NAME: ALADE KABIRAT OLUWATOSIN.

MATRIC NUMBER: 18/MHS01/059.

DEPARTMENT: MEDICINE AND SURGERY.

COLLEGE: MEDICINE AND HEALTH SCIENCES.

COURSE TITLE: INTRODUCTION TO PHYSIOLOGY.

COURSE LECTURER: DR. ONIYIDE

DATE: 27TH JUNE, 2020.

ASSIGNMENT QUESTIONS

1. Discuss the long term regulation of mean arterial blood pressure.
2. Write short notes on the following
    a) Pulmonary circulation
    b) Circle of Willis
    c) Splanchnic circulation
    d) Coronary circulation
    e) Cutaneous circulation
3. Discuss the cardiovascular adjustment that occurs during exercises

a. Pulmonary circulation

This is the part of the circulatory system that carries deoxygenated blood away from the right ventricles to the lungs and returns oxygenated blood to the left atrium and ventricles of the heart. Pulmonary artery supplies deoxygenated blood pumped from right ventricle to alveoli of lungs (pulmonary circulation). After leaving the right ventricle, this artery divides into right and left branches. Each branch enters the corresponding lung along with primary bronchus. After entering the lung, branch of the pulmonary artery divides into small vessels and finally forms the capillary plexus that is in intimate relationship to alveoli. Capillary plexus is solely concerned with alveolar gas exchange. Oxygenated blood from the alveoli is carried to left atrium by one pulmonary vein from each side. Pulmonary artery has a thin wall. Its thickness is only about one third of thickness of the systemic aortic wall. Wall of other pulmonary blood vessels is also thin. Pulmonary blood vessels are highly elastic and more distensible.

The pulmonary veins return oxygenated blood to the left atrium in the left part of the heart. The blood passes the mitral valve and enters the left ventricle. From the left ventricle it passes through the aortic valve to the aorta which is then distributed to the body through systemic circulation before returning back to pulmonary circulation again.

b. Circle of Willis

This is a part of the cerebral circulation and has 5 arteries, 4 which have left and right parts. They are; anterior cerebral artery (left and right), anterior communicating artery, internal carotid artery (left and right), posterior cerebral artery (left and right), posterior communicating artery (left and right). There are variations in circle of Willis. The variations are common in the vessels.

c. Splanchnic circulation

This is also known as visceral circulation and it consists of the blood supply to the gastrointestinal tract, liver, spleen and pancreas. Splanchnic or visceral circulation constitutes three portions; mesenteric circulation supplying blood to GI tract, splenic circulation supplying blood to spleen hepatic circulation supplying blood to liver. Unique feature of splanchnic circulation is that the
blood from mesenteric bed and spleen forms a major amount of blood flowing to liver. Blood flows to liver from GI tract and spleen through portal system.

d. Coronary circulation

This is the circulation of blood in the blood vessels that supply the heart muscles. The coronary arteries supply oxygenated blood to the myocardium and cardiac veins drain the blood once it has been deoxygenated.

Heart muscle is supplied by two coronary arteries, namely right and left coronary arteries, which are the first branches of aorta. Arteries encircle the heart in the manner of a **crown,** hence the name coronary arteries. Right coronary artery supplies whole of the right ventricle and posterior portion of left ventricle. Left coronary artery supplies mainly the anterior and lateral parts of left ventricle. There are many variations in diameter of coronary arteries.

Venous drainage from heart muscle is by three types of vessels; Coronary Sinus, Anterior Coronary Veins, Thebesian Veins.

e. Cutaneous circulation

This is the circulation and blood supply of the skin. The skin is not a very metabolically active tissue and has small energy requirements so its blood supply is different from other organs. Cutaneous blood flow is regulated mainly by body temperature. Hypothalamus plays an important role in regulating cutaneous blood flow. When body temperature increases, the hypothalamus is activated. Hypothalamus in turn causes cutaneous vasodilatation by acting through medullary vasomotor center. Now, blood flow increases in skin. Increase in cutaneous blood flow causes the loss of heat from the body through sweat. When body temperature is low, vasoconstriction occurs in the skin. Therefore, the blood flow to skin decreases and prevents the heat loss from skin.

Cutaneous blood flow performs two functions:

1. Supply of nutrition to skin
2. Regulation of body temperature by heat loss.

CARDIOVASCULAR ADJUSTMENTS DURING EXERCISES

Exercises are healthy activities that should be incorporated into our lives to live a healthy life. There are different exercises and are based on different categories. These are:

- Type of exercise which includes; Dynamic or Static exercises
- Metabolism type which includes; Anaerobic or aerobic exercises
- Severity of exercise which includes; Mild, Moderate or Severe exercises.

The cardiovascular adjustments and changes depends on the type of exercise on is engaging in.

Dynamic exercises: these involve isotonic muscle contractions which keeps the joints and muscles moving and working till the exercise is over. In this exercise, the force of contraction, cardiac output, heart rate and systolic blood pressure are all increased but the diastolic blood pressure is either unaltered or decreased because peripheral resistance is either unaltered or decreased during the exercise which also depends on the severity. These exercises include; swimming, bicycling etc.

Static exercises: these involves isometric muscular contraction which doesn't move the joints. Here the heart rate, force of contraction, cardiac output, systolic blood pressure and diastolic blood pressure increases because peripheral resistance is increased.

The three main adjustments the cardiovascular system make during exercises are;

- Increase in cardiac output
- Increase in local blood flow to working muscles
- Decrease in blood flow to other organs e.g. liver, kidney etc.

Increase in local blood flow: during exercises, the key requirement is to deliver sufficient and required oxygen and other nutrients to the exercising muscles. This increases the blood flow to the localized working muscles drastically. Muscle blood flow can increase as much as 25-folds during most strenuous exercises.

The muscular walls of the heart increase in thickness, particularly in the left ventricle, providing a more powerful contraction. The left ventricles internal dimension increase as a result of increased ventricular filling. The increase in size of the heart enables the left ventricle to stretch more and thus fill with more blood. The increase in muscle wall thickness also increases the contractility resulting in increased stroke volume at rest and during exercise, increasing blood supply to the body. As cardiac output at rest remains constant the increase in stroke volume is accompanied by a corresponding decrease in heart rate. Cardiac output increases significantly during maximal exercise effort due to the increase in SV. This results in greater oxygen supply, waste removal and hence improved endurance performance. People with blood pressure in the 'normal' ranges experience little change in BP at rest or with exercise; however hypertensive people find that their BP reduce towards normal as they do more exercise. This is due to a reduction in total peripheral resistance within the artery, and improved condition and elasticity of the smooth muscle in the blood vessel walls.