LEARNING OBJECTIVES

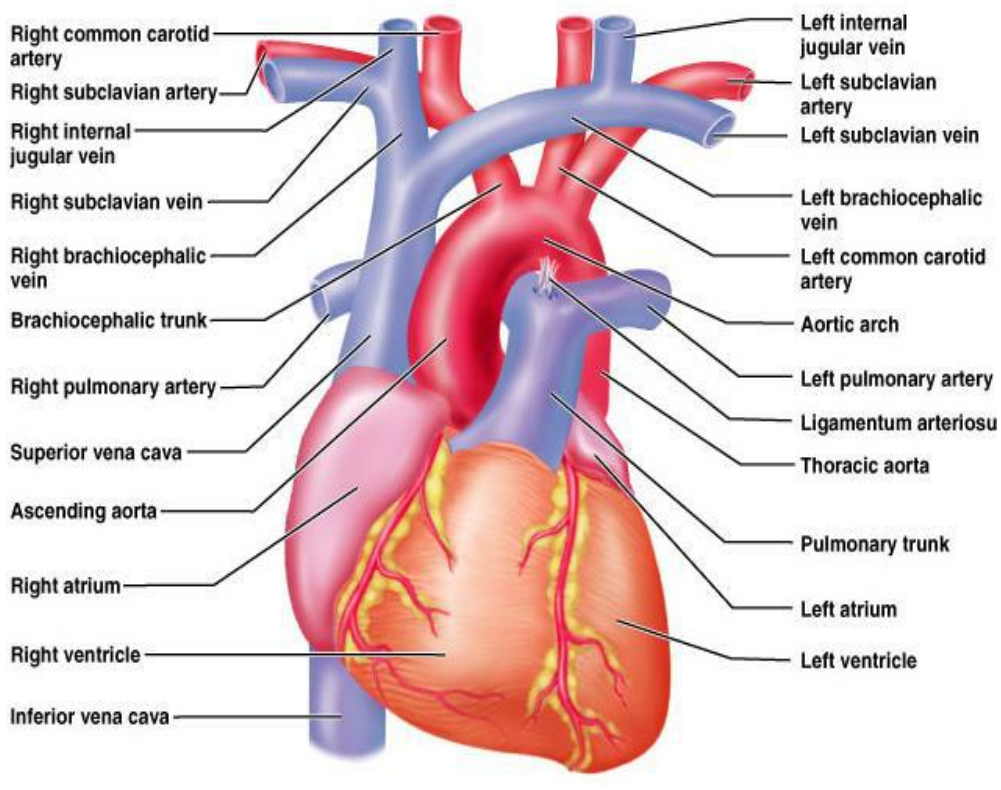
1. To study the structure of blood and lymphatic vessels.
2. To co-relate histology of these structure with their functions.
3. To identify various types of blood vessels in a given slide.

CIRCULATORY SYSTEM

Heart
Blood vessels

Two separate loops:

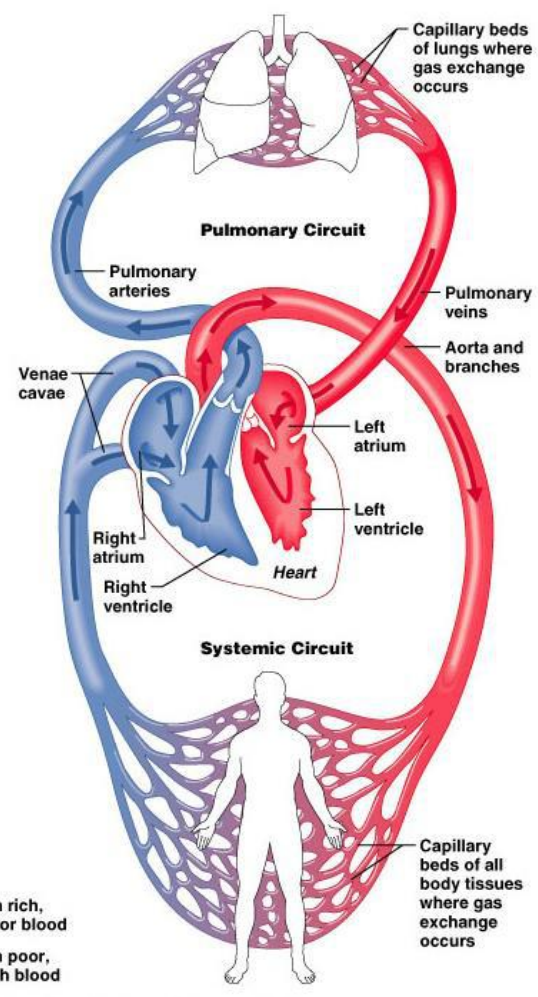
1. Pulmonary Circuit
2. Systemic Circuit



3 MAJOR BLOOD VESSELS

- Arteries- arterioles
- Capillaries
- Veins - venules

Arteries carry blood ***away*** from the heart
Veins carry blood ***towards*** the heart

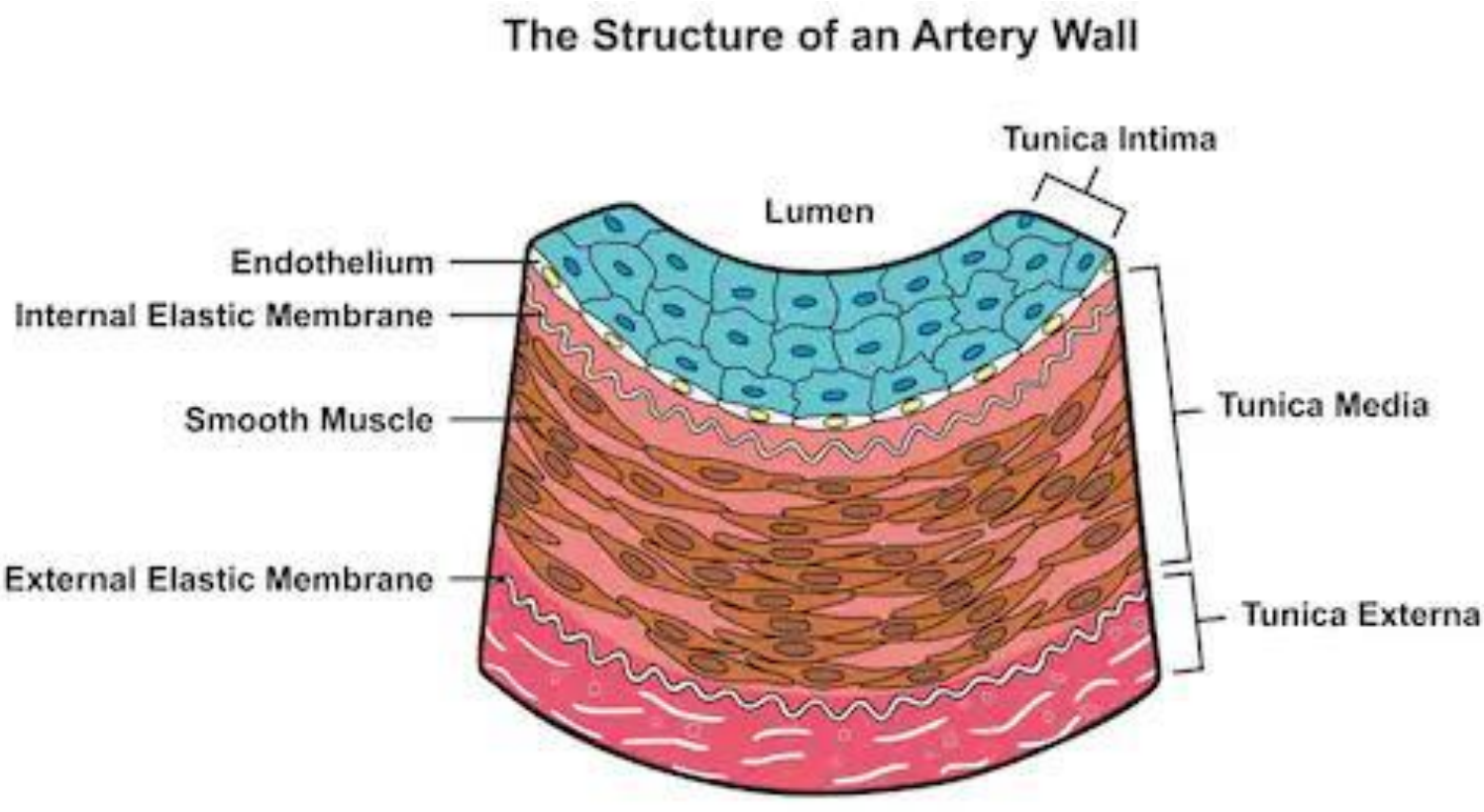


GENERAL STRUCTURE OF VESSELS

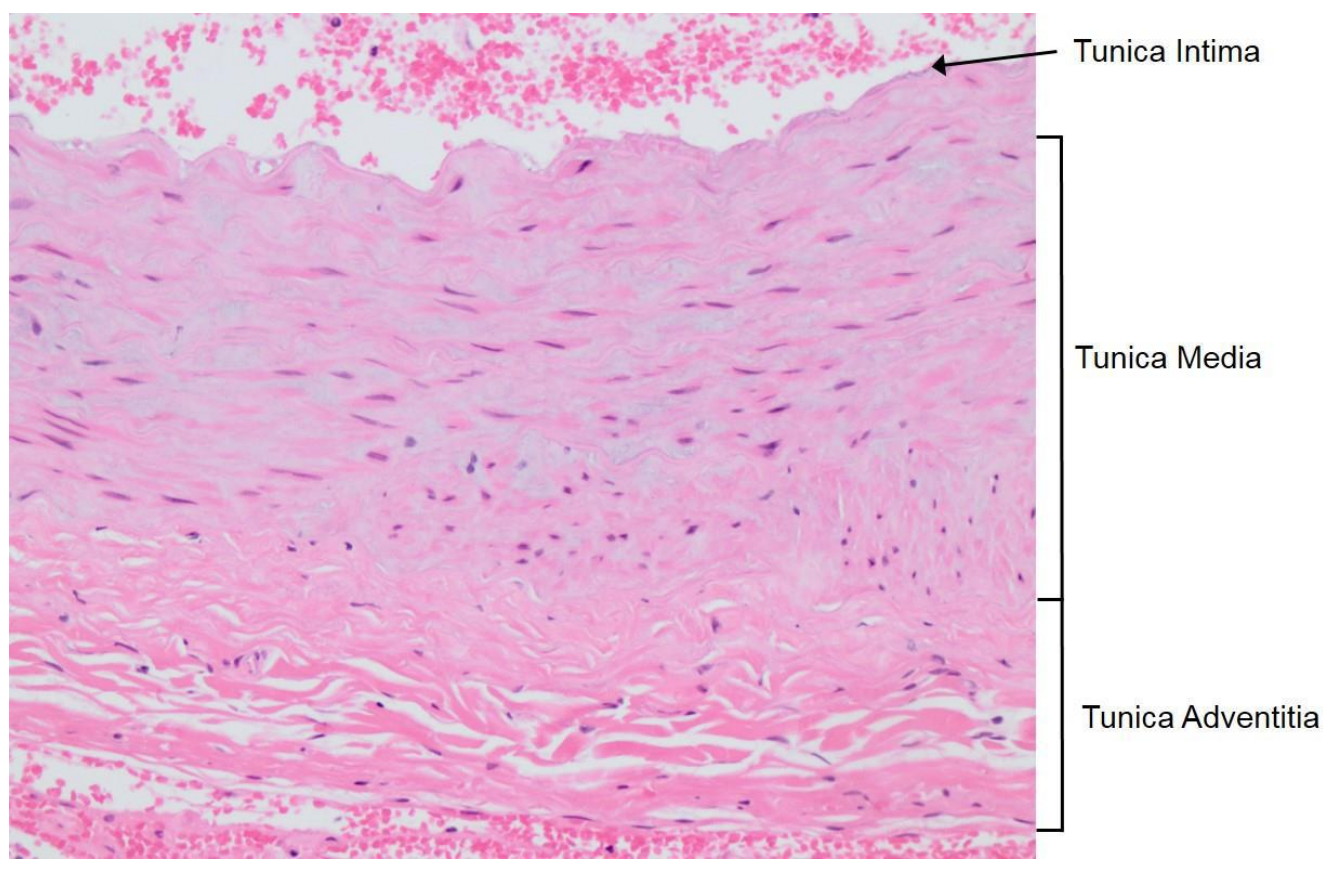
Three layers

1. Tunica intima - intima
2. Tunica media – smooth muscle
3. Tunica externa - adventitia

GENERAL STRUCTURE OF VESSELS

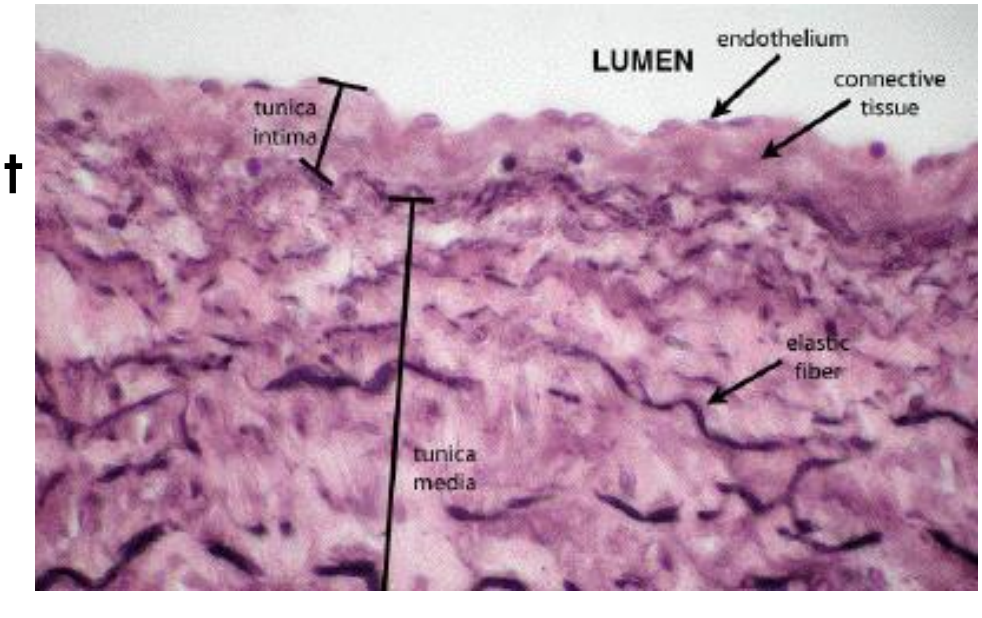


3 TUNICAE



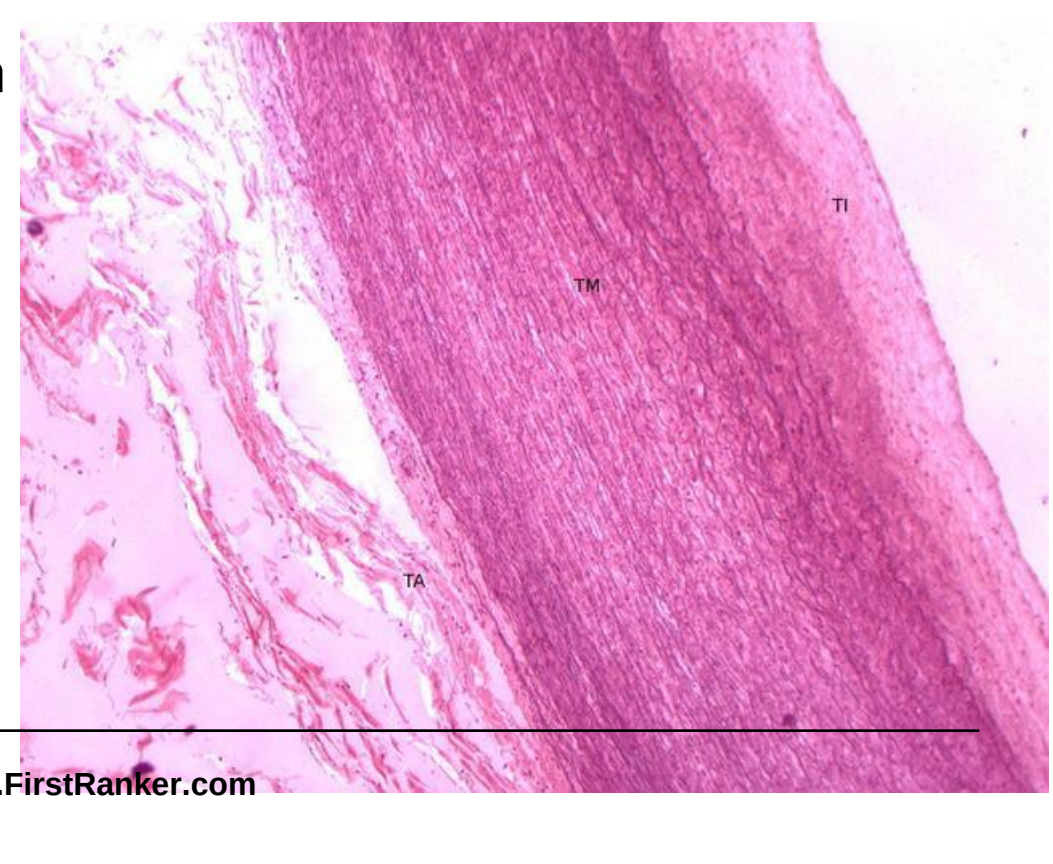
TUNICA INTIMA

- Endothelium
  - Mechanical support
  - Channels
  - Tight junctions, gap junctions
- Basal lamina
- Subendothelial connective tissue
- Internal elastic lamina



TUNICA MEDIA

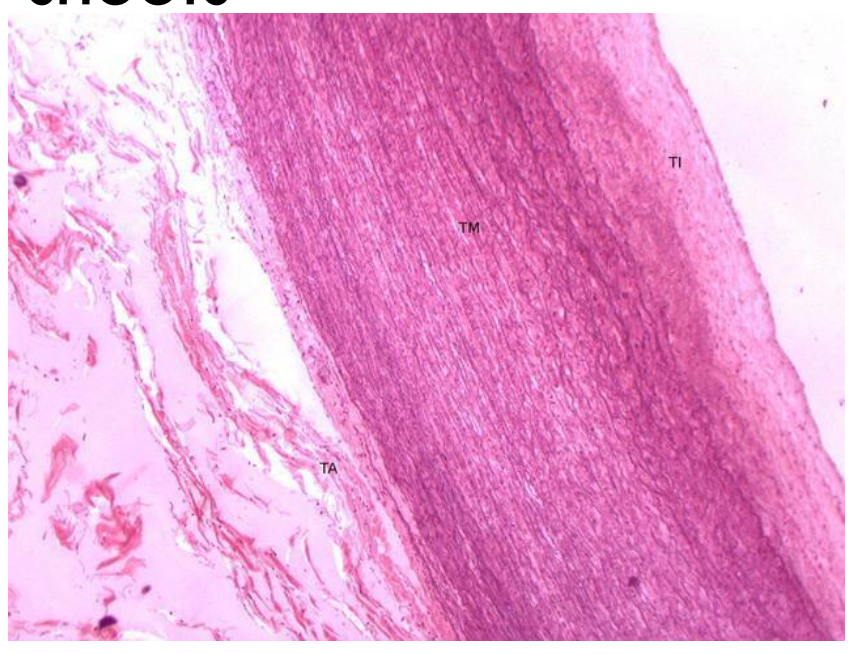
- Smooth muscle
- Circumferential smooth
- Some connective tissue
- External elastic lamina



TUNICA ADVENTITIA

Connective tissue fibres- collagen type ?

Elastic fibres- fenestrated sheets



ARTERIES

Specialisation

- pressure generated during systole
- regulation of blood supply to the target tissues of the arteries.

Elastic arteries

Muscular arteries

ELASTIC ARTERIES

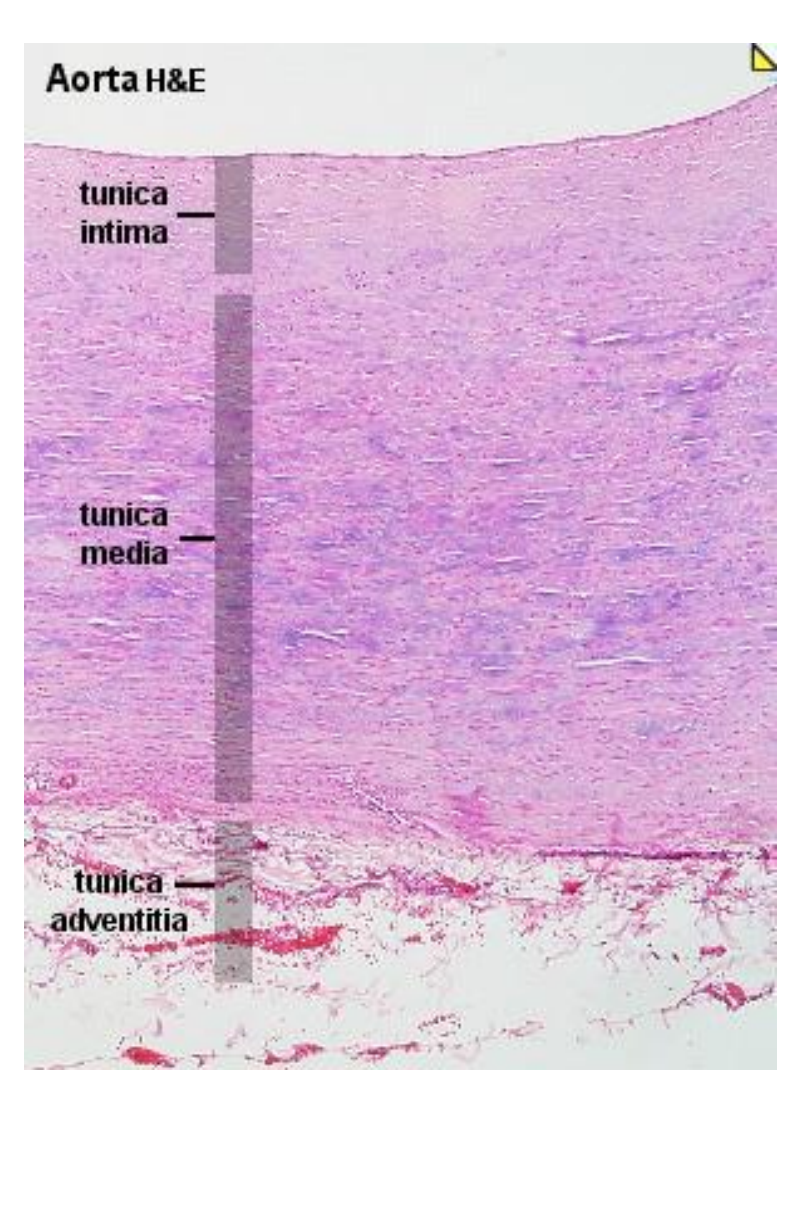
- Expand
- Recoil- additional force
- Propagates blood
- Dampens pressure
- Eg. Aorta and its branches

MUSCULAR ARTERY

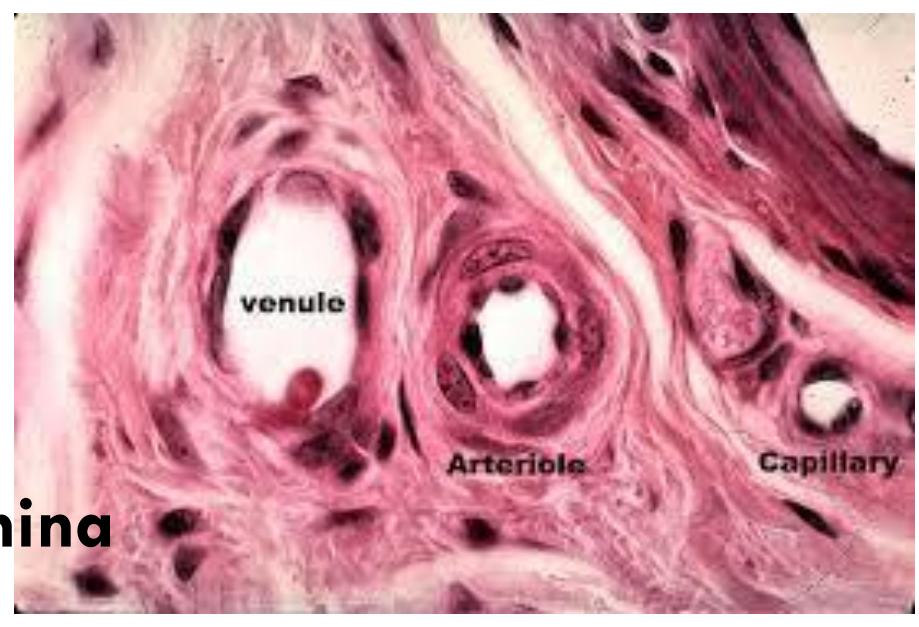
- Change in diameter and
- Regulate flow to organs
- Internal and external

elastic lamina clearly seen

Eg. Coronary artery



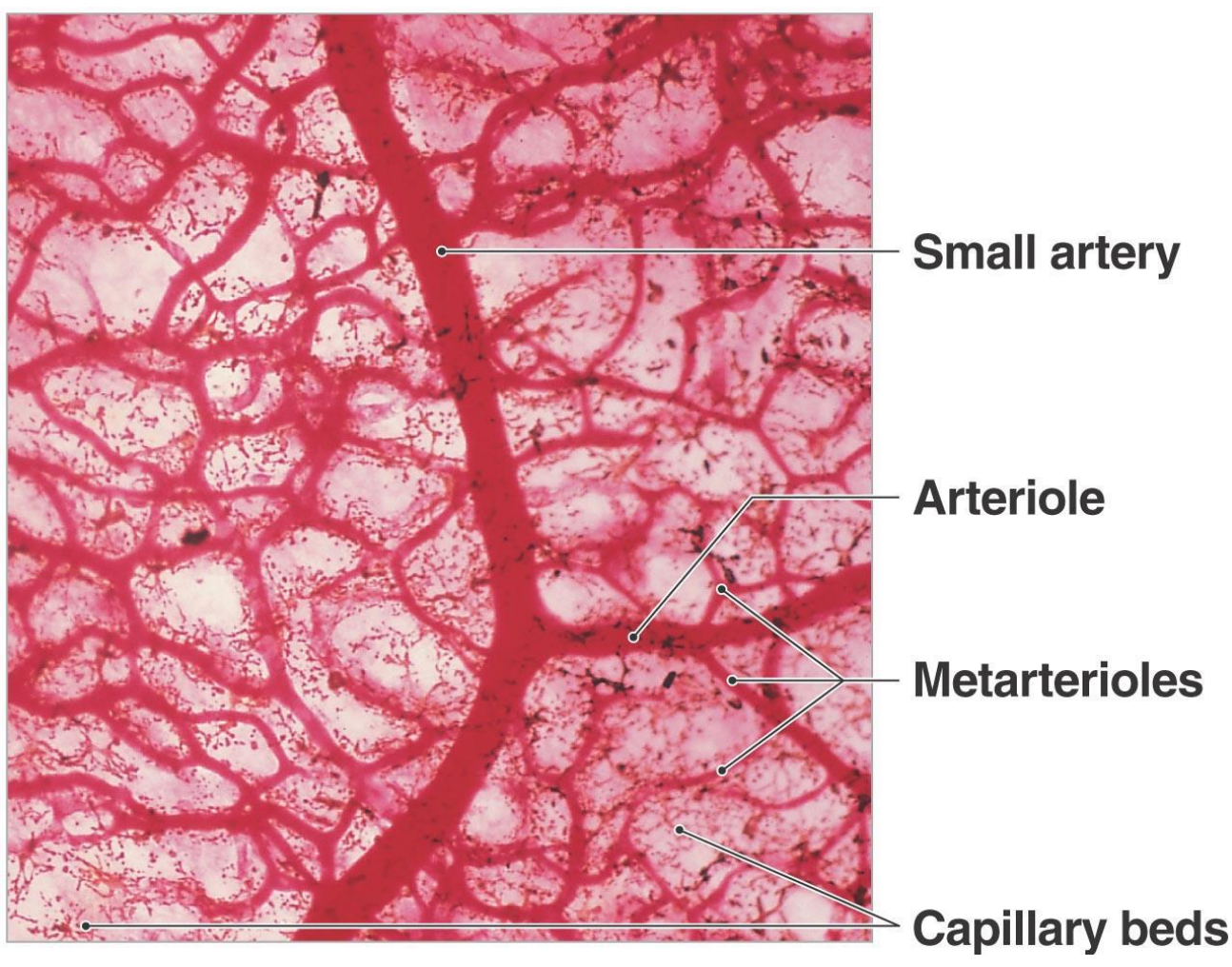
ARTERIOLES



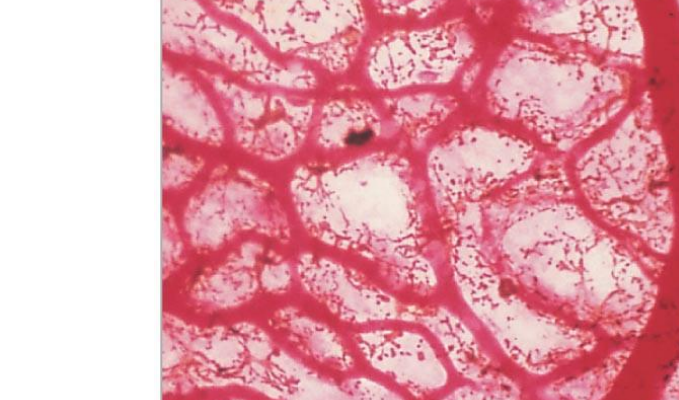
- 100 micron diameter
- **No internal elastic lamina**

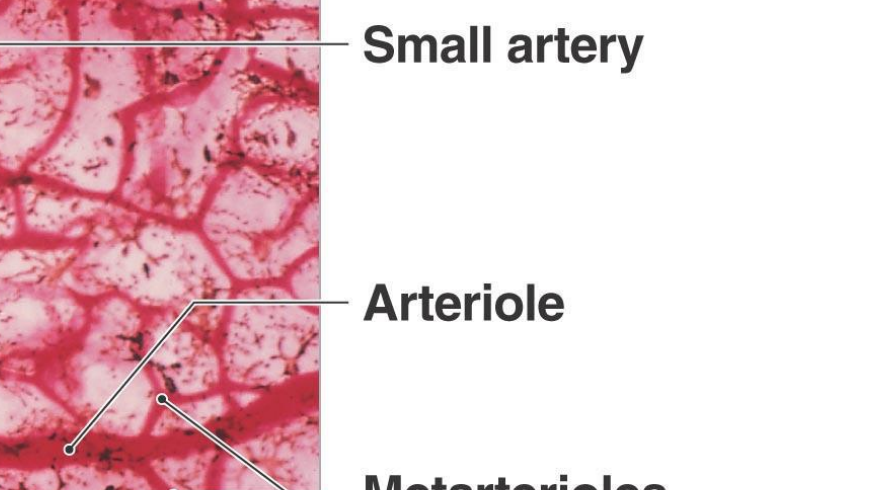
- Terminal arterioles- less than 50 micron -12 micron
  - meta-arterioles (precapillary sphincter)
    - capillaries

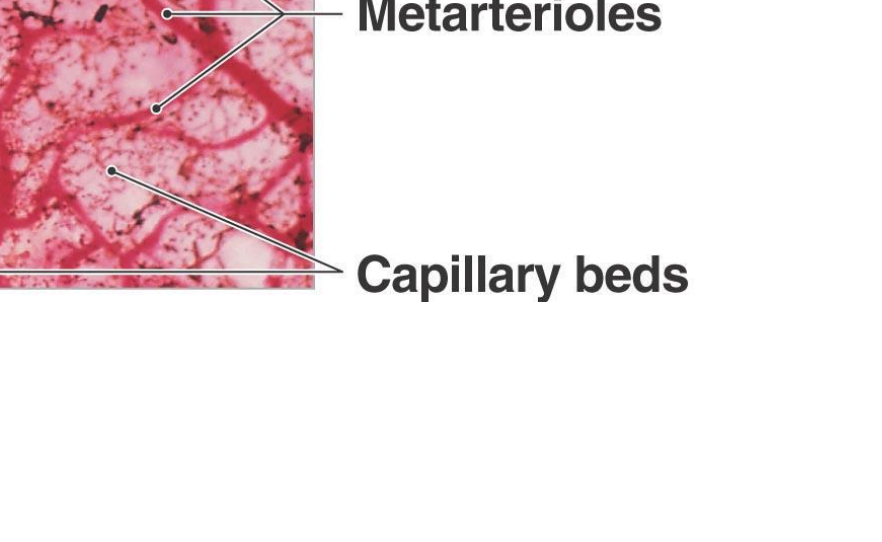
CAPILLARY BED



IDENTIFY







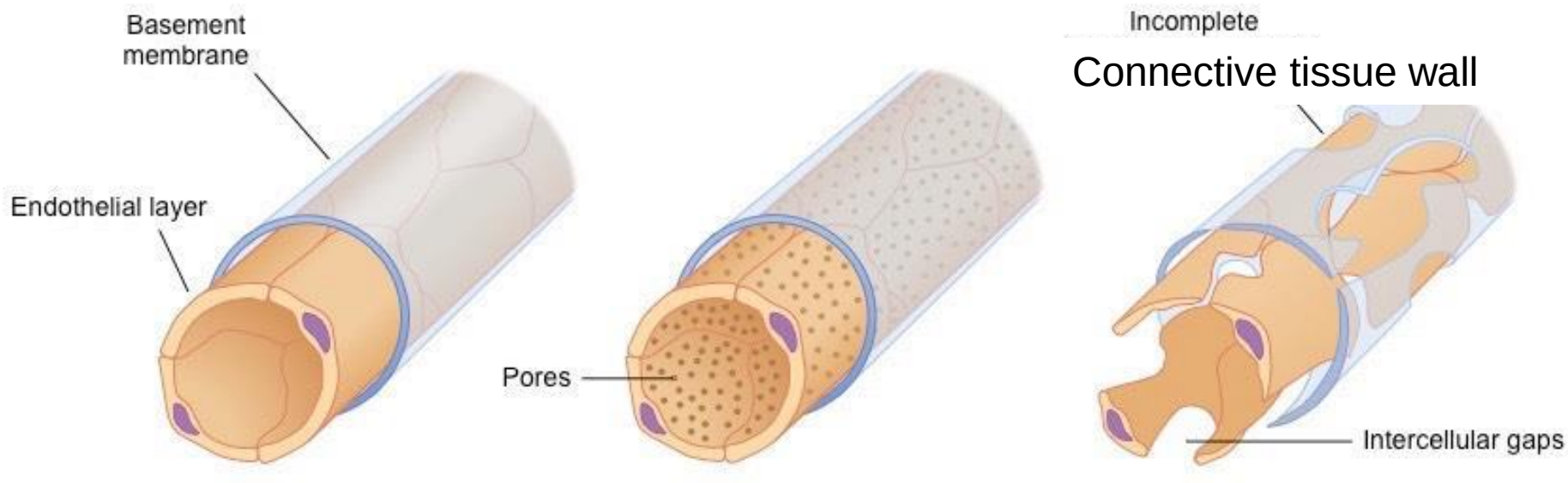
CAPILLARIES

- 8 micron
- Universal function
  - Oxygen and nutrient delivery
  - CO2 and nitrogenous waste removal

  - Single layer of endothelial cells
  - surrounded by basal lamina

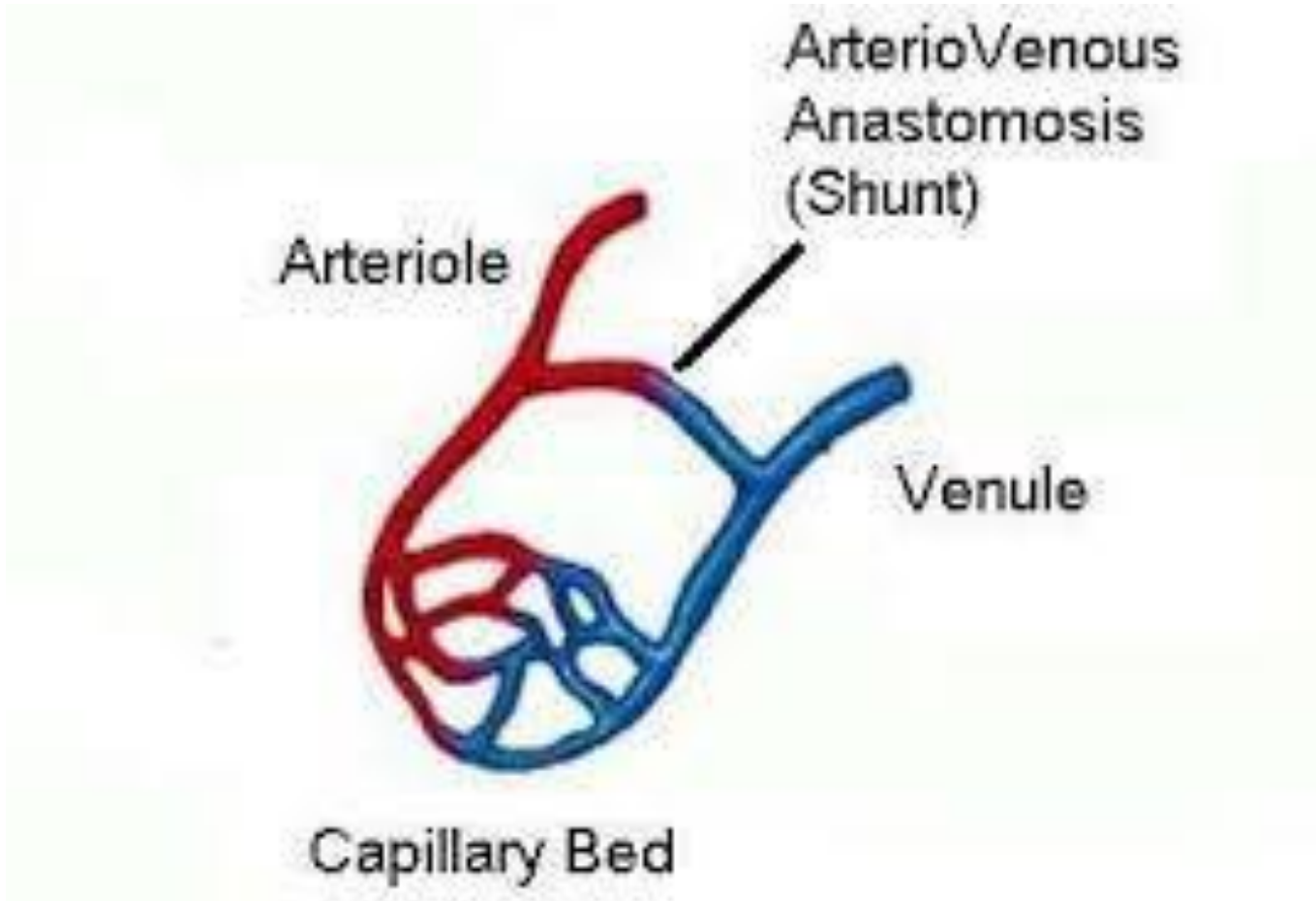
  - Pericytes

CAPILLARIES



Continuous	Fenestrated	Sinusoid
Skin	Renal glomeruli	Spleen
Connective tissue	Intestinal villi	Liver
Muscle	Endocrine glands	Adrenal cortex
Lung	pancreas	Hypophysis
Brain		Parathyroid gland

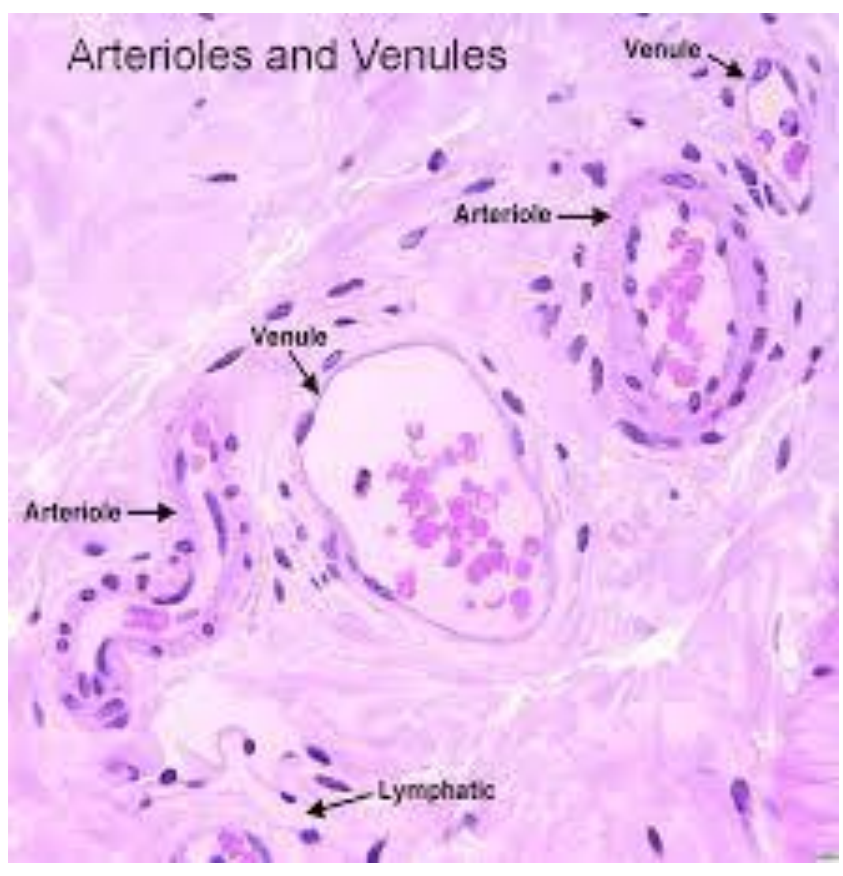
ARTERIOVENOUS ANASTOMOSIS



VENULES

- 20-30 micron
- Endothelium
- Basal lamina
- Thin adventitia

- Permeable wall



VEINS

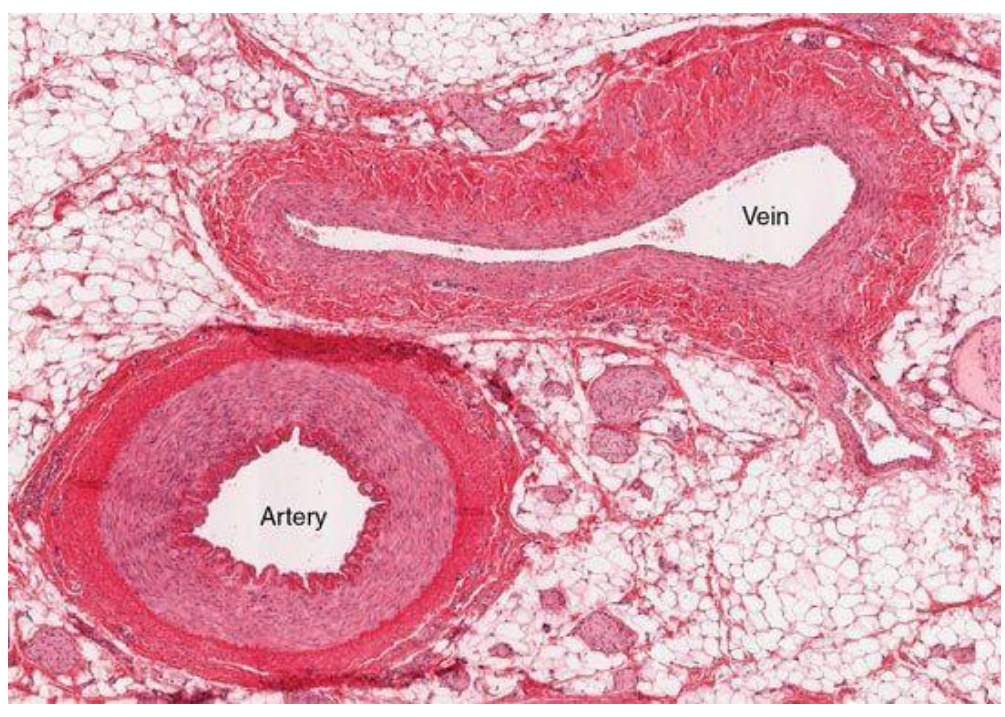
Veins are larger than arteries

Thin walled

More collagen in tunica media

Less elastic tissue

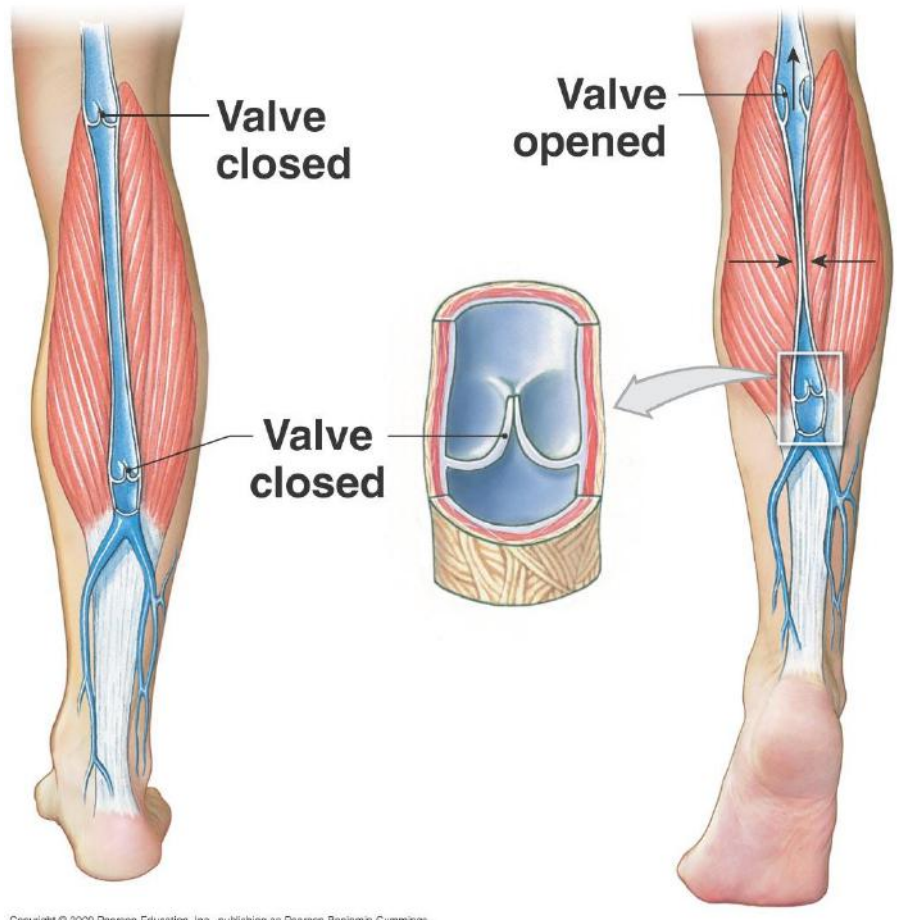
Tunica adventitia thicker than tunica media



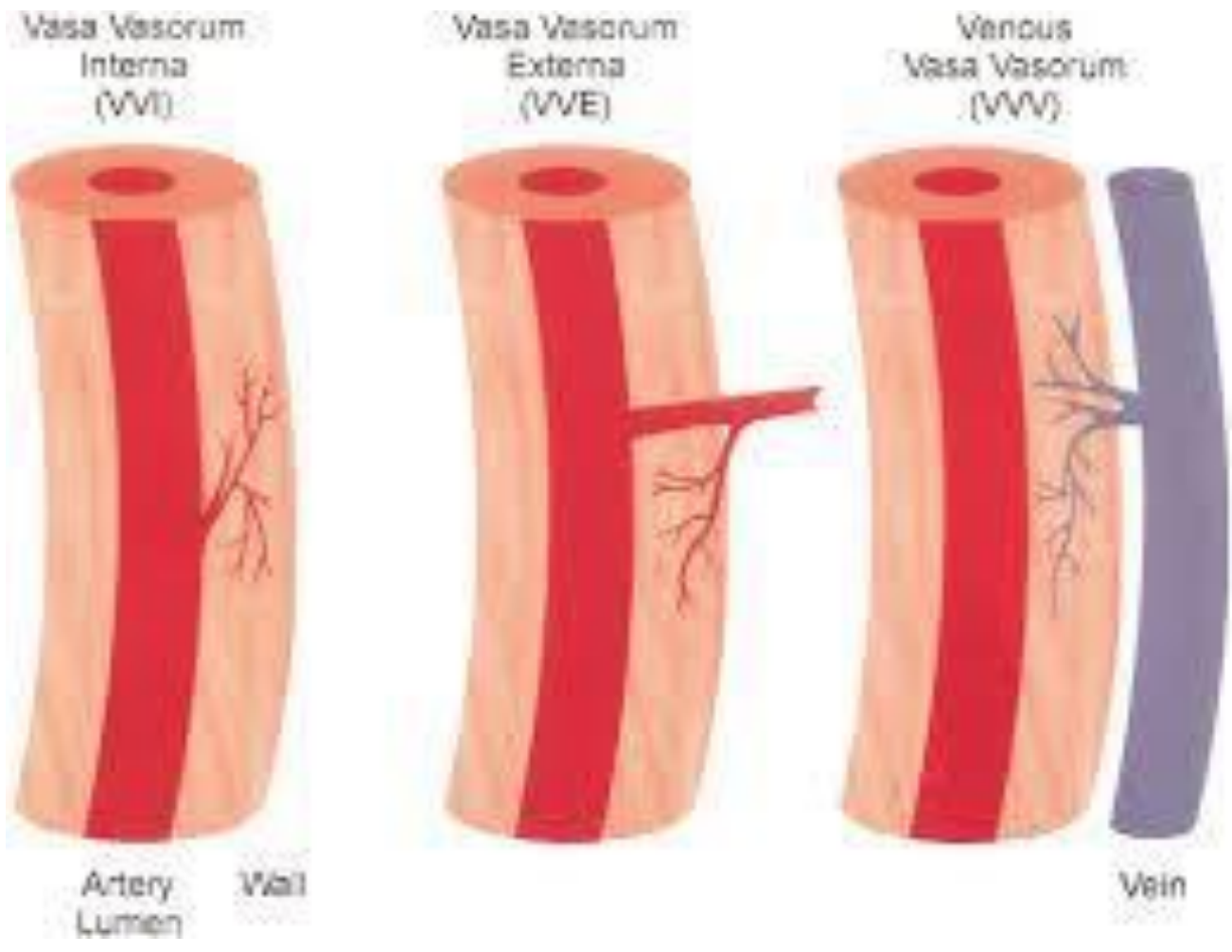
VALVES

- Allow glow towards heart
- Prevent backflow
- Most abundant in legs

- Muscular contraction helps



VASA VASORUM



SOME DISEASES

Atherosclerotic cardiovascular disease

- Cerebrovascular disease – affects brain, strokes
- Coronary artery disease (CAD) – arteries of heart
- Peripheral vascular disease (PVD) – arterial

Affecting veins

- Chronic venous insufficiency
- Deep venous thrombosis (DVT)

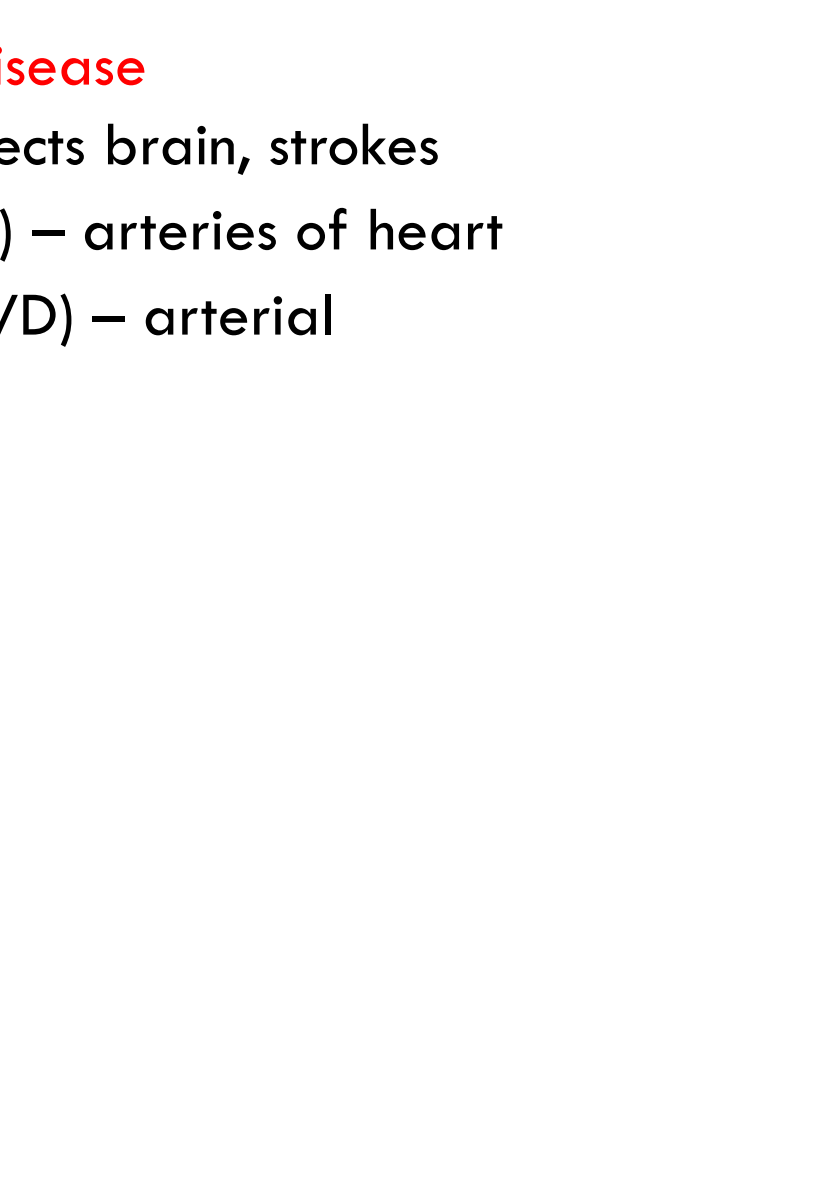
Aneurysms

Portal hypertension

Hypertension

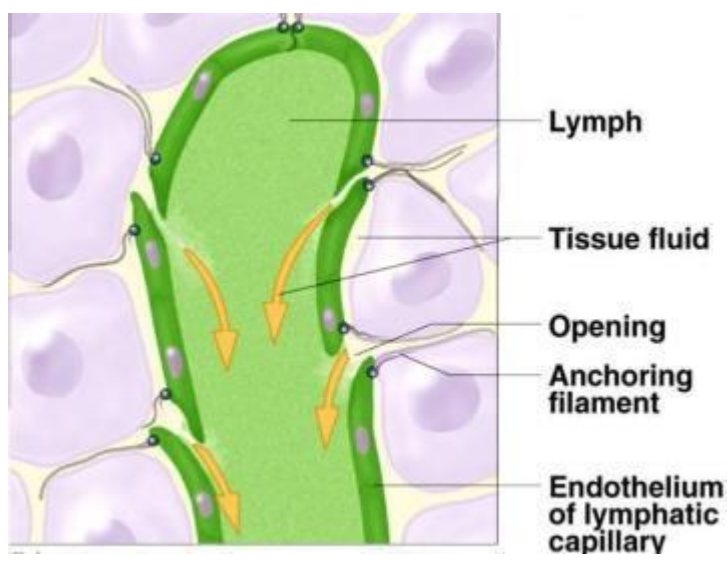
LYMPHATIC SYSTEM

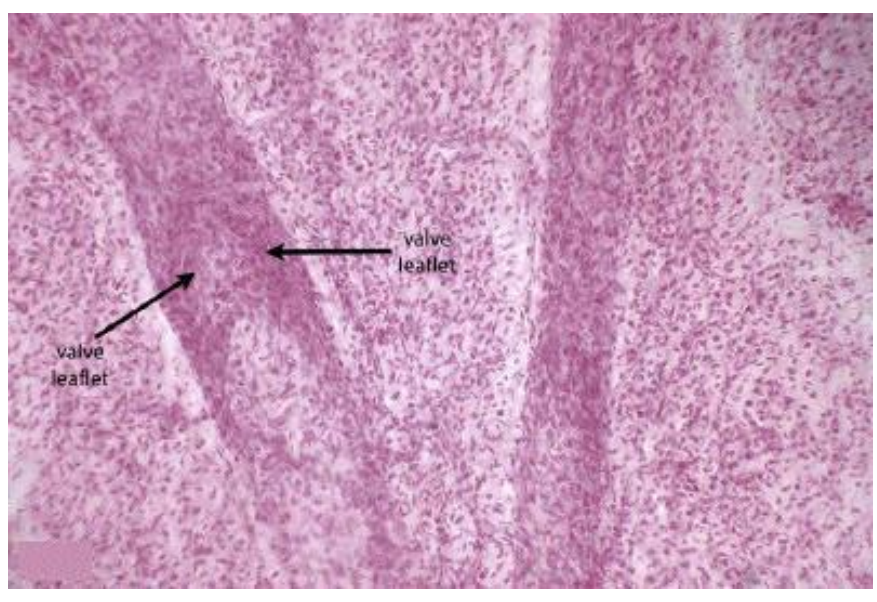
- One way system: to the heart
- Return excess tissue fluid and leaked proteins
- "Lymph" is this fluid
- Edema results if system blocked or surgically removed



LYMPH CAPILLARIES

- Greater permeability
- Endothelium
- Basal Lamina Absent
- No pericytes
- No connective tissue
- Absent in avascular tissues





LYMPHATIC VESSELS

- Similar to blood vessels (3 layers), but thin & delicate
- Superficial - skin with superficial veins
- Deep - trunk and digestive viscera with deep arteries
- Very low pressure
- Drain into lymph nodes