



Anatomy Of The Heart

Objectives :

•At the end of the lecture, the student should be able to :

- Describe the shape of heart regarding :** apex, base, sternocostal and diaphragmatic surfaces.
- Describe the interior of heart chambers :** right atrium, right ventricle, left atrium and left ventricle.
- List the orifices of the heart :**
 - Right atrioventricular (Tricuspid) orifice.
 - Pulmonary orifice.
 - Left atrioventricular (Mitral) orifice.
 - Aortic orifice.
- Describe the innervation of the heart**
- Briefly describe the conduction system of the Heart



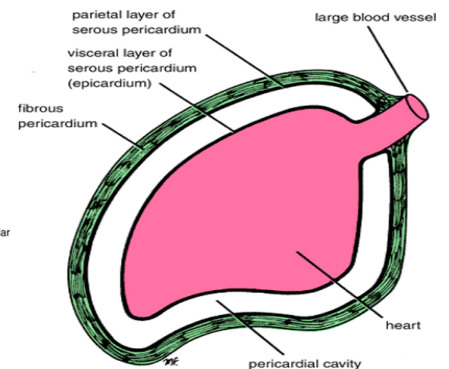
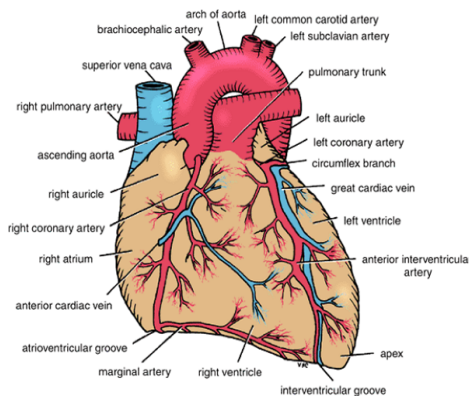
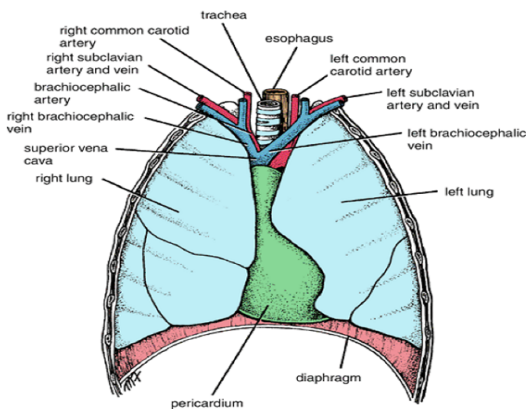
- **New terms :**
- **Sulcus :** any infolding of soft tissue .
- **Sinus :** wide channel containing blood, usually venous blood.
- **Orifice :** opening.
- **Infundibulum :** funnel-shaped(قمعي) channel.

The Heart

- The heart lies in the **middle mediastinum**.
 - The Heart is somewhat pyramidal in shape.
 - It is surrounded by a **fibroserous sac called pericardium** which is differentiated into an **outer fibrous layer (Fibrous pericardium) & inner serous sac (Serous pericardium)**.
 - It consists of **4 chambers : 2 atria (right& left) & 2 ventricles (right& left)**.
-
- The heart is divided into:
 1. **Apex**
 2. **Sterno-costal (anterior surface)**
 3. **Diaphragmatic (inferior surface)**
 4. **Base (posterior surface)**.

1. Apex :

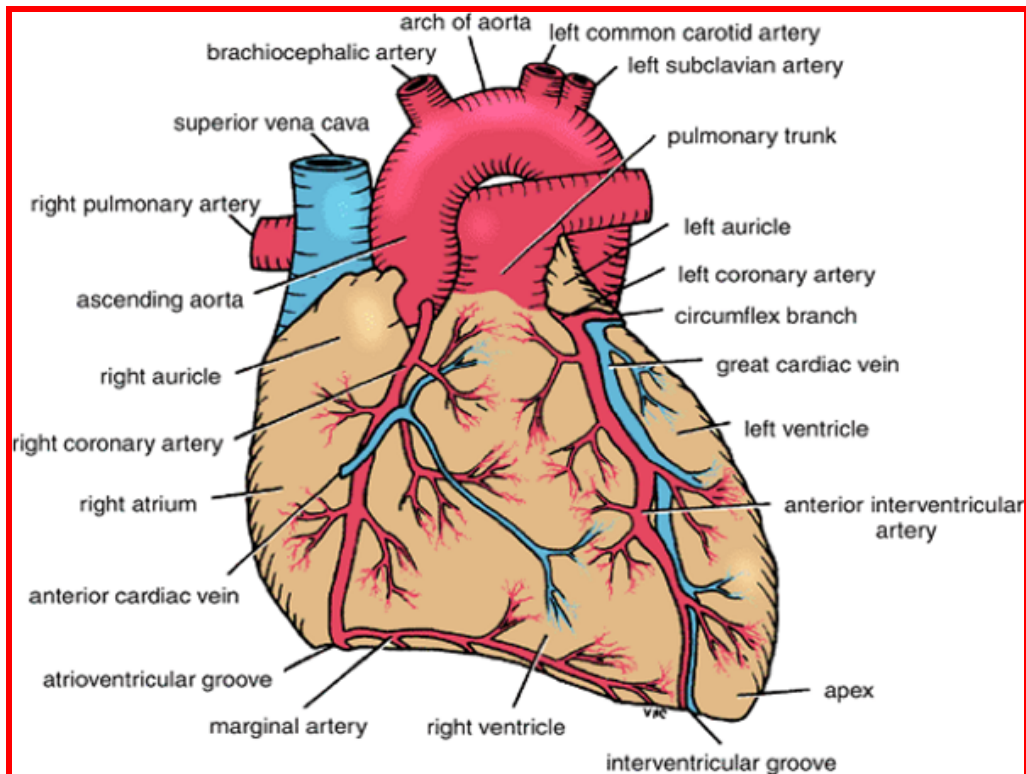
- Directed downwards, forwards and to the left.
- It is formed by the **left ventricle**.
- Lies at the level of **left 5th intercostal space 3.5 inch from midline**.



Note that the base of the heart is called the base because the heart is pyramid shaped; the base lies opposite the apex. The heart does not rest on its base; it rests on its diaphragmatic (inferior) surface

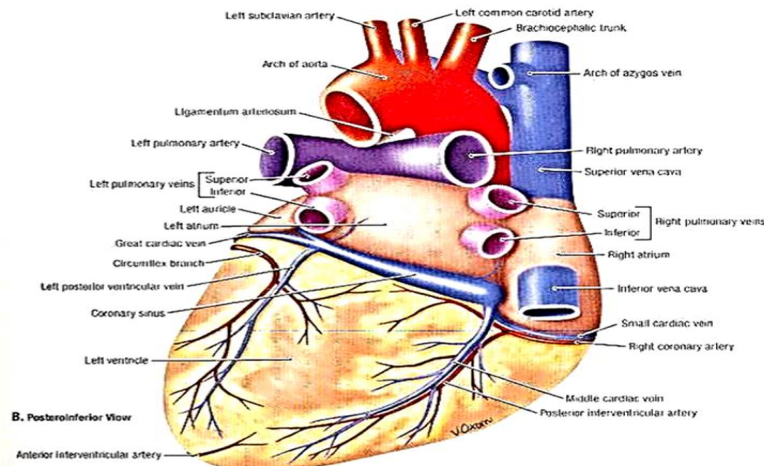
2. Sterno-costal (anterior) surface:

- This surface is formed mainly by the right atrium and the right ventricle.
- Divided by **coronary (atrio-ventricular) groove** into :
 1. **Atrial part**, formed mainly by right atrium.
 2. **Ventricular part** , the right 2/3 is formed by right ventricle, while the left 1/3 is formed by left ventricle.
- The 2 ventricles are separated by **anterior interventricular groove**, which lodges :
 1. **Anterior interventricular artery** (branch of left coronary).
 2. **Great cardiac vein**.
- **The coronary groove** lodges the **right coronary artery**.



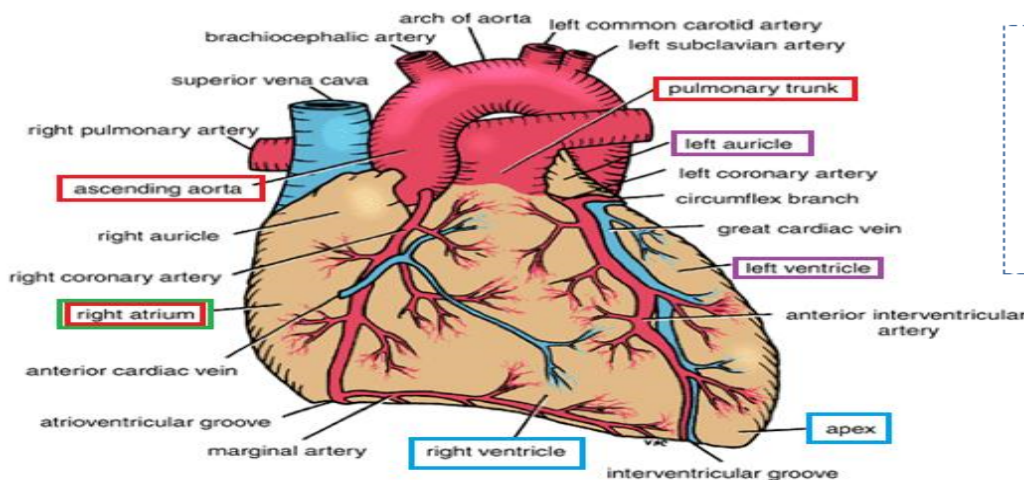
3. Inferior surface (diaphragmatic):

- Formed by the 2-ventricles, mainly **left ventricle(left 2/3)**.
- Slightly concave as it rests on diaphragm.
- Directed inferiorly & backward.
- Separated from base of heart by **posterior part of coronary sulcus**
- The 2-ventricles are separated by **posterior interventricular groove** ; which lodges:
 1. **Posterior interventricular artery**
 2. **Middle cardiac vein**



4. Posterior surface (base):

- Mainly formed by the **L. atrium**.
- Lies opposite to the **middlethoracic vertebrae(5-8)**.
- **4 pulmonary veins** open into it.
- Is separated from the vertebral column by **descending aorta, esophagus and oblique sinus of pericardium**.
- Bounded inferiorly by the coronary sulcus (contains coronary sinus).
- **Borders of the Heart :**



Heart border
Upper border
+ left atrium
Right border
Lower border
Left border

Chambers of the Heart:

The heart has 4 chambers (two right & two left) divided by a vertical septa :

1. Right Atrium
2. Right Ventricle
3. Left Atrium
4. Left Ventricle

The right chambers lie anterior to the left chambers.

1. Right atrium:

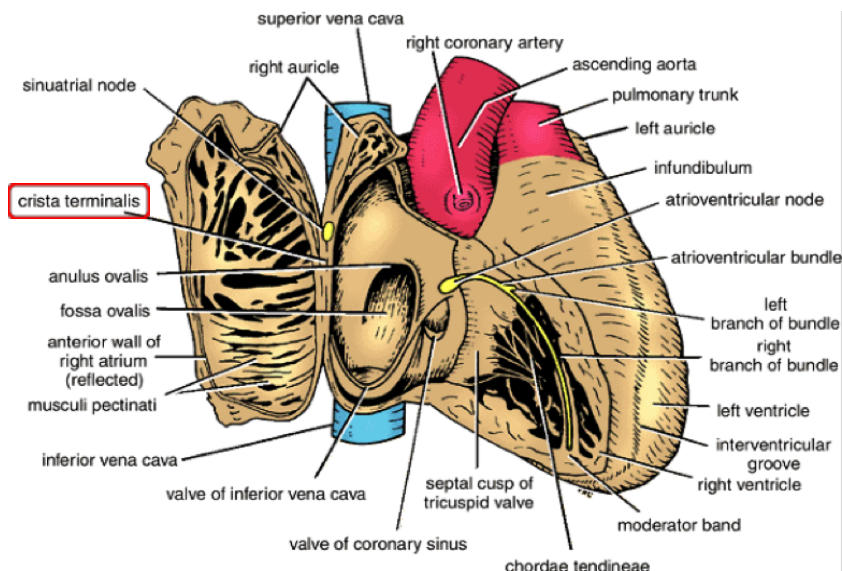
- Lies anterior to the left atrium.
- The right atrium consists of a **main cavity** and an **auricle** (small out pouching).
- From the outside there's a junction between the right atrium and the right auricle called sulcus terminalis, which on the inside forms a ridge the crista terminalis.

Cavity of the right atrium:

➤ **Crista terminalis:** divides right atrium into

A- Anterior part: ROUGH and trabeculated (by bundles of muscle fibres (musculi pectinati)).

B- Posterior part: SMOOTH



The interatrial septum:

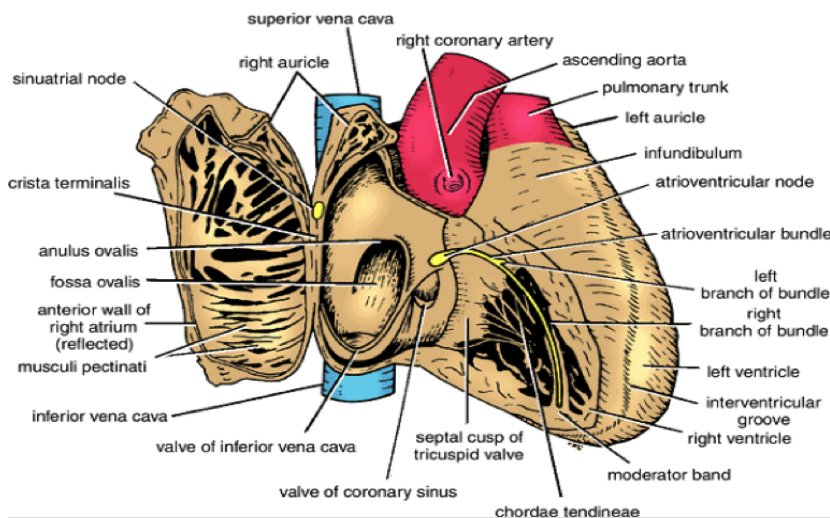
- Carries an oval depression called **Fossa ovalis**. The margin of this depression is called **Anulus ovalis**.
- The blood leaves the right atrium and goes to the right ventricle via Tricuspid valve.

Openings in right atrium:

- Superior vena cava (SVC) : has no valve
- Inferior vena cava (IVC) : guarded by a valve
- Coronary sinus : has a well-defined valve
- Right atrioventricular orifice : lies anterior to IVC opening , it is surrounded by a fibrous ring which gives attachment to the tricuspid valve
- Small orifices of small veins
- This here is a video that might help you : [right atrium anatomy](#)

2. Right ventricle:

- It has a thinner wall than the left ventricle, and the wall has projection called trabeculae carnae.
- Large projection arise from the wall called Papillary muscles which attach to the cusps of the tricuspid valves by tendinous threads called chordae tendinae.
- The three papillary muscles:
 1. Anterior papillary muscle: Interventricular septum is connected to it by a muscular band called moderator band.
 2. Posterior papillary muscle
 3. Septal papillary muscle
- This here is a video that might help you : [right ventricle anatomy](#)



3. Left atrium of the heart :

- The left atrium communicates with the left ventricle through the atrioventricular orifice and with the aorta through the aortic orifice.
- It forms the greater part of base of heart.

- Its wall is smooth except for small **musculi pectinati** in the left auricle.
- **Receives 4 pulmonary veins** which have **NO VALVES**.
- **Sends blood to left ventricle through the left atrioventricular orifice** which is guarded by **mitral valve**.
- This here is a video that might help you : [left atrium anatomy](#)

4. Left ventricle of the heart :

- Its wall is thicker than that of right ventricle.
- It receives blood from left atrium through left atrio-ventricular orifice which is guarded by mitral valve.
- Its wall contains trabeculae canae.
- Its wall contains 2 large papillary muscles (anterior & posterior). They are attached by chordae tendinae to cusps of mitral valve.
- The blood leaves the left ventricle to the ascending aorta through the aortic orifice.
- The part of left ventricle leading to ascending aorta is called aortic vestibule. The wall of this part is fibrous and smooth.
- This here is a video that might help you : [left ventricle anatomy](#)

Heart Valves :

1. Right atrio-ventricular (tricuspid) valve:

- One inch wide, admitting tips of three fingers.
- It is guarded by a fibrous ring which gives attachment to the cusps.
- It has **3 cusps** (anterior - posterior - septal or medial).
- The *atrial surface* of the cusps are smooth while their *ventricular surface* give attachment to the **chordae tendinae**.
- The blood leaves the **right atrium to right ventricle** via tricuspid valve.
- The right ventricle communicates with the right atrium through it.

2. Pulmonary orifice :

- Surrounded by a fibrous ring which gives attachment to the cusps of the pulmonary valve.
- The valve is formed of 3 semilunar cusps (2 anterior and one posterior) which are concave superiorly and convex inferior.
- No chordae tendinae or papillary muscles are attached to these cusps

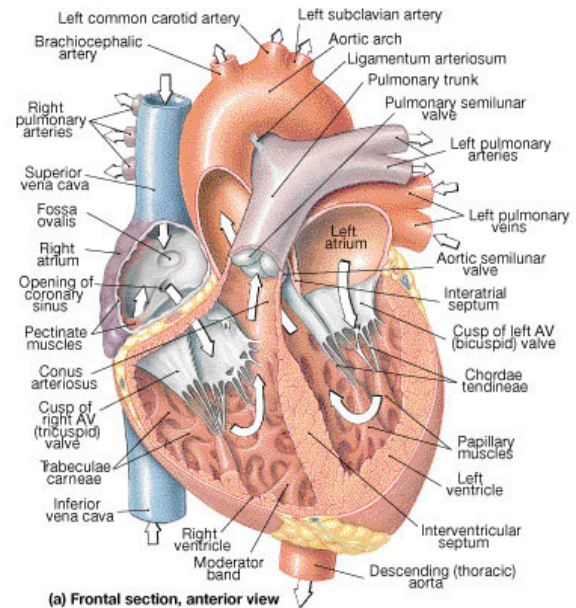
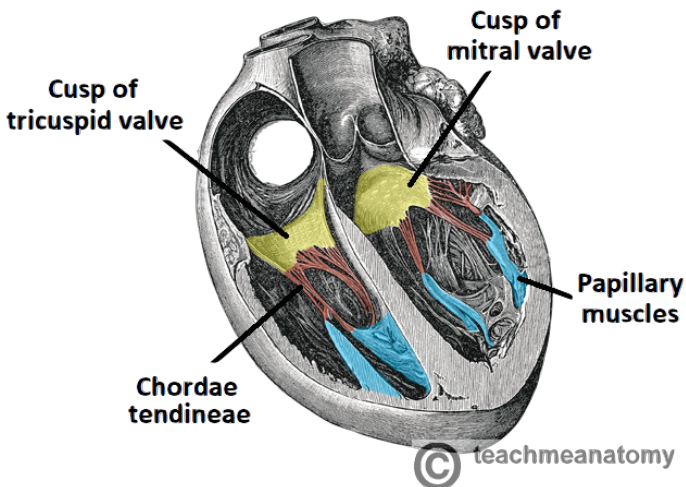
3. Left atrio-ventricular (mitral) orifice :

- Smaller than the right, admitting only tips of 2 fingers.
- Guarded by a **mitral valve**.
- Surrounded by a fibrous ring which gives attachment to the cusps of mitral valve.
- Mitral valve is composed of **2 cusps**:
 1. **Anterior cusp** : lies anteriorly and to right.
 2. **Posterior cusp** : lies posteriorly and to left.

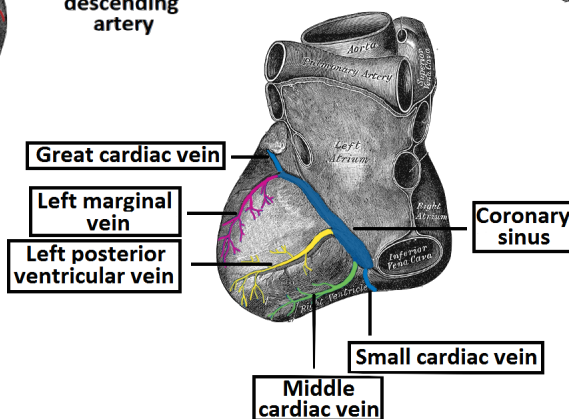
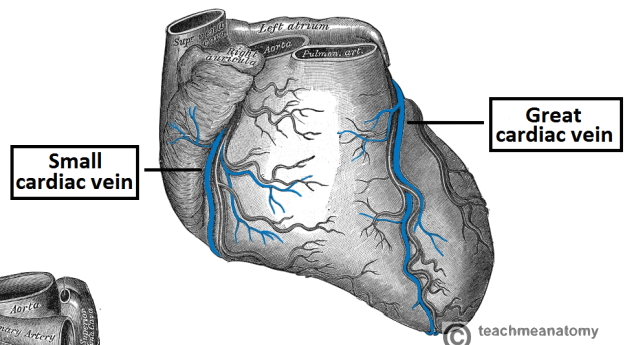
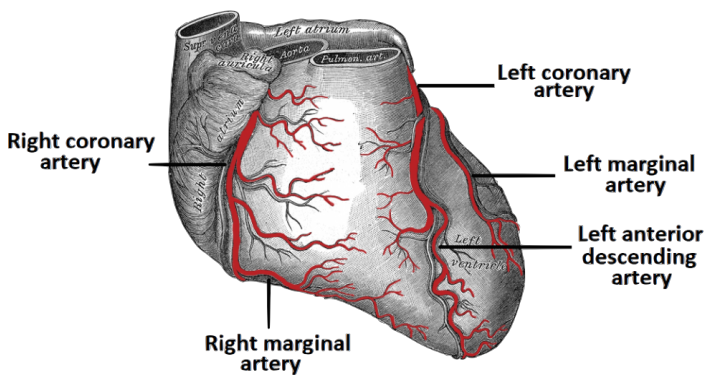
The atrial surfaces of the cusps are smooth, while ventricular surfaces give attachment to chordae tendinae.

4. Aortic orifice :

- Surrounded by a fibrous ring which gives attachment to the cusps of **aortic valve**.
- Aortic valve is formed of **3 semilunar cusps** which are similar to those of pulmonary valve, but the position of the cusps differs being **one anterior** and **2 posterior**.



Blood vessels of the heart :

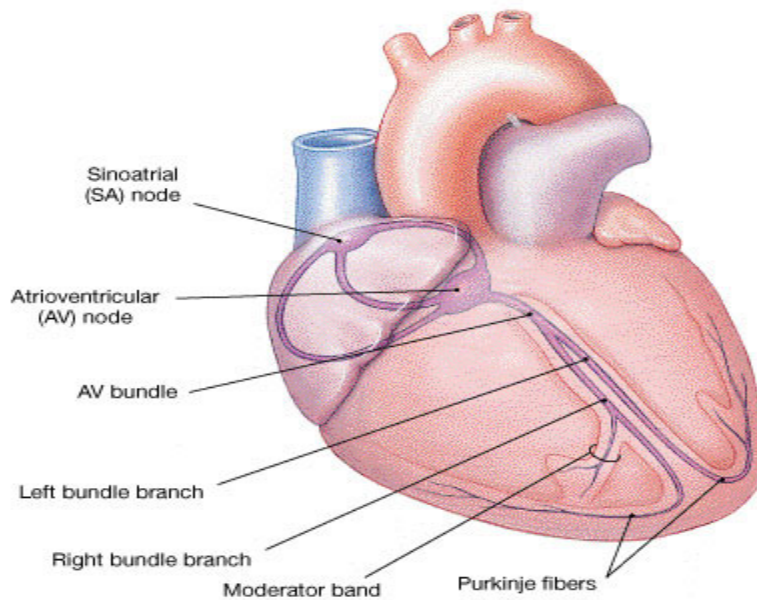


Nerve supply of the heart :

- By sympathetic & parasympathetic fibers via the cardiac plexus situated *below arch of aorta*.
- The sympathetic fibres arise from the cervical & upper thoracic ganglia of sympathetic trunks.
- The parasympathetic fibres arise from the vagus nerve.
- Postganglionic fibres reach heart along SAN, AVN & nerve plexus around coronary arteries.
- Sympathetic Fibers accelerate heart rate but Parasympathetic Fibers slow heart rate (constriction of coronary arteries)

Conduction system of the heart :

- The beating of the heart is regulated by the intrinsic conduction (nodal) system.
- Its function is to ensure that the chambers of the heart contract in the proper rhythm and sequence.
- The main center is the sinoatrial (SA) node, located in the right atrium.
- The atrioventricular (AV) node is located at the junction of the atria and the ventricles.
- The atrioventricular (AV) bundle (bundle of His) is located in the interventricular septum.



(a) Nodes and conducting fibers

- The Purkinje fibers are located inside the walls of the ventricles
- The SA node is the pacemaker of the heart, because it generates the impulse

Summary

/surfaces

<p>Apex: formed by left V. at lvl of 5th left intercostal</p>	<p>A. : (sternocostal) divided by AtrioVentreular groove to A part & V part (A part is formed by right atrium & V part is formed 2/3 by right and 1/3 by left V) + contain A. InterVentricle groove(groove between the 2 V) which contains great cardiac vein and A. interV artery + contain AtrioVentreular groove(aka:coronary groove) which contains right coronary artery + contain InFundibulum(below pulmonary trunk)</p>
<p>I. : (diaphragmatic) formed by the two V but mainly the left one + separated base by coronary sulcus + contain P. interverntreular groove which contains middle cardiac vein and P. interV. artery</p>	<p>P. : (base) formed by left A, lies at T 5-8 + contain 4 pulmonary veins + between it and Vert. column lies descending aorta, esophagus & pericardium oblique sinus + has coronary sulcus inferiorly which contains coronary sinus</p>

/chambers

	RIGHT	LEFT
A	<p>Divided by crista terminalis to A.(which has muscoli pectinati) and P.(which has interatrium septum that contains fossa ovalis & anullus ovalis) +</p> <p>Contain inner cristae terminalis and outer sulcus terminalis +</p> <p>Openings: S. vena cava(valveless -due to drainage location with the gravity) & I. vena cava(with valve) & some small openings(for small veins) & right atreioventrecular orifice</p>	<p>Heart base +</p> <p>Has muscoli pectineti on the left +</p> <p>Receives O2 blood from 4 pulmonary viens +</p> <p>Uses mitral(bicuspid) valve to send blood to the V</p>
V	<p>Wall contain trabeculae carnae +</p> <p>Contain 3 large projections(papillary muscles) found A.,P. & on septal which is connected to the cusps via chordae tendenae +</p> <p>A. papillary muscle is attached to interV septum by moderate band +</p> <p>Smooth infundibulum with no mucle</p>	<p>Wall contain trabeculae carnae +</p> <p>Much thicker wall +</p> <p>Contain 2 large projections(papillary muscles) found A.,P. which is connected to the cusps via chordae tendenae +</p> <p>Sends blood to ascending aorta via aortic orifice</p>

AV	<p>Fibrous ring that provides attachment for the tricuspid +</p> <p>Smooth A surface & roguh V surface</p>	<p>Smaller -due to bicuspid only +</p> <p>Fibrous ring that provides attachment for the bicuspid(right cusp is A. & left P.) +</p> <p>Smooth A surface & roguh V surface(due to tendons attachment)</p>
Orifice	<p>Pulmonary</p> <p>3 semi lunar valves (2A. & 1P.) +</p> <p>Surrounded by fibrous ring providing pulmonary cusps attachment</p>	<p>Aortic</p> <p>3 semi lunar valves (1A. & 2P.) +</p> <p>Surrounded by fibrous ring providing attachment & smooth wall +</p> <p>NO papillary muscles or chordae tendinae attached to cusps +</p> <p>Contain smooth area called aortic vestibulae(lies between orifice and V)</p>

MCQ

1- Oxygenated blood transmit from lungs to left atrium through :

A- pulmonary artery

B- pulmonary vein

C- arch of aorta

D- right ventricle

2-Which of the following connects papillary muscles to cusps :

A-valve

B- moderator band

C-trabeculae carneae

D- chordae tendinae

3- Which of the following is true about action sympathetic fibers in the heart :

A- arise from vagus nerve

B- causes slow heart rate

C- dilatation of coronary artery

D- vasodilatation

4- The main part of intrinsic conduction system that generates the impulse :

A- purkinji fibers

B- SAN

C- AVN

d- bundle of his

Done by :

عبدالرحمن الكاف، طارق الحسن، عبدالعزيز النويبت، عبدالله الجميعة، عبدالله العمير، محمد الرويتع، هشام المهيزع، أحمد العالم، يوسف اللهييميد

Knowledge is power ..

anatomyteam434@gmail.com