THE CARDIOVASCULAR SYSTEM

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Unit Objectives

- By the end of the unit learners should be able to:

1. Define key terms of the cardiovascular system
2. Describe the cardiovascular system
3. Describe the structure of the heart and the blood vessels
4. Describe blood circulation- pulmonary and systemic

Introduction

The Heart

- It is the organ that propels blood throughout the body
- **Circulation-** the continuous one way circuit of blood through the blood vessels..
- It is located between the lungs and the center and a bit of the left of the body's midline.

Introduction cont'

- The heart occupies most of the **mediastinum** (the pointed, inferior portion)
- The broad, superior base is where the large vessels carrying blood into and out of the heart are attached.

Tissue Layers of the Heart wall

- The wall of the heart is made of **three layers**.

1. The **Endocardium**- the thin smooth layer of epithelial cells that line the heart's interior.

2. The **myocardium**-it is the heart muscle.

- It is the thickest layer of the heart that pumps blood through the vessels

3. The **epicardium**- it is a serous membrane that forms the thin, outermost layer of the heart wall.

The Pericardium

- This is the sac that encloses the heart. It is characterised by the following special features:
- Its cells are lightly striated (striped) with actin and myosin filaments
- The cells have a single nucleus
- The muscles are also involuntarily controlled
- There are intercalated disks that firmly attach adjacent cells to each other but allow for rapid and coordinated communication between them
- The muscle cells are highly branched and interwoven

Divisions of the Heart

- The heart is divided into two parts: ***right heart*** and ***left heart.***
- The right side pumps blood low in oxygen content to the lungs through the **pulmonary circuit**
- The left side pumps highly oxygenated blood to the remainder of the body through the **systemic circuit.**
- Each side is divided into **two chambers (cont')**

Divisions of the Heart…

- **The Four Chambers of the Heart:**

1. the atria- the **upper chambers** on the right and left sides

- These chambers are mainly blood-receiving chambers.

2. the ventricles- the **lower chambers** on the right and left side, are forceful pumps. (cont')

Divisions of the Heart…

1. **The Right Atrium-**

- It is a thin walled chamber that receives the blood returning from the body tissues.
- The **superior venacava** brings blood from the head, chest and arms
- The **inferior venacava** delivers blood from the trunk and legs.

Divisions of the Heart…

The Right Ventricle

- It pumps the venous blood recieved from the right atrium to the lungs.
- It pumps into a large pulmonary trunk, which then divides into right and left pulmonary arteries.
- Branches of these arteries carry blood to the lungs.

Divisions of the Heart…

3. The Left Atrium

- This receives blood that is high in oxygen content as it returns from the lungs in pulmonary veins.
- Pulmonary veins carry oxygenated blood unlike other veins which carry blood low in oxygen

Divisions of the Heart…

4. The Left Ventricle

- It is the chamber with the thickest wall
- It pumps highly oxygenated blood to all parts of the body.
- This blood goes first into the aorta and then into the branching systemic arteries
- The heart's right and left chambers are separated from each other by **septum.**

Heart Valves

1. The Right Artioventricular (AV) Valve

- It is also known as the **tricuspid valve**
- When it opens, blood flows from the right atrium into the right ventricle.
- When the right ventricle begins to contract, however the valve is closed by blood squeezed backward against the cusps. Therefore, blood cannot return to the right atrium but must flow forward into the pulmonary arterial trunk.

Heart Valves…

2. The Left Atrioventricular (AV) Valve

- It is the bicuspid valve but it is commonly referred to as the **mitral valve.**
- The valve permits blood to flow freely from the left atrium into the ventricle.
- Its cusps close when the left ventricle begins to contract
- This closure prevents blood from returning to the left atrium and ensures the forward flow of blood into the aorta.

Heart Valves…

3. The Pulmonary Valve

- It is also called the pulmonic valve.
- It is a *semilunar valve* located between the right ventricle and the pulmonary trunk that leads to the lungs.
- As soon as the right ventricle begins to relax from a contraction, pressure in that chamber drops.
- The higher pressure in the pulmonary artery closes the valve and prevents blood from returning to the ventricle.

Heart Valves…

4. The Aortic Valve

- It is also a semilunar valve located between the left ventricle and the aorta. After contraction of the left ventricle, back pressure closes the aorta into the ventricle

Blood Supply to the Myocardium

- The myocardium has its own blood circulation i.e the coronary circulation.
- It has the right and left coronary arteries
- They are main arteries and are the first to branch off the aorta and then they branch to all regions of the heart muscle.
- They receive blood only when the ventricles relax

Blood Supply to Myocardium…

- After passing through the capillaries, blood drains into a system of cardiac veins that brings blood back towards the right atrium.
- Blood finally collects in the coronary sinus (a dilated vein that opens into the right atrium near the inferior venacava)

Assignment

Read and write short notes on the following:

i. The cardiac cycle
ii. Cardiac output
iii. Heart's conduction system