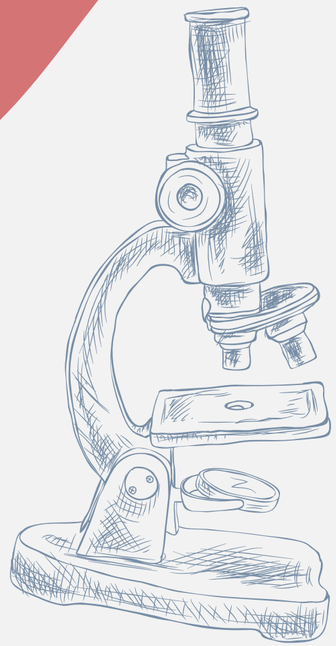


Structure of the wall of the heart and cardiac valves

Lecture no.1

Editing file

Color index:

Main text	Important
Boys slides	Girls slides
Dr's notes	Extra

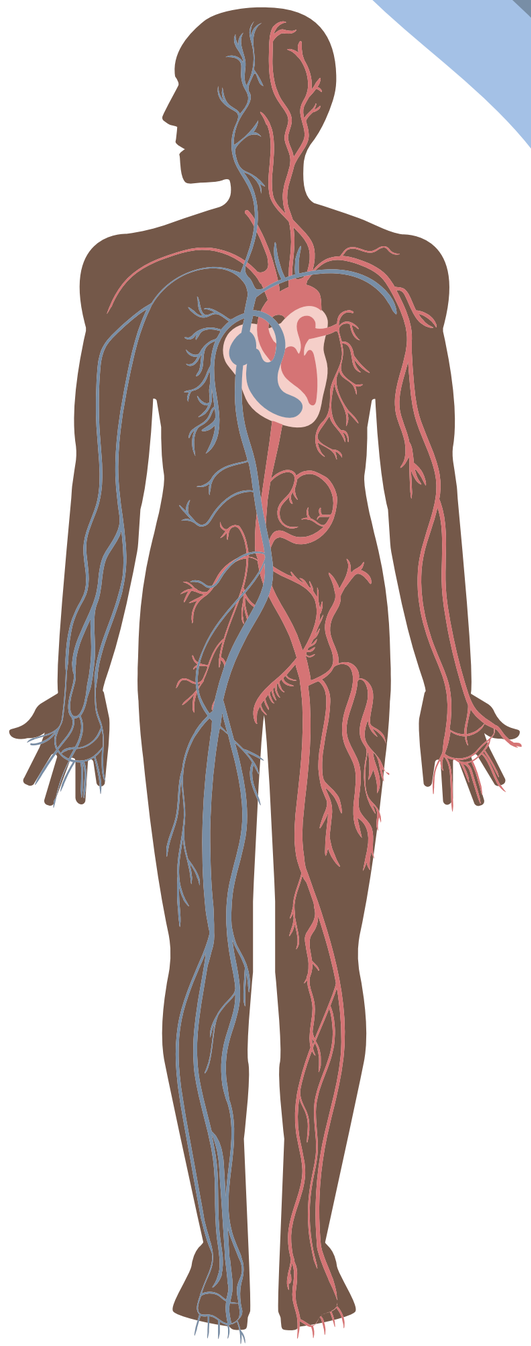
Long Helpful video that explain the most of the lecture in arabic

﴿وَقُل رَبِّ زِدني عِلمًا﴾

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

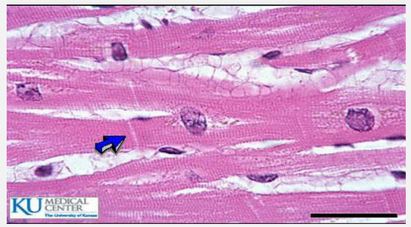


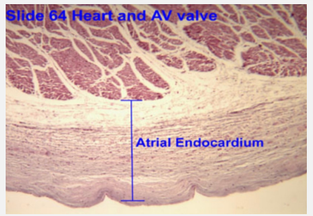
WALL OF THE HEART

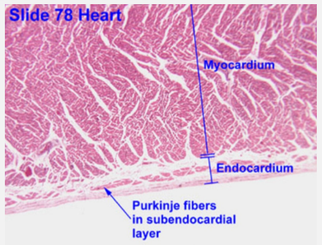
Very short Helpful video!

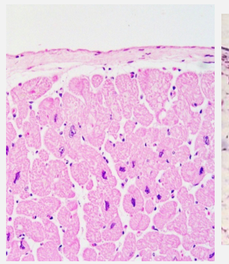
Inner **ENDOCARDIUM**	Middle **MYOCARDIUM**	Outer **EPICARDIUM** Epi=Above=Over
1- Endothelium: simple squamous epithelium	1- It is the middle layer	1- Mesothelium: simple squamous epithelium
2- Subendothelial C.T. layer: ➤ Loose Fibroelastic C.T.	2- It is the most thick layer	2- Visceral layer of pericardium (outer)
3- Dense C.T. layer: ➤ Dense Fibroelastic C.T.	3- It contains cardiac muscle cells with endomysium (loose C.T.)	3-Subepicardial C.T. layer: Loose C.T. that contains: ➤ Coronary vessels ➤ Nerves ➤ Ganglia ➤ Fat cells (amount of cells is affected by age)
IMPORTANT 4-Subendocardial layer: ➤ Loose C.T. layer that contains: **Purkinje fibers**, Small blood vessels & Nerves. ➤ It attaches to the endomysium of the cardiac muscle.		

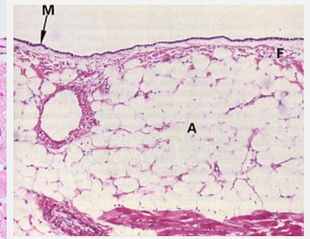
Extra helpful note from 443:
Epithelial tissue is Avascular, so it Gets nutrients & O2 from near blood vessels in the **Connective tissue**











PURKINJE FIBERS (MODERATOR BAND) VS. CARDIAC MUSCLES

	Purkinje Fibers	Cardiac muscles Detailed in the next slide
Nuclei	Peripheral spherical (more than one nucleus) often binucleated	Central
Diameter	Larger	Intermediate (Medium)
Stain	Paler (More glycogen)	Darker
N.Myofibrils	Fewer Myofibrils (actin & myosin) (Mainly peripheral)	Few Myofibrils
Intercalated discs	No intercalated discs	Present
Unique Features of Purkinje fibers	IMPORTANT ➤ Connected together by desmosomes and **gap junctions** ➤ **Almost no T-tubules**	

Two questions from Male's Dr:

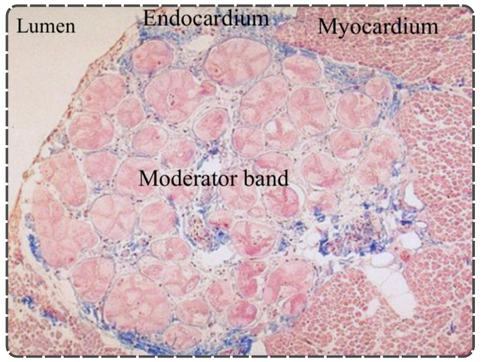
Q1: Does **purkinje fibers** have diad or triad?
A1: It **doesn't** have either of them

Q2: Does the **cardiac Intermediate** muscle have diad or triad?
A2: it **has diad**

Note: (the **triad** is in the **skeletal** muscle)

➤ **Diad muscle:**
A structure in the cardiac myocyte that is located in the sarcomere Z-line.

➤ **Triad muscle:**
A structure formed by a t-tubule with a sarcoplasmic reticulum on either side.

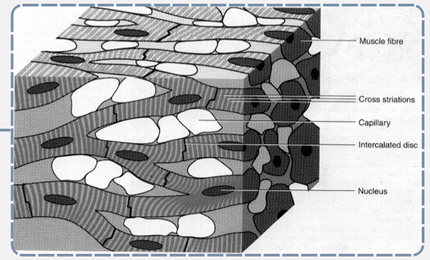


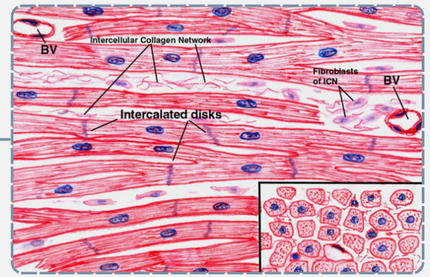
CARDIAC MUSCLE

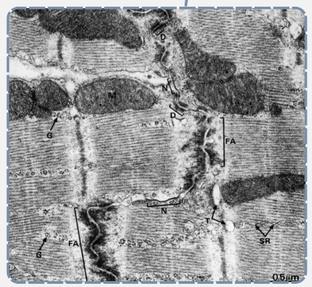
- Found in the myocardium
- Striated and Involuntary

L.M. picture of cardiac muscle fibers (versus skeletal muscle fibers):

- Cylindrical in shape
- Intermediate in diameter between skeletal and smooth muscle fibers
- Branch and anastomose
- Coverd by a thin sarcolemma
- Mononucleated cardiac muscle cells Nuclei are oval and central
- Sarcoplasm is **Acidophilic** and shows non-clear striations (fewer myofibrils)
- Divided into short segments (cells) by the intercalated discs







E.M. picture:

- Few myofibrils
- Numerous mitochondria
- Less abundant SR (sarcoplasmic reticulum) مانحتاج قوة انقباض زي skeletal
- **T-tubules** come in contact with only one cisterna of SR forming **"Diads"**(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, fascia adherence junctions and **gap junctions**)

Male's Dr's important Question:

Q) Sarcoplasm of cardiac muscle is Acidophilic or Basophilic?
A) Sarcoplasm is **Acidophilic**

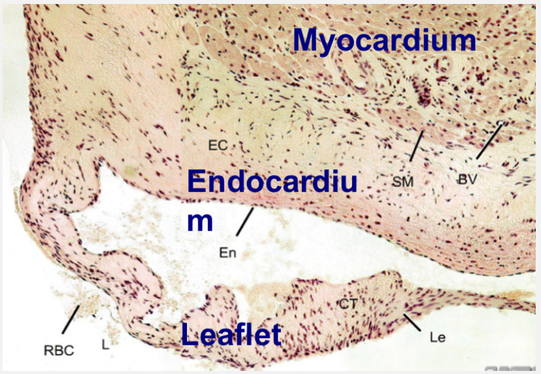
HEART VALVES (CARDIAC VALVES)

➤ Each leaflet (Cusp) of heart valve is formed of:

1- A core of C.T.: 3 layers, The main type of C.T is Dense C.T.

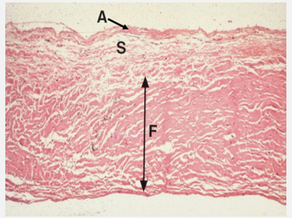
2- This core is covered by: **Endothelium**

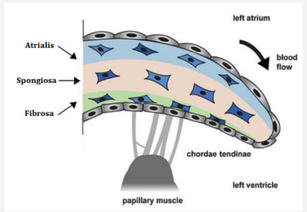
- The leaflet of the heart valves are normally **AVASCULAR**
- Blood capillaries can be found **only** in the base or roof of the leaflet

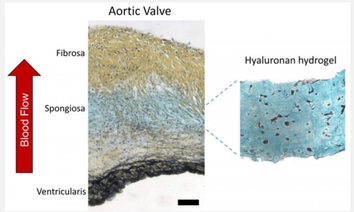


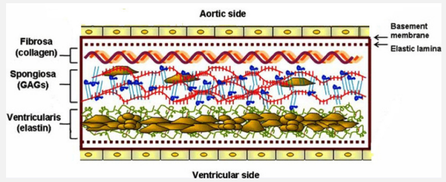
Male's Dr: this table is not important and won't come in the exam!

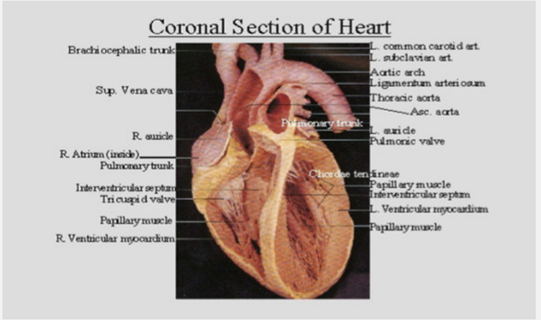
Leaflet of Atrioventricular (AV) Valve A valve from Atrium to ventricle	Leaflet of Aortic Valve Valve from ventricle to aorta
• 3 layers of C.T: 1. Atrialis: elastic & collagen fibers	• 3 layers of C.T: 1. Ventricularis: elastic & collagen fibers
2. Spongiosa: proteoglycans (Matrix), interstitial cells (e.g fibroblasts) & few collagen fibers	
3. Fibrosa: mainly dense collagen fibers	











Important Question from Male's Dr:

Q) Most of the core of the cusp contain blood vessels, True or false?

A) False.
Why? Cuz it is mostly **Avascular,** only about 5-10% is vascularized.

And vice versa!

Q1) Which of the following features is detected in the light microscopic picture of the subendocardial layer?

A	Purkinje muscle fibers	B	Purkinje cell	C	Endothelium	D	Mesothelium

Q2) Which one of the following is a feature of purkinje muscle fibers?

A	They have numerous myofibrils	B	They have gap junctions	C	They have intercalated disks	D	They have basophilic cytoplasm

Q3) What type of epithelium is found in the Mesothelium?

A	Columnar epithelium	B	Respiratory epithelium	C	Simple squamous epithelium	D	Simple cuboidal epithelium

Q4) D Q5) A Q6) B

Q4) Which of these best describes heart valves?

A	Vascular Endothelium	B	Core of endothelium	C	Myofibrils	D	Avascular dense connective tissue

Q5) Which one of these characteristics is found in cardiac muscle?

A	Sarcoplasm is Acidophilic	B	Spindle in shape	C	Non Branched	D	Form triad

Q6) What forms the core of the heart valves?

A	Loose connective tissue	B	Dense connective tissue	C	Mesothelium	D	All of the above

Histology team 444

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