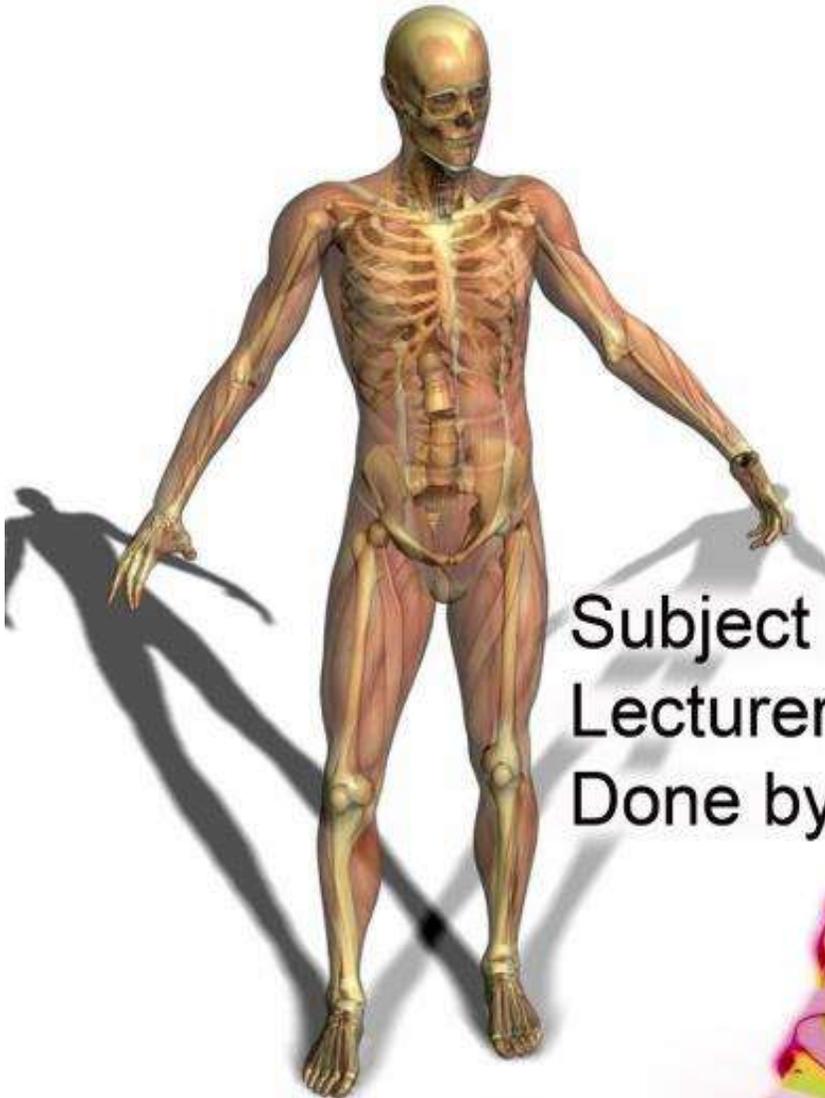




ANATOMY



Subject : *Introduction to Anatomy*

Lecturer : *Dr. Maher Hadidi*

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KEY POINTS:

- 1) Right side of the heart
- 2) Papillary muscles
- 3) Left side of the heart
- 4) Comparison between right and left sides of the heart.
- 5) Blood supply of the heart
- 6) Coronary Vein
- 7) Fibrous skeleton of the heart
- 8) Cardiac conduction system and its component.

RIGHT SIDE OF THE HEART (ATRIUM AND VENTRICLE)

Wall in the right ventricle:

- The inflow part in the right ventricle is **Rough**:

The roughness of the wall of the ventricle is due to a network of bundles of muscles that they are projecting from the wall of the ventricle, and they are very important so that the heart will work as **one unit**.

One example of these networks is: The Papillary muscle >> rough with projecting cardiac muscle bundles forming a network of ridges (ridges forms when these Papillary muscles attach to the ventricular walls throughout their length other attach to both ends forming bridges).

- The outflow part is smooth:

The outflow tract of the right ventricle which leads to the pulmonary trunk is the **Infundibulum**.

PAPILLARY MUSCLE:

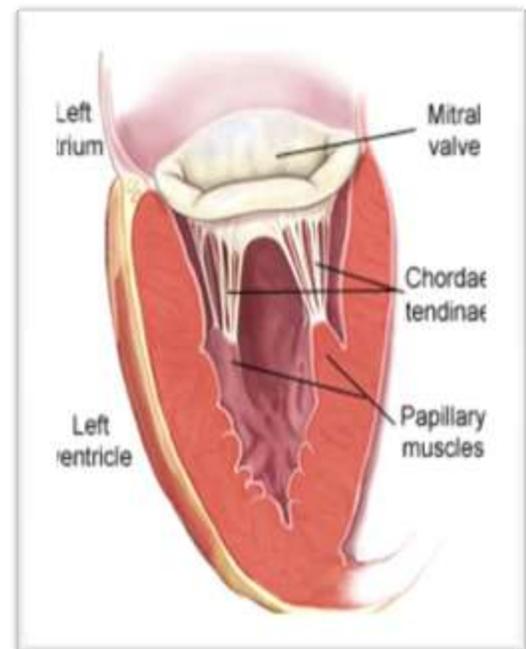
- Each papillary muscle is conical in shape (**pyramidal**)
- Extending from the wall of the ventricle.
- It has **Base**: attached to the wall of the ventricle.
- It has **Apex**: within the lumen or cavity of the atrium >> from the apex there are tendon-like fibrous cords called (**chordae tendineae**), they are like parachute man.
- These Tendons are attached to **free margins** of the cusps. The Tricuspid valve has 3 cusps (ثلاثي الشرفات) each cusp has **fixed** part to the ring of the valve and **free** part which is movable (margin).
- The **chordae tendineae** is attached to the **free** margin of the cusps, but **WHY?**

Because they move it up and down by the affect of **WHOM?**

By the affect of the papillary muscles.

- **Chordae tendineae** extend from Apex to free margins of the cusps.
- **Contraction of papillary muscles:**

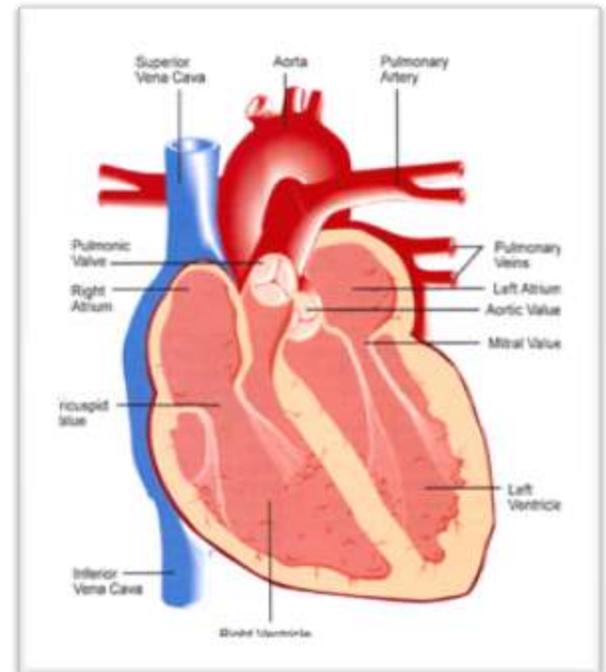
Confirm complete closure of valves **before** contraction of the Ventricles.



- **WHY** the papillary muscles confirm closure of the valves before the contraction of the ventricle?

Because ventricles cannot contract and push the blood to –for example- pulmonary trunk except when these valves are closed.

>>**Example:** a proper closing of the **Tricuspid valve** causes blood to exit the right ventricle and move into the pulmonary trunk.



LEFT SIDE OF THE HEART (ATRIUM AND VENTRICLE):

LEFT ATRIUM:

- Forms the base of the heart
- Receives oxygenated blood from the lungs through four **Pulmonary veins**.
- Sends blood to the left ventricle through **Bicuspid valve** (Bi means two – one anterior and the other posterior).
- Most of it is smooth except left auricle.
Left auricle>> it is a reserved part of the atrium.
[auricle means dog's ear]
- What is the function of the auricle? When the atrium receive **extra** amount of blood will go within it until be released or go to the lumen of the atrium.
- **Example:** it is just like the attic in the house when there are extra things we send it to the attic.

LEFT VENTRICLE:

- The main chamber of the heart
- Forming the **Apex** of the heart
- Forming the left border of the heart
- Share the formation of the inferior surface of the heart.
- Has thicker wall than the wall of the right ventricle.
- Its wall has a rough part and smooth part.
-In the rough part we have the **papillary muscles** and they are larger than the right side because the effort in this chamber is more than the right side.

- It is the highest pressure of within the chambers of the heart.
- It Receives blood through **bicuspid valve** then it will send it through the **out flow part** which is smooth we call it **Aortic vestibule**. (الدهلينز الأبهري)

WHAT ARE THE DIFFERENCES BETWEEN RIGHT AND LEFT VENTRICLES?

- **THE Wall:** the wall of the left ventricle is 3 times thicker than the wall of the right ventricle.
- **Pressure:** the pressure in the left side is higher than the right side.
- **THE shape of the cavity:** the cavity of the left ventricle is **circular**, while the cavity of the right ventricle is **crescent** (هلالية الشكل) because the interventricular septum due to the high pressure is pushed to the right side.

CHAMBERS OF THE HEART:

The blood supply of the heart:

Coronary arteries (الشرايين التاجية).

- They are 2 in numbers (left and right)
- Each originates from ascending aorta.
- Each should pass within coronary groove (derived from its name).
- The right >>mainly to the right
the left >>mainly to the left.
- The right coronary artery is **smaller** than the left, **WHY? Because** the right side is **venous side** and the left side is **arterial side**.
So the left side needs more blood than the left coronary artery should be **larger** than the right one.

RIGHT CORONARY ARTERY:

- It originates from ascending aorta
- Passes between pulmonary trunk and right auricle
- Passes through coronary groove
- The right will continue to the inferior border
- When it reaches to the inferior (lower) border it will wind around the heart to be in the inferior surface within coronary groove.
- On reaching the interventricular groove (posterior inter ventricular groove) it will give a branch which is called **posterior interventricular artery** that will continue toward the apex of the heart

- **At the Apex of the heart:** both the right and the left arteries **anastomose** at the apex
Conclusion>>The Apex is supplied by the two coronary arteries, **WHY?**
Because it is the sight of the **maximum** beat of the heart.
Notice that the right coronary artery supplies the SA node (conduction system of the heart) in the majority of people (about 60% of people), **While** 40% of people are supplied by the left coronary artery.

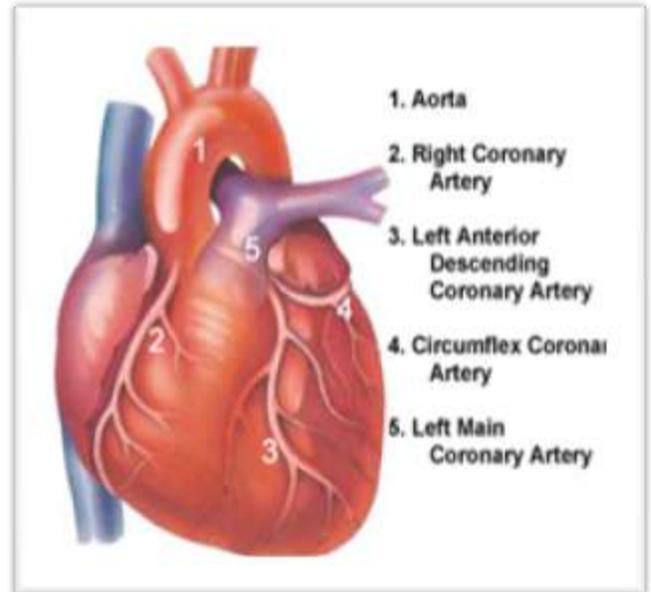
LEFT CORONARY ARTERY:

- **Originates** from ascending aorta
- passing between pulmonary trunk and left auricle
- it will pass through coronary groove
- There it will be divided into **circumflex branch** which is the **main arterial supply to the left ventricle.**

Notice that this branch is the common site affected by diseases such as **Angina** (الذبحة الصدرية) because it is the most branch functioning.

Circumflex branch is the first and main and the largest branch of the left coronary artery.

- It will wind on left surface of left ventricle.
- It will go to the inferior surface of the heart to give the **Anterior inter ventricular branch** which will go and anastomose with the posterior inter ventricular branch.
- **Question:** If the right coronary artery is blocked does the heart stop functioning??
No, because both coronary arteries anastomose with each other **freely** (area of overlap) over the heart. Which means that the left supply part of the right and the right supply part of the left.



CORONARY VEIN:

- Coronary sinus
- It is located at the coronary groove at the inferior surface of the heart.
- About 5 cm long
- Extend from left to right.
- It will drain and end into right atrium.

- It receive blood from Great cardiac vein (beginning) in anterior inter ventricular groove, at the **middle** it receives middle cardiac vein and at its end it will receive small cardiac vein, finally it will finish and drain its blood into the right atrium.
- Receive 3 main veins: **Great** cardiac vein, **Middle** cardiac vein, **Small** cardiac vein. So, Coronary vein drains blood from heart tissue itself.

****Important notes:**

- All cells in the body **send** their venous blood to the right atrium.
- All cells in the body **receive** their blood from Aorta.

FIBROUS SKELETON OF THE HEART:

- **Form** of 4 dense connective tissue rings surround valves of the heart
- **They** unite with each other and fuse with the **interventricular septum**.
- **Example:** like flower with 4 petals, the flower represents the septum and the petals represent the rings of the valves.
- **FUNCTIONS:**
 - 1- **Separates** arterial muscles from ventricular muscles, so, the contraction of the atriums will not affect the contraction of the ventricles.
 - 2- **Fixation** site for valves.
 - 3- Act as **electrical insulator** >>impulses from atriums **DO NOT** go to the ventricles.

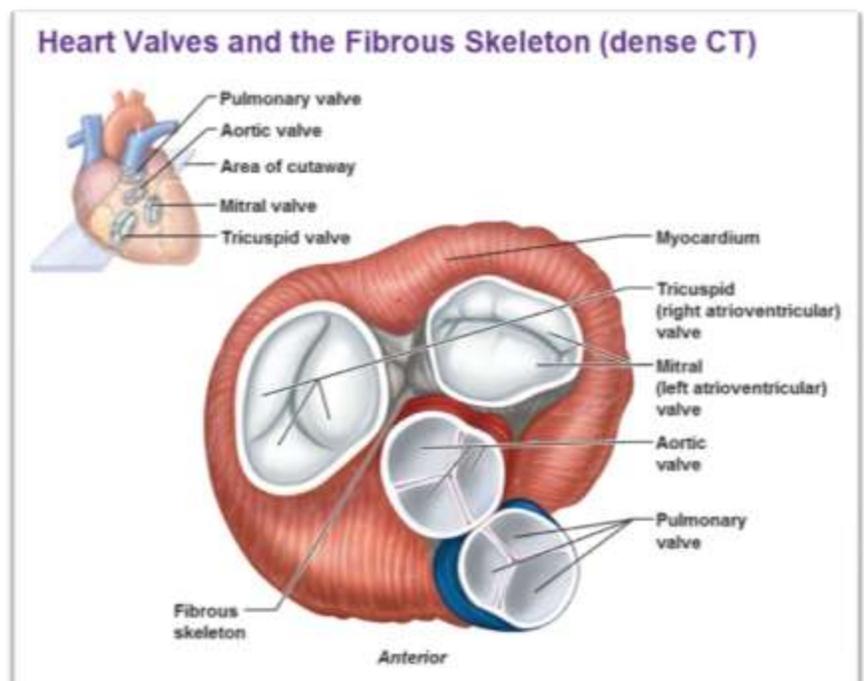
*The only direct connection between the atriums and ventricles is **AV bundle**.

CONDUCTION SYSTEM OF

THE HEART:

- **FUNCTIONS** of the muscle:
 - 1- Conductivity
 - 2- Contractivity

Note>>muscles cannot contract before receiving impulses.



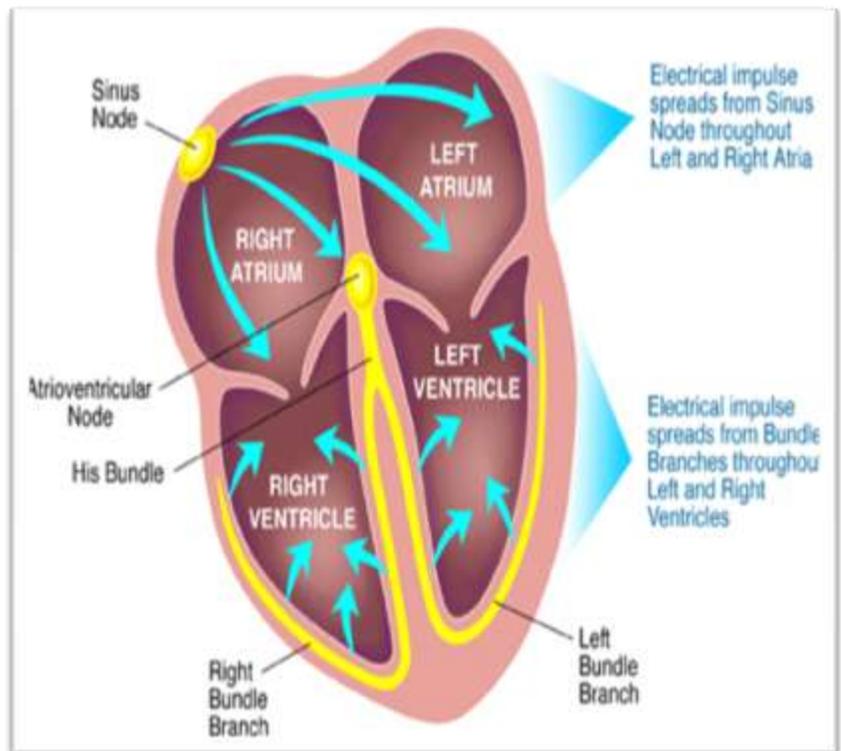
- Conductive system of the heart is formed of a net work of **Modified cardiac muscles**.
- **What is the modification?**

It does not contract (lost its contractivity and retain its conductivity)

- So it is modified cardiac muscle that spread the impulses in **one direction**.
- **Specialized** in conduction only.

- It is **autorythemic**>>initiates and coordinates atrial and ventricular muscle contraction.

- **Insulated** from myocardium by connective tissue.
- Establishes a **unidirectional pathway** of excitation and contraction. [from SA node to AV node, atrium then ventricle]



THE FOUR BASIC COMPONENTS OF THE CONDUCTION SYSTEM OF THE HEART:

1- SA node:

- Located in the right atrium at the inferior end of superior vena cava.
- It is the one which is **auto rhythmic**.
- It is the one which spread excitation over the walls of atriums. That is why when the Rhythm decreases in a patient, they fix it by putting a **pacemaker** which function like battery because the rhythm must be **Auto rhythmic**.
- It works on balance between sympathetic and parasympathetic system.

2- AV node:

- **Located** in the right atrium at the inferior end of the inter arterial septum
- **It** receive the impulse and it will give the **AV bundle**
- **Receive** atrial excitation and extended to all ventricular muscles.
- **Divides** into **right** and **left** bundles within muscular part of the interventricular septum.

3- Purkinje Fibers:

- At the end of the bundle there are small fibers called Purkinje fibers.
- They spread to the muscles of the ventricular wall.

- The **First excitation** goes to **papillary muscles** which receive the impulses before the muscles of the wall so as to **contract before** the muscles of the wall of the ventricles in order to **confirm** closure of the valves.

