Almaaqal University
College of Health and Medical Techniques
Department of Medical Laboratory Techniques

Lectures in Histology laboratories

for 2nd year students

By

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Lecture 7

CIRCULATORY SYSTEM

(Cardiovascular system)

Circulatory system

*Is the system that transports materials around the body to and from the cells.

*The main function of this system is to deliver oxygenated blood to cells and tissues and to return venous blood to the lungs for gaseous exchange.

The cardiovascular system consist of:

1- Heart

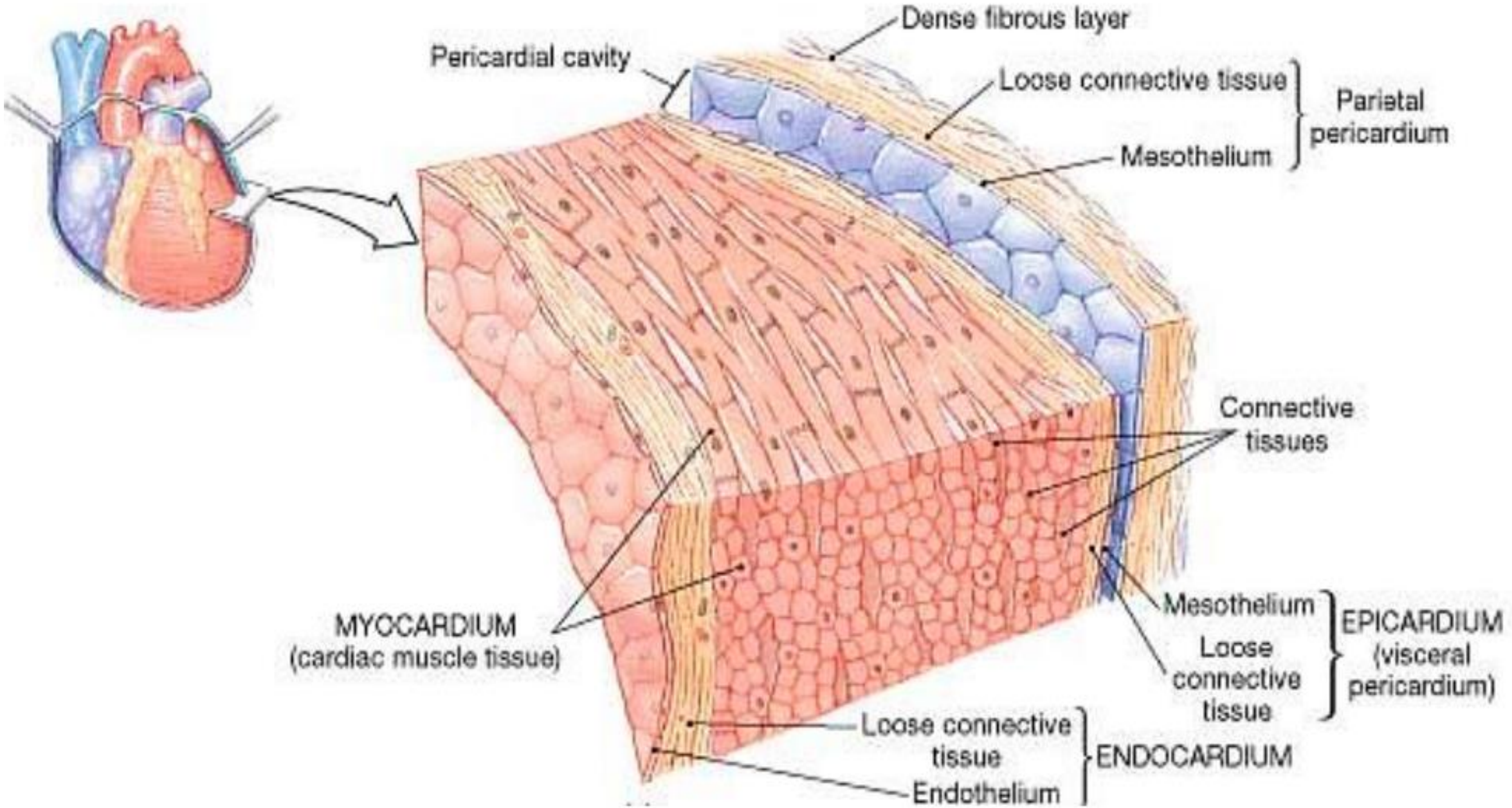
2. Blood vessels

3. Blood

Heart

The heart wall consist of three main layers:

1. **Endocardium**
2. **Myocardium**
3. **Pericardium**


Dense fibrous layer
Pericardial cavity
Loose connective tissue
Parietal pericardium
Mesothelium
Connective tissues
MYOCARDIUM
(cardiac muscle tissue)
Mesothelium
Loose connective tissue
EPICARDIUM (visceral pericardium)
Loose connective tissue
Endothelium
ENDOCARDIUM

Heart

The endocardium –

Consists mainly of :

1. A thin inner layer of endothelium.
2. A middle myoelastic layer of smooth muscle fibers.
3. A deep subendocardial layer of connective tissue

Heart

The myocardium –

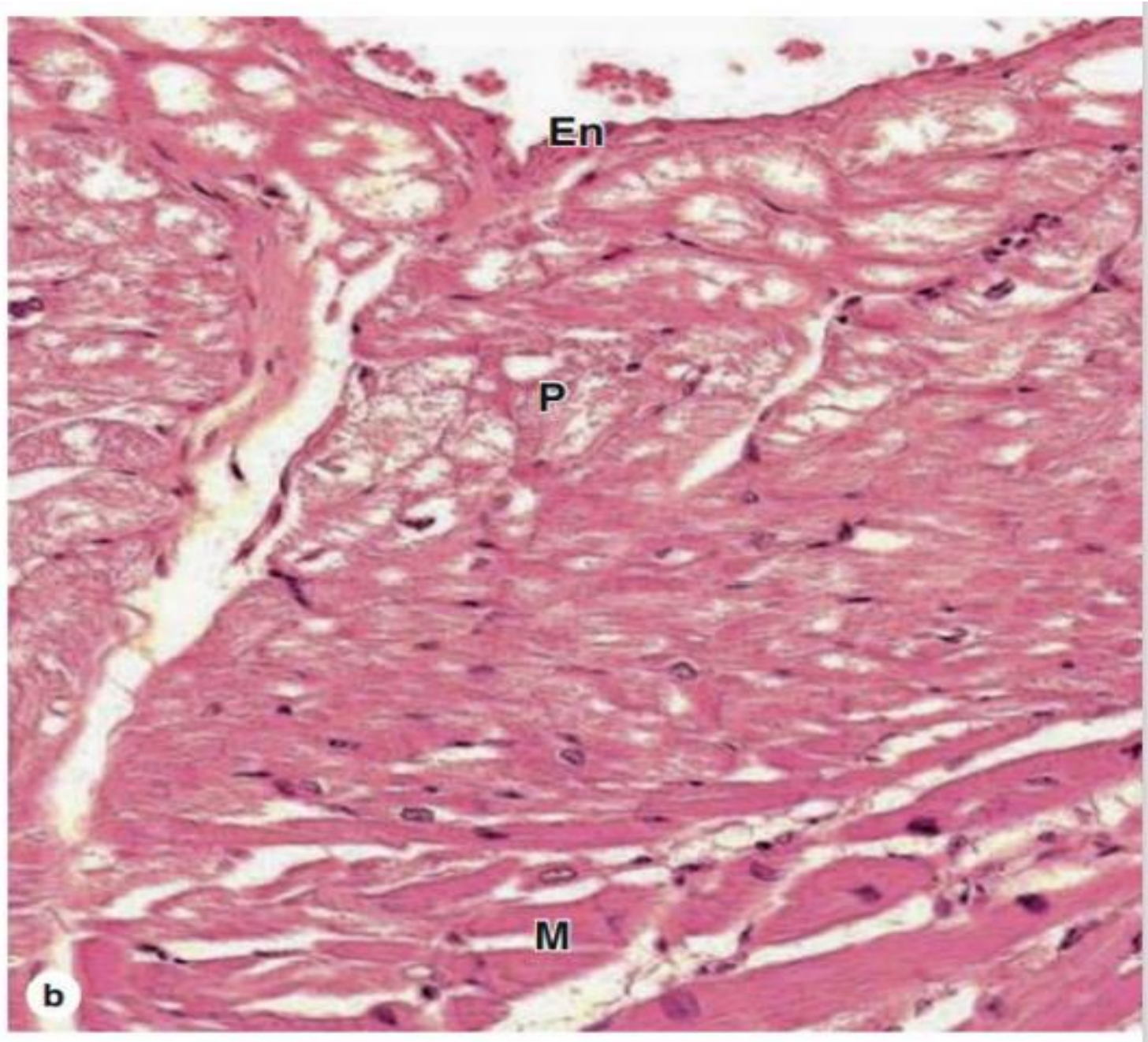
The myocardium is much thicker in the walls of the ventricles, particularly the left, than in the atrial walls due to the strong force required to pump blood through the systemic and pulmonary circulations.

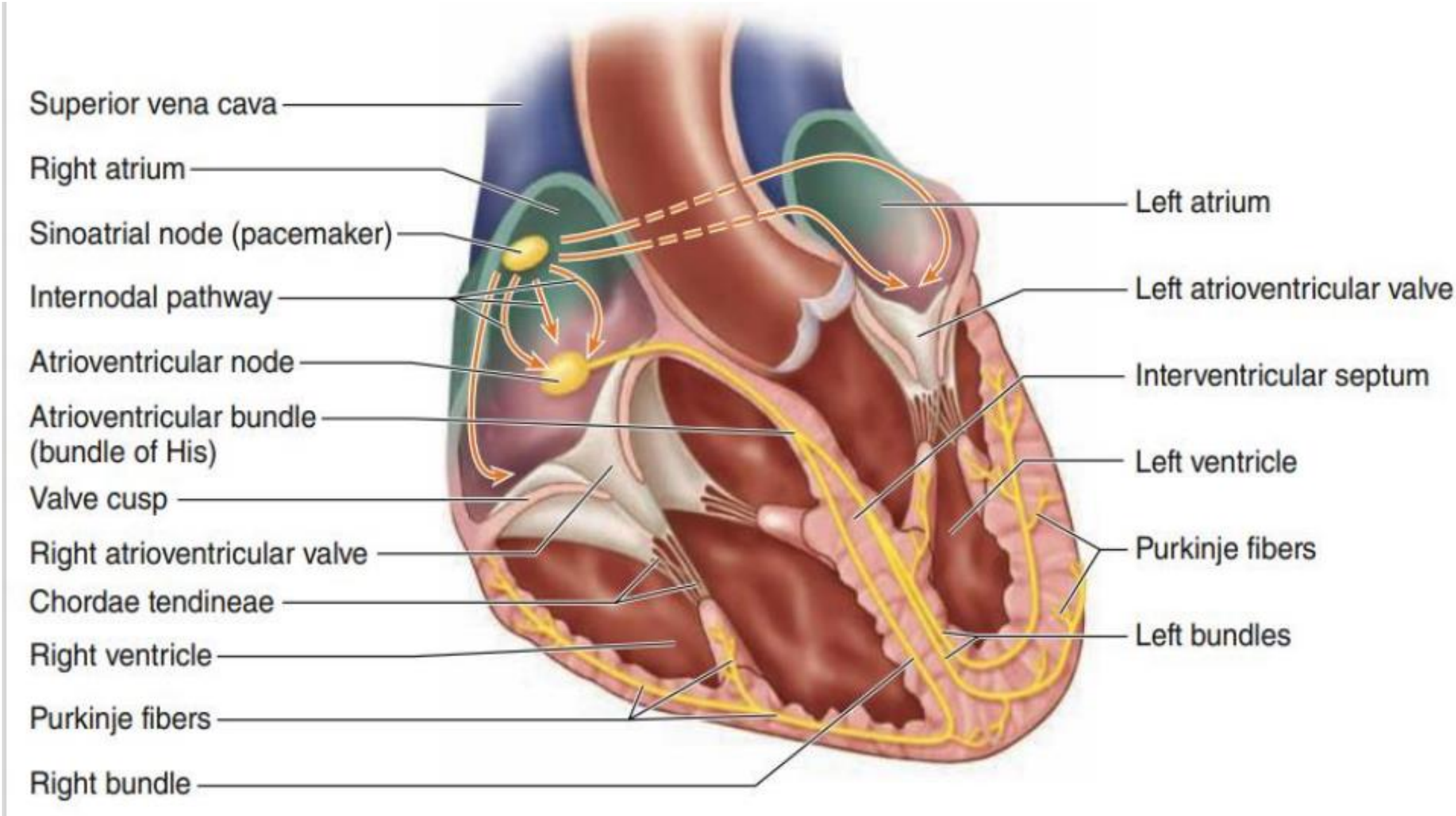
Heart

The pericardium –

Consist of:

- The visceral pericardium (epicardium), Pericardial cavity, parietal pericardium, and fibrous pericardium.


En
P
M
b


Superior vena cava
Right atrium
Sinoatrial node (pacemaker)
Internodal pathway
Atrioventricular node
Atrioventricular bundle (bundle of His)
Valve cusp
Right atrioventricular valve
Chordae tendineae
Right ventricle
Purkinje fibers
Right bundle
Left atrium
Left atrioventricular valve
Interventricular septum
Left ventricle
Purkinje fibers
Left bundles

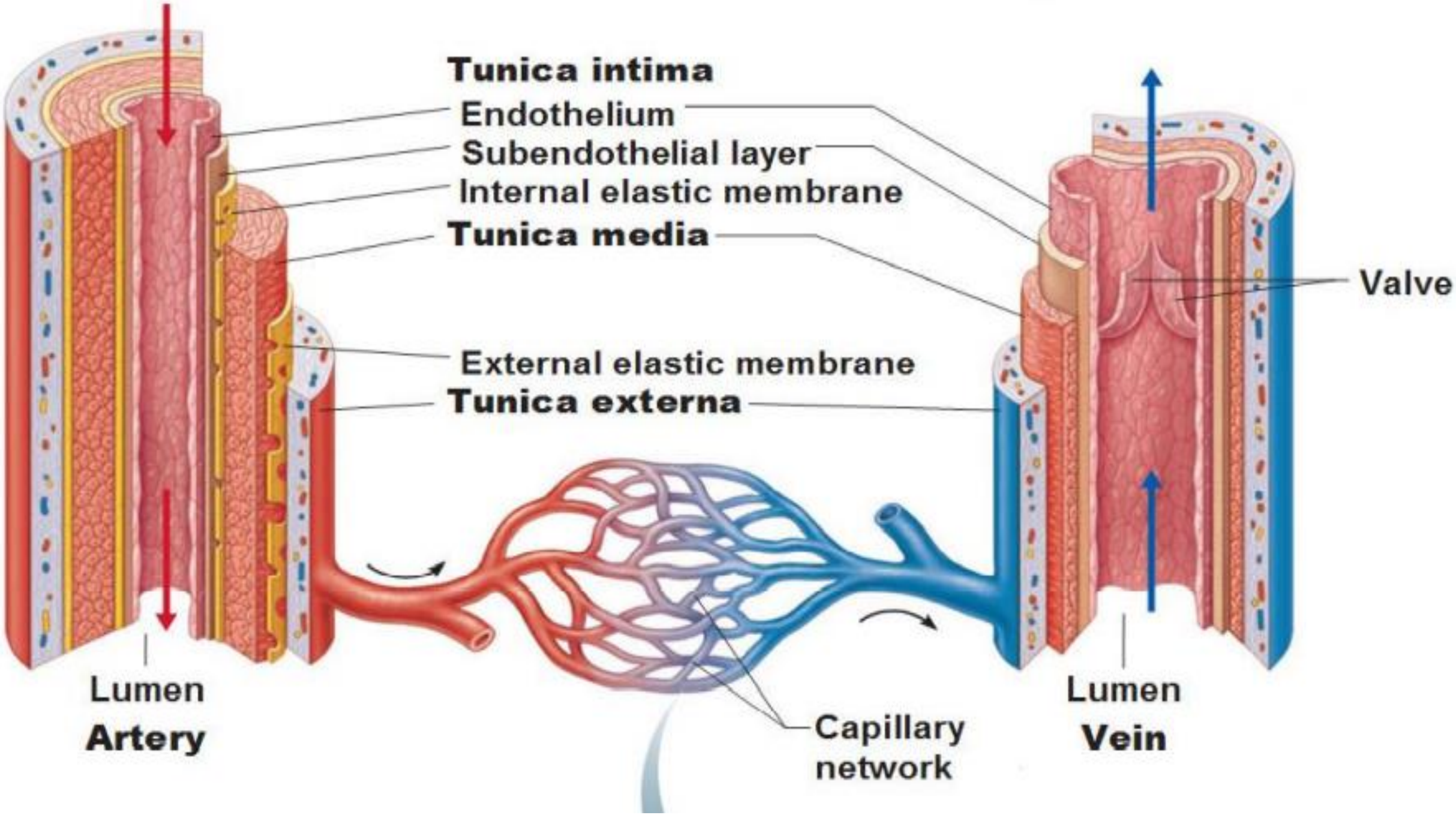
Blood vessels

There are **three types** of blood vessels:

1. Arteries
2. Veins
3. Capillaries

- Except for the capillaries, all blood vessels have walls made of 3 layers of tissue:

- 1. The inner layer (Tunica intima) of epithelial tissue.
- 2. The middle layer (Tunica media) of smooth muscle.
- 3. The outer layer (Tunica adventitia) of connective tissue.


Tunica intima
Endothelium
Subendothelial layer
Internal elastic membrane
Tunica media
External elastic membrane
Tunica externa
Valve
Lumen
Artery
Capillary
network
Lumen
Vein

Arteries

There are three main types of Arteries:

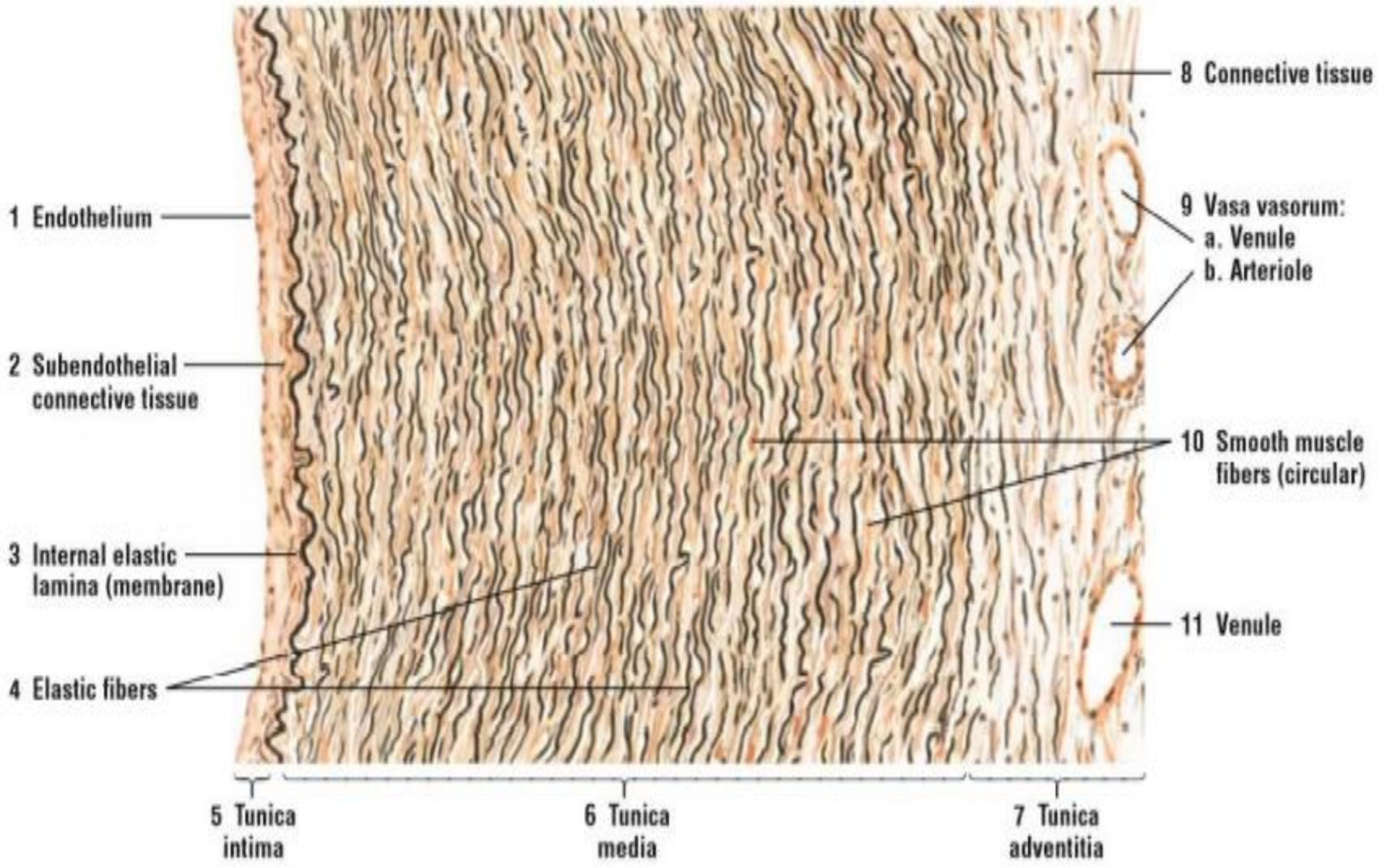
1. Elastic arteries
2. Muscular arteries
3. Arterioles

	Elastic arteries	Muscular arteries	Small arteries	Arterioles
Tunica intima	Endothelium; connective tissue with smooth muscle	Endothelium; connective tissue with smooth muscle, internal elastic lamina prominent	Endothelium; connective tissue with less smooth muscle	Endothelium; no connective tissue, or smooth muscle
Tunica media	Many elastic lamellae alternating with smooth muscle	Many smooth muscle layers, with much less elastic material	3-10 layers of smooth muscles	1-3 layers of smooth muscle
Tunica adventitia	Connective tissue, thinner than media, with vasa vasorum	Connective tissue, thinner than media; vasa vasorum maybe present	Connective tissue, thinner than media, no vasa vasorum	Very thin connective tissue layer

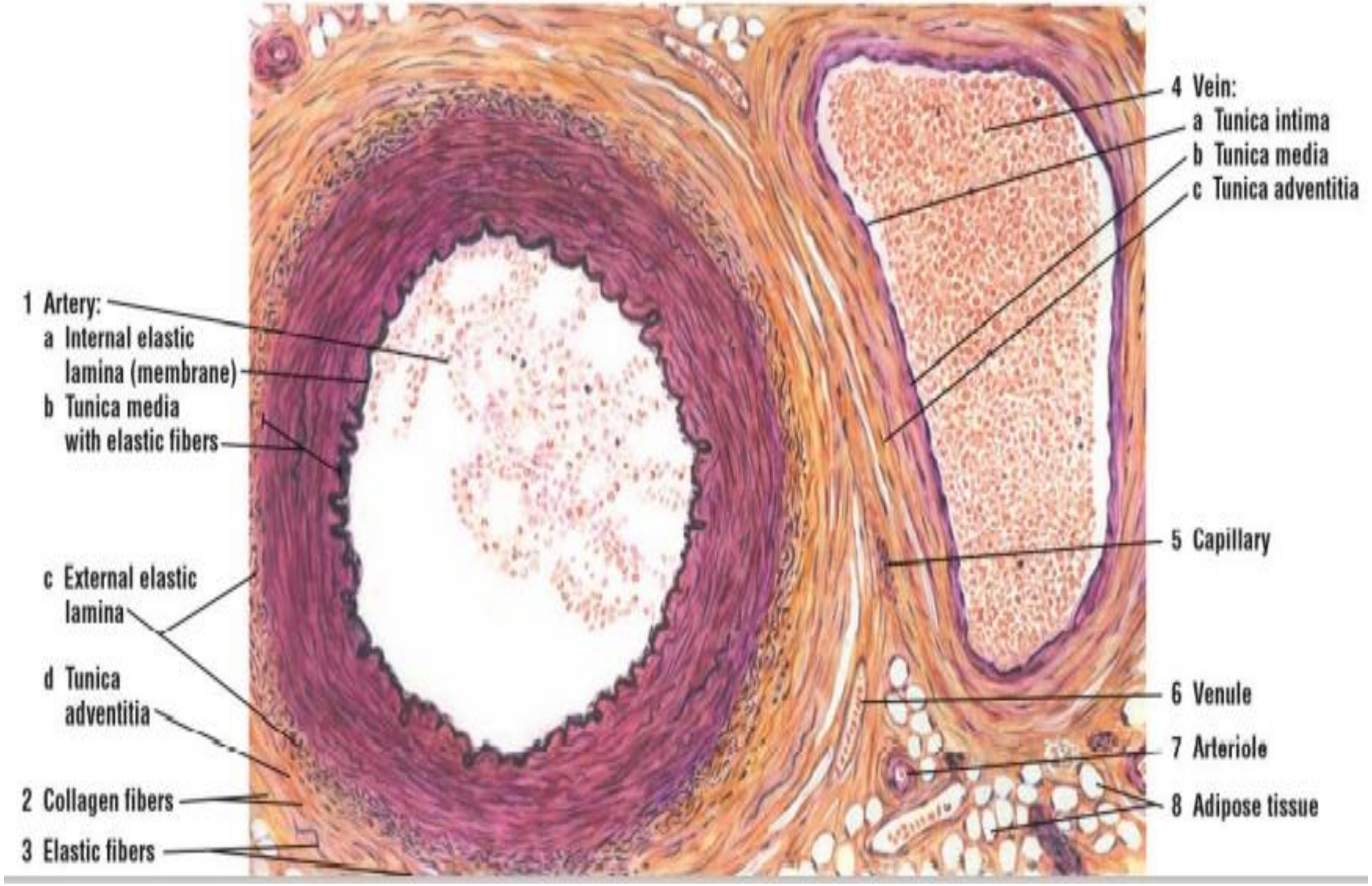
*The walls of arteries are thicker than those of veins.

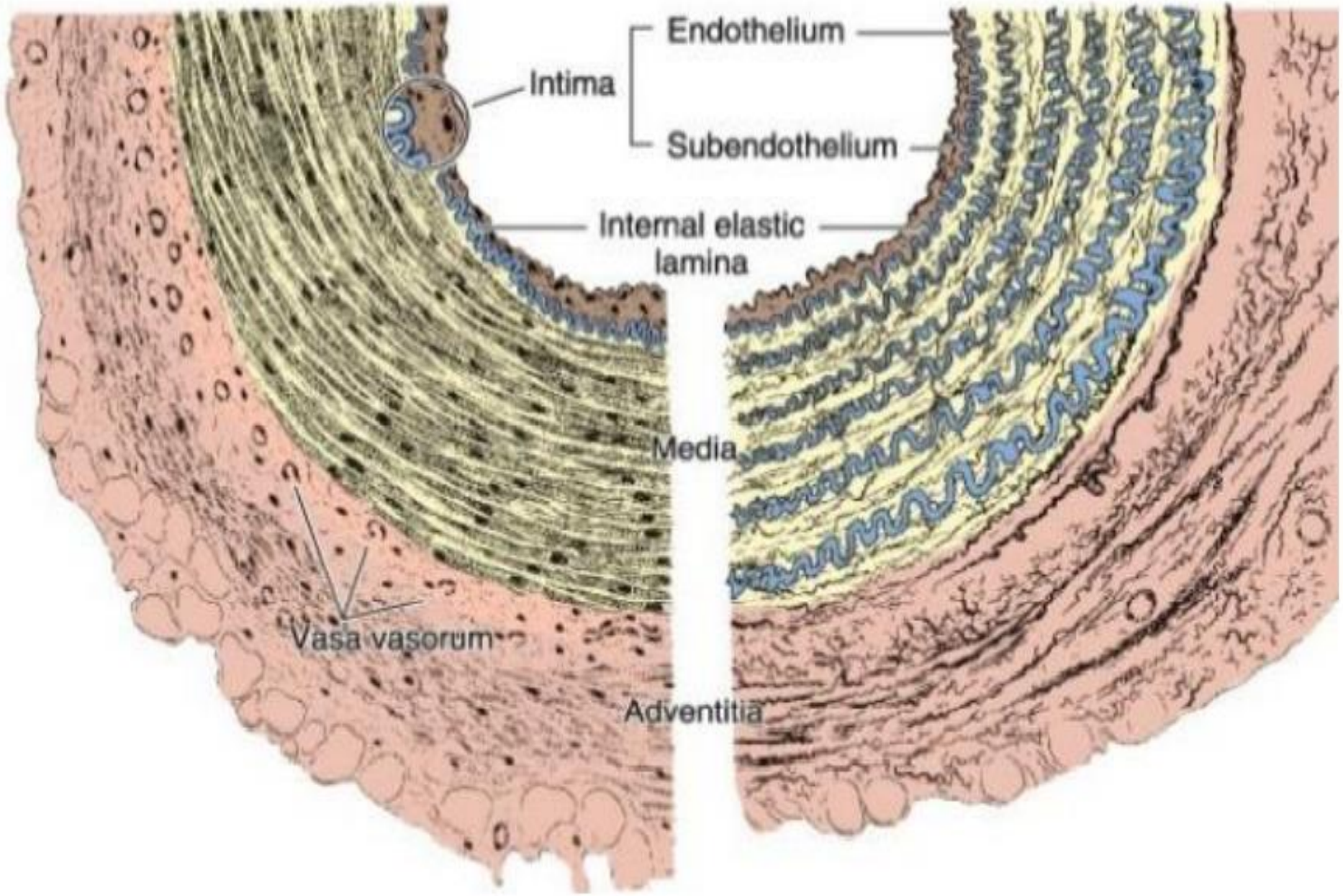
*The smooth muscle and elastic fibres that make up their walls enable them to withstand the high pressure of blood as it is pumped from the heart.

• Elastic arteries

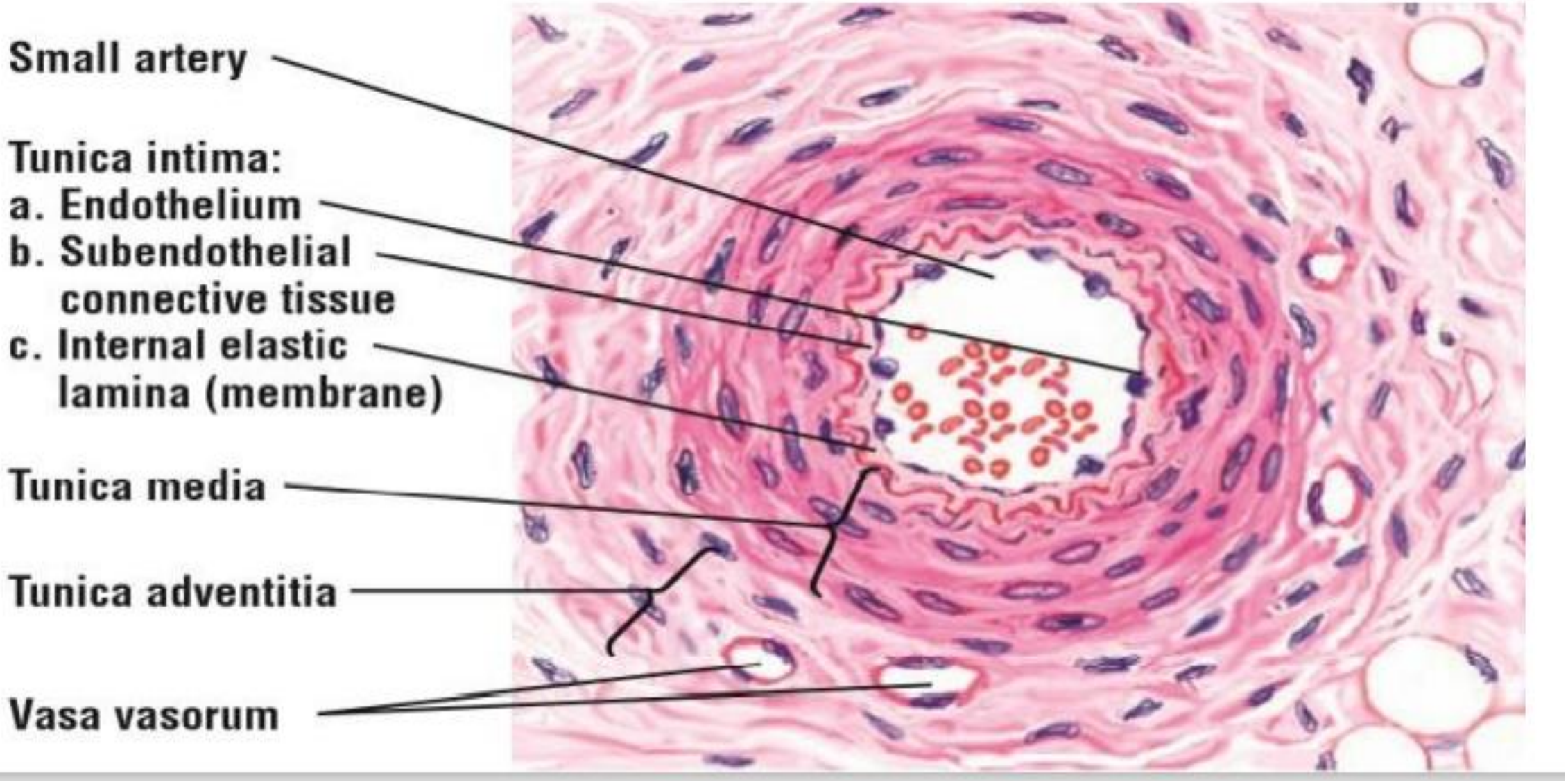


Muscular arteries




Endothelium
Intima
Subendothelium
Internal elastic lamina
Media
Vasa vasorum
Adventitia

Small arteries



Arterioles

Veins

There are three main types of veins:

1. Large veins 2. Medium veins 3. Venules

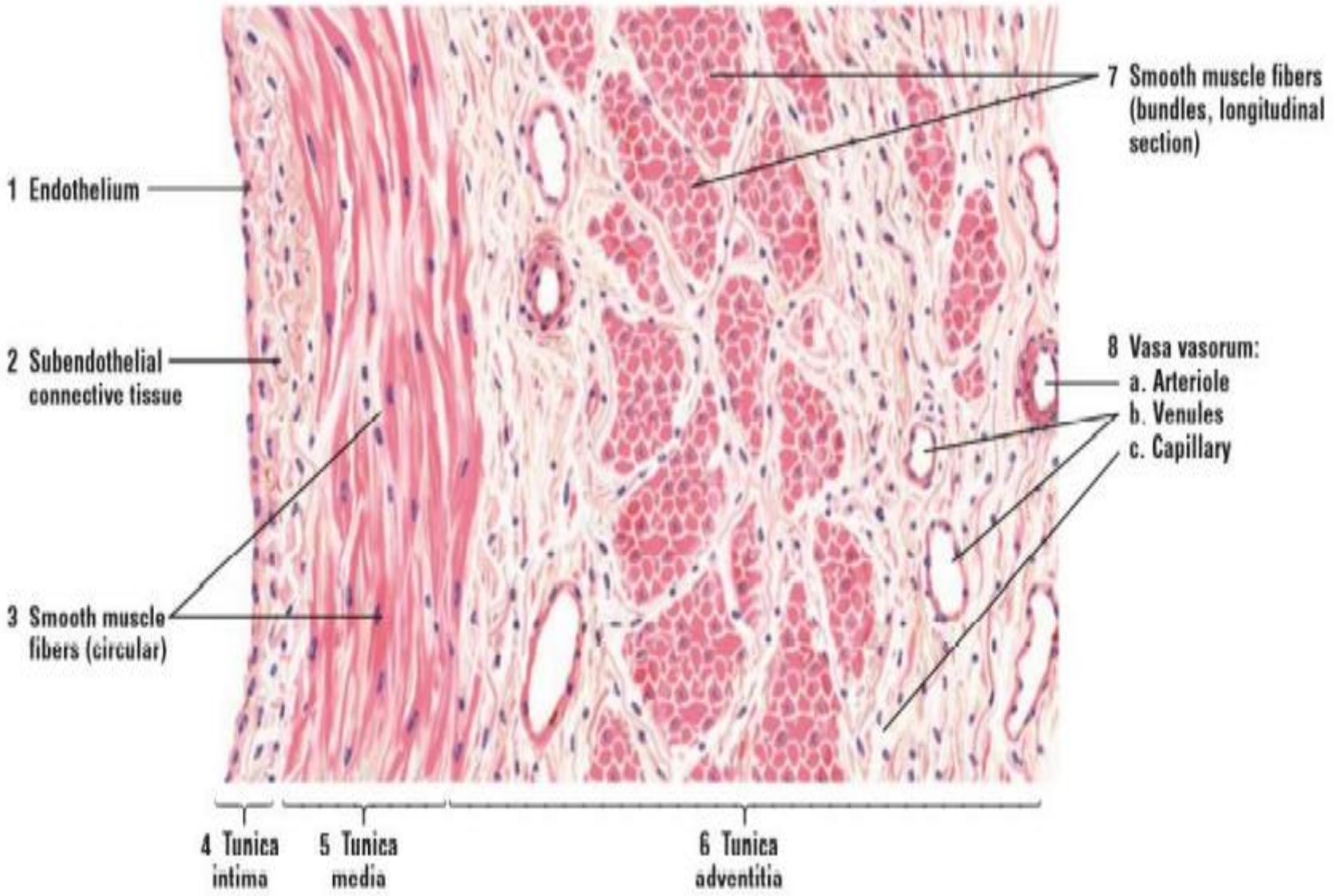
*The walls of veins are thinner and less elastic than arteries, but they are also more flexible.

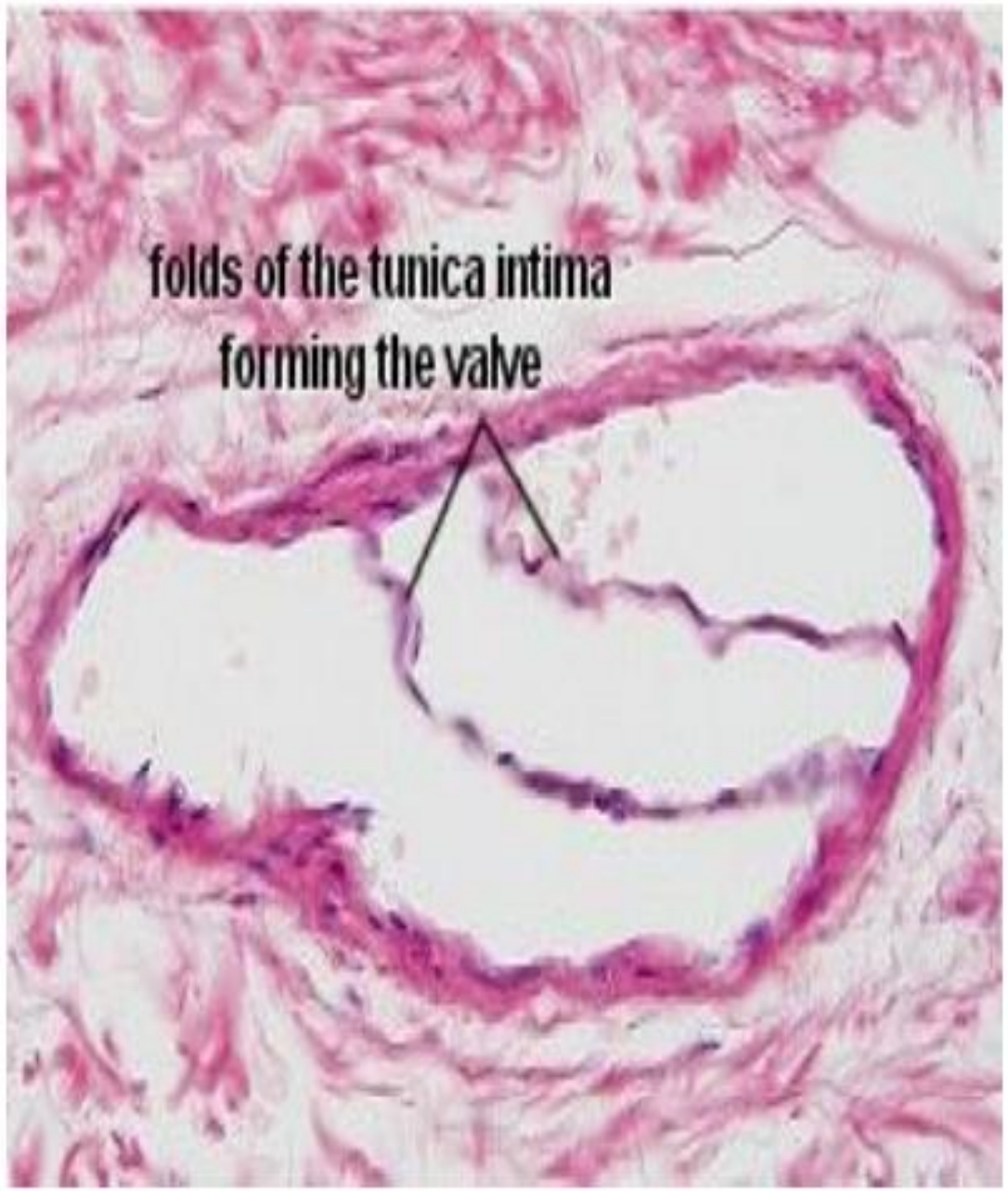
*The larger veins contain valves that maintain the direction of blood-flow.

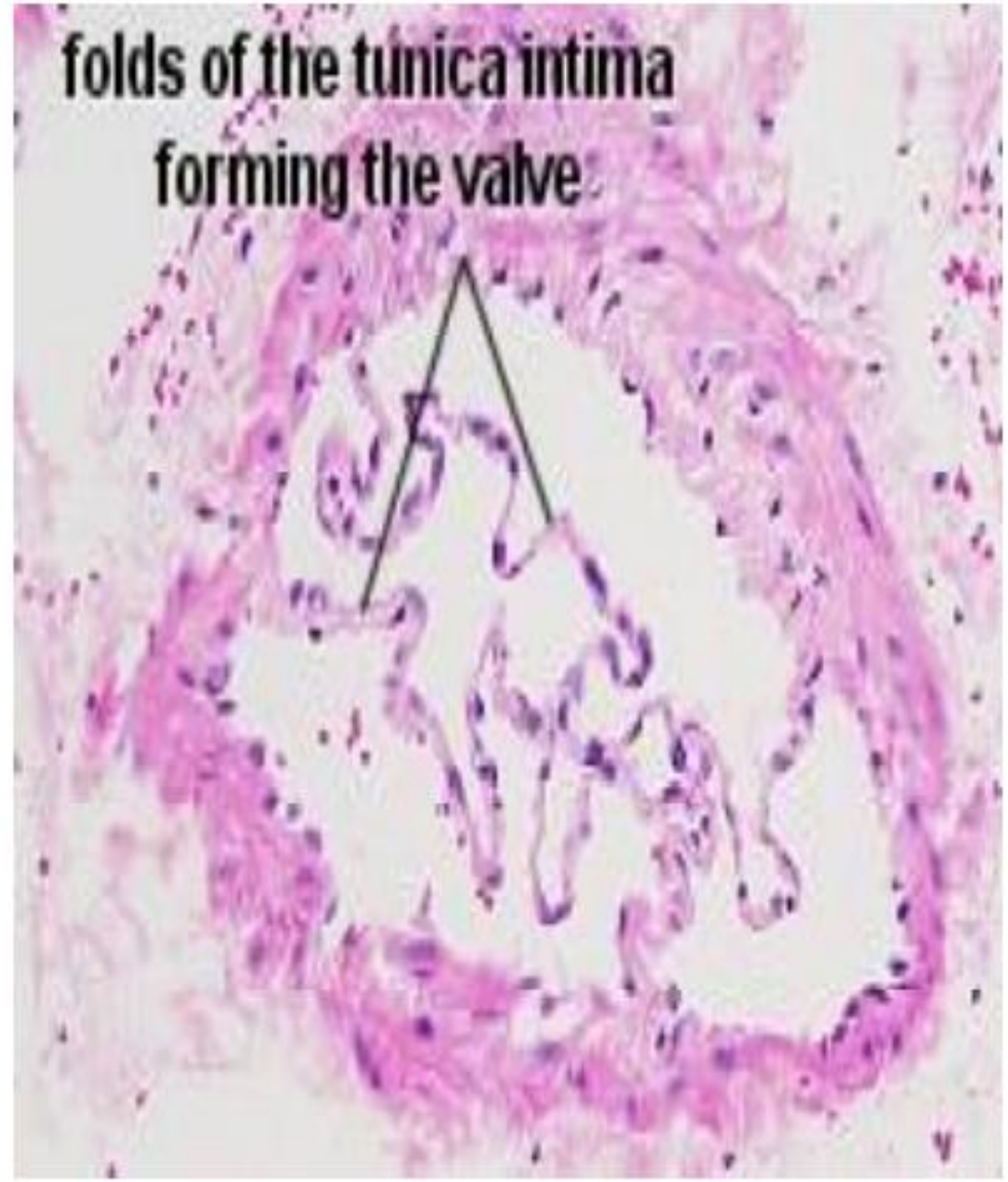
This is important where blood must flow against the force of gravity.

	Large veins	Medium veins	Small veins	Venules
Tunica intima	Endothelium; connective tissue, smooth muscle cells with prominent valves	Endothelium; connective tissue, with valves	Endothelium; connective tissue with scattered smooth muscle fibers	Endothelium; no valves
Tunica media	> 5 layers of smooth muscle, with much collagen	3-5 layers of smooth muscle	Thin, 2-3 loose layers of smooth muscle cells	Pericytes and scattered smooth muscle cells
Tunica adventitia	Thickest layer, with bundled longitudinal smooth muscle	Thicker than media, smooth muscle may be present	Connective tissue, thicker than media	None

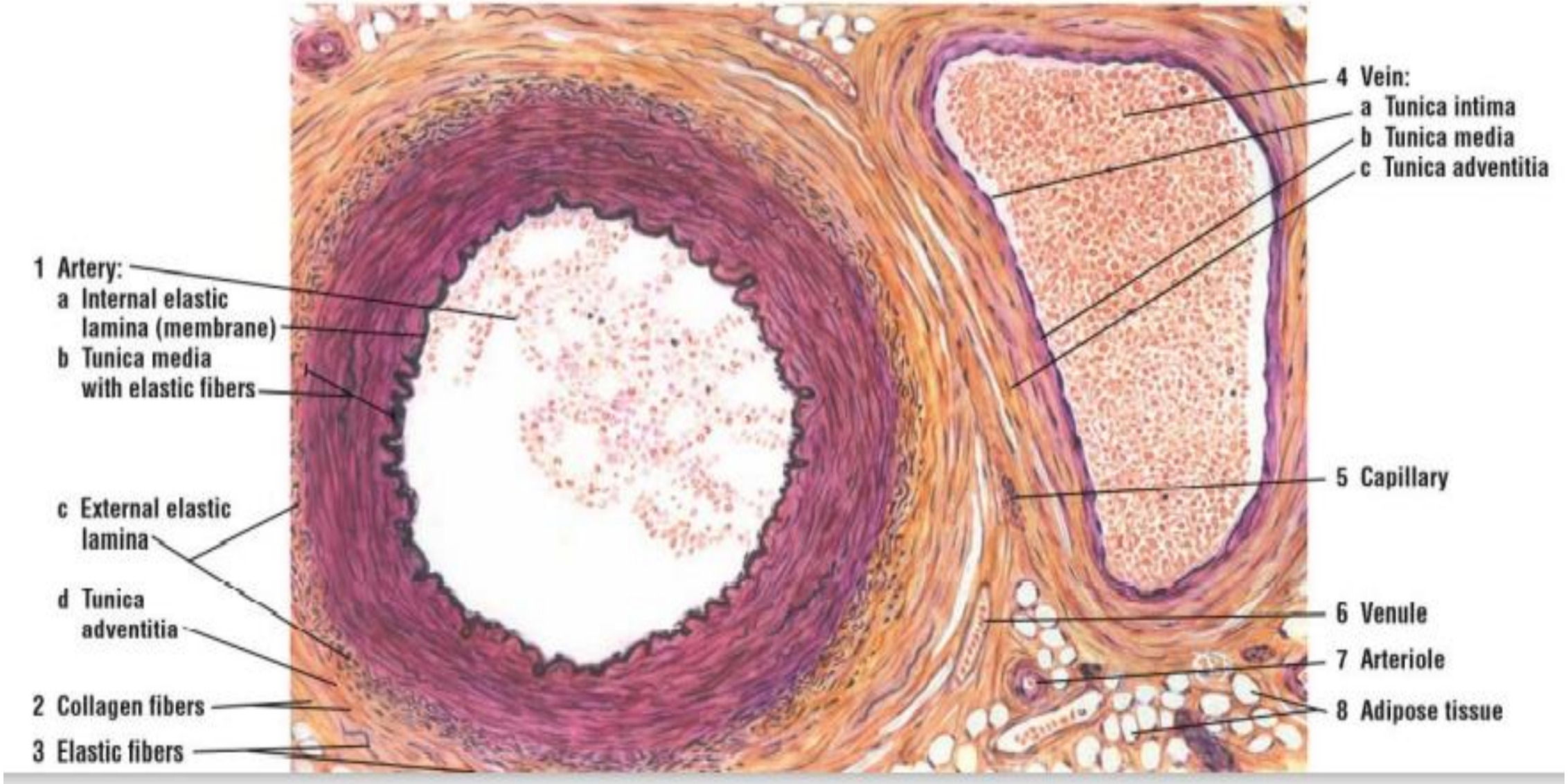
Large veins


1 Endothelium
2 Subendothelial connective tissue
3 Smooth muscle fibers (circular)
4 Tunica intima
5 Tunica media
6 Tunica adventitia
7 Smooth muscle fibers (bundles, longitudinal section)
8 Vasa vasorum:
a. Arteriole
b. Venules
c. Capillary

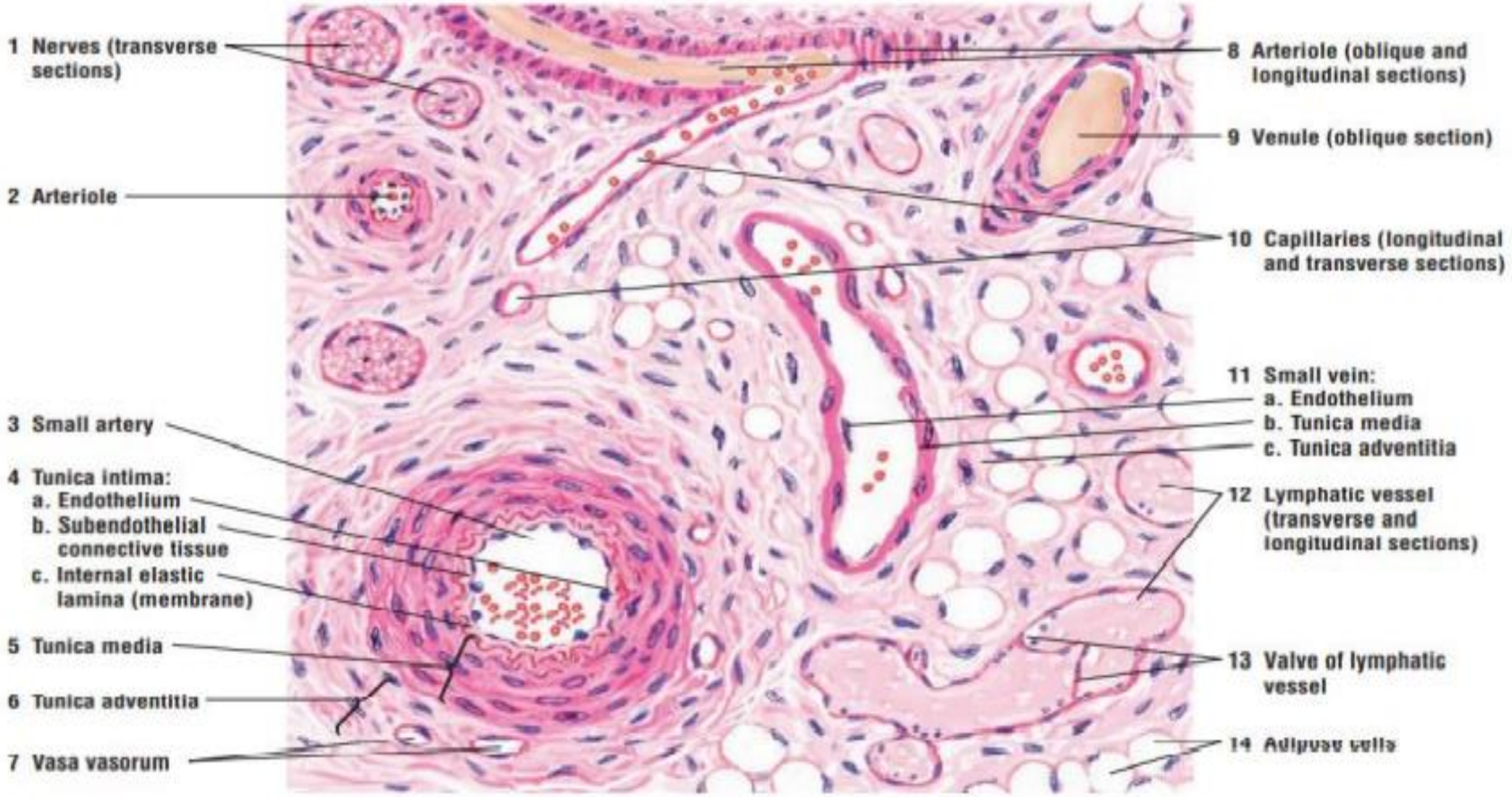

folds of the tunica intima
forming the valve


folds of the tunica intima
forming the valve

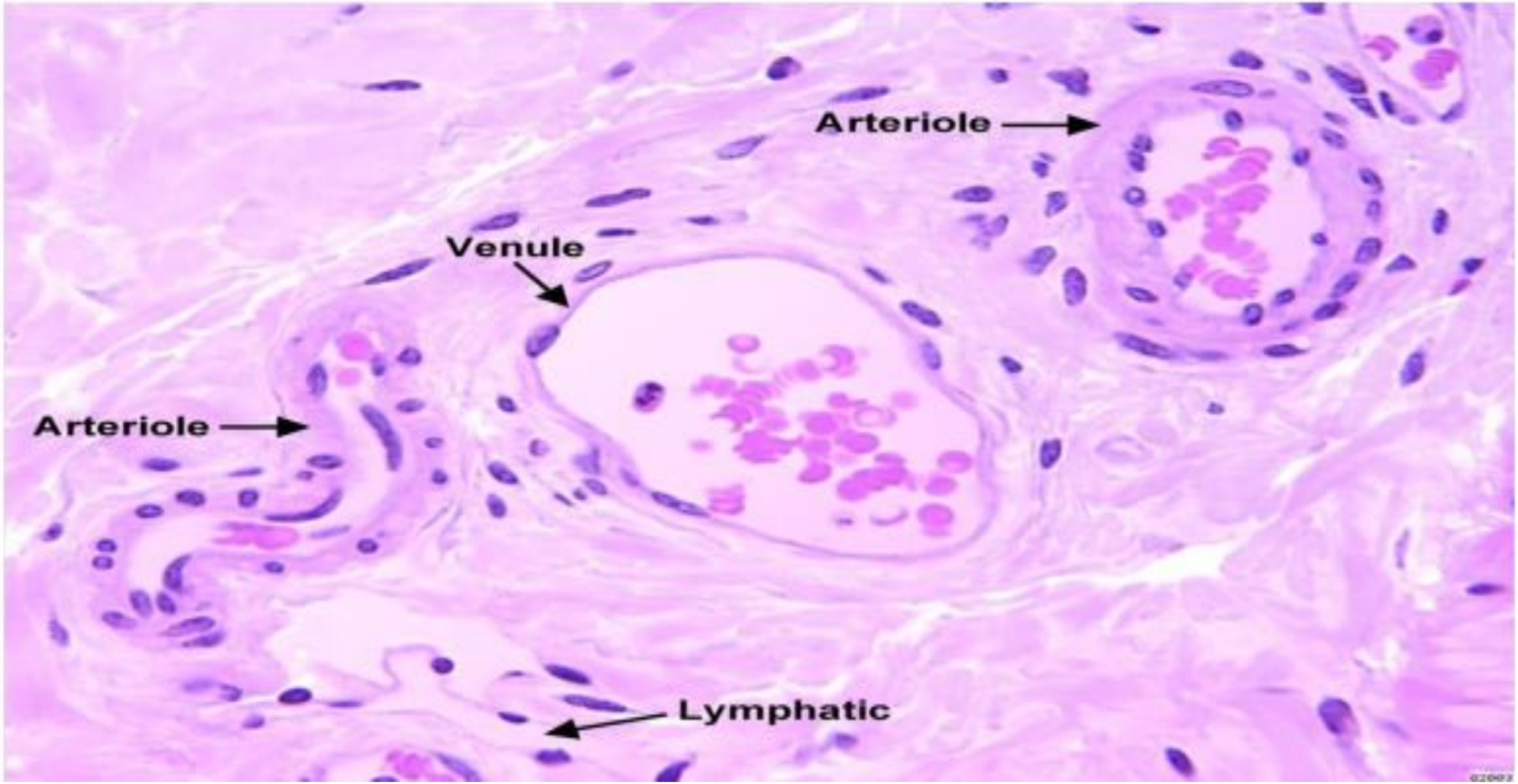
Medium veins



Small veins


1 Nerves (transverse sections)
2 Arteriole
3 Small artery
4 Tunica intima:
a. Endothelium
b. Subendothelial connective tissue
c. Internal elastic lamina (membrane)
5 Tunica media
6 Tunica adventitia
7 Vasa vasorum
8 Arteriole (oblique and longitudinal sections)
9 Venule (oblique section)
10 Capillaries (longitudinal and transverse sections)
11 Small vein:
a. Endothelium
b. Tunica media
c. Tunica adventitia
12 Lymphatic vessel (transverse and longitudinal sections)
13 Valve of lymphatic vessel
14 Adipose cells

Venules

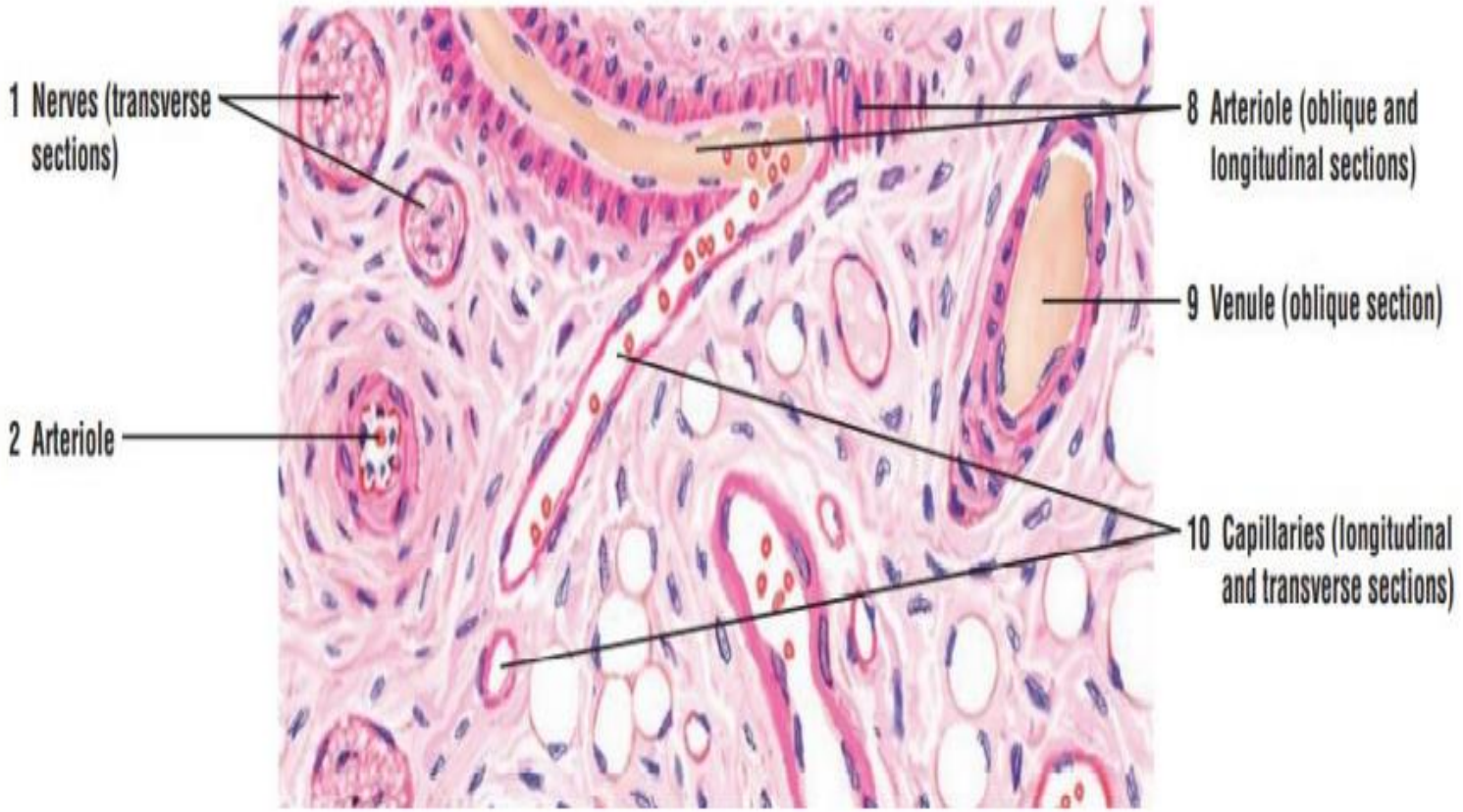


Capillaries

Capillaries are usually 10-4 µm in diameter.

*The wall of blood capillaries consist of:

1. Endothelium with basement membrane.
2. A few pericytes.



Thank you