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MATRIC NUMBER; 18/MHS01/138

COURSE: PHYSIOLOGY

ASSIGNMENT

1. Discuss the long-term regulation of mean arterial blood pressure.

A blood pressure monitor gives a systolic and diastolic blood pressure reading and a small number is included underneath or alongside the standard blood pressure reading. This number is the mean arterial blood pressure (MAP). Mean arterial blood pressure is the average pressure in a patient’s arteries during one cardiac cycle. It is not the arithmetic mean of systolic and diastolic pressures. It is the diastolic pressure plus one third of pulse pressure. Formula:

***Mean arterial blood pressure= Diastolic pressure+1/3 of pulse pressure***

It is a calculation that doctors use to check whether there is enough blood flow, resistance, and pressure to supply blood to all major organs. The kidney plays an important role in the long-term regulation of arterial blood pressure. Kidneys regulate arterial blood pressure by two ways:

1. ***Regulation of Extracellular fluid volume (ECF)***

When the blood pressure increases the kidney excretes large amount of water and salt, particularly sodium by means of *pressure diuresis* and *pressure natriuresis*. Because of diuresis and natriuresis there is a decrease in ECF volume and blood volume which in turn brings the arterial blood pressure back to normal.

1. ***Through Renin-angiotensin mechanism:*** The Kidney does not directly sense blood pressure but acts to regulate blood pressure over the long term. They do this via the *renin-angiotensin* system that regulates the amount of extracellular fluid in the body which in turn is regulated by levels of sodium in the blood plasma.

Hormones are also involved in the regulation of blood pressure. They decrease or increase the blood pressure. Hormones such as; *Adrenaline, Noradrenaline, Thyroxine,* *Aldosterone, Vasopressin, Angiotensin* and *Serotonin* increase blood pressure. While *vasoactive intestinal polypeptide, Bradykinin, Prostaglandins, Histamine, Acetylcholine, Atrial natriuretic peptide, brain natriuretic peptide and c-type natriuretic peptide* decrease blood pressure.

Some local substances also regulate blood pressure by **vasoconstriction** or **vasodilation**.

2.) Write short notes on the following:

1. **Pulmonary Circulation**: This system of circulation carries deoxygenated blood away from the right ventricle to the lungs and returns oxygenated blood to the left atrium and ventricle of the heart. Deoxygenated blood from the lower half of the body enters the heart from the inferior vena cava while deoxygenated blood from the upper body is delivered to the heart by the superior vena cava.
2. **Circle of Willis**: The circle of Willis encircles the stalk of the pituitary gland and provides important communications between the blood supply of the forebrain and hindbrain. It is the joining area of several arteries at the inferior (bottom) side of the brain.
3. **Splanchnic circulation:** This is also known as *visceral circulation*. In the splanchnic circulation blood is supplied to the gastrointestinal tract, liver, spleen and pancreas. A unique feature of this circulation is that the blood from mesenteric bed and spleen forms a major amount of blood flowing to liver. Blood flows to the liver from the gastrointestinal tract and spleen through portal system. It constitutes of three portions:
4. Mesenteric circulation supplying blood to Gastrointestinal tract
5. Splenic circulation supplying blood to the spleen
6. Hepatic circulation supplying blood to the liver.
7. **Coronary circulation**: This circulation is part of the systemic circulatory system that supplies blood to and provides drainage from tissues of the heart. It involves the circulation of blood in blood vessels that supply the heart muscle. Coronary arteries supply oxygenated blood to the heart muscle and cardiac vein drain away the blood once it has been oxygenated.
8. **Cutaneous circulation**: The skin is not a very metabolically active tissue and has relatively small energy requirements so its blood supply is different. The cutaneous circulation is the circulation and blood supply of the skin. Its main function is the regulation of body temperature through heat loss and provision of nutrients to the skin.
9. Discuss the cardiovascular adjustments that occurs during exercise?

Exercise promotes the circulation of oxygen through the blood and is associated with an increased rate of breathing. During exercise there is an increase in metabolic needs of the body tissues especially the muscles. The adjustments in the body during these exercises are aimed at supply of nutrients and oxygen to muscles including other tissues involved in the exercise and prevention of increase in body temperature. Cardiovascular adjustment due to exercise occurs on;

* *Blood*
* *Blood volume*
* *Heart Rate*
* *Cardiac output*
* *Venous Return*
* *Blood flow to Skeletal Muscles*
* *Blood pressure*

**Blood:** During exercise, the cardiovascular system redistributes the blood so that more of it goes to the muscles. The heart pumps harder and faster to circulate blood oxygen to the muscles. Mild hypoxia developed during exercise stimulates the bone marrow and causes release of red blood cells. Increased carbon dioxide content in blood decreases the pH value of blood.

**Blood Volume:** The cutaneous vasculature and sweat glands are thermoregulatory effectors of the skin and promote heat loss by increasing skin blood flow via cutaneous vasodilation and by sweating.This sweating leads to; fluid loss, reduced blood volume and hemoconcentration. Severe exercise may lead to dehydration.

**Heart Rate:** The heart is a muscle which becomes more efficient with exercise.  When you exercise, your muscles help to circulate blood through the body taking some of the strain and effort off the heart. Therefore heart rate increases during exercise. This increase is as a result of vagal withdrawal. Some factors are also included:

1. Impulses from proprioceptors
2. Increased carbon dioxide tension that acts through medullary centers.
3. Rise in body temperature which acts on cardiac centers via the hypothalamus, high temperature and stimulates the sinoatrial nodes
4. Circulating catecholamine which are secreted in large quantities.

**Cardiac Output:** Cardiac output increases because of increase in the heart rate and stroke volume. During exercise, the cardiac output increases more than the total resistance decreases, so the mean arterial pressure usually increases by a small amount.

**Venous Return:** During exercise**,** skeletal muscle contractions compress venous vessels, forcing blood centrally and supplementing venous return. Venous return increases during exercise because of *muscle pump, respiratory pump and splanchnic.*

**Blood Pressure**:Physical activity such as exercisemakes your heart stronger and a stronger heart can pump more blood with less effort. When the heart can work less to pump, the force on your arteries decreases, lowering your blood pressure.Exercise lowers blood pressure by reducing blood vessel stiffness so blood can flow more easily. The effects of exercise are most noticeable during and immediately after a workout. Lowered blood pressure can be most significant right after you work out.