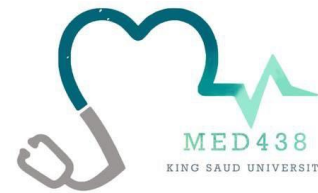


Histology team 438  
King Saud University



# WALL OF THE HEART & CARDIAC VALVE

 Editing file

Color index :  
Red : important  
Grey : Doctor notes /extra



## Objectives:

By the end of the lecture, the student should be able to describe the microscopic structure of:

- Wall of the heart:
  - Endocardium.
  - Myocardium.
  - Epicardium.
- Cardiac valves.

# Wall of the heart

From the inside to the outside:

## 1. Endocardium

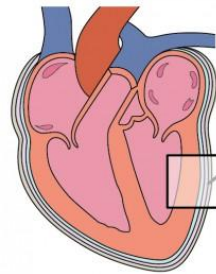
Endothelium

Subendothelial C.T

Dense C.T layer

Subendocardial layer

## 2. Myocardium



Endocardium

Myocardium

Extra

Pericardial cavity

Fibrous pericardium

Parietal layer of serous pericardium

Epicardium (visceral layer of serous pericardium)

## 3. Epicardium

Mesothelium

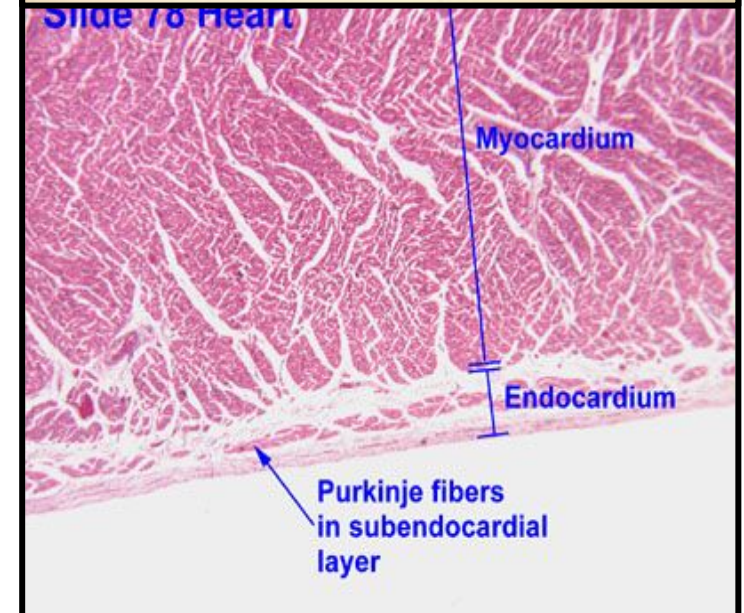
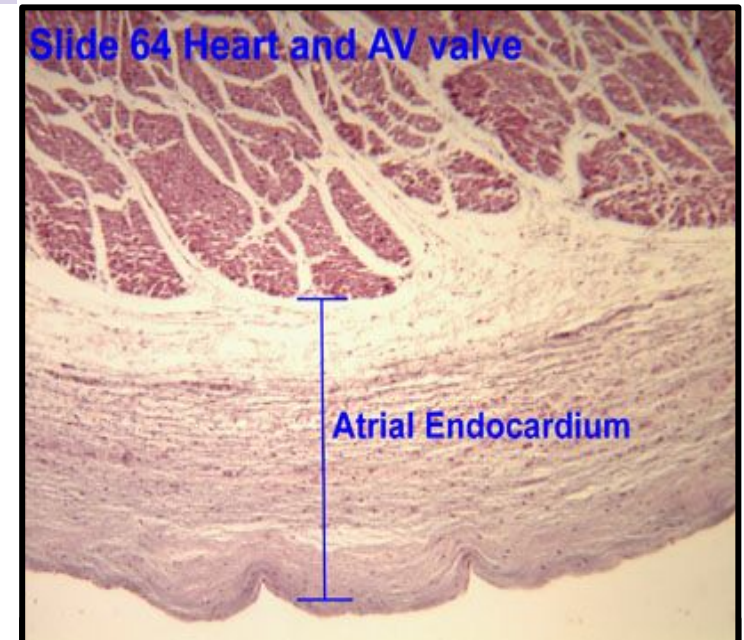
C.T layer

## Endocardium (inner layer)

Endothelium	simple squamous epithelium. (same as the epithelium in the blood vessels)
Subendothelial C.T. layer	Thin loose CT, for nutrition.
Dense C.T. layer	Collagen
Subendocardial layers	<ul style="list-style-type: none"><li>Loose C.T. layer that contains <b>Purkinje fibers<sup>1</sup></b>, small blood vessels &amp; nerves.</li><li>It attaches to the endomysium of the cardiac muscle.</li></ul>

## Myocardium (middle layer)

- It is the most thick layer.
- contains **cardiac muscle cells<sup>2</sup>** with endomysium (loose C.T.)



<sup>1</sup> more information in slide 8

<sup>2</sup> more information in slides 6

# Epicardium (outer layer)

Visceral layer of pericardium<sup>1</sup>

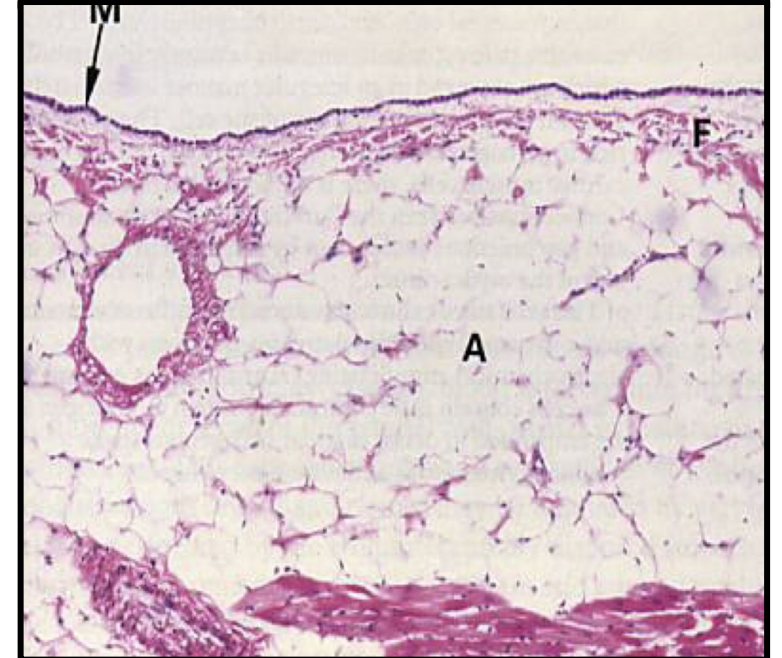
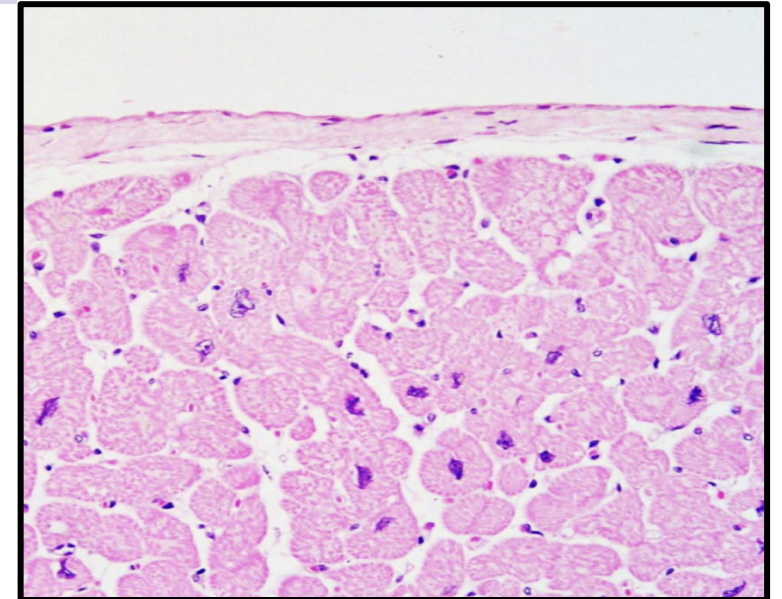
Is formed of:

- ▣ **Mesothelium:** Simple squamous epithelium.
- ▣ **Subepicardial C.T. layer:** Loose C.T. contains:
  - coronary vessels
  - nerves
  - ganglia
  - fat cells

The Difference between Pericardium and Epicardium:

The pericardium consists of a fibrous layer and a serous layer. Similarly to the pleura, the serous layer contains a parietal and visceral layer.

Therefore, the epicardium is a part of the pericardium (specifically, the visceral layer of the pericardium)



# Cardiac Muscle

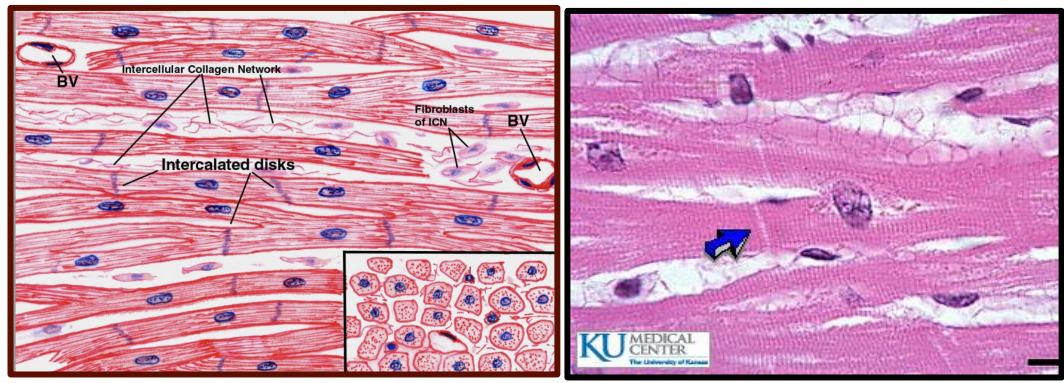
## LM

- ❑ Found in the **myocardium**.
- ❑ Striated and involuntary.
- Cylindrical in shape.
- Intermediate in diameter between skeletal and smooth muscle fibers.
- Branch and anastomose.
- Covered by a thin sarcolemma.
- Mononucleated. Nuclei are oval and central.
- Sarcoplasm is acidophilic and shows non-clear striations (fewer myofibrils).
- Divided into short segments (cells) by the intercalated discs.

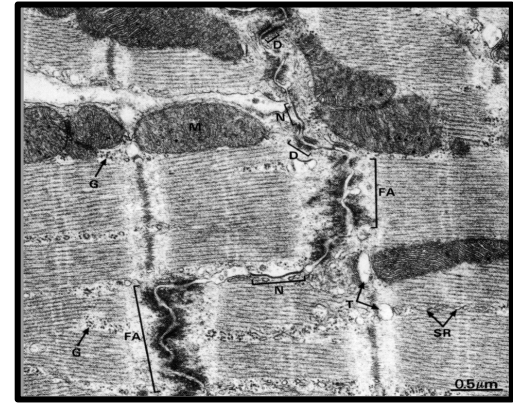
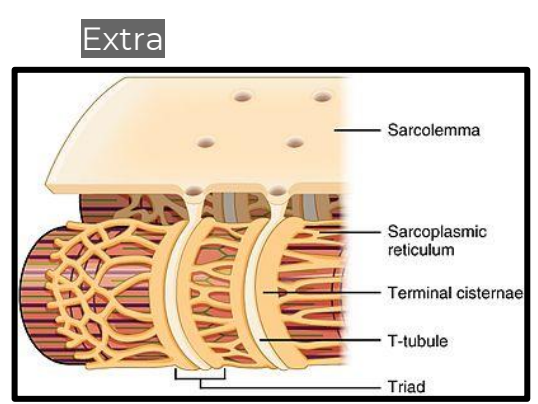
## EM

- Few myofibrils.
- Numerous mitochondria.
- Less abundant SR.
- T-tubules come in contact with only one cisterna of SR forming "Diads = pairs = two" (not triads).
- Glycogen & myoglobin.
- Intercalated discs: are formed of the two cell membranes of 2 successive cardiac muscle cells, connected together by junctional complexes (desmosomes and gap junctions\*).

Gap junctions are the channels between the cells so the impulses reach to all the cells at the same time.  
 كأنها دباسة Desmosome



blue arrow = intercalated disc

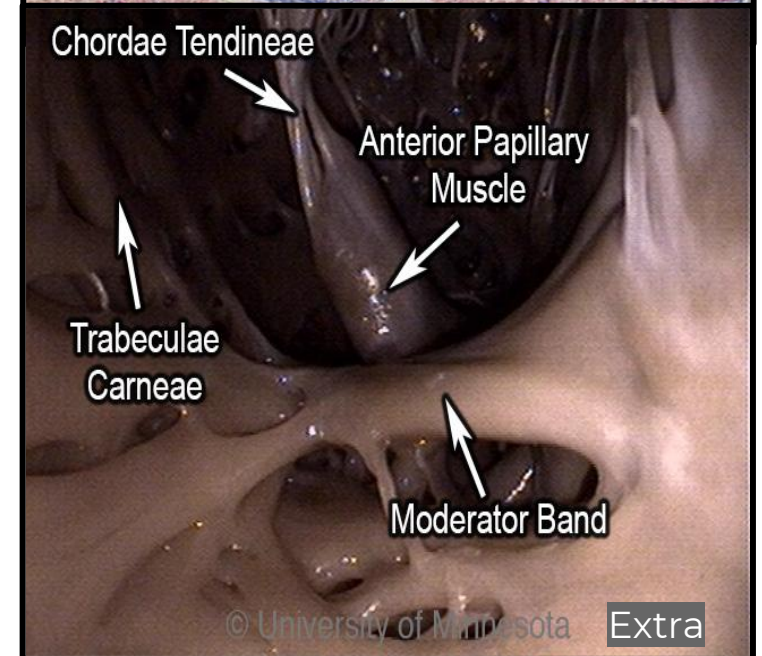
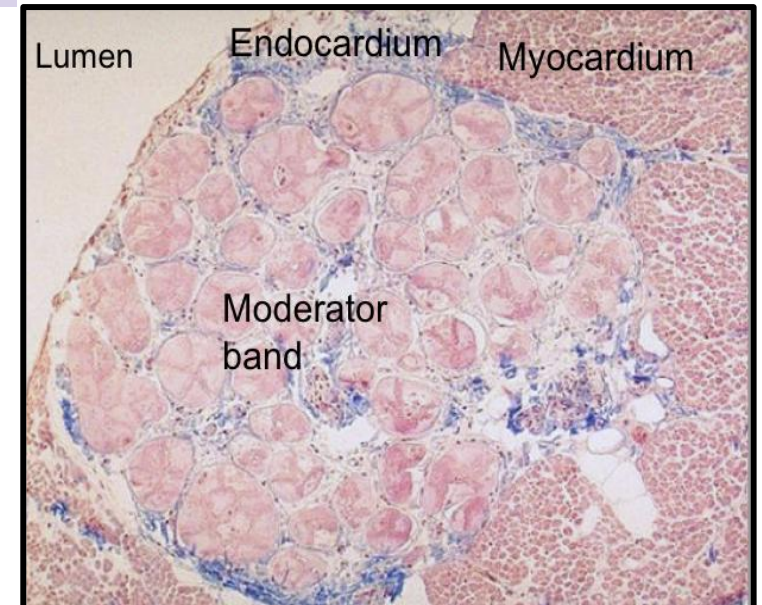


E.M Picture of **myocardium**

# Purkinje fibers (Moderator Band) vs. cardiac muscle cells

are located in the inner ventricular walls of the heart, in a space called the **subendocardium**. The Purkinje fibres are specialised conducting fibres composed of electrically excitable cells that are larger than cardiomyocytes with fewer myofibrils and a large number of mitochondria and which conduct cardiac action potentials more quickly and efficiently than any other cells in the heart.

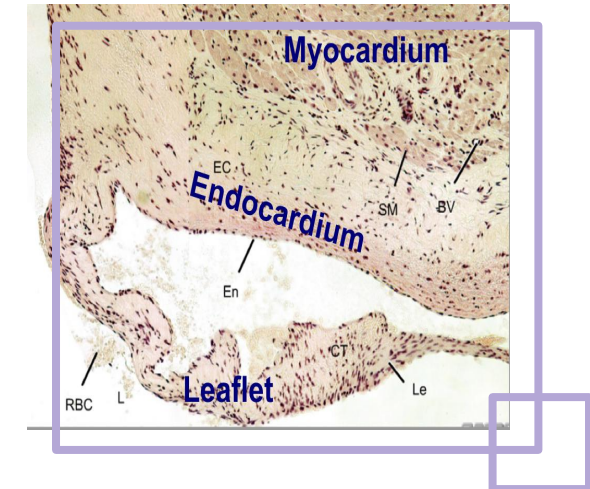
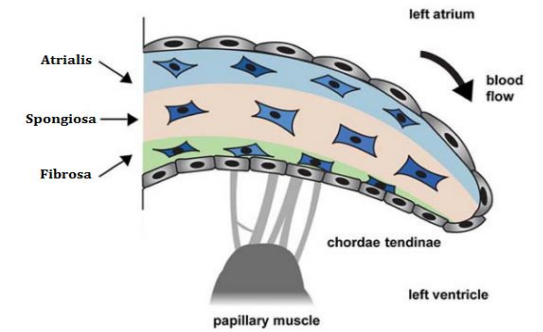
	Purkinje fibers	Cardiac muscle
Nuclei	<b>Peripheral.</b> usually binucleated	Central.
Diameter	<b>Large.</b>	Medium sized.
Stain	<b>Paler</b> in staining (more glycogen Why? For more energy ).	Darker stain.
Number of myofibrils	<b>Fewer</b> myofibrils (mainly peripheral).	Numbered myofibrils.
Intercalated disc	<b>Absent.</b>	Present.



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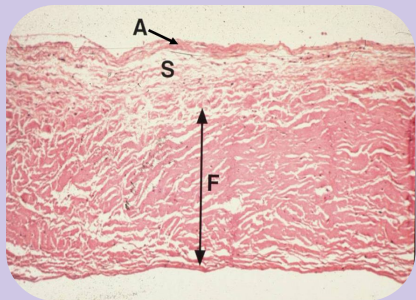
# Heart valves (cardiac valves)

- The leaflets of the heart valves are normally **AVASCULAR**. (makes leaflet weak because nutrition will be poor)
- **Blood capillaries** can be found only in the **base** or **root** of the leaflet.
- Each leaflet (cusp) of the atrioventricular and aortic valve is formed of:
  - A **core of C.T.** that is covered by **endothelium** and extended from endocardium
  - the core is **formed by three layers**:



## Atrioventricular valve (AV)

1. **Atrialis:**  
elastic & collagen fibers.

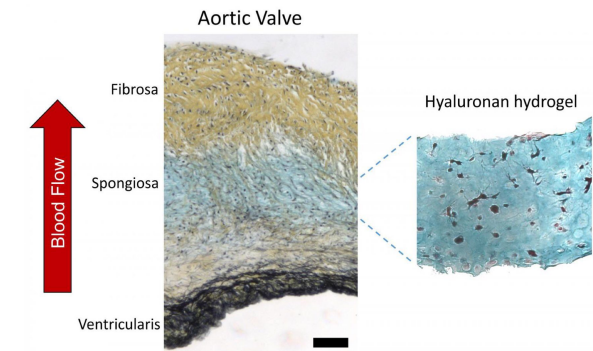


## BOTH

2. **Spongiosa:** proteoglycans (matrix), interstitial cells (e.g. fibroblasts) & few collagen fibers.
3. **Fibrosa:** mainly dense collagen fibers.

## Aortic valve


1. **Ventricularis:**  
elastic & collagen fibers.






# Quiz

1. Purkinje fibers are found in
  - a. Spongiosa
  - b. Subendocardial layer of endocardium
  - c. Ventricularis
  - d. Subendothelial layer of endocardium
2. Which of the following is not true about Purkinje fibers compared to cardiac muscle
  - a. Less myofibrils
  - b. Larger diameter
  - c. Central nuclei
  - d. More glycogen
3. Which layer of aortic valve contains elastic & collagen fibers
  - a. Ventricularis
  - b. Fibrosa
  - c. Atrialis
  - d. Spongiosa
4. The core of atrioventricular valve is covered by
  - a. Simple squamous epithelium
  - b. Simple columnar epithelium
  - c. Endothelium
  - d. Both a & c
5. Sarcoplasm of cardiac muscle
  - a. Acidophilic
  - b. Shows non clear striations
  - c. Has fewer myofibrils
  - d. All of the above
6. Which of the following is true
  - a. The leaflets of heart valves are vascular
  - b. In cardiac muscle fibers, t-tubules form triads
  - c. Subepicardial layer contains ganglia
  - d. Myocardium is the thinnest layer

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