HEART STRUCTURE

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PLAN:

I. GENERAL OVERVIEW

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1. FIBROUS FRAMEWORK OR SKELETON OF THE HEART
2. MUSCLE FIBERS

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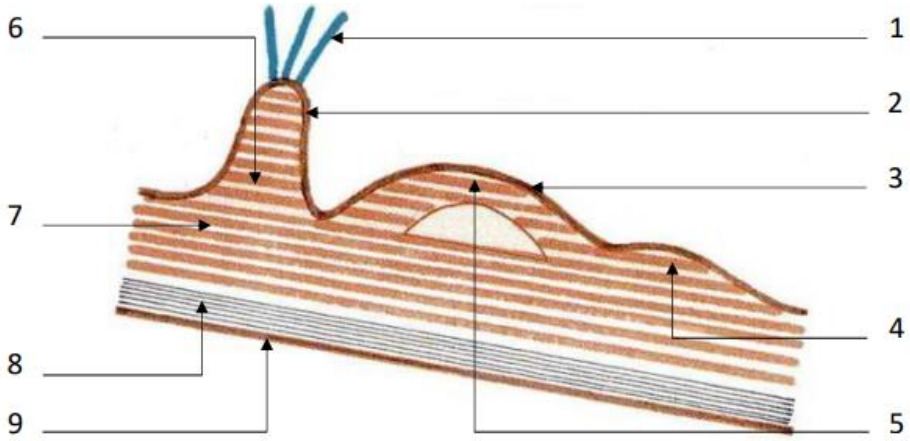
I – GENERAL OVERVIEW:

The wall of the heart consists of:

- a thick muscular layer, the **myocardium**;
- a membrane, the **endocardium**, which lines the inner surface of the myocardium and defines the cardiac chambers;
- and a fibrous-serous sac, the **pericardium**, which encloses the heart.



1- Chordae tendineae
2- Papillary muscle
3- Endocardium
4- Trabeculae carneae of the 3rd order
5- Trabeculae carneae of the 2nd order
6- Trabeculae carneae of the 1st order
7- Myocardium
8- Epicardium
9- Pericardium

Longitudinal section through the ventricular cardiac muscle

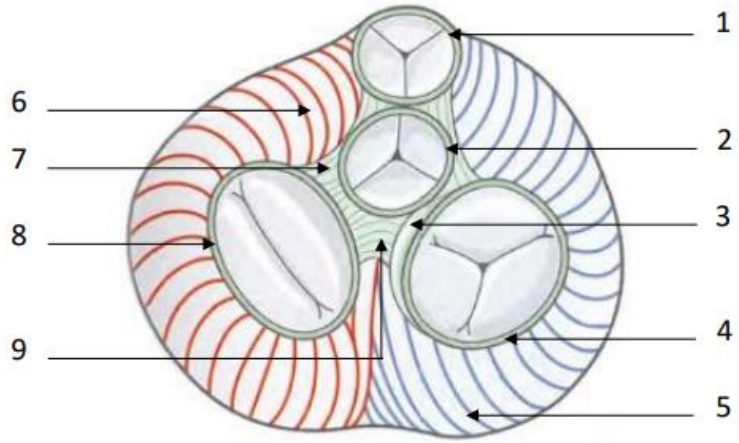
II - MYOCARDIUM:

- The heart is a predominantly muscular organ.
- Its thickness is determined by the myocardium, which is composed of striated myofibres arranged in interwoven and anastomosing bundles.
- It is a richly vascularised muscle, traversed by the conduction system.
- All muscle fibres originate from a fibrous structure located at the base of the ventricles, forming the **fibrous framework of the heart**.

1. Fibrous framework or the skeleton of the heart:

It includes the fibrous rings and fibrous trigones of the heart.

- The fibrous rings surround the atrioventricular and arterial orifices.
- The right fibrous trigone connects the aortic and right atrioventricular rings.
- The left fibrous trigone connects the pulmonary and left atrioventricular rings.



1- Fibrous ring of the pulmonary orifice
2- Fibrous ring of the aortic orifice
3- Atrioventricular septum
4- Fibrous ring of the right atrioventricular septum
5- Right ventricle
6- Left ventricle
7- Left fibrous trigone
8- Fibrous ring of the left atrioventricular septum
9- Right fibrous trigone

Superficial layer of the myocardium (viewed from the base of the ventricles, with the atria removed)

2. Muscle fibers:

Three categories of muscle fibres must be distinguished:

- those of the ventricles;
- those of the atria;
- and the conduction or excitatory system, which controls cardiac activity.

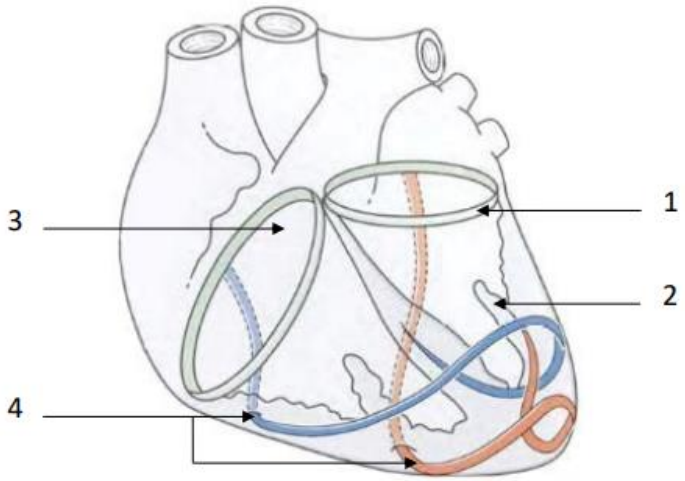
a. The ventricles:

They are composed of three muscular layers: **superficial**, **middle**, and **deep**.

- **The superficial layer** is made up of fibres common to both ventricles. These fibres arise from the fibrous rings and trigones, follow a spiral path, and form a whorl at the apex, known as the cardiac vortex.
  They terminate either within the interventricular septum or in the trabeculae carneae.
  The orientation of the bundles runs left to right for the left ventricle, and right to left for the right ventricle.

- **The middle layer**, which is thicker, consists of arciform bundles specific to each ventricle.

- **The deep layer**, formed by fibres derived from the previous two layers, gives rise to the trabeculae carneae and papillary muscles.

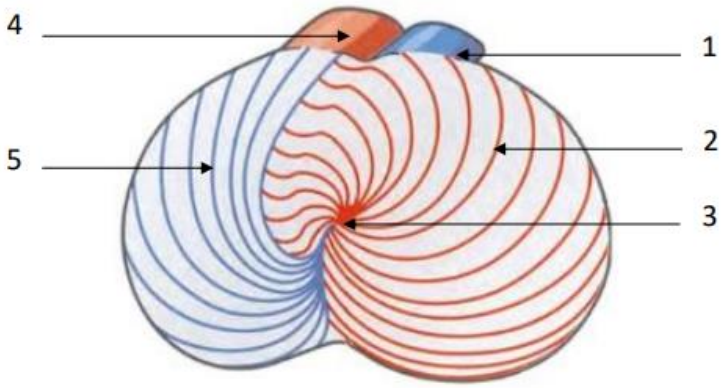


1- Fibrous ring of the aortic orifice
2- Trabeculae carneae
3- Fibrous ring of the pulmonary orifice
4- Path of the muscle fibers.

Orientation of the myofibres in the superficial layer of the myocardium

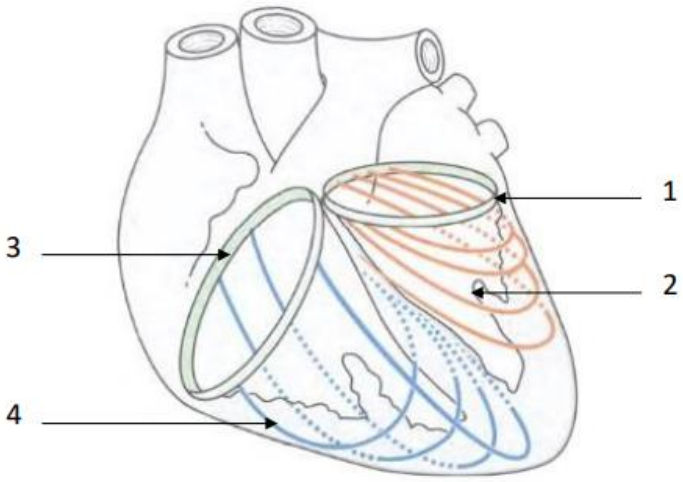
b. The atria:

They have a thin muscular wall composed of fibres specific to each atrium, as well as shared fibres.



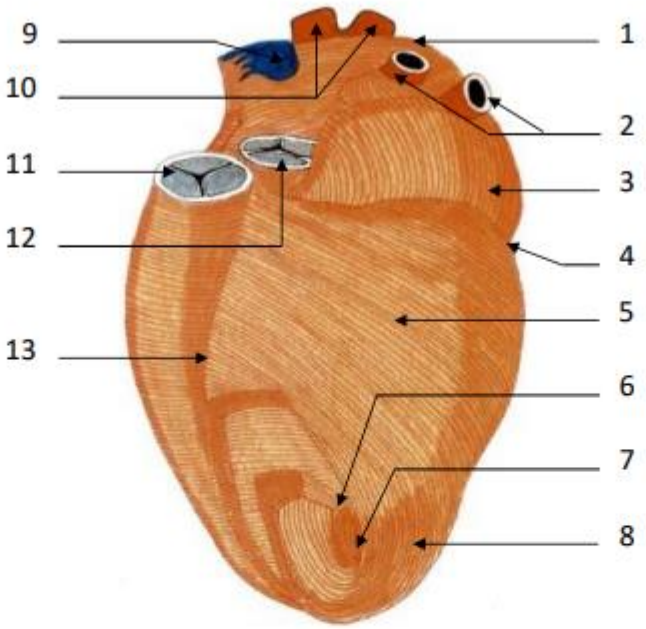
1- Pulmonary trunk
2- Left ventricle
3- Cardiac vortex
4- Aorta
5- Right ventricle

Superficial layer of the myocardium at the level of the apex



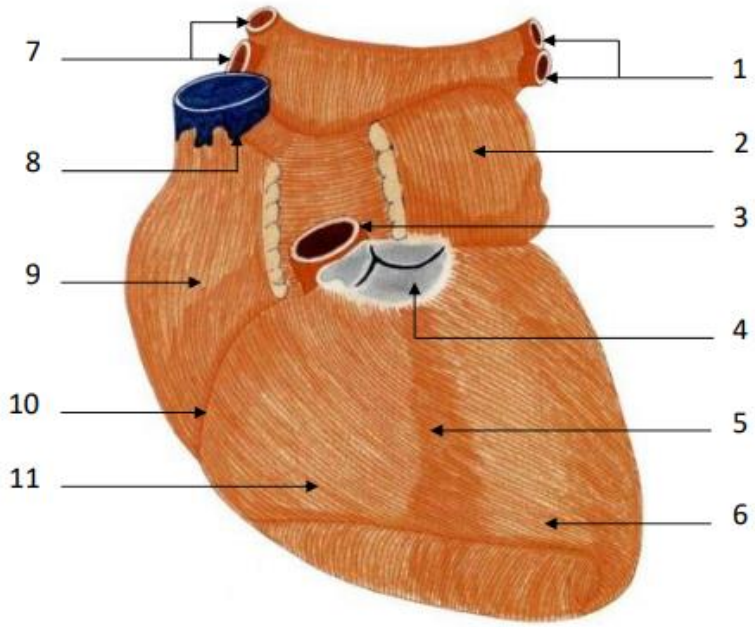
1- Fibrous ring of the aortic orifice
2- Muscle fibers of the left ventricle
3- Fibrous ring of the pulmonary orifice
4- Muscle fibers of the right ventricle

Middle layer of the myocardium



1- Left atrium
2- Left pulmonary veins
3- Left auricle
4- Atrioventricular sulcus
5- Left ventricle
6- Middle layer of the myocardium
7- Deep layer of the myocardium
8- Outer layer of the myocardium
9- Superior vena cava
10- Left pulmonary veins
11- Pulmonary valve
12- Aortic valve
13- Anterior interventricular sulcus

Left lateral view of the heart showing the myocardial layers



1- Left pulmonary veins
2- Left atrium
3- Pulmonary artery
4- Aorta
5- Anterior interventricular sulcus
6- Left ventricle
7- Right pulmonary veins
8- Superior vena cava
9- Right atrium
10- Atrioventricular sulcus
11- Right ventricle

Anterior view of the heart showing the arrangement of the myocardial fibers

3. The conduction or excitatory system:

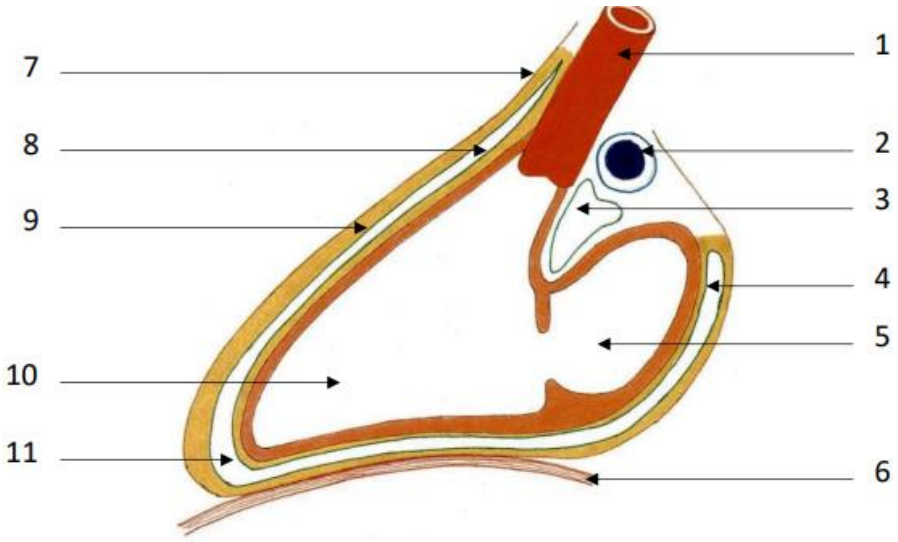
- The heart contains a specialised muscular tissue known as the cardiac conduction system or cardionector system, which spontaneously and rhythmically generates local impulses.
- These impulses are transmitted over distance, stimulating the remainder of the myocardium and triggering its contraction.
- This specialised network of muscle bundles and neural elements ensures the coordinated propagation of myocardial contraction.

III – ENDOCARDIUM:

- The **endocardium** is a thin, smooth, and adherent membrane that lines the interior of the heart. It is continuous with the inner lining of the blood vessels (the **endothelium**).
- It contains **no blood vessels** of its own and is nourished by the blood flowing over its surface.

IV – PERICARDIUM:

It is represented by a **fibrous-serous sac** that encloses the heart and consists of two components: an outer **fibrous layer**, and a deeper **serous layer**.



1- Aorta
2- Pulmonary artery
3- Transverse sinus
4- Haller's sinus (oblique sinus)
5- Left atrium
6- Diaphragm
7- Fibrous pericardial sac
8- Serous pericardium (visceral layer)
9- Serous pericardium (parietal layer)
10- Left ventricle
11- Pericardial cavity

Longitudinal section of the heart showing the arrangement of the pericardium

VII - CONCLUSION:

- In conclusion, the heart's structure is a highly specialized and coordinated system that ensures its efficient functioning.
- The myocardium, with its distinct layers and fibre arrangement, allows for powerful and rhythmic contractions.
- The endocardium, as the inner lining, ensures smooth blood flow, while the fibrous skeleton provides structural support.
- The conduction system facilitates the synchronization of cardiac activity, ensuring a coordinated heartbeat. Together, these components work in harmony to maintain the essential role of the heart in circulating blood throughout the body.