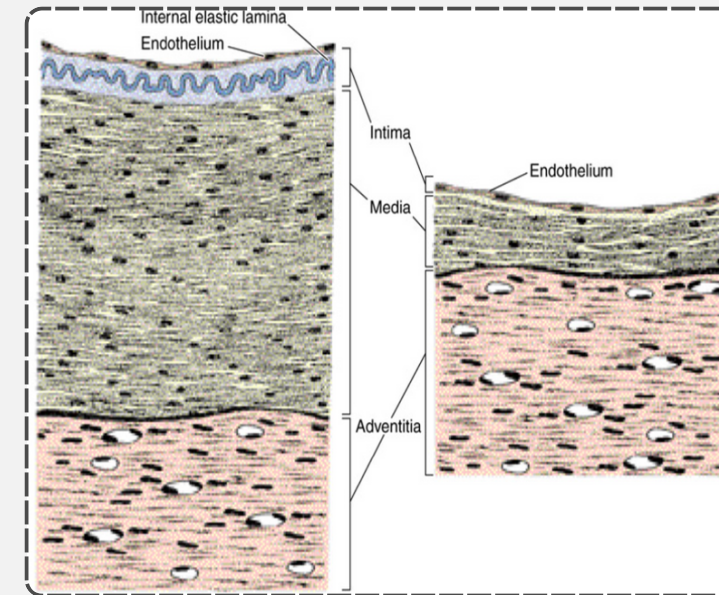
- Is composed of 2 leaflets
- Each leaflet has a thin fold of T. Intima
- Components of each leaflet:
 - Endothelium
 - core of C.T



MEDIUM-SIZED ARTERY

VS

MEDIUM-SIZED VEIN:



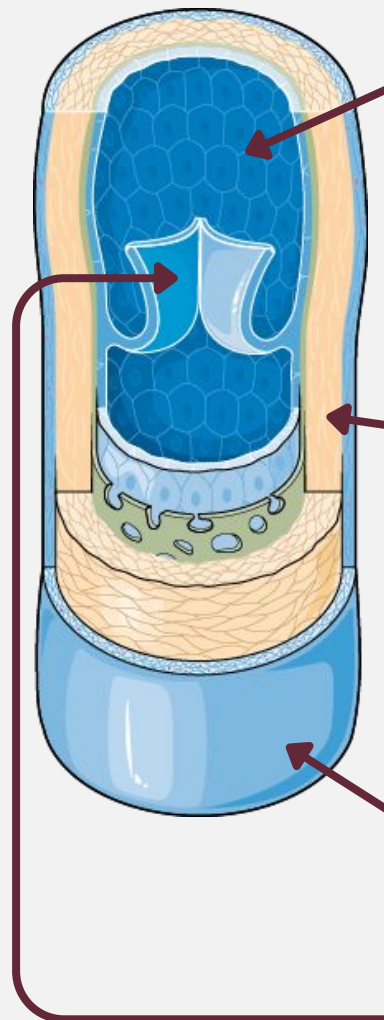
T. Intima

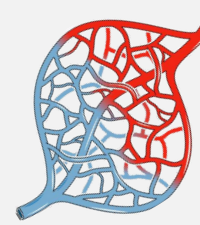
T. Media

T. Adventitia

Valves

(leaflets, cusps)





BLOOD CAPILLARIES

- **Diameter:**

Usually 8-10 μm

- **Microscopic structure:**

1

Single layer of squamous **endothelial** cell

2

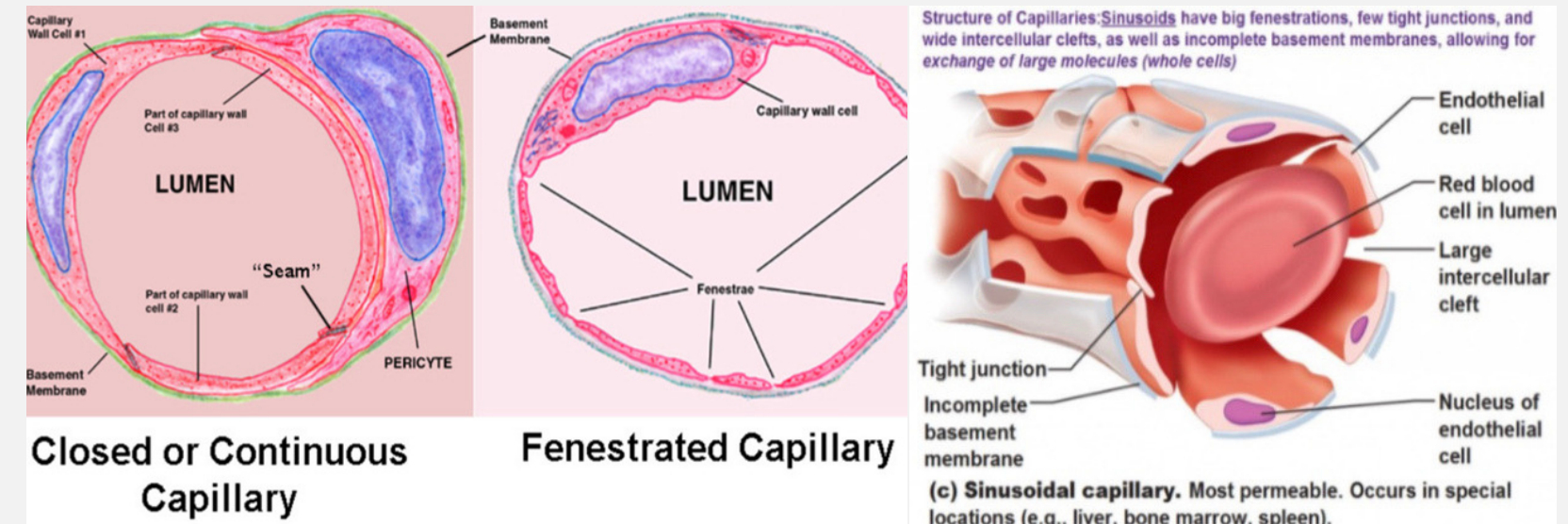
Basal lamina:

Surrounds the external surface of the endothelial cells

3

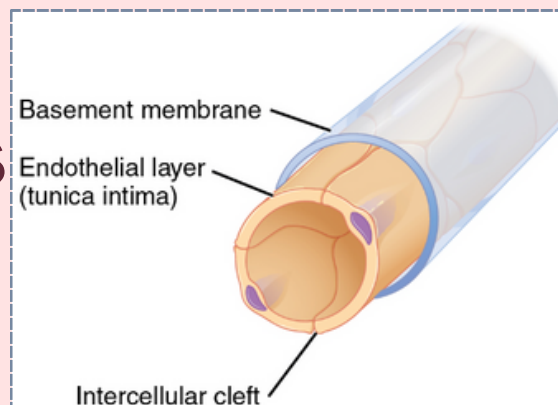
Pericyte:

- Have processes
- Share the basal lamina of the endothelial cells
- Act as stem cells for arterioles and venules SMCs, and capillary endothelium
- Help in moving the blood from arterioles to venules



TYPES OF BLOOD CAPILLARIES:

Continuous capillary



No pores or fenestrae in their walls

Why? To prevent entering of harmful material into major organs

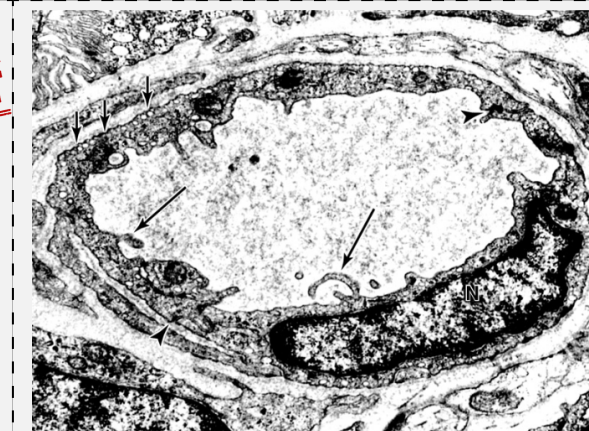
Distribution

- Muscles
- Nervous T.
- C.T:

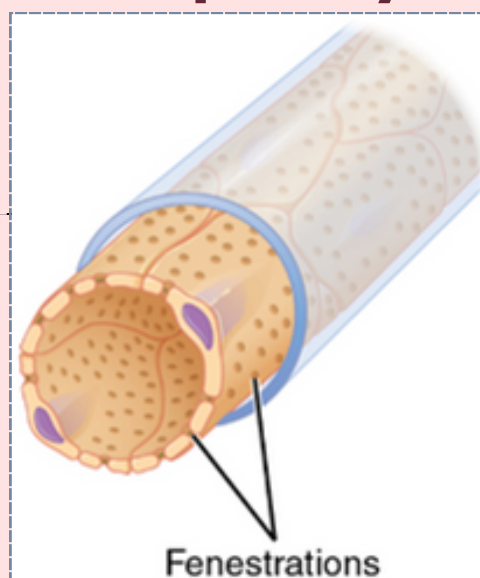


e.g: pulmonary blood capillaries
check the MCQs at the end!!!

E.M



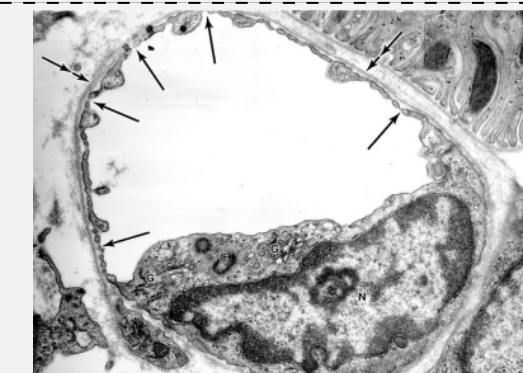
Fenestrated capillary



With diaphragm

- The walls of their endothelial cells have pores (fenestrae)
- These pores are covered by diaphragm

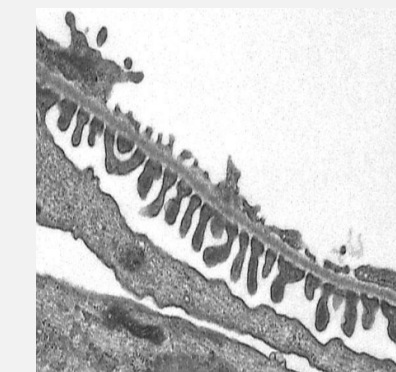
- Intestine
- Pancreas
- Endocrine glands



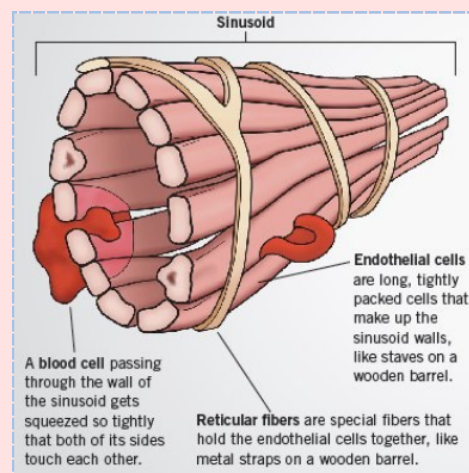
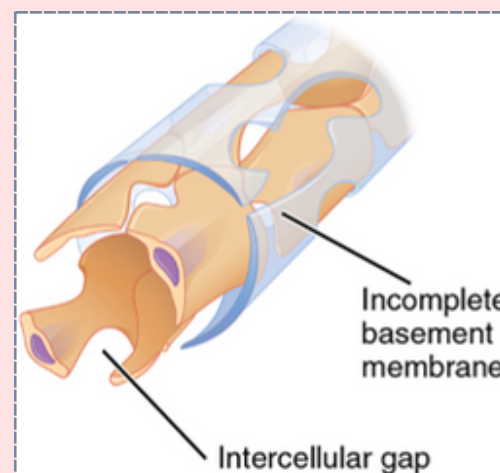
Without diaphragm

- The walls of their endothelial cells have pores (fenestrae)
- These pores are **NOT** covered by diaphragm

- Renal glomerulus

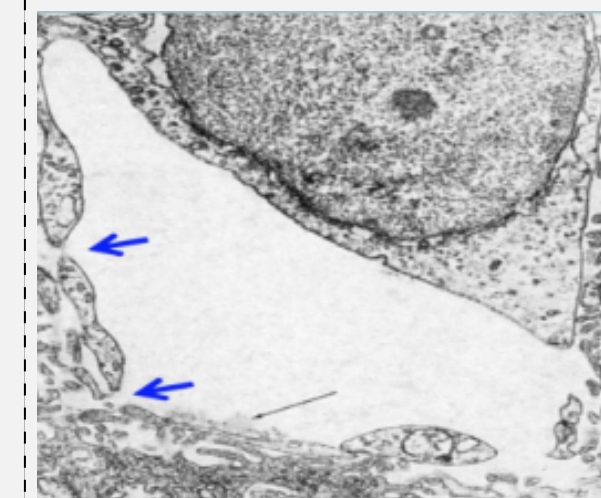


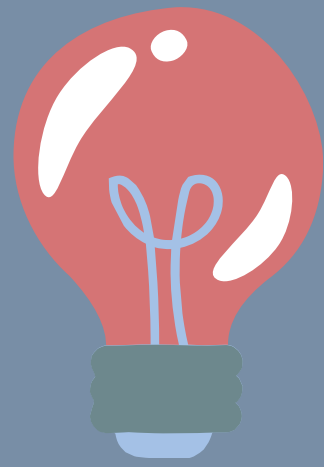
Sinusoidal capillary



- Diameter: irregular (30-40 μm)
- Their endothelial cells have fenestrae without diaphragms
- They possess discontinuous endothelial cells & basal lamina
- Macrophages may be located in or along the outside of the endothelial wall

- Red bone marrow
- Liver
- Spleen
- Certain endocrine glands





MCQs!




Q1) c Q2) D Q3) c

Q1) which of the following is a feature of aorta?

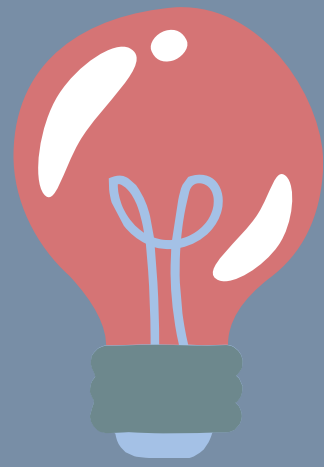
A	<u>prominent</u> Internal elastic lamina	B	Tunica adventitia is <u>thicker</u> than tunica media	C	Contain <u>fenestrated</u> elastic lamina	D	None!
---	--	---	---	---	---	---	-------

Q2) What type of collagen is found in the tunica media?

A	Type 1&4	B	Type 3&4	C	CR7 type 	D	Type 1&3
---	----------	---	----------	---	--	---	----------

Q3) In which one of the following the Internal elastic lamina become prominent?

A	Elastic artery	B	Large artery	C	Medium-sized artery	D	Medium-sized Vein
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MCQs!



Q4) Which one of the following structures represent a continuous capillary?

A	Pulmonary septa	B	Pulmonary trunk	C	Liver	D	Spleen
---	-----------------	---	-----------------	---	-------	---	--------

Q5) Which of the following light microscopic features is observed in the wall of medium-sized veins?

A	<u>prominent</u> Internal elastic lamina	B	Tunica adventitia is <u>thicker</u> than tunica media	C	Contain <u>fenestrated</u> elastic lamina	D	None!
---	--	---	---	---	---	---	-------

Q6) Which one of the following capillaries have fenestrated blood capillaries without diaphragm?

A	Nervous tissue	B	Muscles	C	Renal glomerulus	D	Spleen
---	----------------	---	---------	---	------------------	---	--------



Team leaders



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