

## HEART – CIRCULATORY SYSTEM

**Ranjitha M**

U11GT21S0381

I Year B.Sc, Second Semester

Government First Grade College, Tumkur, Karnataka, India -572104

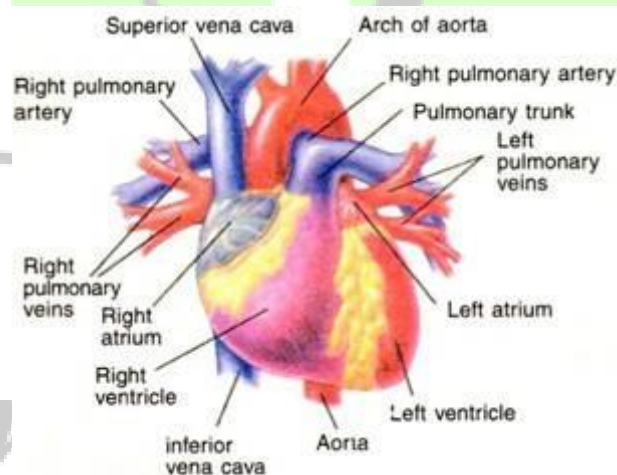
[ssrinivas82363@gmail.com](mailto:ssrinivas82363@gmail.com)

Ph.no: 7204381916

The human heart is pinkish about the size of a fist and weighs approx. 300 gms, the weight in females being about 25% lesser than the males.

It is a hollow, highly muscular, cone-shaped structure located in the thoracic cavity above the diaphragm in between the two lungs.

It is protected by rib cage. The narrow end of the triangular heart is pointed to the left side, during working this end gives a feeling of the heart being on the left side.



### LOCATION OF HEART

Heart is right in the centre between the two lungs and above the diaphragm in the ribcage. The narrow end of the roughly triangular heart is pointed to the left side and during working the contraction of the heart is most powerful at this end giving a feeling of the heart being on the left side.

### EXTERNAL STRUCTURE

The heart is surrounded by two layered tissue membrane called pericardium. The space between the two layers is filled with fluid called pericardial fluid. This fluid protects the heart from external pressure, push, shock and reduces friction during the heart beat and facilitates free heart contraction.

### INTERNAL STRUCTURE

The heart is composed of outer pericardial, middle myocardial and inner endocardial layers, which correspond to tunica adventitia, tunica media and tunica internal respectively of the blood vessels layers. The heart consists of four chambers. The two thin walled auricles which are upper chambers (right and left). Right and left auricles are separated from each other by an inter-auricular septum.

Right auricle receives deoxygenated blood from the body parts by anterior and posterior vena cava. The two thick walled lower chamber (right and left) are called ventricles. Right and left ventricles are separated by an inter-ventricular septum. The walls of left ventricle are much thicker as it supplies blood to large distance and up to the brain against gravity. The left ventricle has chordae tendinae and papillary muscles which prevent tricuspid and bicuspid valves from being pushed into auricles at the time of ventricular contraction.

### **BLOOD VESSELS ENTERING AND LEAVING THE HEART:**

#### **1. (a) Superior vena cava:**

It brings deoxygenated blood from anterior body parts (head, neck, chest and arms) to the right auricle.

#### **(b) Posterior vena cava:**

It brings deoxygenated blood from posterior or lower body parts i.e. abdomen and legs to the right auricle. It is the largest vein.

#### **2. Pulmonary artery:**

It arises from right ventricles and carries deoxygenated blood to the lungs for oxygenation.

#### **3. Pulmonary vein:**

It arises from each lung and brings oxygenated blood from lungs to left auricle.

#### **4. Aorta:**

It arises from left ventricles and carries oxygenated blood to supply it to all body parts. Abdominal aorta is the largest artery.

#### **5. Coronary arteries:**

There are two coronary arteries right and left, arising from the base of aorta and supply blood to heart muscles, (blockage at these arteries result a myocardial infraction or heart attack).

### **VALVES IN THE HEART**

1. Right atrio-ventricular valve (Tricuspid valve)-Located at the opening between right auricle and right ventricle.

2. Left atrio-ventricular valve ("Mitral" or bicuspid valve)-Located at the similar way between left auricle and left ventricle.

3. Pulmonary semi-lunar valve: Present at the opening of right ventricle into pulmonary artery.
4. Aortic Semi-Lunar Valve: Located at the point of origin of aorta from left ventricle.

### **PACEMAKER TISSUES OF THE HEART**

Certain tissues in the heart, concerned with the initiation (generation of impulse) and propagation (conduction) of the heart beat, are called “Pace- Maker” tissue, such as:

#### **1. Sino Atrial Node (S.A. Node):**

It is located at the junction of superior vena cava with right auricle it initiates and maintains the myocardial activity and its rhythmicity, (called pace maker of heart).

#### **2. Atrio-Ventricular Node (A.V. Node):**

Located posteriorly on right side of the interatrial septum near coronary sinus, in the destruction of S.A. Node. The function of pace maker can be taken up by the A.V. Node.

#### **3. Bundle of HIS:**

Starts from A.V. Node along interventricular septum at the top. Impulses travel along bundle of HIS on to ventricles.

#### **4. Purkinje Fibers:**

Located at the terminal divisions of right and left branch of the bundle of HIS. Purkinje fibers transmit the impulse at a fast velocity of 4 mts/sec.

### **WORKING OF HEART**

The pumping action of heart (Fig. 1.4) starts by the contraction of its muscular walls (Fig. 1.5). The alternate contraction and relaxation (dilation) continues regularly. The waves of contraction is initiated by Sino-auricular node (S.A. Node) situated on inner wall of right auricle. Right auricle is filled with deoxygenated blood, brought through the right and left superior vena cava from right and left side of the head, neck, chest and arm. Right and left posterior vena cava brings deoxygenated blood to right auricle from left and right lower body parts such as abdomen and legs.

(Simultaneously left auricle is filled with oxygenated blood) when both auricles are filled with the blood, wave of contraction starts from S.A. Node and spreads over both the auricles resulting the contraction of both auricles, simultaneously, and blood is pushed into ventricles of their sides through atrio-ventricular valves. Atrio-ventricular valve (tricuspid) which is a three flap valve present between the right auricle and right ventricle, stops back flow of blood from ventricles to auricle.

Atrio-ventricular valve which is a two flap (bicuspid) valve present between left auricle and left ventricle and stops back flow of blood from ventricle to auricle. Just after the filled of ventricles, relaxation starts in the walls of auricles due to this deoxygenated blood rushes from veins to right auricle and oxygenated blood through pulmonary vein in to left auricle Now atrio- ventricular node is excited, (Present near inter auricular septum on the wall of right auricle) by the wave of contraction of

auricles, wave of contraction spreads over to wall of ventricles through bundle of HIS and Purkinje Fibers. Now both the ventricles contract simultaneously causing pressure of blood contained in them, blood of right ventricle is forced in pulmonary artery through semilunar valves, (this valve prevent the backflow of the blood) to the lungs for gaseous exchange, (oxygenation and carbon dioxide removal and also provide nutrition to the lungs) after this oxygenated blood comes to left auricle through pulmonary vein. From left auricle oxygenated blood passes into left ventricle through left auri-ventricular valve. Now from left ventricle oxygenated blood is pumped into aorta through aortic semilunar valve to supply it to all body parts. Sometimes the pacemaker becomes faulty (slow heart beat) causing heart trouble. A battery operated artificial “pacemaker” is fixed in the heart of such patient.

### **ELECTRO CARDIOGRAM**

Einthovan is the father of ECG. An instrument called electrocardiograph can record the electrical changes during the heart beats. The electrodes attached to the skin of the chest, near the heart, pick up electrical signals from the heart.

The graph of electrical voltage produced by heart with time recorded by an electrocardiograph is called electrocardiogram or ECG. S.A. Node has a unique property of self excitation, thus it is called pace-maker. Paul M. Zoll an American developed a technique for pacing the heart through the pace-maker, intact into the chest.

