



MED441
KING SAUD UNIVERSITY



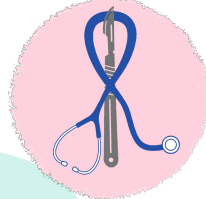
Histology team

Cardiovascular Block | Histology

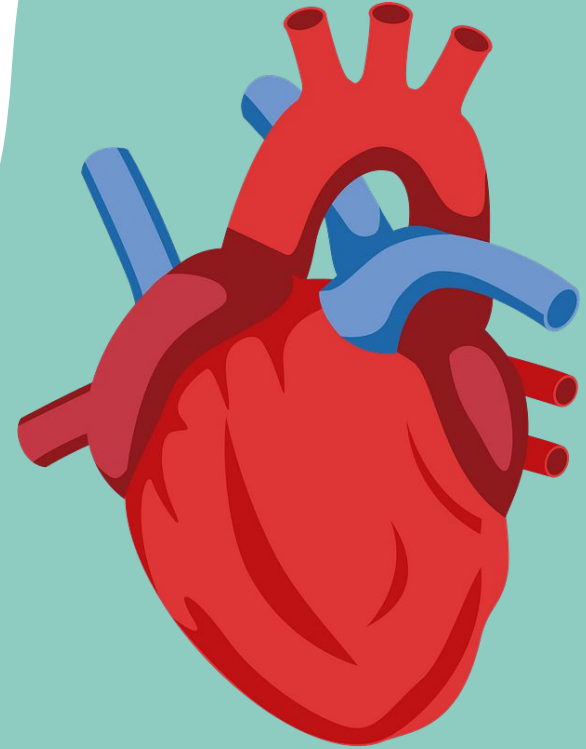
Histology of The Blood Vessels

- Color index :
Main text
Important
Female slide
Male slide
DR.Notes
extra

Revised & Reviewed
by:
Abdulaziz & Bahammam
Faye Wael Sendi



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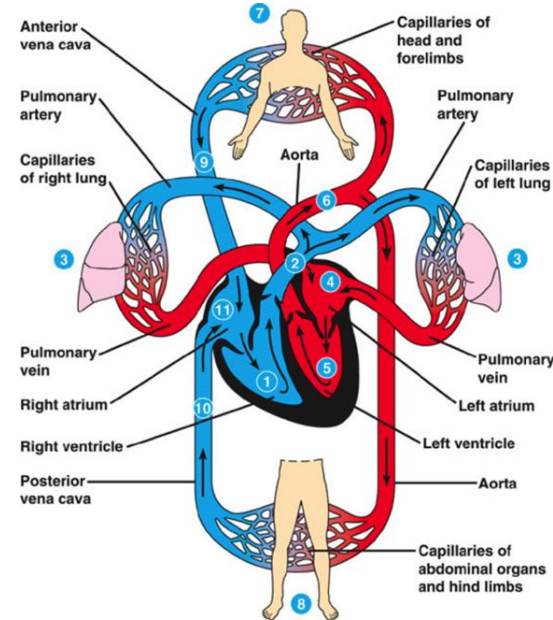


Helpful video

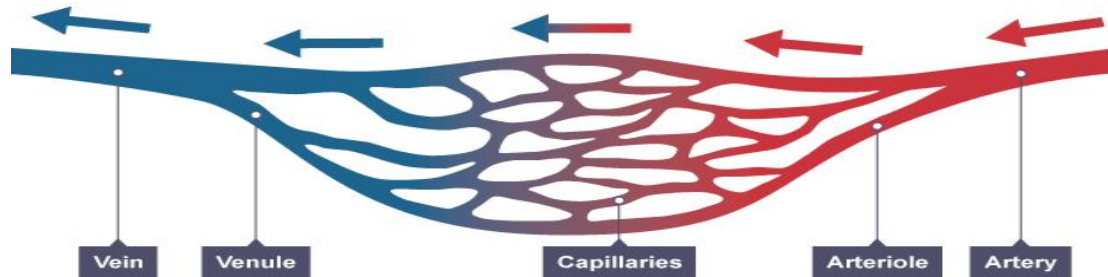
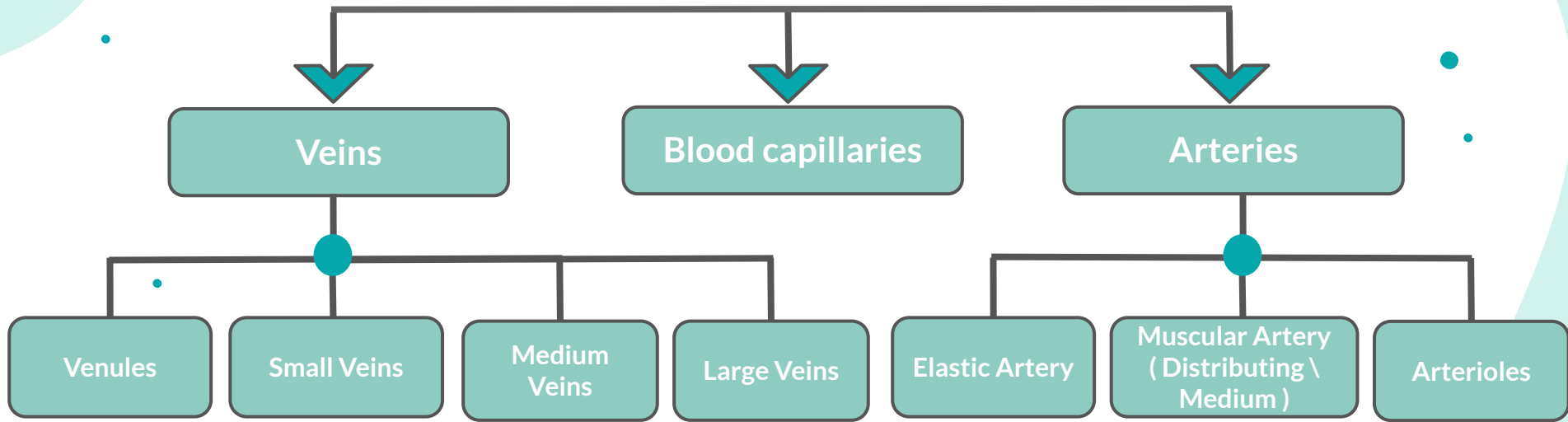
Objectives :

By the end of this 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



General Structure of Blood Vessels

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

Tunica intima (Interna):

Innermost layer Composed of:

- **Endothelial cells:** Simple squamous epithelium
- **Subendothelial layer:** Loose C.T.
- **Internal elastic lamina:** fenestrated elastic sheet.

Tunica media:

Intermediate layer Composed of:

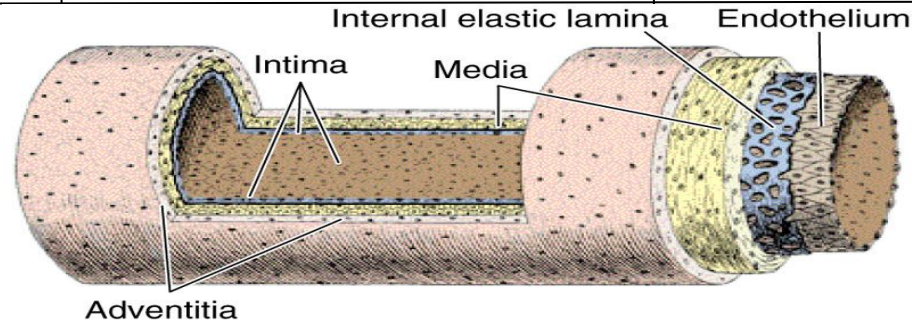
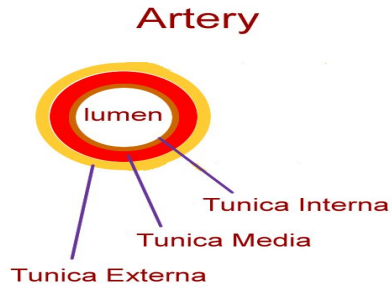
- **Smooth muscles:** Helically arranged
- **Elastic fibers.**
- **Type III collagen** (reticular fibers).
- **Type I collagen**

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

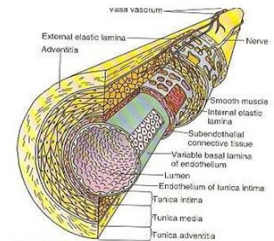
Tunica adventitia (Externa)

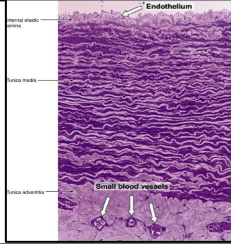
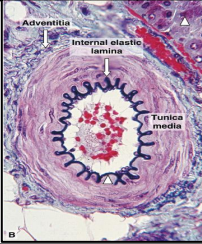
Outermost layer Composed of:
C.T containing **Vasa vasorum**, which are:

- **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.



Layers of the wall of Blood Vessels



Microscopic Structure	Elastic Arteries	Muscular Arteries (Medium-Sized Arteries)
T. Intima	<ul style="list-style-type: none"> ● Endothelium ● Subendothelial C.T ● Internal elastic lamina: <ul style="list-style-type: none"> ○ Not prominent ○ Indistinct 	<ul style="list-style-type: none"> ● Endothelium ● Subendothelial C.T ● Internal elastic lamina: <ul style="list-style-type: none"> ○ Prominent ○ Display an undulating surface 
T. Media (T.M):	<ul style="list-style-type: none"> ● Fenestrated Elastic: (The Main component) Membranes (sheets or lamellae) ● In between, there are: <ul style="list-style-type: none"> ○ Smooth muscle cells. ○ Type III collagen fibers (Reticular fibers) ○ Type I collagen fibers ○ Elastic fibers. 	<ul style="list-style-type: none"> ● Smooth muscle cells (SMCs): (The Main component) Thicker than T. Adventitia or similar in thickness ● In between there are: <ul style="list-style-type: none"> ○ Elastic fibers. ○ Type III collagen fibers (Reticular fibers) ○ Type I collagen fibers ○ External elastic lamina: may be <u>identifiable</u>
T. Adventitia (T.A)	<ul style="list-style-type: none"> ● Thinner than T.M. ● Composed of Loose C.T ● Contains Vasa Vasorum → Send branches to the outer part of T.M 	<ul style="list-style-type: none"> ● Composed of Loose C.T
Examples of Arteries	Aorta \ Common Carotid \ Subclavian Common iliac \ Pulmonary Trunk	Brachial \ Ulnar \ Renal

MEDIUM-SIZED VEIN

Their wall is **thinner** than the accompanying artery

T.Intema

- Usually forms **valves**
- **No** internal elastic lamina

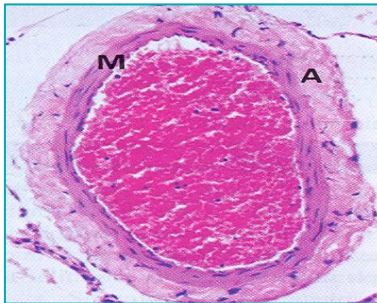
T. Media

Thinner than T. Adventitia

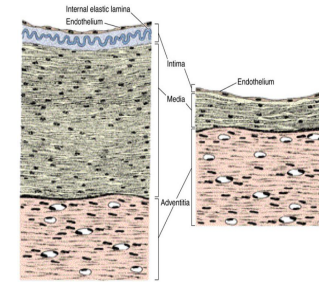
- Consists of:
 - Fewer SMCs
 - Type I & III collagen fibers

T. Adventitia

- (T. Adventitia **THICKER** than T. Media)



Medium-Sized artery and vein

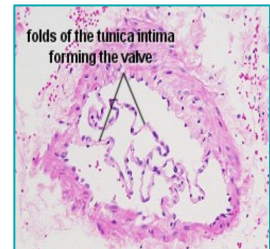


Valves of veins:

- Composed of **2 leaflets**.
- Each leaflet has a thin fold of the T. Intima.

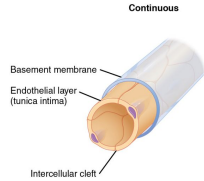
Components:

- Endothelium
- Core of C.T

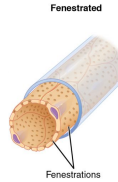


Blood Capillaries

Types



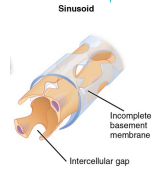
Continuous blood capillaries



Fenestrated blood capillaries

With diaphragms

Without diaphragms



Sinusoidal blood capillaries

Microscopic structure

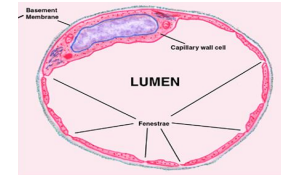
Diameter: usually 8-10 μm .

Single layer of squamous endothelial cells

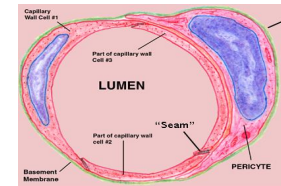
Basal lamina: Surrounds the the external surface of the endothelial cells

Pericytes:

- Have processes.
- Share the basal lamina of the endothelial cells.
- Act as stem cells

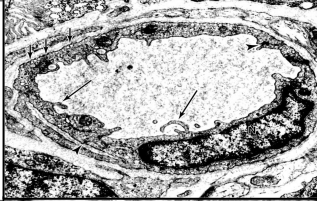
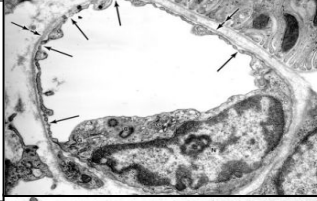
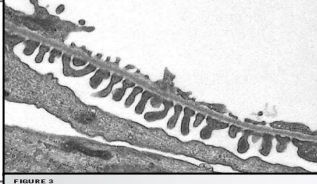
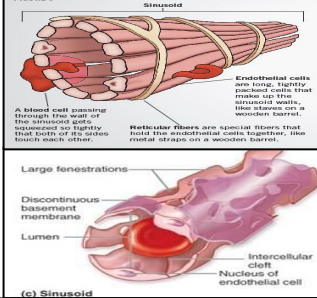


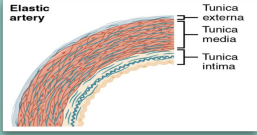
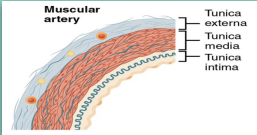
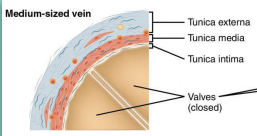
Fenestrated Capillary



Closed or Continuous Capillary

Blood capillaries

*BC= blood capillaries	Microscopic structure	<u>Distribution</u>	Pictures
Continuous BC	<ul style="list-style-type: none"> • No pores or fenestrae in their walls 	<ul style="list-style-type: none"> • Muscles • C.T • Nervous Tissue 	
Fenestrated BC <u>With</u> diaphragm	<ul style="list-style-type: none"> • The walls of their endothelial cells Have pores (Fenestrae) • Pores are Covered by diaphragm 	<ul style="list-style-type: none"> • Intestine • Pancreas • Endocrine glands 	
Fenestrated BC <u>Without</u> diaphragm	<ul style="list-style-type: none"> • The walls of their endothelial cells Have pores (Fenestrae) • Pores are NOT Covered by diaphragm 	<ul style="list-style-type: none"> • Renal Glomerulus 	
Sinusoidal Capillaries Diameter is irregular 30-40 μm	<ul style="list-style-type: none"> • Endothelial cells Have pores (Fenestrae) Without diaphragms • Possess discontinuous endothelial cells • Possess discontinuous basal lamina • Macrophages Located in\along the outside of endothelial wall 	<ul style="list-style-type: none"> • Red bone marrow • Liver • Spleen • Some Endocrine glands 	 <p>FIGURE 3</p> <p>Sinusoid</p> <p>Endothelial cells are long, tightly packed cells that make up the sinusoid wall. The fenestrae are a wooden barrel.</p> <p>A blood cell passing through the wall of the sinusoid gaps, contacted so tightly that both of its sides touch each other.</p> <p>Reticular fibers are special fibers that hold the endothelial cells together, the fenestrae on a wooden barrel.</p> <p>Large fenestrations</p> <p>Discontinuous basement membrane</p> <p>Lumen</p> <p>Intercellular cleft</p> <p>Nucleus of endothelial cell</p> <p>(c) Sinusoid</p>

	Tunica intima (interna)	Tunica media	Tunica adventitia (externa)
Elastic Arteries 	<ol style="list-style-type: none"> 1) Endothelium 2) Subendothelial C.T. 3) Internal elastic lamina (Not prominent) 	<ol style="list-style-type: none"> 1) Fenestrated Elastic Membranes 2) In between, there are: <ul style="list-style-type: none"> • Smooth muscle cells • Collagen fibers (Type I) • Reticular fibers (Type III) • Elastic Fibers 	<ul style="list-style-type: none"> • Much Thinner than T.Media. • Composed of loose • C.T. Contains vasa vasorum
Muscular Arteries 	<ol style="list-style-type: none"> 1) Endothelium 2) Subendothelial C.T. Layer 3) Internal Elastic Lamina (Prominent) 	<ul style="list-style-type: none"> • Thicker than T.Adventitia or similar in thickness 1) Smooth muscle cells 2) In between, there are: <ul style="list-style-type: none"> • Smooth muscle cells • Collagen fibers (Type I) • Reticular fibers (Type III) • External elastic lamina 	<ul style="list-style-type: none"> • Loose C.T.
Medium-sized Veins 	<ul style="list-style-type: none"> • Usually forms valves • No internal elastic lamina • Composed of 2 leaflets each leaflet has a thin fold of T.Intima Which contain: <ol style="list-style-type: none"> 1) Endothelium 2) Core of C.T. 	<ul style="list-style-type: none"> • Thinner than T.Adventitia 1) Smooth Muscle Cells (Fewer) 2) Type I & III Collagen Fibers 	<ul style="list-style-type: none"> • Thicker than T.Media

Summary

Blood Capillaries

1) Continuous Blood Capillaries

- No pores or fenestrae in their walls

-Found in: muscles, nervous tissue, connective tissue.

2) Fenestrated Blood Capillaries

A) Without Diaphragms

The walls of their endothelial cells have pores (fenestrae).

-Found in: renal glomerulus

B) With Diaphragms

The walls of their endothelial cells have pores (fenestrae) which are covered by a diaphragm

-Found in: Intestine, pancreas, endocrine glands

3) Sinusoidal Blood Capillaries

- Their endothelial cells have fenestrae without diaphragms and they possess both discontinuous endothelial cells and basal lamina.

-Found in: red bone marrow, liver, spleen, Certain endocrine glands

The Creative Crew!

Cardiovascular Block | Histology Team (441)



Boys Captain

Alwaleed Alnasser



Girls Captain

Norah Alawlah



The Crew



- Abdullah Alqarni
- Mohammed Almousa
- Abdulmajeed Alharbi
- Mansor Aldaijy

- Lubna Altamimi
- Fay Alluhaidan
- Iyah Alhasan
- Dania Alhudaithi

Click [here](#) for questions done by Q Bank team