

CARDIOVASCULAR SYSTEM

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- Organ system that distributes blood to all parts of the body.
- Its major function is transportation, using blood as the transport vehicle.
- This system carries oxygen, nutrients, cell wastes, hormones and other substances vital for body homeostasis to and from cells.
- The force to move blood around the body is provided by the pumping heart and blood pressure.

THE HEART

- The human heart is approximately the size of a fist, and weighs less than a pound.
- It is enclosed within the inferior mediastinum, the medial cavity of the thorax and flanked on each side by lungs.
- The heart is enclosed by a double walled sac called pericardium.
- The superficial loosely fitted part is called the fibrous pericardium which protects and

anchors the heart.

- Deep to the fibrous pericardium is the slippery, two layer serous pericardium.
- The parietal layer lines the interior of the fibrous pericardium.
- The parietal layer attaches to the large arteries leaving the heart and then makes a U-turn and continues inferiorly over the heart surface as the visceral layer or epicardium.
- A slippery lubricating fluid is produced by the serous pericardial membranes which allows the heart to beat easily in a relative frictionless environment.
- Inflammation of the pericardium, **pericarditis**, often results in a decrease in the serous fluid.
- This cause the pericardial layers to stick, forming painful adhesions that interfere with heart movements.

LAYERS OF HEART

The heart walls are composed of 3 layers:-

1. **EPICARDIUM** → It is the outer layer ~~continuous~~ continuous with the pericardium.

2. **MYOCARDIUM** → It consists of thick bundles of the cardiac muscle twisted into ring like arrangements.

→ This is the layer of the heart that actually contracts.

→ Reinforced by dense, fibrous connective tissue (heart skeleton)

3. **ENDOCARDIUM** →

→ The endocardium is a thin glistening sheet of endothelium that lines the heart chambers.

→ It is continuous with the linings of the blood vessels leaving and entering the heart.

CHAMBERS OF HEART → The heart has four hollow chambers:

→ 2 Atria

→ 2 ventricles.

ATRIA →

→ These are thin walled upper chambers.

→ Both atrium are separated by atrial septum.

→ Right side of septum has oval depression,

fossa ovalis cordis, ~~femora~~ remnant of the foramen ovale.

→ Atria acts as receiving chambers for blood returning from the body and lungs.

VENTRICLES

→ The ventricles are thick walled discharging chambers.

→ They are the pumps of the heart.

→ When they contract, blood is propelled out of the heart and into circulation.

→ The right ventricle forms most of the heart's anterior surface.

→ The left ventricle forms the apex.

→ The septum that divides the heart longitudinally is the interventricular septum or interatrial septum based on the chambers it separates.

FUNCTION OF HEART

→ The heart functions as a double pump.

→ The right side works as the pulmonary

Circuit pump.

- Receives relatively oxygen-poor blood from the veins of the body through the large superior and inferior vena cava.
- The blood then pumps out through the pulmonary trunk which splits into the left and right pulmonary arteries.
- The pulmonary arteries carry blood to the lungs, where oxygen is picked up and CO_2 is unloaded.
- Oxygen-rich blood drains from the lungs and is returned to the left side of the heart through the four pulmonary veins.
- This circuit is called **pulmonary circulation**.
- Its only function is to carry blood to the lungs for gas exchange and then return it to the heart.
- Blood returned to the left side of the heart is pumped out of the heart into the aorta.
- The systemic arteries branch from the aorta to supply the blood tissues with blood.

- Oxygen-poor blood circulates from the tissues back to the right atrium via the systemic veins, which empty their blood into either the superior or inferior vena cava.
- The second circuit, from the left side of the heart through the body tissues and back to the right side of the heart is called **systemic circulation**.
- It supplies oxygen and nutrient-rich blood to all body organs.
- Because the left ventricle is the systemic pump that pumps blood over a much longer pathway through the body, its walls are thicker than those of the right ventricle.
- It is a more powerful pump.

VALVES OF HEART → The heart also has four valves.

- 2 valves that separates the atria from the ventricles
- 2 valves that separates the ventricles from their arteries

- All of these valves prevent back flow.
- The **anterioventricular (AV)** valves are b/w the atria and ventricles.
- on the left is the **bicuspid** or **mitral valve**.
- on the right is the **tricuspid valve**.
- They are all anchored by the **chordae-tendineae**.

CARDIAC CYCLE

- When the heart is relaxed and blood is passively filling its chambers, the AV-valve flaps hang limply into the ventricles.
- As the ventricles contract, they press on the blood in their chambers, and the intra ventricular pressure rises.
- The **semilunar valves** guard the bases of the large arteries leaving the ventricular chambers.
- on the right is the **pulmonary valve**.
- on the left is the **aortic valve**.
- When the ventricles are contracting these valves are forced open and flattened against

the arterial walls.

→ When the ventricles are relaxed the blood flows back towards the heart.

→ This prevents arterial blood from reentering the heart.

→ The **coronary arteries** branch from the base of the aorta and encircle the heart in the coronary ~~scut~~ sulcus (AV groove) at the junction of the atria and ventricles.

→ The coronary arteries and their major branches are compressed when the ventricles are contracting and fill when the heart is relaxed.

→ The myocardium is drained by several cardiac veins, which empty into coronary sinus.

→ The coronary sinus, in turn, empties into the right atrium.

→ When the heart beats rapidly the myocardium can receive an ~~ade~~ inadequate amount of blood.

→ This can result in crushing chest pain

called **angina pectoris**

→ Pain due to angina pectoris is a warning sign.

→ If angina is prolonged, oxygen-deprived heart cells may die forming an infarct

→ The resulting **myocardial infarction** is a **heart attack**.