NAME: OJO, IYESENI PRISCILLA

MATRIC NO: 18/MHS01/258

DEPARTMENT: MEDICINE AND SURGERY

COLLEGE: MEDICINE AND HEALTH SCIENCES

ASSIGNMENT

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

Long-term regulation involves mainly the regulation of extracellular fluid volume by pressure natriuresis mechanisms residing in the kidney and by widespread actions of angiotensin 2. Long-term regulation of arterial pressure is linked closely to volume homeostasis through the renal body fluid feedback mechanisms. Studies in hypertensives have suggested that the long-term-controlled variable is not arterial blood pressure, but the balance between intake and output of fluid and electrolytes. Renin is a peptide hormone released by the granular cells of the juxtaglomerular apparatus in the kidney. It is released in response to:

- Sympathetic stimulation
- Reduced sodium-chloride delivery to the distal convoluted tubule
- Decreased blood flow to the kidney

Renin facilitates the conversion of angiotensinogen to angiotensin I which is then converted to angiotensin II using angiotensin-converting enzyme **(ACE)**.

Angiotensin II is a potent vasoconstrictor. It acts directly on the kidney to increase sodium reabsorption in the proximal convoluted tubule. It’s clinical relevance is Hypertension. Hypertension is defined as a sustained increase in blood pressure. It may be primary (of an unknown cause) or secondary to another condition such as chronic renal disease or Cushing’s syndrome.

2. Write short notes on the following

Pulmonary circulation

System of blood vessels that forms a closed circuit between the heart and the lungs, as distinguished from the systemic circulation between the heart and all other body tissues.
The pulmonary circulation is supplied with both sympathetic and parasympathetic innervation. In general, increased sympathetic activity leads to release of catecholamines (e.g., dopamine, norepinephrine, epinephrine, and neuropeptide Y) that cause vasoconstriction and an increase in pulmonary vascular resistance. The pulmonary circulation differs from the systemic in that it is under minimal resting tone and is almost fully dilated under normal conditions. The pulmonary

circulation conducts the entire cardiac output with a remarkably low driving pressure from the pulmonary artery (mean Ppa of 15 to 20 mm Hg) to the left atrium (Pla of 7 to 12 mm Hg). The pulmonary circulation conducts the entire cardiac output with a remarkably low driving pressure between the pulmonary artery (mean Ppa = 15–20 mmHg) and the left atrium (Pla = 7–12 mmHg).

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 (ie, between the internal carotid and vertebro-basilar systems following obliteration of primitive embryonic connections). The circle of Willis begins to form when the right and left internal carotid artery (ICA) enters the cranial cavity and each one divides into two main branches: the anterior cerebral artery (ACA) and middle cerebral artery (MCA). The circle of Willis is a ring of interconnecting arteries located at the base of the brain around the optic chiasm or chiasma (partial crossing of the optic nerve – CNII; this crossing is important for binocular vision), infundibulum of the pituitary stalk and the hypothalamus. The circle of Willis allows equalization of blood flow between the left and right cerebral hemispheres, and can allow anastomotic circulation if parts are occluded. For example, if there is an obstruction of blood supply through the left internal carotid artery, and blood cannot reach the front of the left side of the brain through this artery, blood will be routed to this area, through the anterior communication artery, from the right internal carotid artery.

Splanchnic Circulation

The splanchnic circulation is composed of the blood flow originating from the celiac, superior mesenteric, and inferior mesenteric arteries and is distributed to all abdominal viscera. It describes the blood flow to the abdominal gastrointestinal organs including the stomach, liver, spleen, pancreas, small intestine, and large intestine. The splanchnic circulation receives over 25% of the cardiac output and contains a similar percentage of the total blood volume under normal conditions. The splanchnic circulation is, more than any other vascular circuit, governed by an elaborate network of vasodilator and vasoconstrictor neurons, and this neural system is just one component of GI vascular control that, in addition, comprises metabolic, paracrine, and endocrine factors. The splanchnic circulation comprises the gastric, small intestinal, colonic, pancreatic, hepatic, and splenic circulations. They are arranged in parallel and fed by the celiac artery and the superior and inferior mesenteric arteries. The splanchnic circulation powerfully influences systemic arterial pressure via two distinct mechanisms. Widespread contraction of arteries in the splanchnic bed reduces blood flow to the region. The low oxygen consumption of splanchnic organs allows for a very large reduction in blood flow without producing ischemia.

Coronary circulation

Coronary circulation is the movement of blood throughout the vessels that supply the myocardium also known as the heart muscle. Although the heart is continually pumping blood throughout its chambers, the myocardium is too thick for the diffusion of blood to happen effectively.

So, instead, the coronary circulation provides an efficient way for the exchange of substances to occur. The coronary circulation system is mainly made up of arteries and veins. The aorta (the main blood supplier to the body) branches off into two main coronary blood vessels (also called arteries). These coronary arteries branch off into smaller arteries, which supply oxygen-rich blood to the entire heart muscle.

The right coronary artery supplies blood mainly to the right side of the heart. The right side of the heart is smaller because it pumps blood only to the lungs.

The left coronary artery, which branches into the left anterior descending artery and the circumflex artery, supplies blood to the left side of the heart. The left side of the heart is larger and more muscular because it pumps blood to the rest of the body. The coronary circulation is also made up of veins, called cardiac veins.

They are responsible for returning deoxygenated blood and waste products like carbon dioxide, from the myocardium to the lungs.

The blood moves from the capillary beds of the myocardium into the cardiac veins. The cardiac veins usually follow the same path as the coronary arteries.

So, just like their arterial counterparts, there's the great cardiac vein in the anterior interventricular sulcus, a middle cardiac vein in the posterior interventricular sulcus, and a small cardiac vein, running along the inferior margin of the right heart.

Cutaneous circulation

The cutaneous circulation is the circulation and blood supply of the skin. The skin is not a very metabolically active tissue and has relatively small energy requirements, so its blood supply is different to that of other tissues.

Some of the circulating blood volume in the skin will flow through will flow through arteriovenous anastomoses (AVAs) instead of capillaries.

It's main function is to help in the regulation of body temperature

3. Discuss cardiovascular adjustment that occurs during exercise

The cardiovascular system provides the link between pulmonary ventilation and oxygen usage at the cellular level. During exercise, efficient delivery of oxygen to working skeletal and cardiac muscles is vital for maintenance of ATP production by aerobic mechanisms. The integrated response to servere exericse involves fourfold to fivefold increases in cardiac output, which are due primarily to increases in cardiac rate and to a lesser extent to augmentation of stroke volume. The increase in stroke volume is partly due to an increase in end-diastolic cardiac size (Frank-Starling mechanism) and secondarily due to a reduction in end-systolic cardiac size. Despite the great changes in cardiac output, increases in blood pressure during exercise are maintained within relatively smaller limits, as both pulmonary and systemic vascular resistance to blood flow is reduced. Redistribution of blood flow to the working muscles during exercise also contributes greatly to the efficient delivery of oxygen to sites of greatest need. Despite the great changes in cardiac output, increases in blood pressure during exercise are maintained within relatively smaller limits, as both pulmonary and systemic vascular resistance to blood flow is reduced. Redistribution of blood flow to the working muscles during exercise also contributes greatly to the efficient delivery of oxygen to sites of greatest need.