



Circulatory System (Cardio-Vascular System)

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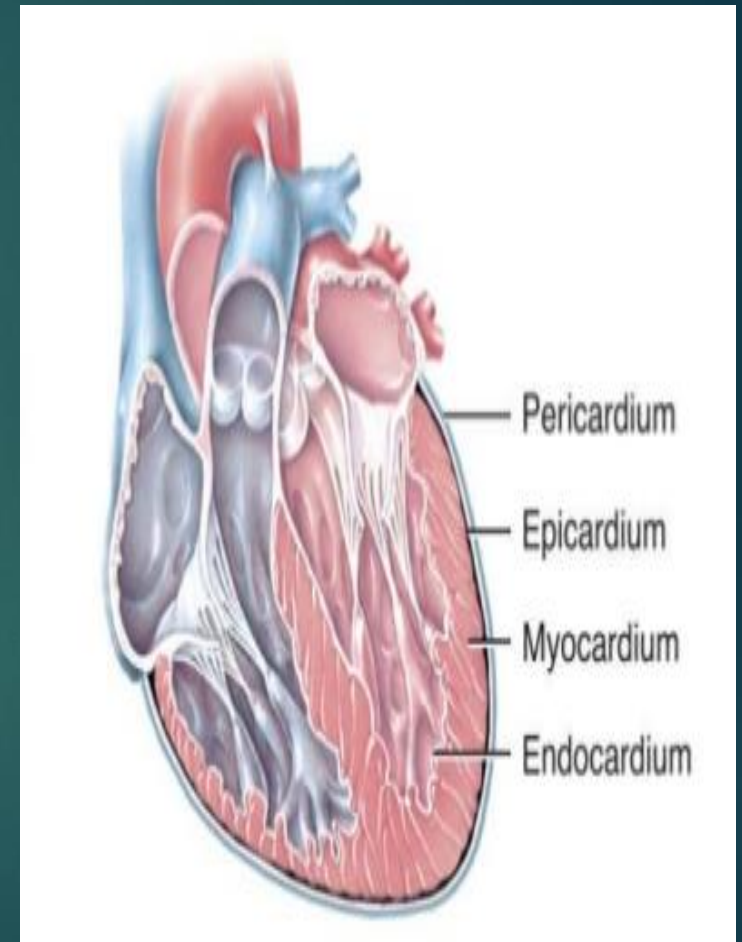
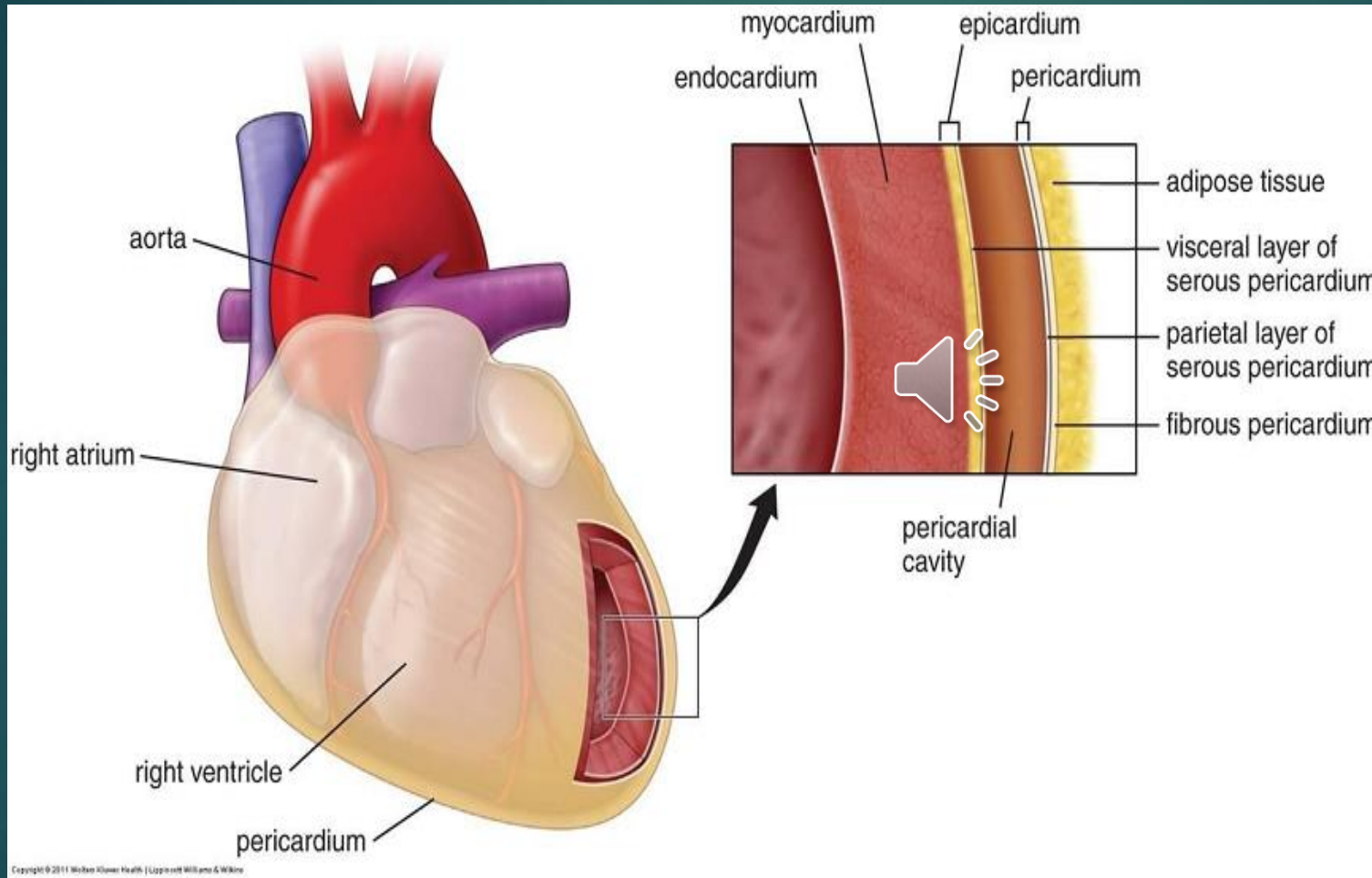
Circulatory System (Cardio-Vascular System)

► The circulatory system includes:

1. The heart: function is to pump the blood.
2. Arteries: function is to carry the blood with nutrients and oxygen to the tissues.
3. Venins: they convey the blood to be pumped again.
4. Capillaries: through whose walls the interchange between blood and tissues take place.
5. Lymphatic vascular system: function to return the fluid of the tissue spaces to the blood.



The Heart

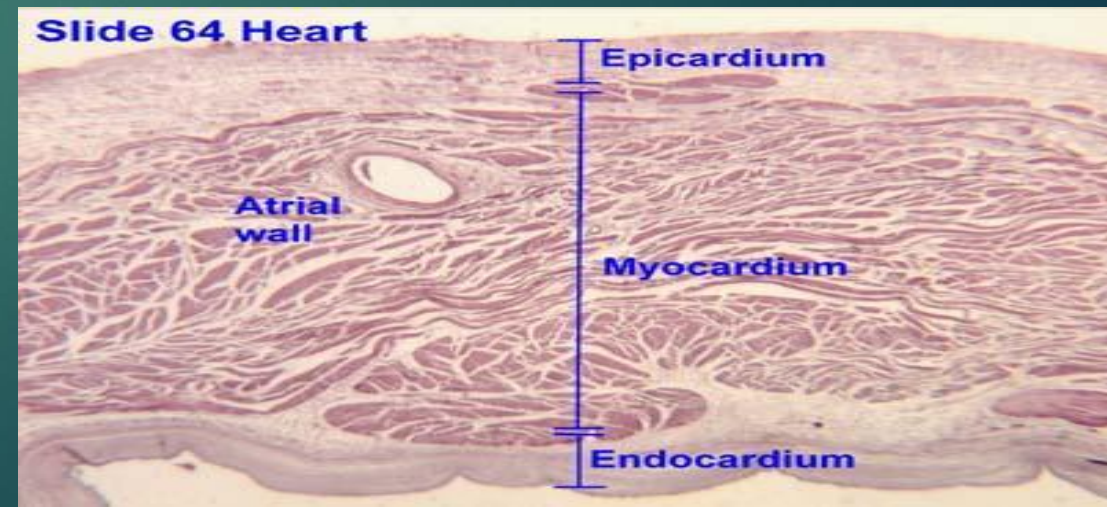
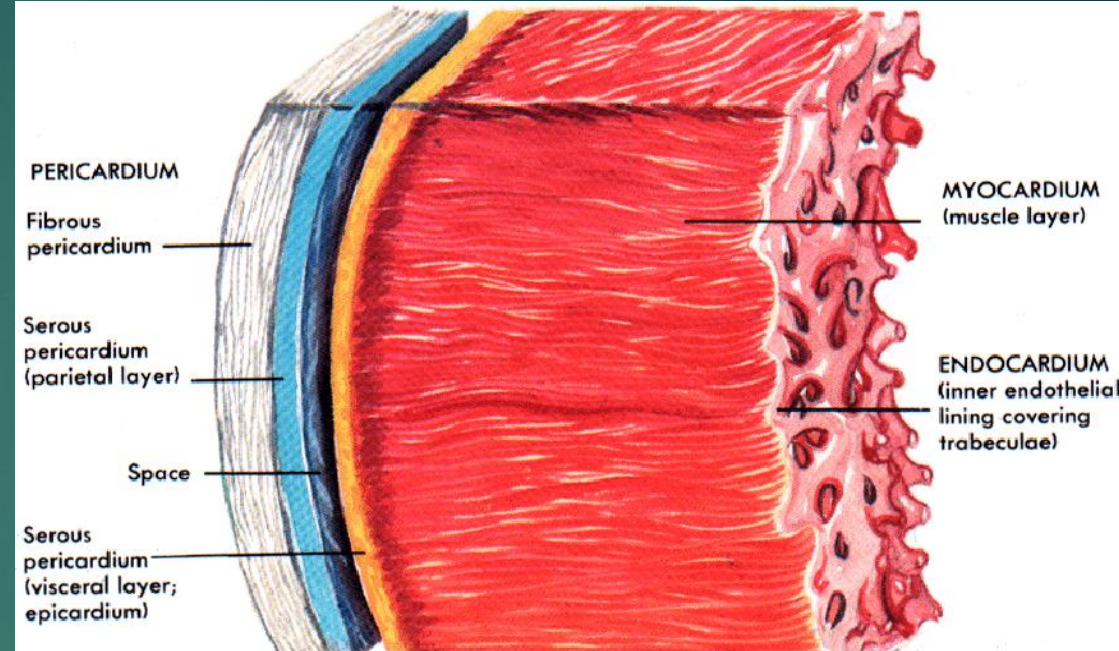


The Heart

▶ The heart has four chambers, two ventricles and two atria. The walls of all heart chambers **consist of three layers:**

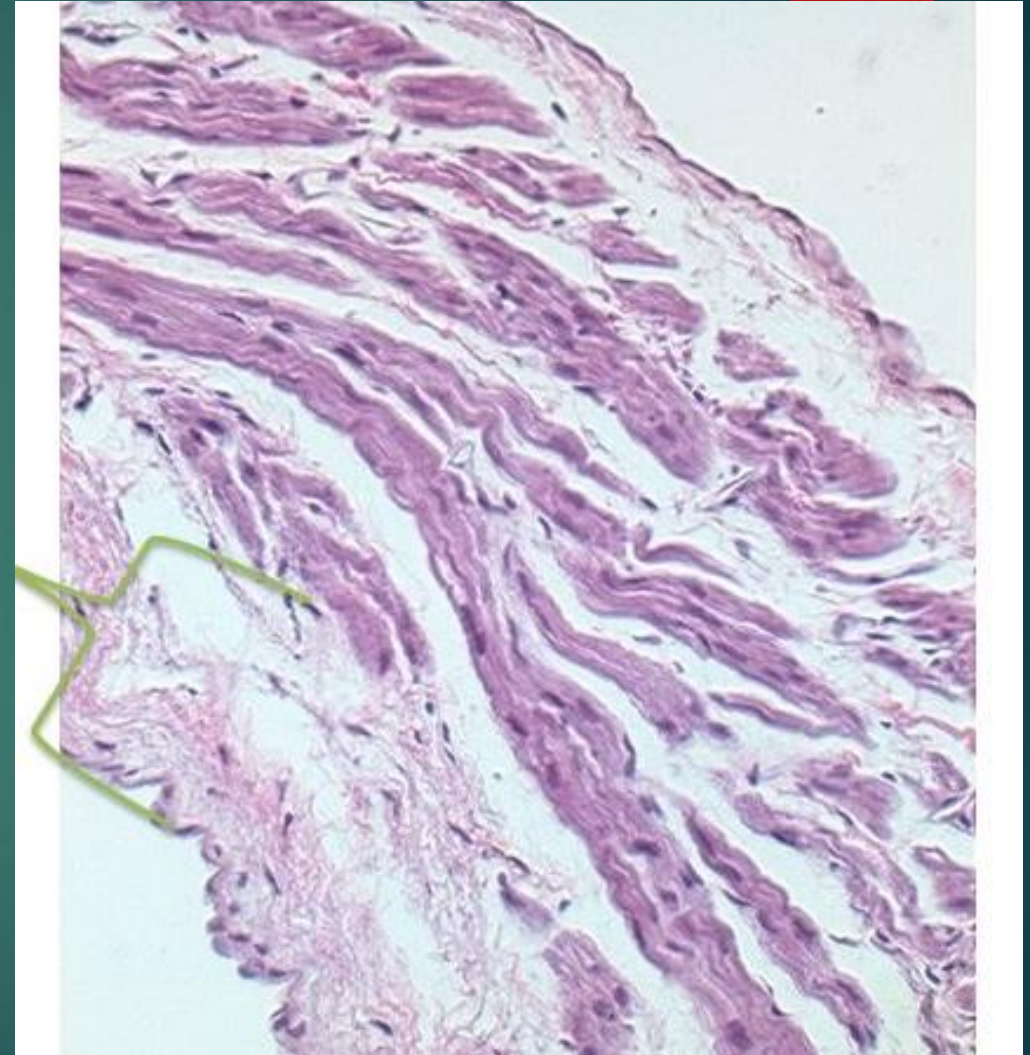


- ▶ . Endocardium (Internal)
- ▶ Myocardium (The Middle)
- ▶ Epicardium (External)




▶ **A- Endocardium (Internal)**
consist of:-

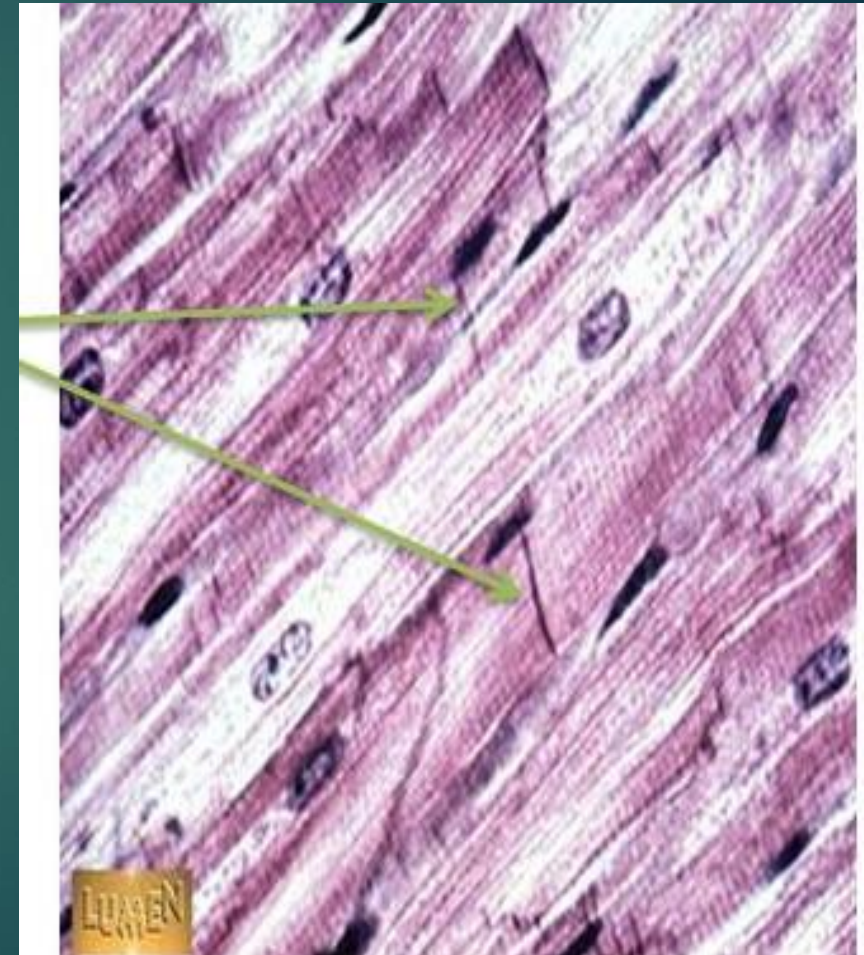
1. A single layer of squamous epithelium tissue on.
2. A thin layer of loose connective tissues with elastic and collagen fibers.
3. Smooth muscle cells



The Heart

▶ B- Myocardium (The Middle):-

- ❖ The thickest layer of the layers.
- ❖ Consist of cardiac muscle cells. 
- ❖ Cardiac muscle arranged in layers in a complex spiral surround the heart chambers.
- ❖ Myocardium is much thicker in the ventricles than in the artria, Why?

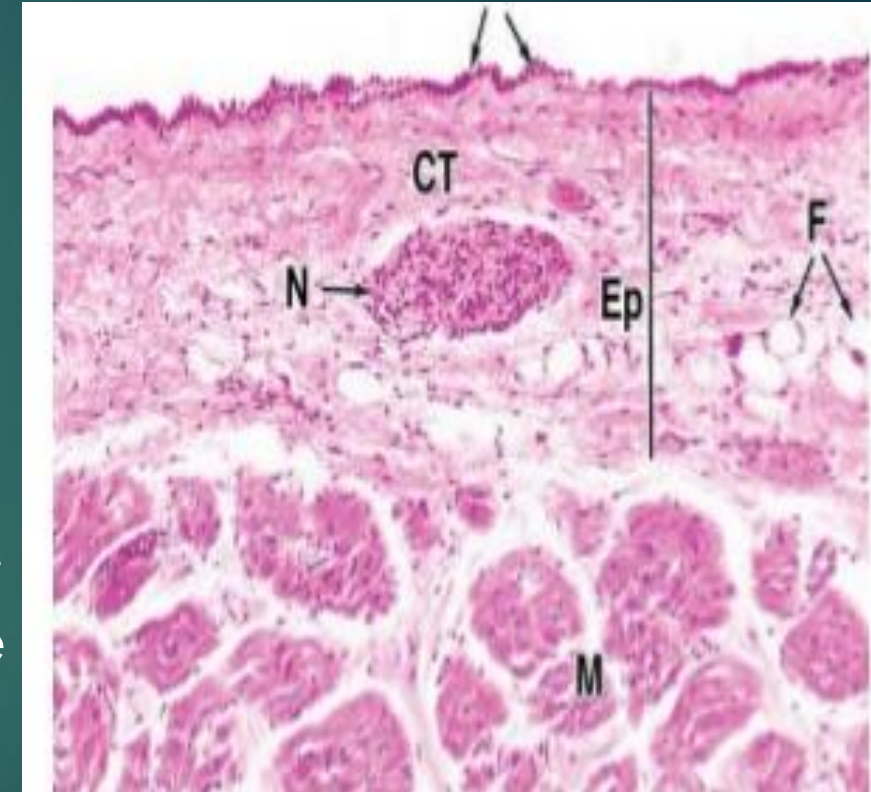


The Heart

▶ C- Epicardium (External)

❖ Epicardium consist of:-

- A. Simple squamous epithelium tissue called (mesothelium).
- B. Thin layer of connective tissue for support.
- C. A subepicardial layer of connective tissue veins, nerves and many adipocytes.



Note: the cardiac valves consist of central core of:

1. Dense connective tissue with both collagen and elastic fibers.
2. Lined by endothelial layers.
3. Bases of the valves are attached to strong fibrous rings. §

Tissues of The Vascular Wall

▶ Walls of larger blood vessels contain three basic components:

1. **Simple squamous epithelium tissue (Endothelium).**
2. **Smooth muscles.**
3. **Connective tissue with elastic elements and collagen.**



▶ Arrangement of these tissues in vessels are influenced by mechanical factors, blood pressure and metabolic factor.

Note: endothelium is semipermeable barrier between blood plasma and interstitial tissue fluid.

Structural Plan of Blood Vessels

▶ Blood vessels are composed of the following layers:

A. Tunica intima (internal) has:-

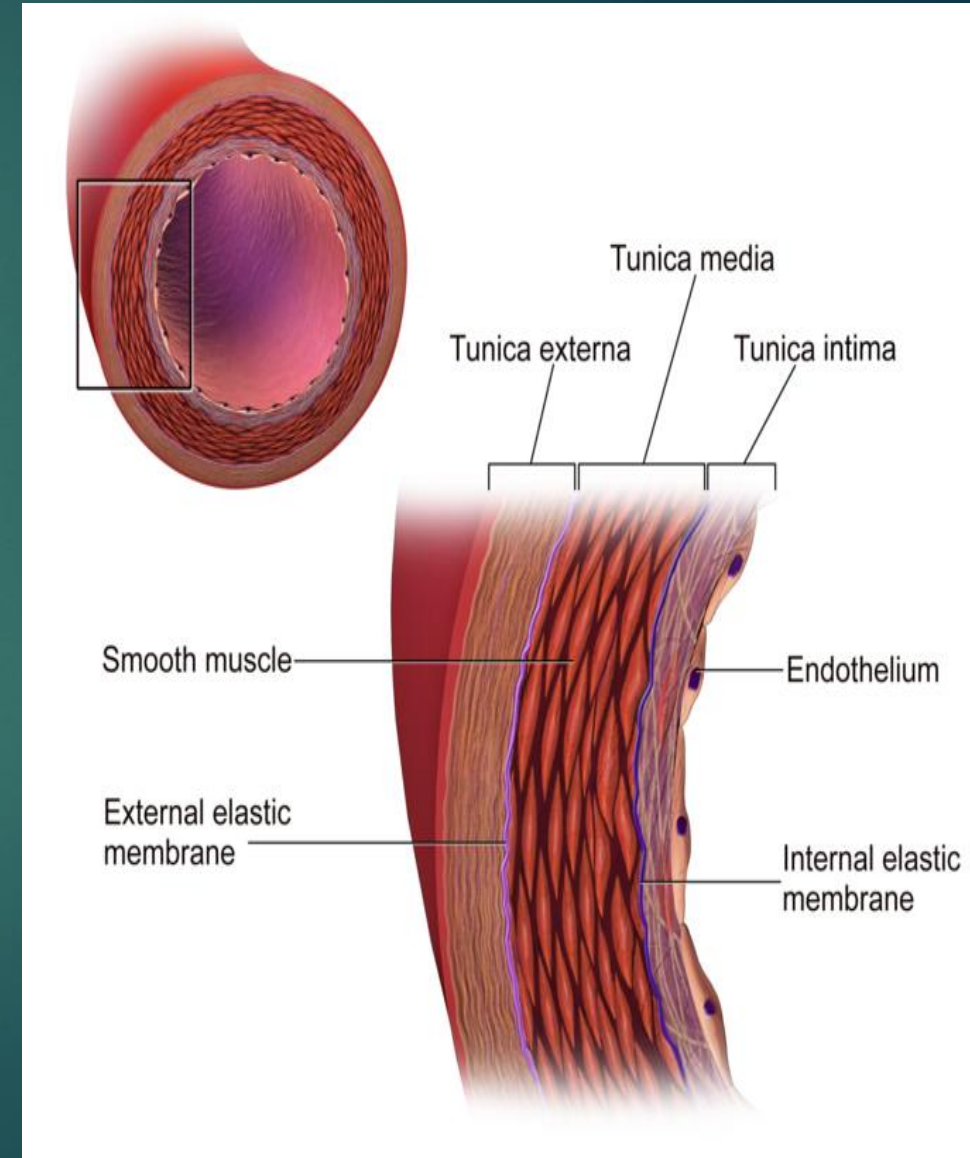
1. One layer of endothelium.
2. Loose connective tissue.
3. Occasional with smooth muscle cells.



B. The tunica media (Middle Layer). Consist mainly of helically arranged smooth muscle cells interposed among smooth muscle cells are variable amount of elastic fibers veticular fibers of collagen, proteoglycans and glycoprotein.

C. The tunica adventitia (External) consist mainly of type I collagen and elastic fibers.

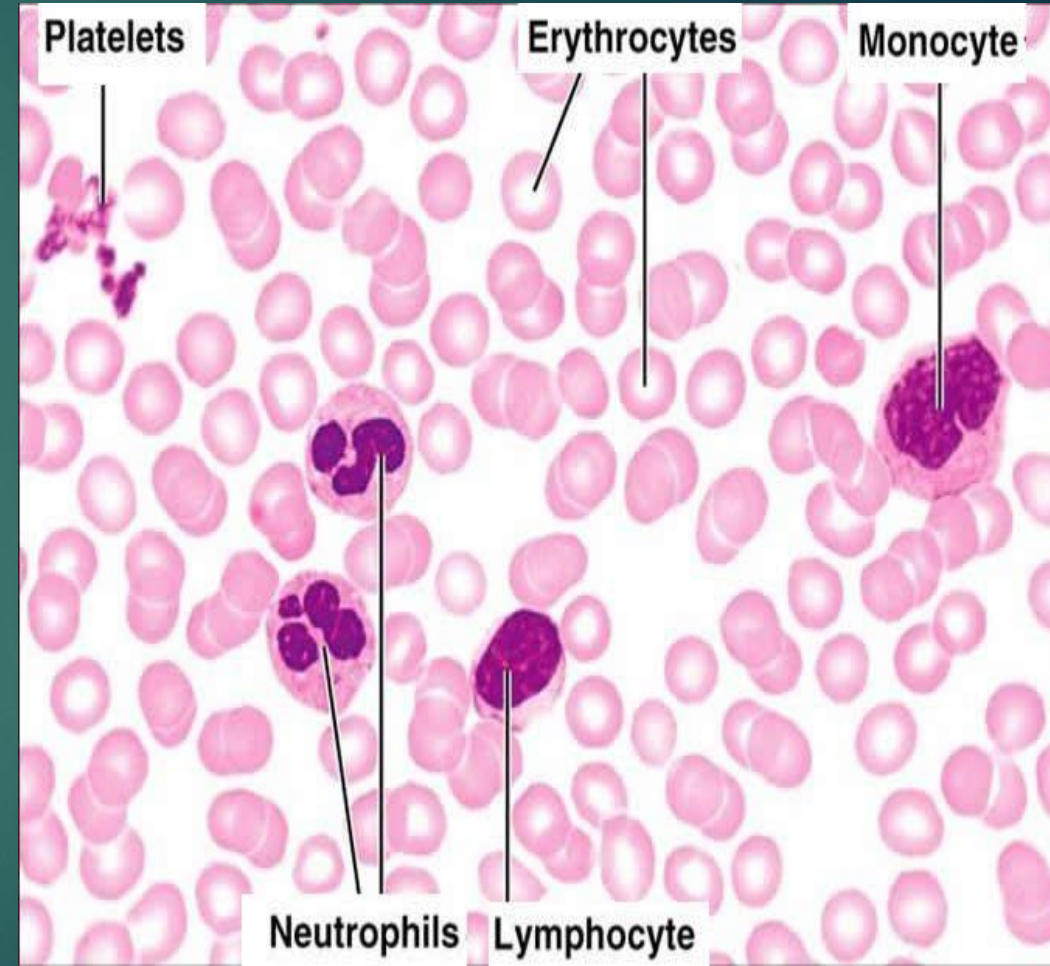
The adventitia is generally continuous with the connective tissue of the organ through which the blood vessel runs.



The Blood

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- ▶ The blood is specialized connective tissue with cells suspended in plasma.
- ▶ There is about 5 liter of blood in adult.
- ▶ **the cells are:-**
 1. **Erythrocytes (Red blood cells).**
 2. **Luekocytes (White blood cells).**
 3. **Platelets.**
- ▶ **Plasma is an aqueous soluation containing plasma proteins such:**
 1. **Albumin. Made in liver, maintaining osmotic pressure in blood.**
 2. **α and β globulins, made by liver.**
 3. **γ globulins, are immunoglobulins (antibodies).**
 4. **Complement proteins.**
 5. **Fibrinogen, made in liver, block blood loss from small-vessels.**



Hemopoiesis

- ▶ Hemopoiesis is blood making organs which are:
 - A. In embryo, blood cells arise from the yolk sac mesoderum.
 - B. In the 2nd trimester, blood cells arise from liver and spleen.
 - C. In the 3rd trimester, blood cells arise from bone marrow.
 - D. After birth blood cells are deroved from stem cells in bone marrow.

Quiz

- ▶ Blood moves in one direction, far from heart or toward the heart. Why and How?
- ▶ Please send your answers through email.