HISTOLOGY OF THE CARDIOVASCULAR SYSTEM

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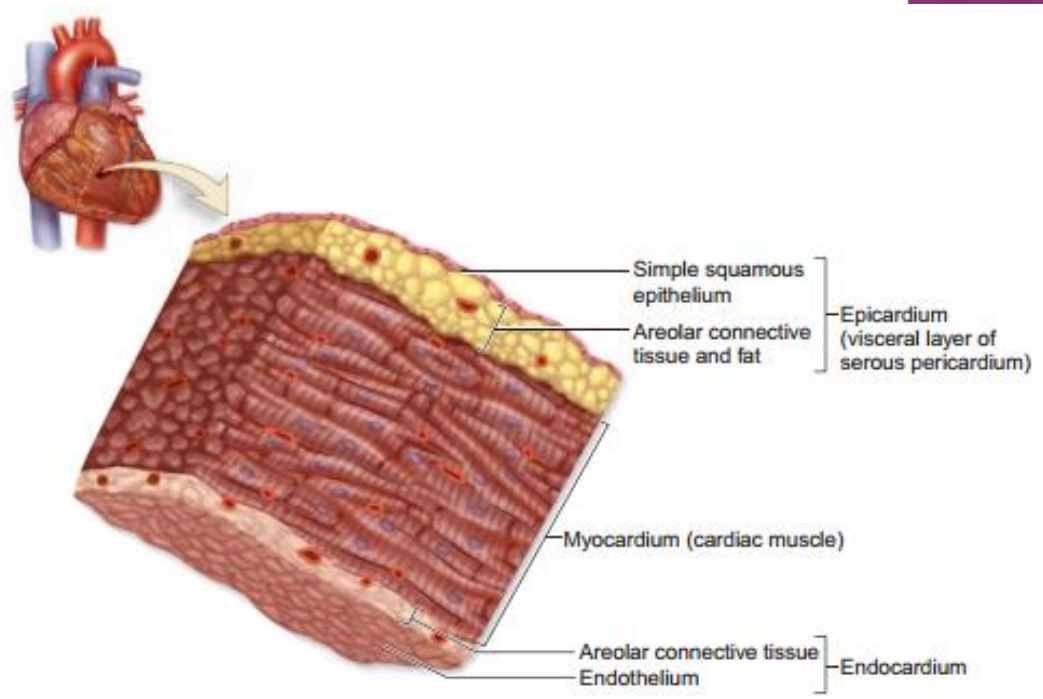
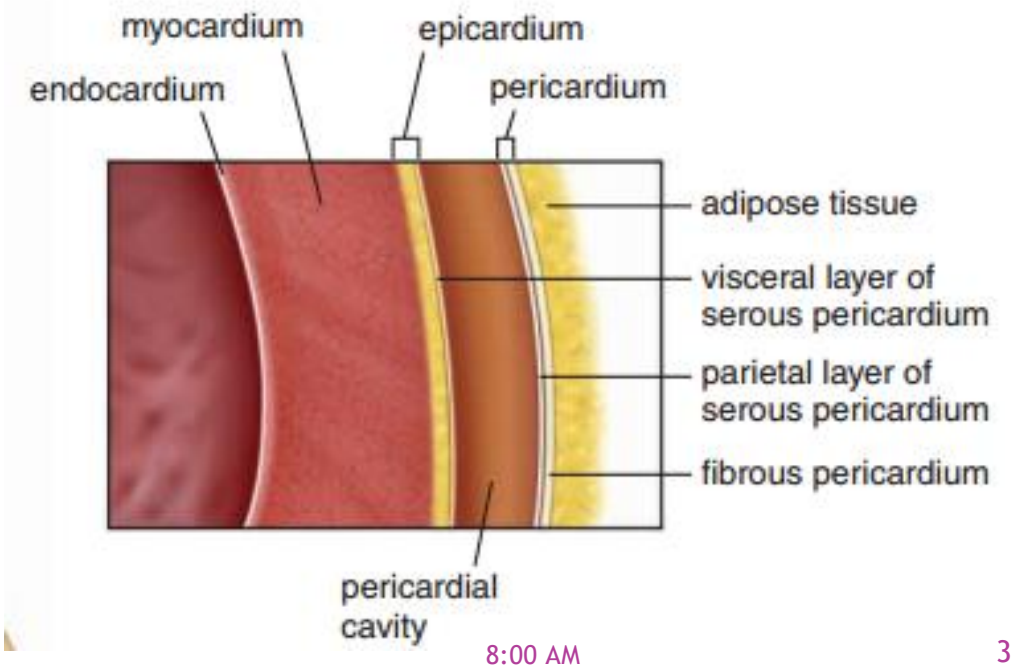
HEART

- The wall of the heart is composed of three layers:
  - Epicardium,
  - Myocardium, and
  - Endocardium.



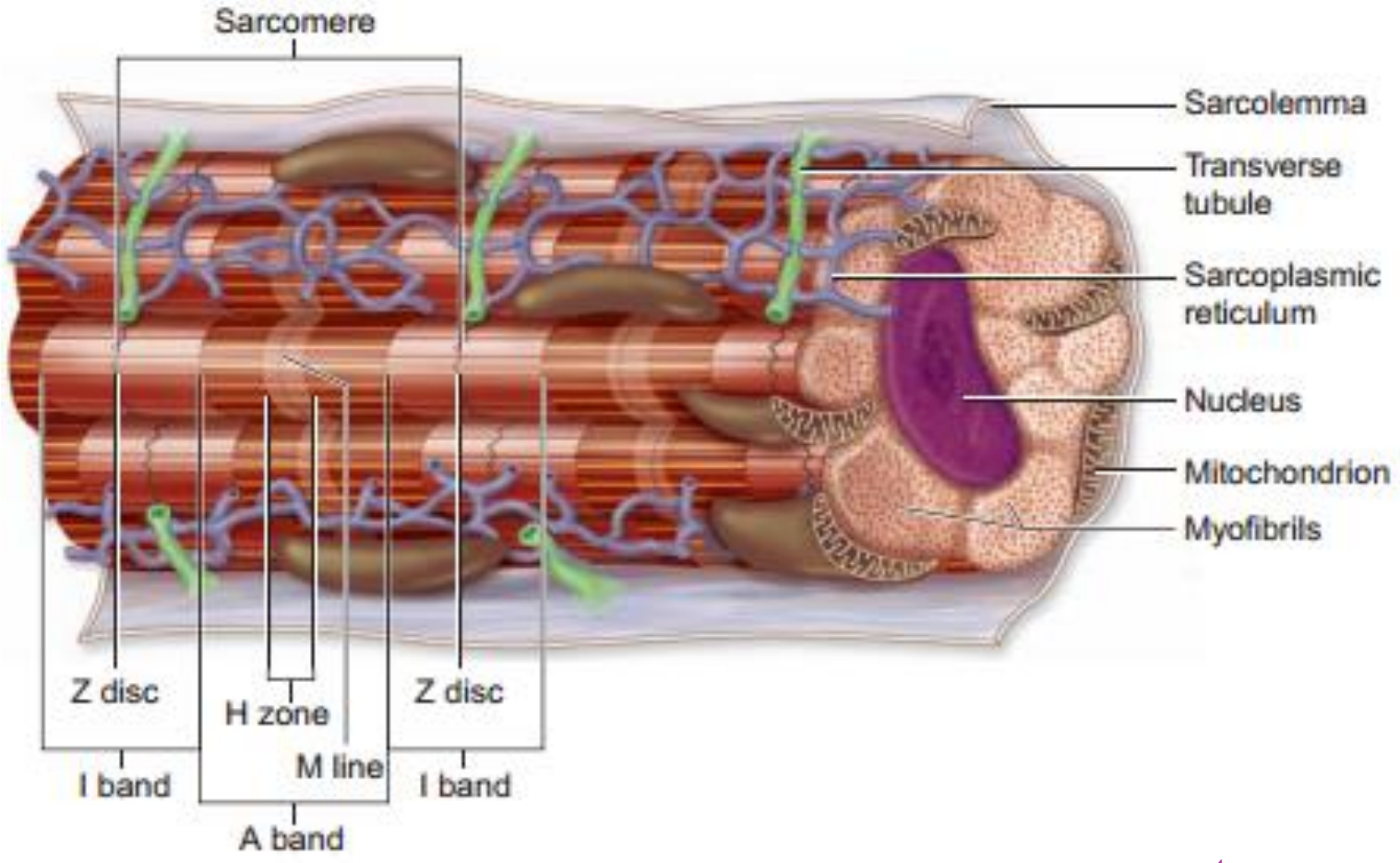
EPICARDIUM

- **Epicardium** is the outer layer of the heart and consists of mesothelium with underlying connective and adipose tissue.
- It contains coronary vasculature.



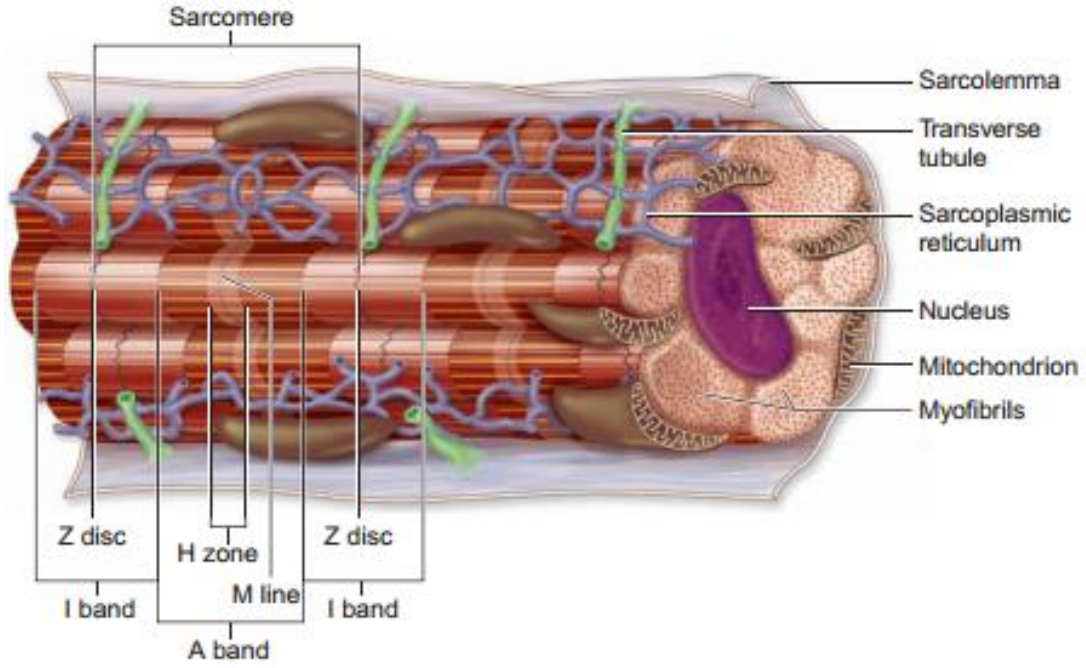
MYOCARDIUM

- **Myocardium** is the middle layer and consists of cardiac muscle.



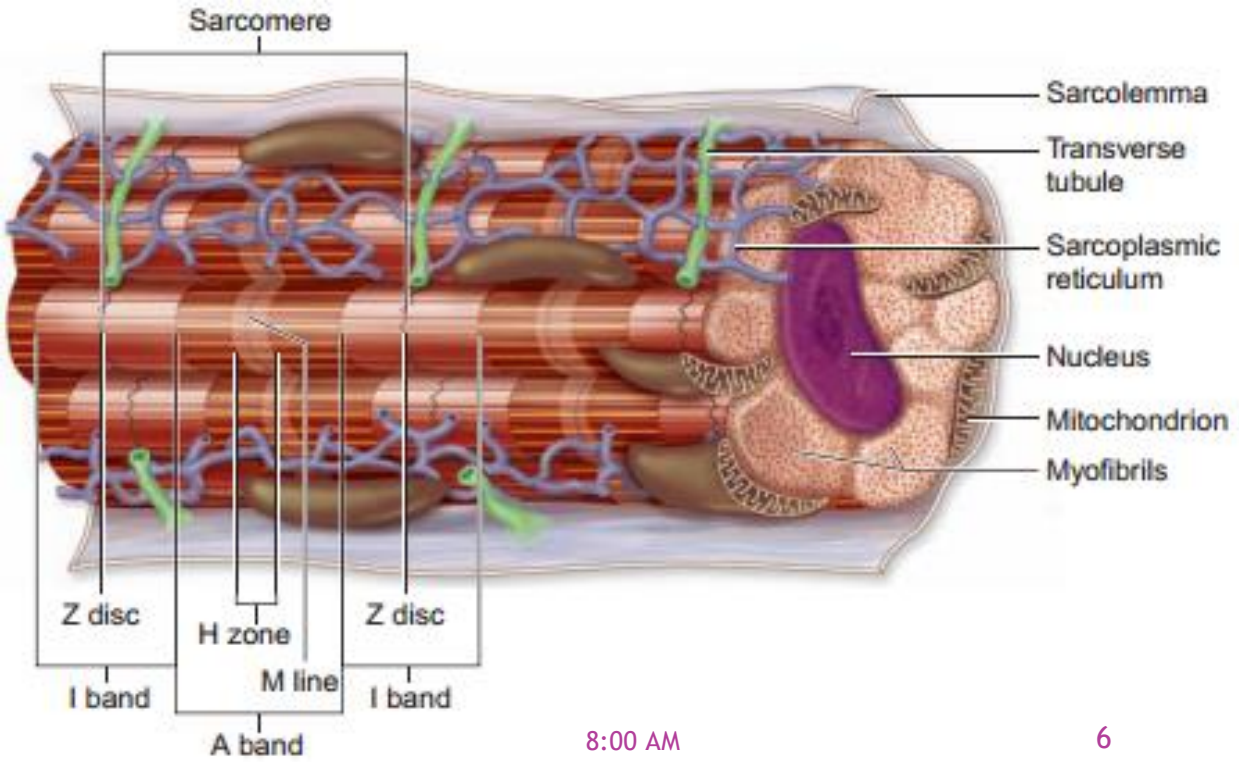
CHARACTERISTICS OF CARDIAC MUSCLE TISSUE

1. Cells are short and branching
2. 1 or 2 nuclei in the center of the cell
3. Cells joined by intercellular junctions in intercalated discs

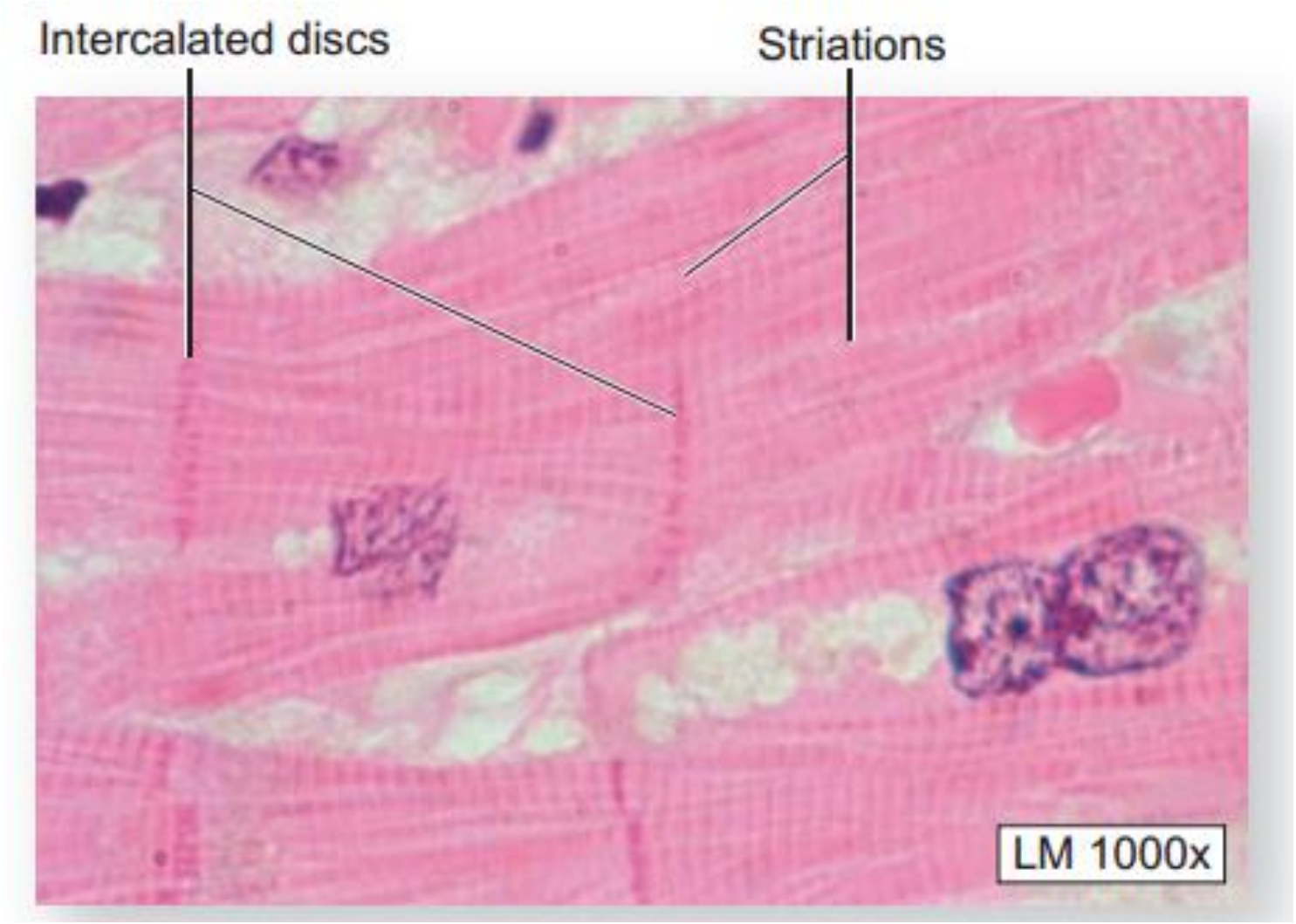


CHARACTERISTICS OF CARDIAC MUSCLE TISSUE

4. T-tubules overlie Z-discs
5. Contains sarcoplasmic reticulum but less than in skeletal muscle
6. More mitochondria than in skeletal muscle



CARDIAC MUSCLE LS

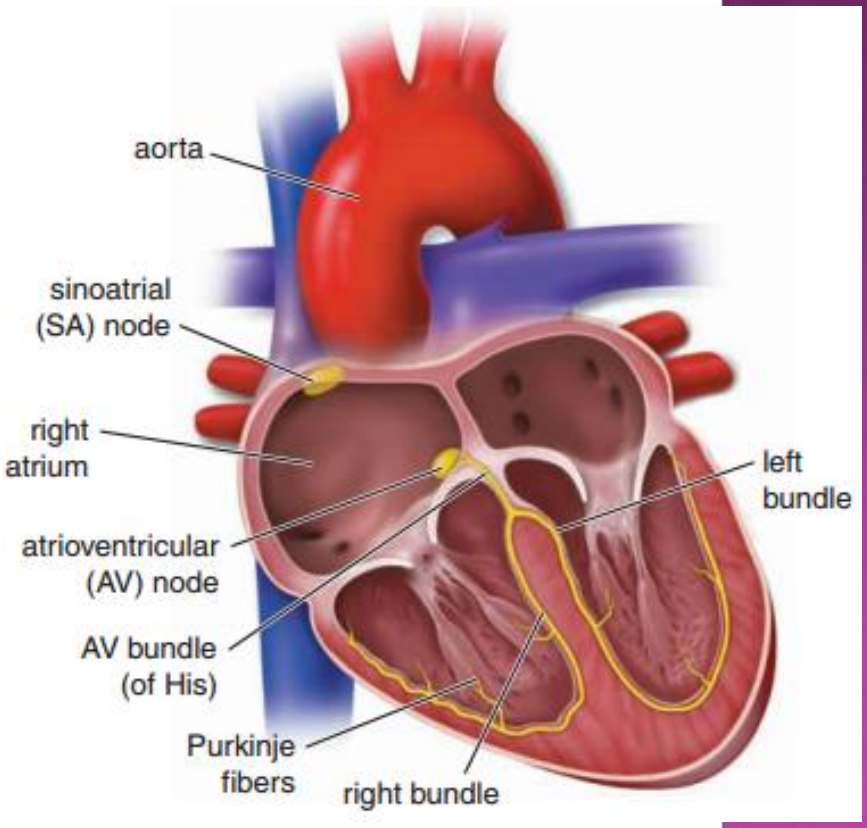


ENDOCARDIUM

- Is the inner layer and consists of
  - Endothelium
  - Subendothelial connective tissue
  - Subendocardial layer containing cells of the conducting system of the heart.

CONDUCTING SYSTEM

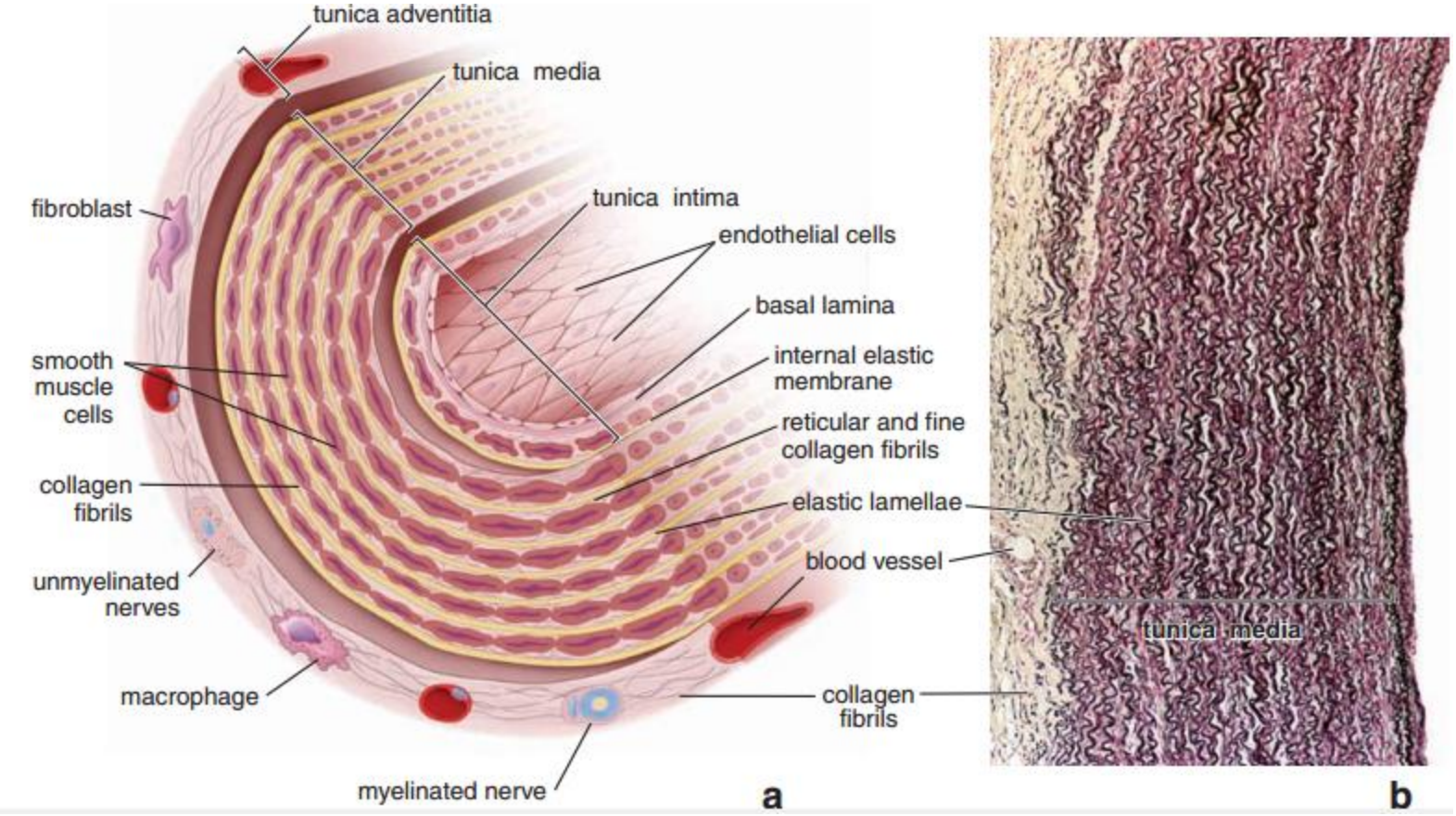
- Contraction of the heart is initiated and synchronized by the **conducting system**, which consists of modified cardiac myocytes forming:
  - **Sinoatrial (SA) node**,
  - **Atrioventricular (AV) node**,
  - **AV bundle (of his)**, and
  - **Purkinje f bers.**



GENERAL FEATURES OF ARTERIES AND VEINS

- The walls of arteries and veins are composed of three layers called *tunics*.
  - **Tunica intima**,
  - **Tunica media**,
  - **Tunica adventitia**,

DIAGRAM AND PHOTOMICROGRAPH OF AN ELASTIC ARTERY



Vessel	Diameter	Tunica Intima (Inner Layer)	Tunica Media (Middle Layer)	Tunica Adventitia (Outer Layer)
Large artery (elastic artery)	>10 mm	Endothelium Connective tissue Smooth muscle	Smooth muscle Elastic lamellae	Thinner than tunica media Connective tissue Elastic fibers
Medium artery (muscular artery)	2–10 mm	Endothelium Connective tissue Smooth muscle Prominent internal elastic membrane	Smooth muscle Collagen fibers Relatively little elastic tissue	Thinner than tunica media Connective tissue Some elastic fibers
Small artery	0.1–2 mm	Endothelium Connective tissue Smooth muscle Internal elastic membrane	Smooth muscle (8–10 cell layers) Collagen fibers	Thinner than tunica media Connective tissue Some elastic fibers
Arteriole	10–100 μm	Endothelium Connective tissue Smooth muscle	Smooth muscle (one or two cell layers)	Thin, ill-defined sheath of connective tissue
Capillary	4–10 μm	Endothelium	None	None

PHOTOMICROGRAPHS OF THE WALL OF AN ELASTIC OF ARTERY

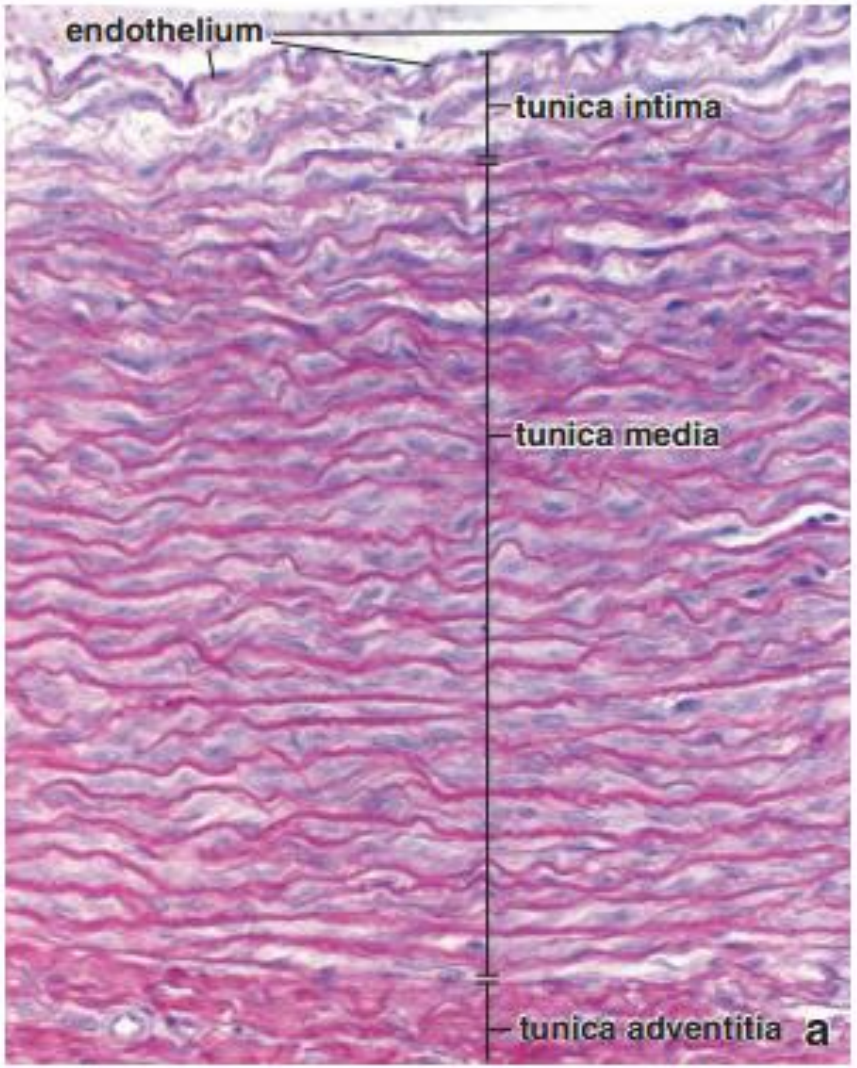
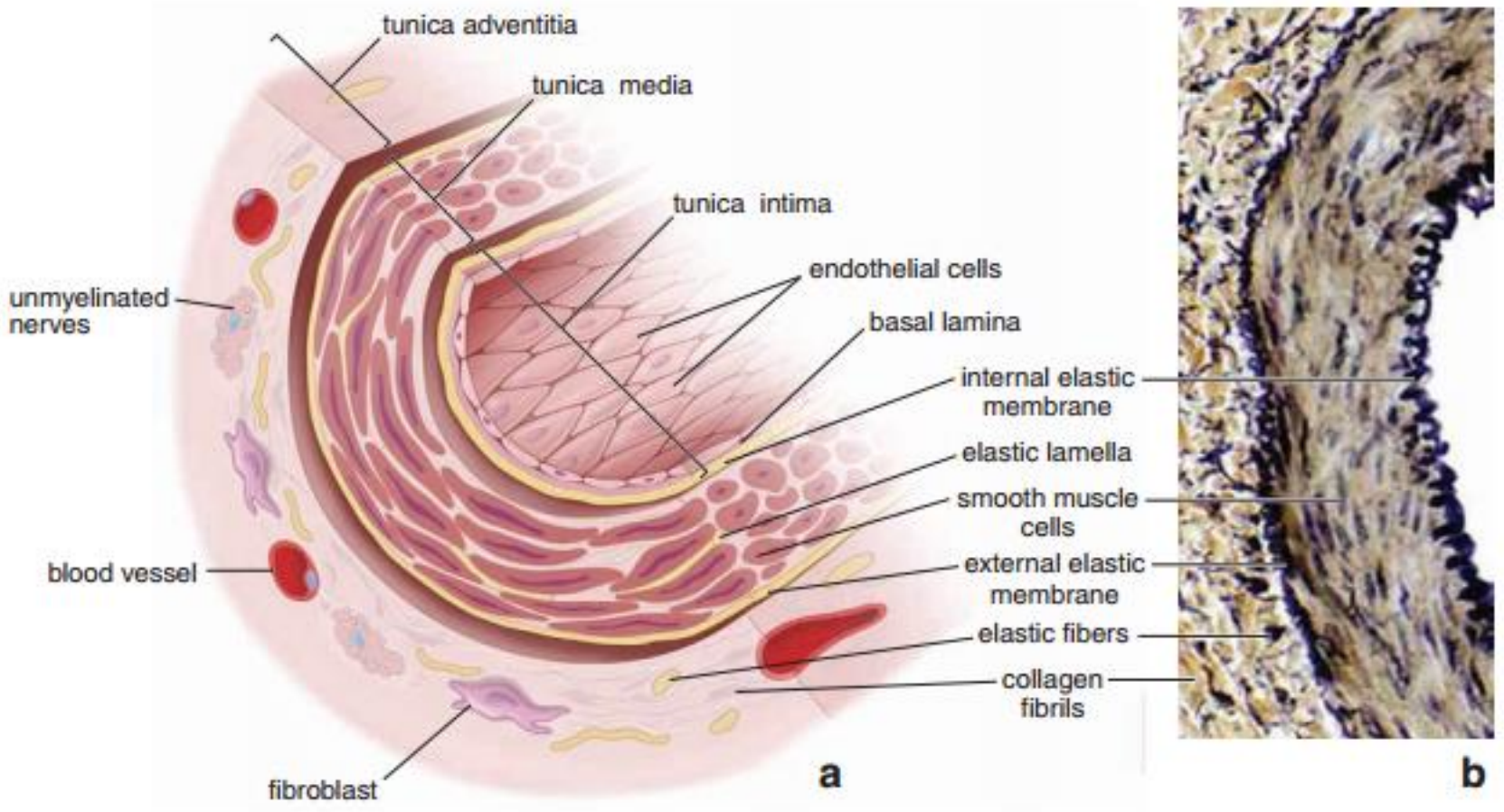
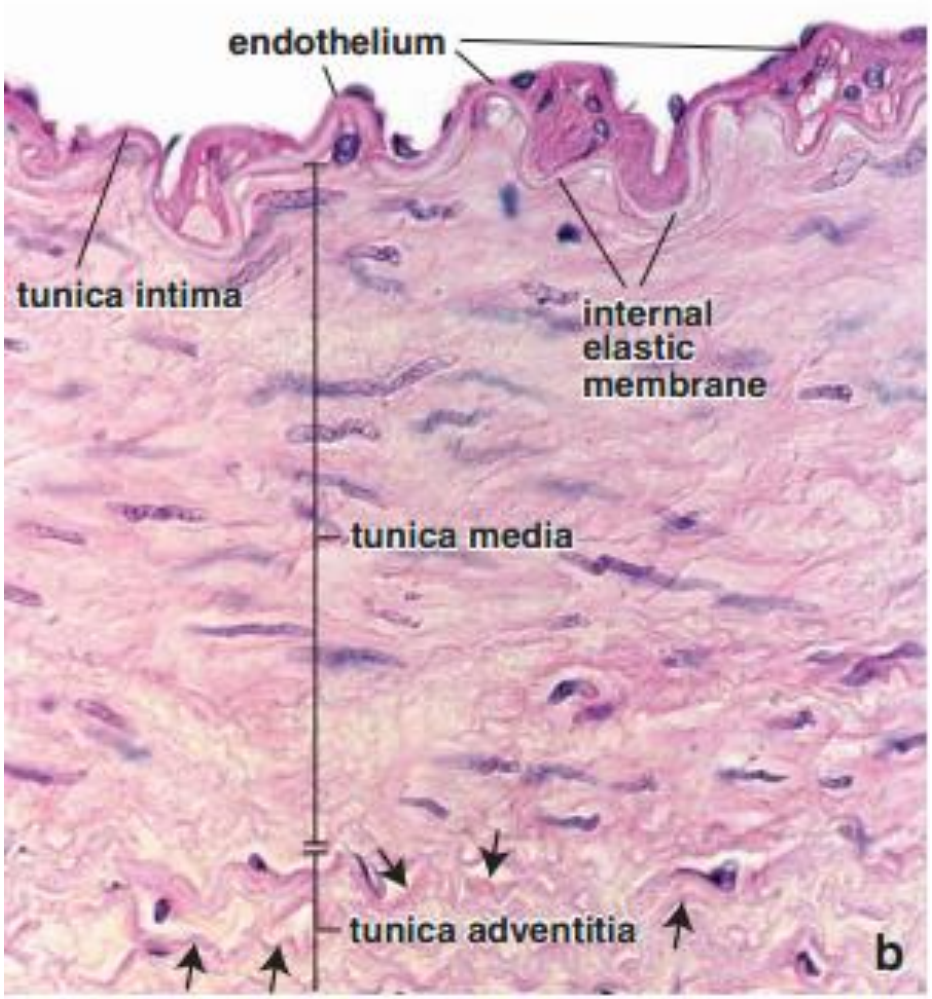


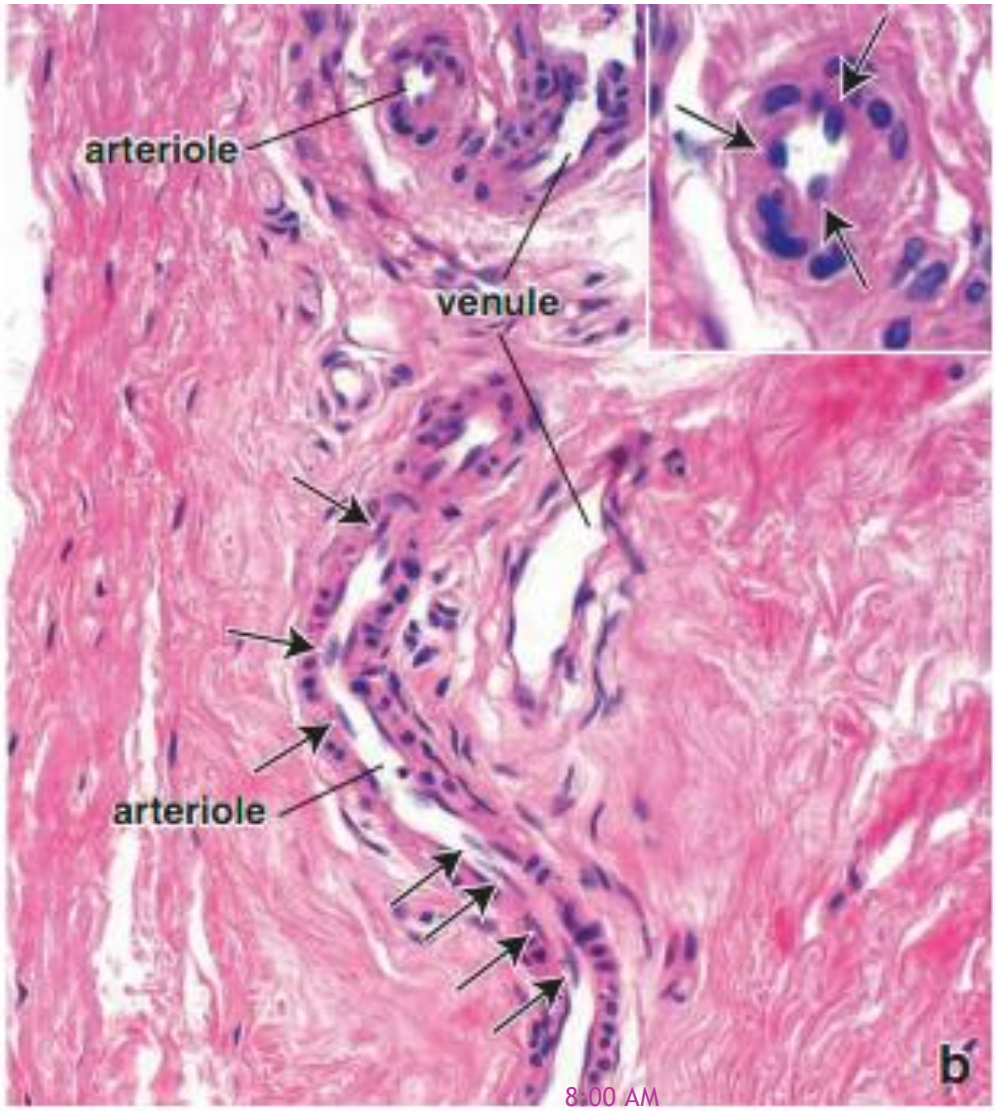
DIAGRAM AND PHOTOMICROGRAPH OF A MUSCULAR ARTERY



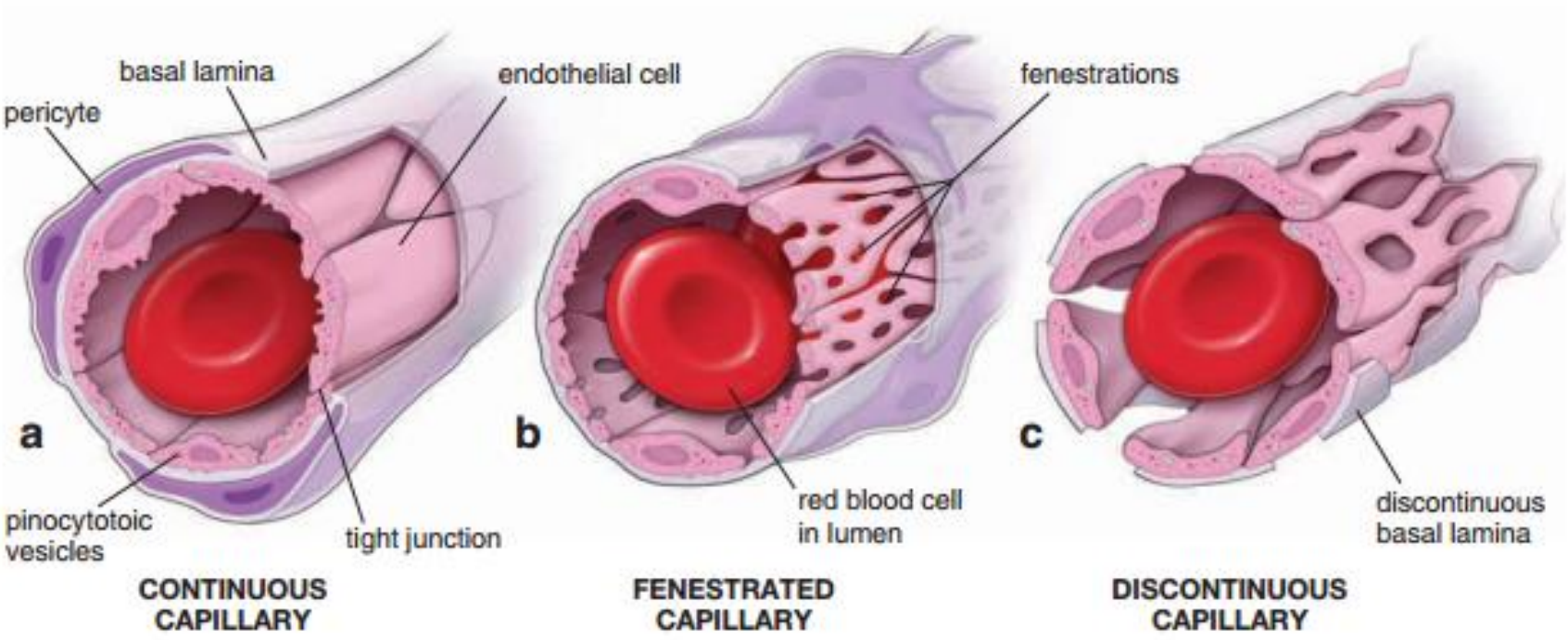
PHOTOMICROGRAPHS OF THE WALL MUSCULAR ARTERY



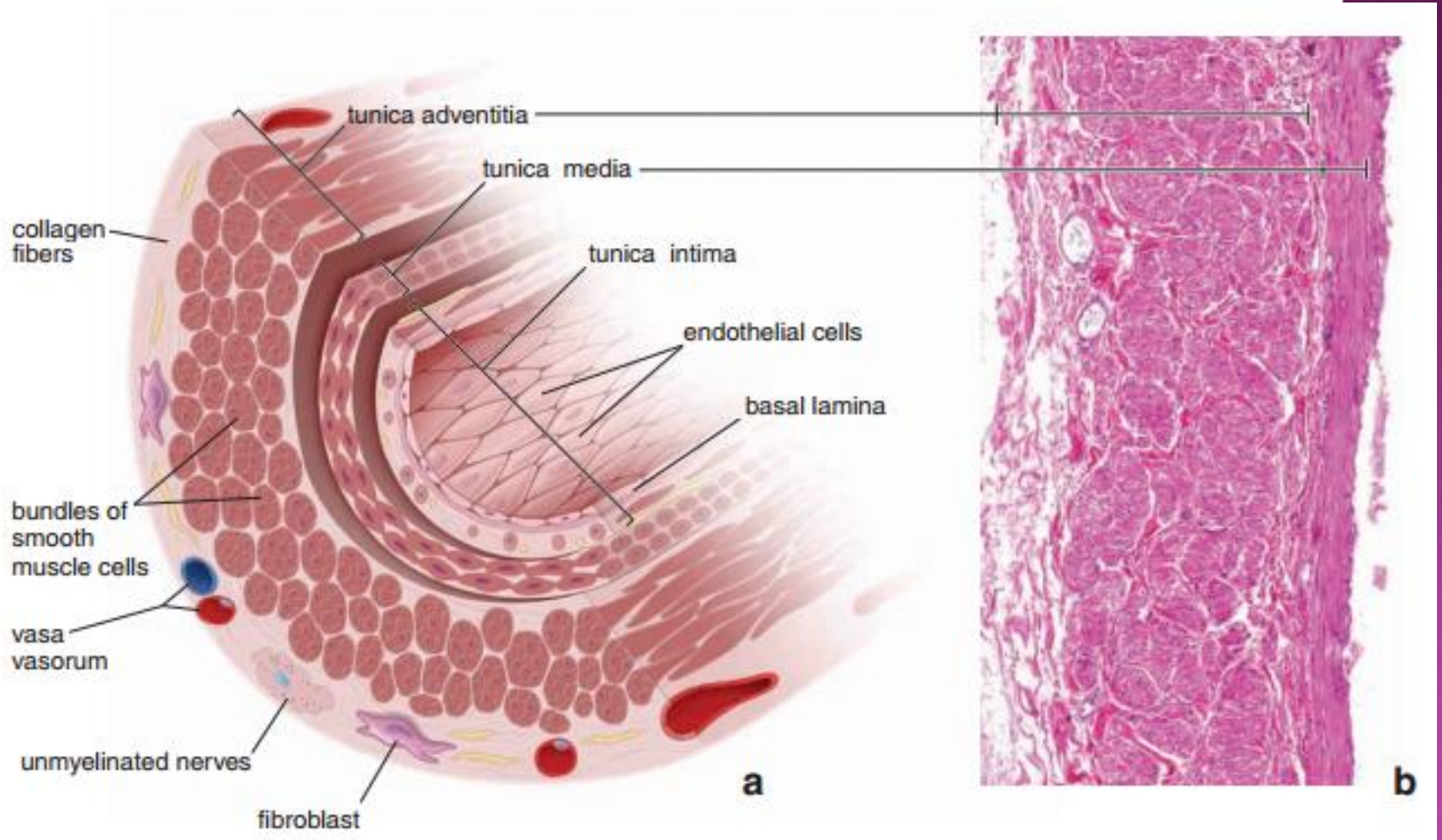
PHOTOMICROGRAPH OF ARTERIOLE AND VENULE IN THE DERMIS



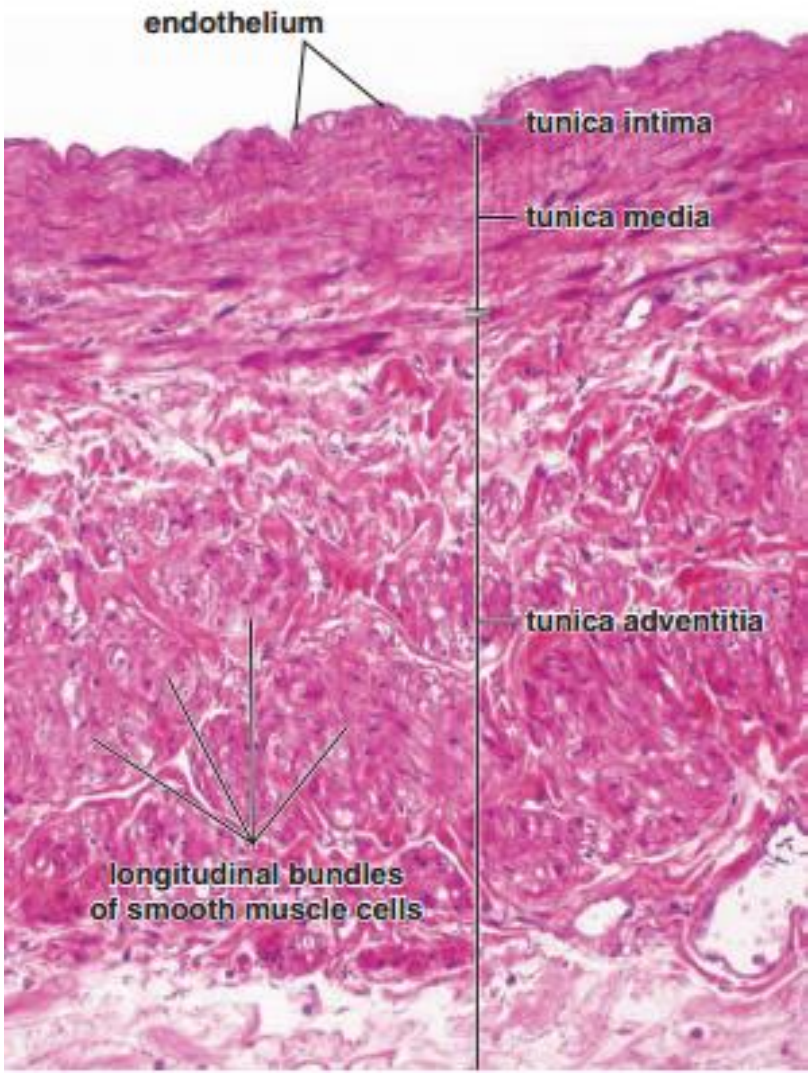
CAPILLARIES



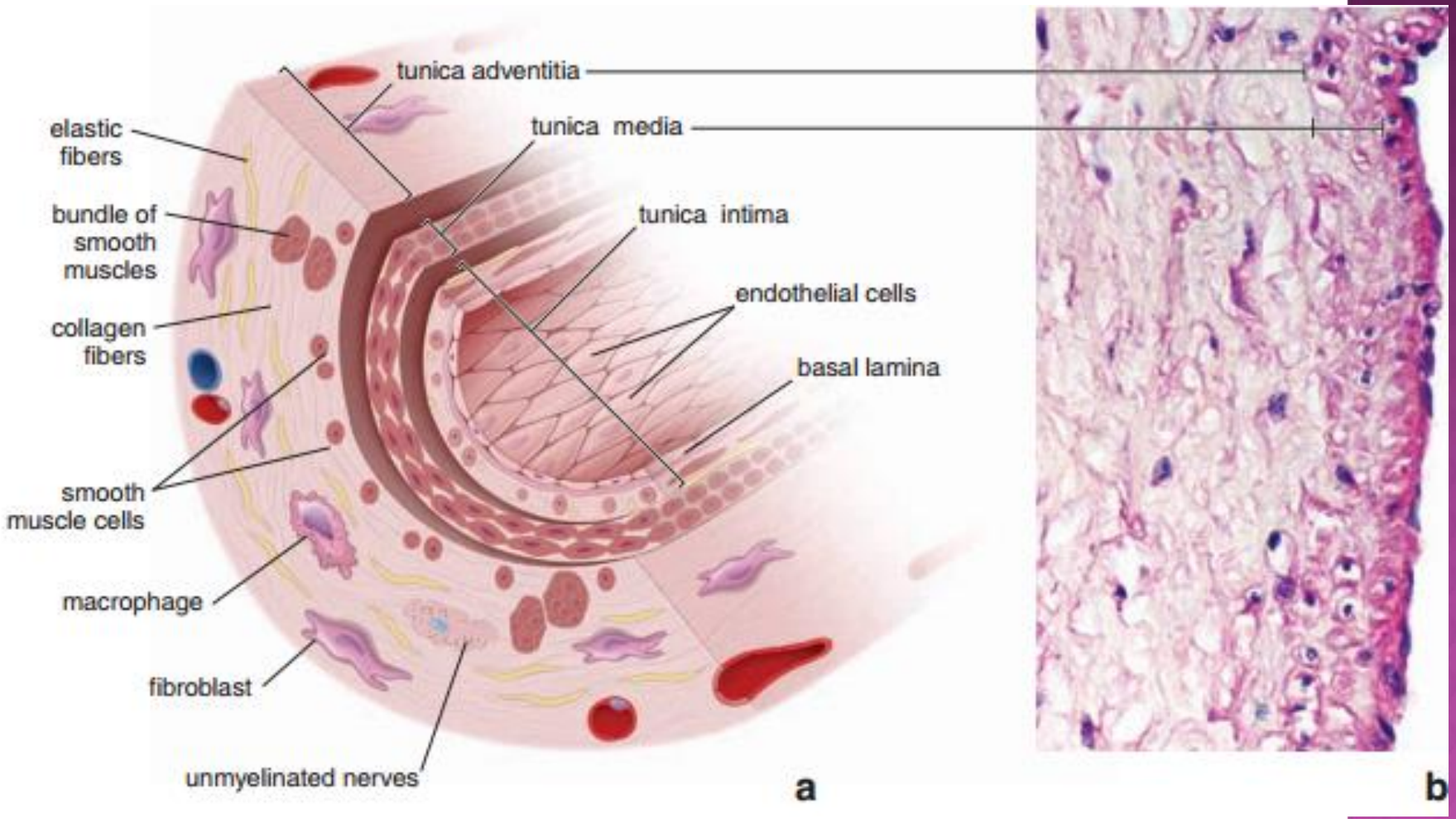
LARGE VEIN


tunica adventitia
tunica media
tunica intima
collagen fibers
endothelial cells
basal lamina
bundles of smooth muscle cells
vasa vasorum
unmyelinated nerves
fibroblast
a
b

PHOTOMICROGRAPH OF A LARGE VEIN



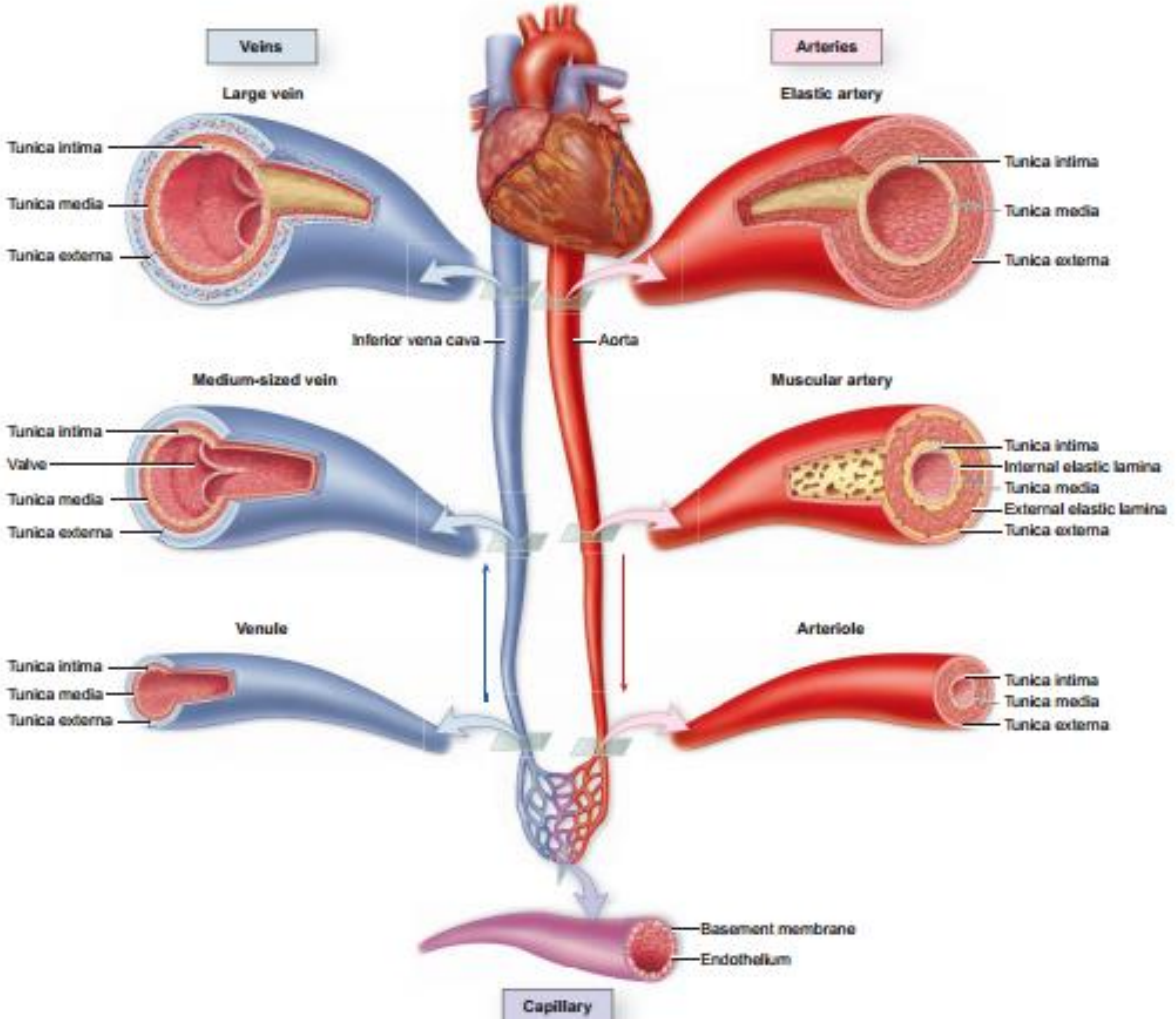
MEDIUM SIZED VEIN



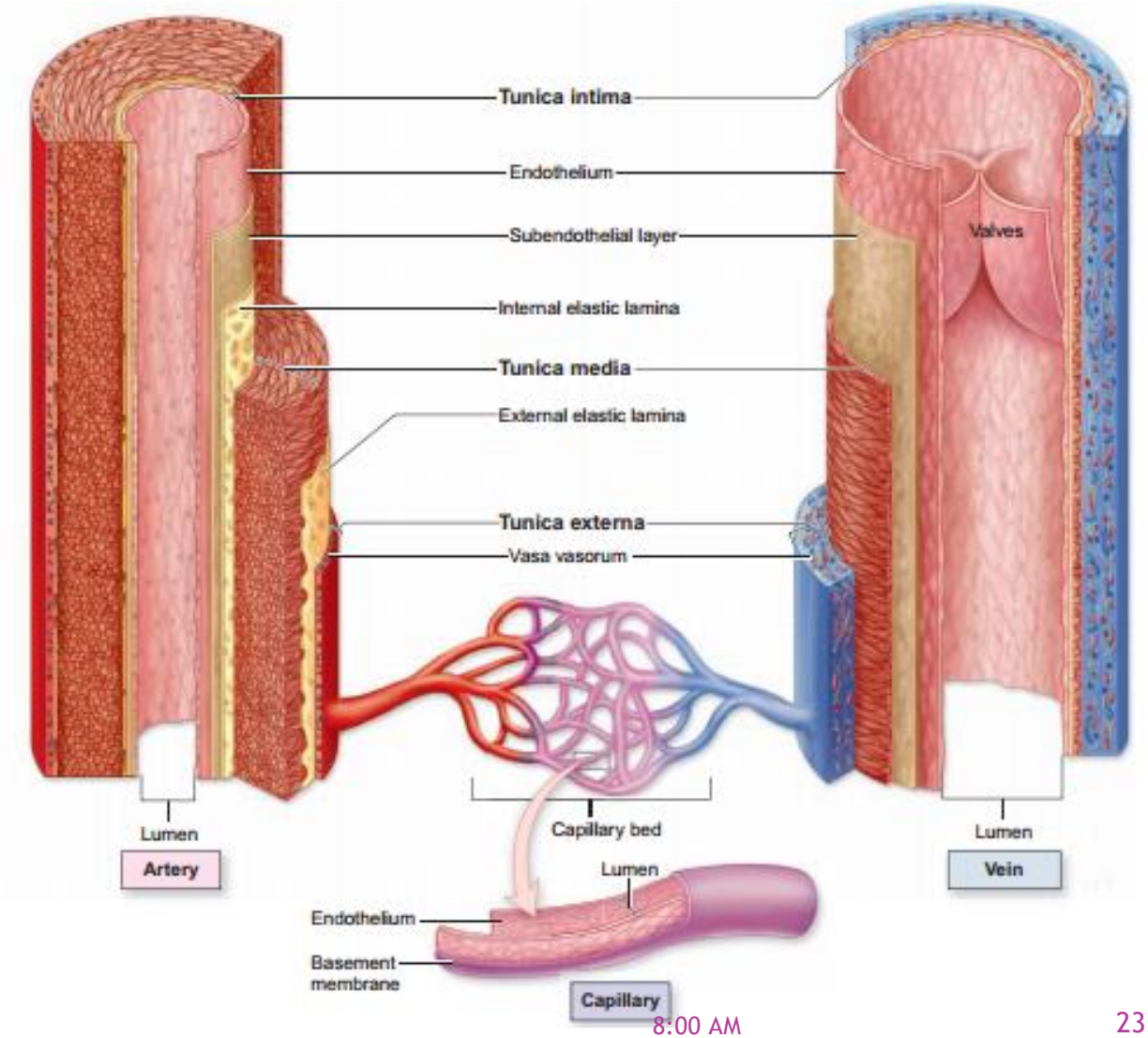
Veins

Vessel	Diameter	Tunica Intima (Inner Layer)	Tunica Media (Middle Layer)	Tunica Adventitia (Outer Layer)
Postcapillary venule	10–50 μm	Endothelium Pericytes	None	None
Muscular venule	50–100 μm	Endothelium	Smooth muscle (one or two cell layers)	Thicker than tunica media Connective tissue Some elastic fibers
Small vein	0.1–1 mm	Endothelium Connective tissue Smooth muscle (two or three layers)	Smooth muscle (two or three layers continuous with tunica intima)	Thicker than tunica media Connective tissue Some elastic fibers
Medium vein	1–10 mm	Endothelium Connective tissue Smooth muscle Internal elastic membrane in some cases	Smooth muscle Collagen fibers	Thicker than tunica media Connective tissue Some elastic fibers
Large vein	>10 mm	Endothelium Connective tissue Smooth muscle	Smooth muscle (2–15 layers) Collagen fibers	Much thicker than tunica media Connective tissue Some elastic fibers, longitudinal smooth muscles Cardiac muscle extensions (myocardial sleeves) into great veins near the heart

SUMMARY


Veins
Large vein
Tunica intima
Tunica media
Tunica externa
Medium-sized vein
Tunica intima
Valve
Tunica media
Tunica externa
Venule
Tunica intima
Tunica media
Tunica externa
Arteries
Elastic artery
Tunica intima
Tunica media
Tunica externa
Inferior vena cava
Aorta
Muscular artery
Tunica intima
Internal elastic lamina
Tunica media
External elastic lamina
Tunica externa
Arteriole
Tunica intima
Tunica media
Tunica externa
Basement membrane
Endothelium
Capillary

ARTERY VS. VEIN



THANKS