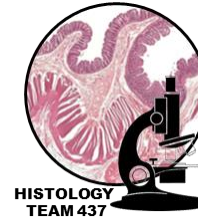




Histology of the blood vessel



Red: important.

Black: in male | female slides.

Gray: notes | extra.

Editing file

غيداء آل مضمع
عبدالرحمن الحيسوني

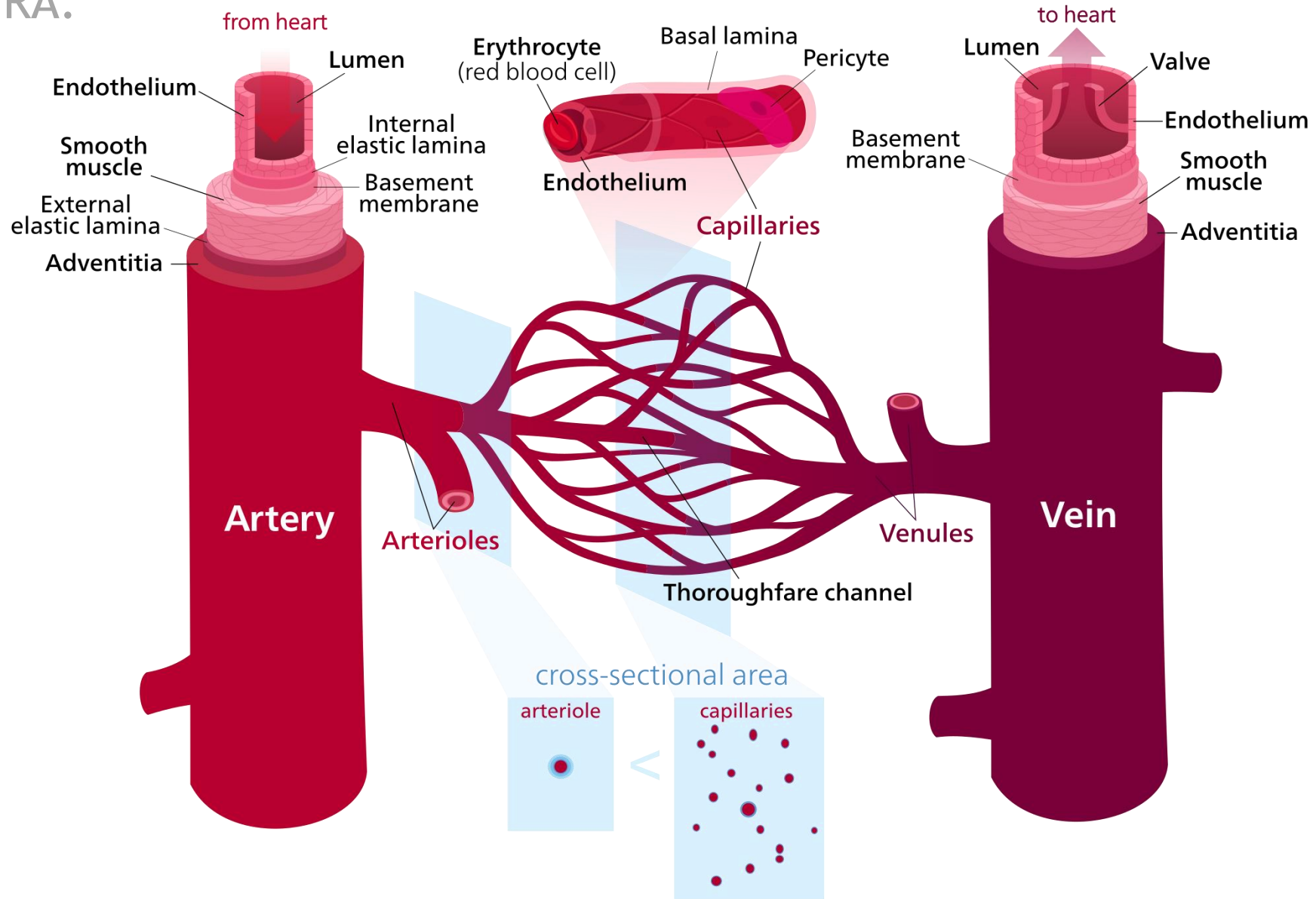
Revised by

➤ OBJECTIVES

Identify and describe the microscopic structure of the wall of the blood vessels including:

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

EXTRA:



Blood vessels

Arteries

Blood Capillaries

Veins

Elastic arteries

Medium-sized arteries
(Muscular "distributing")

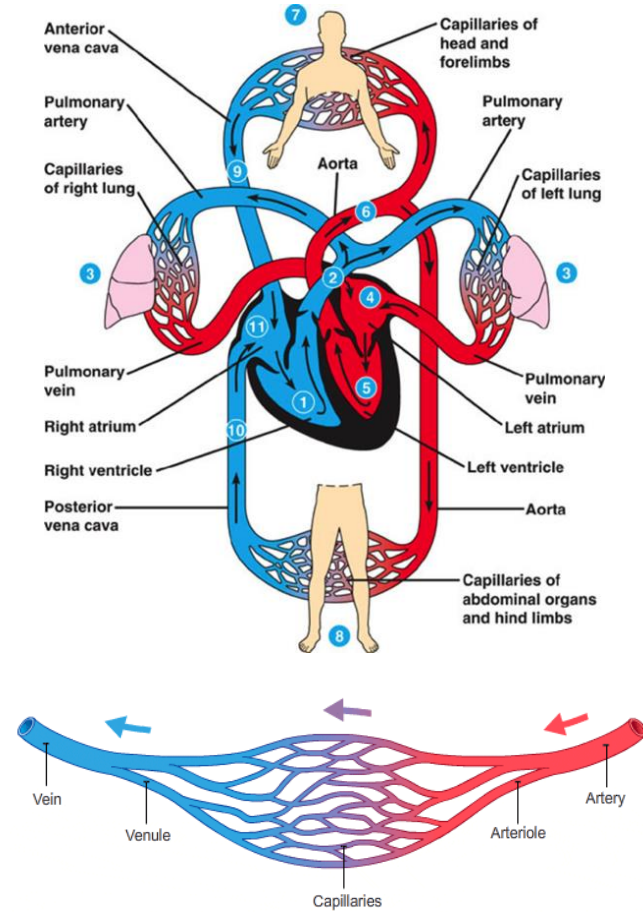
Arterioles

Venules

Small veins

Medium-sized veins

Large veins



➤ Major structure of blood vessels:

Tunica intima (Interna)

- innermost layer
- Composed of:
 - 1- Endothelial cells: SSE=Simple squamous epithelium
 - “Remember SSE lining all circularity system”
 - 2- Subendothelial layer: loose C.T.
 - 3- Internal elastic lamina: fenestrated elastic sheet “rich”

Tunica media

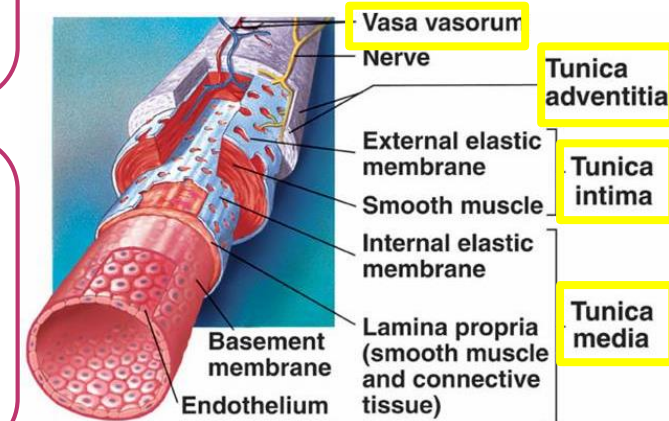
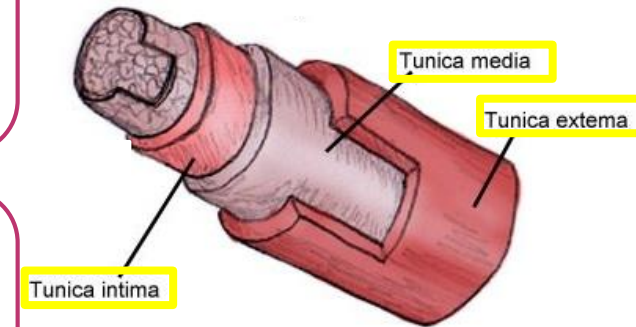
- Intermediate layer “Thickest layer”
- Composed of:
 - 1- Smooth muscles “mainly”
 - 2- Elastic fibers
 - 3- Type I collagen
 - 4- Type III collagen (reticular fibers)

*NB: Large muscular arteries have external elastic lamina separation the tunica media from the tunica adventitia.

Tunica adventitia (Externa)

- Outermost layer “mainly connective tissue”
- Composed of 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 (because venous blood contains less oxygen and nutrients than arterial blood)

“Tunica = layer”



	Elastic arteries “Large artery”	Muscular arteries “Medium-sized artery”
EX.	Aorta, common carotid artery, subclavian artery, common iliac artery, pulmonary Trunk.	Brachial, ulnar, renal.
T. Intima (Interna)	<ul style="list-style-type: none"> • Endothelium • Subendothelial C.T. • Internal elastic lamina: not prominent “not clear” & indistinct 	<ul style="list-style-type: none"> • Endothelium. • Subendothelial C.T. layer. • Internal elastic lamina: Is prominent & displays an undulating surface.
T. Media	<p>It consists of:</p> <p>A. Fenestrated elastic membranes: sheets & lamellae “main component of T.M.”</p> <p>B. In between, there are:</p> <ol style="list-style-type: none"> 1- Elastic fibers “predominant (main) component = 90%” 2- Collagen fibers (type I collagen) 3- Reticular fibers (type III collagen) 4- Smooth muscle cells 	<p>(Thicker than T. Adventitia or similar in thickness).</p> <p>Components:</p> <p>A. Smooth muscle cell (SMCs) “predominant component”</p> <p>B. In between, there are:</p> <ol style="list-style-type: none"> 1- Elastic fibers 2- Collagen fibers (type I collagen) 3- Reticular fibers (type III collagen) <p>C. External elastic lamina: may be identifiable.</p>
T. Adventitia (Externa)	<ul style="list-style-type: none"> • Much thinner than T.M. • It is composed of loose connective tissue • Contains vasa vasorum → send branches to the <u>outer part of T.M.</u> 	Loose connective tissue
Pic.	<p>The diagram shows a cross-section of an elastic artery with three layers: Tunica externa (outermost), Tunica media (middle, thick), and Tunica intima (innermost). A histological section shows the Tunica media containing Vasa vasorum, Elastin fibers, and the Lumen.</p>	<p>The diagram shows a cross-section of a muscular artery with three layers: Tunica externa (outermost), Tunica media (middle, thick), and Tunica intima (innermost). A histological section shows the Tunica intima with an External elastic membrane, Tunica media, and Tunica intima with an Internal elastic membrane, and the Lumen.</p>



Medium-sized vein

• Thickness of the wall:
thinner than the accompanying artery

T. Intima
(Interna)

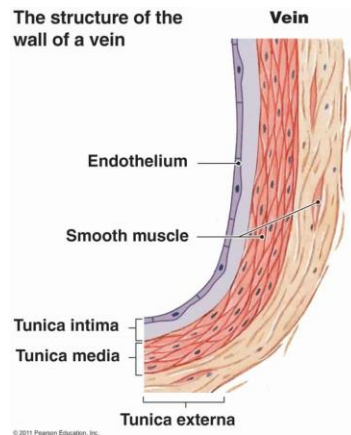
- usually forms **valves**
- no internal elastic lamina

T. Media

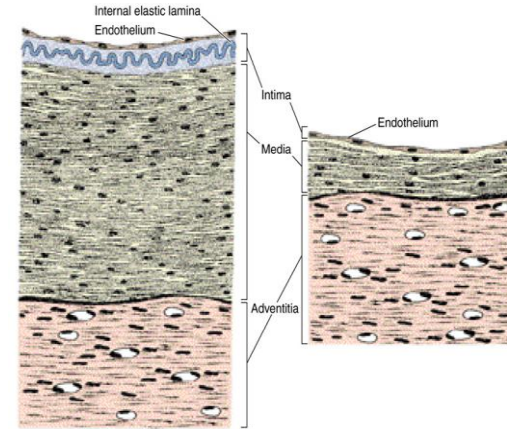
- Thinner than T. Adventitia.
- It consists of:
 - 1- Fewer SMCs
 - 2- Types I & III Collagen fibers

T. Adventitia
(Externa)

- thicker than T. Media

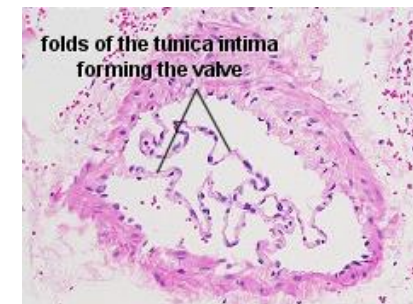
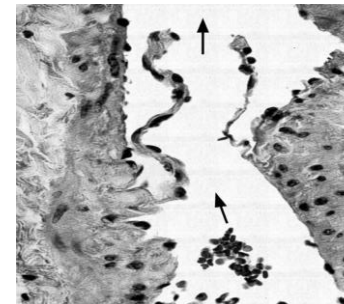


➤ Medium-sized artery & vein



➤ Valves of the vein

- Valve of a vein is composed of **2 leaflets**.
- Each leaflet has a **thin fold of the T. Intima**.
- Components:
 - Endothelium
 - Core of Connective tissue



➤ Blood capillary

□ **Diameter:** usually 8-10 μm

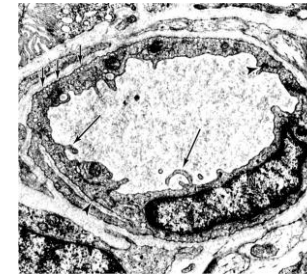
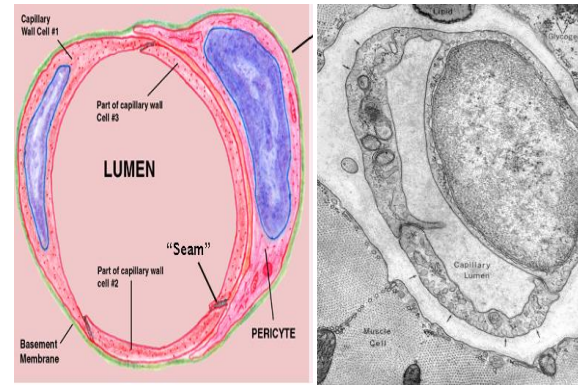
□ **Microscopic structure:**

- **Single layer of squamous endothelial cells.**
- **Basal lamina:** surrounds the external surface of the endothelial cells.
- **Pericytes:** “act as stem cell for endothelium cells & for smooth muscle in blood vessel”
 - Have processes
 - Share the basal lamina of the endothelial cells

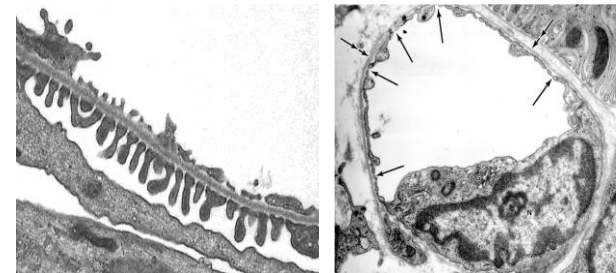
□ **Types:**

- (1) **Continuous blood capillaries**
- (2) **Fenestrated blood capillaries**
 - (2A) With diaphragm
 - (2B) Without diaphragm

*Diaphragm allow the substance to pass in one direction
- (3) **Sinusoidal blood capillaries**



(1)



(2A)

(2A)



	Continuous blood capillaries	Fenestrated blood capillaries	Sinusoidal blood capillaries
Distribution	In muscles, nervous tissue, C.T.	<p>(with diaphragm): In intestine, pancreas and endocrine glands</p> <p>(without diaphragm): In renal glomerulus (only one structure)</p>	Red bone marrow, liver, spleen and certain endocrine glands *Diameter: irregular (30-40 μm).
Microscopic structure	No <u>pores</u> or <u>fenestrae</u> in their walls	<p>(with diaphragm):</p> <ul style="list-style-type: none"> The walls of their endothelial cells have pores (fenestrae). These pores are covered by diaphragm. <p>(without diaphragm):</p> <ul style="list-style-type: none"> The walls of their endothelial cells have pores (fenestrae). These pores are NOT covered by diaphragm. 	<ul style="list-style-type: none"> Their endothelial cells have “large” fenestrae without diaphragms. They possess discontinuous endothelial cells. They possess discontinuous basal lamina. Macrophages may be <u>located</u> in or along the <u>outside</u> of the <u>endothelial wall</u>.
Pic.	<p>a Continuous capillary</p>	<p>b Fenestrated capillary</p>	<p>c Sinusoid</p>



➤ **QUESTIONS:**

Q1: What is the thickest layer of blood vessel?

- A) Tunica intima (interna) B) Tunica media C) Tunica adventitia D) Tunica (externa)

Q2: What is the innermost layer of blood vessel?

- A) Tunica intima (interna) B) Tunica media C) Tunica adventitia D) Tunica (externa)

Q3: What is the function of external elastic arteries?

- A) Separating T. media from T. adventitia B) Collecting T. intima from T. adventitia
C) Separating T. intima from T. adventitia D) Collecting T. media from T. adventitia

Q4: What is the type of epithelial cells the tunica Interna composed of?

- A) stratified squamous epithelium B) Simple cuboidal epithelium
C) Simple columnar epithelium D) Simple squamous epithelium

Q5: Where can we find the external elastic arteries?

- A) Large muscular vein B) Small muscular artery C) Large muscular artery D) Elastic artery

C -5
D -4
A -3
A -2
B -1

Q6: What is Vasa vasorum?

- A) Small arterioles in tunica adventitia
- B) Small arterioles in tunica intima
- C) Small venioles in tunica adventitia
- D) Small arterioles in tunica media

Q7: Describe the internal elastic lamina under microscope in T. intima in elastic & muscular arteries?

- A) Prominent “elastic”, NOT prominent “muscular”
- B) Prominent in both
- C) Not prominent “elastic”, prominent “muscular”
- D) Not Prominent in both

Q8: What is another name for collagen (type III)?

- A) Collagen fiber
- B) Elastic fiber
- C) Reticular fiber
- D) Smooth muscle cell

Q9: Ulnar artery is example of?

- A) Arterioles
- B) Elastic artery
- C) Muscular artery
- D) both A&C

Q10: What is the main component structure of tunica media in muscular artery?

- A) Collagen fiber
- B) Elastic fiber
- C) Reticular fiber
- D) Smooth muscle cell

D -01
C -6
C -8
C -7
A -9



Q11: In medium-sized vein: valves usually forms?

- A) Tunica intima (interna) B) Tunica media C) Tunica adventitia D) Tunica (externa)

Q12: In medium-sized vein: fewer Smooth muscle cell find in?

- A) Tunica intima (interna) B) Tunica media C) Tunica adventitia D) Tunica (externa)

Q13: Valve of a vein is composed of?

- A) 2 leaflets B) 3 leaflets C) 4 leaflets D) 6 leaflets

Q14: What is the type of the capillaries that find in the **spleen**?

- A) Fenestrated blood capillaries with diaphragm B) Sinusoidal blood capillaries
C) Fenestrated blood capillaries without diaphragm D) Continuous blood capillaries

Q15: Under microscope, when we can see **macrophage** outside the endothelial wall?

- A) Fenestrated blood capillaries with diaphragm B) Sinusoidal blood capillaries
C) Fenestrated blood capillaries without diaphragm D) Continuous blood capillaries

15-B
14-B
13-A
12-B
11-A



Q16: If the capillary without pores or fenestrae in their wall, That means the capillary?

- A) Fenestrated blood capillaries with diaphragm
- B) Sinusoidal blood capillaries
- C) Fenestrated blood capillaries without diaphragm
- D) Continuous blood capillaries

Q17: Describe Fenestrated blood capillaries with & without diaphragm under microscope?

- A) The walls of their endothelial cells have pores
- B) find in pancreas
- C) Some pores are covered by diaphragm
- D) both A&C

Q18: Components of the valves of the veins are?

- A) Endothelium
- B) Core of C.T.
- C) Endothelium + core of C.T.
- D) None of them

Q19: Which of them structure surrounding the external surface of the epithelial cells?

- A) leaflets
- B) Elastic fiber
- C) Pericytes
- D) Basal lamina

Q20: Distribution of Fenestrated blood capillaries without diaphragm?

- A) Endocrine glands
- B) Nervous tissue
- C) renal glomerulus
- D) Red bone marrow

C -02
D -61
C -81
D -71
D -91



" سنين الجهد إن طالت ستطوى .. لها أمدٌ وللأمد إنتضاءٌ
لنا بالله آمال وسلوى .. وعند الله ما خاب الرجاء "

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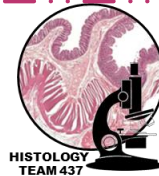
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