Matric no: 18/mhs01/219

1. Long term level of mean arterial pressure: this is dependent on the relationship between arterial pressure and urinary output of salt and water, which is affected by a number of factors. There are several physiological mechanisms that regulate blood pressure in the long term, the first of which is:

Renin-Angiotensin-Aldosterone system: renin is a peptide humor released by the granular cells of the juxteglomerular 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

Anti-diuretic Hormone: the second mechanism by which blood pressure is regulated is the release of anti-diuretic hormone from the OVLT of the hypothalamus in response to thirst or an increased plasma Osmolarity. It acts to increase the permeability of the collecting duct to water by inserting aquaprin Channels into apical membrane, it also stimulates sodium reabsorption from the thick ascending limb of the loop of Henle. This increases water reabsorption thus, increasing plasma volume and decreasing osmolarity.

Other factors that can affect the regulation of long term arterial blood pressure are natriuretic peptides. It is synthesized and stored in the cardiac myocytes, it also acts to promote sodium excretion.

Prostaglandin acts as a local vasodilator to increase GFR and reduce sodium reabsorption. They also act to prevent excessive vasoconstriction triggered by the sympathetic nervous and renin-angiotensin-aldosterone systems.

2a. Pulmonary circulation : this is a system of transportation that shunts deoxygenated blood from the heart to the lungs to be resarurated with oxygen before being dispersed into systemic circulation. Deoxygenated blood from the lower limb enters from the inferior Vena cava while deoxygenated blood from the upper limb enters from the superior Vena cava which empties blood into the right atrium. Blood flows through the tricuspid valve into the right ventricle. It then flows through the pulmonic valve into the pulmonary artery before being delivered to the lungs. While in the lungs, blood diverges into the numerous pulmonary capillaries where it releases carbon dioxide and is replenished with oxygen. Once fully saturated with oxygen, the blood is transported via the pulmonary vein into the left atrium which pumps blood through the moral valve and into the left ventricle which then expels oxygenated blood through the aortic valve and into the aorta.

b. Circle of willis: the circle of Willis is a circulatory anastomosis that supplies blood to the brain and surrounding structures. It encircles the middle part of the brain including the stalk of the pituitary gland and other important structures. Two arteries, called carotid arteries supply blood to the brain. They run along either side of the neck and lead directly to the circle of willis. Each carotid artery branches into and internal and external carotid artery. The internal artery branches into the cerebral arteries. This structure allows all of the blood from the two internal carotid arteries to pass through the circle of Willis. The structures of the circle of Willis include:

- Left and right internal carotid arteries
- Left and right anterior cerebral arteries
- Left and right posterior cerebral arteries
- Left and right posterior communicating arteries
- Basilar artery
- Anterior communicating artery.

c. Splachnic circulation: this compromises of the gastric, small intestine, colonic, pancreatic, hepatic and splenic circulation. They are Arranged in parallel and fed by the coeliac artery and the superior and inferior mesenteric arteries. The resistance arterioles are the primary determinant of vascular resistance in the splachnic circulation. Neuronal control of the mesenteric circulation is almost entirely sympathetic in origin. The parasympathetic fibers from the vagi have little to no effect on the blood flow. Overall splachnic blood flow requires about 25% cardiac output. The splachnic venous capacitance reservoir contains about one-third of the body's total blood volume.

d. Coronary circulation : this is part of the systemic circulatory system that supplies blood to and provides drainage from the tissues of the heart. Two coronary arteries arise from the aorta just beyond the semilunar valves, during diastole, the increased aortic pressure above the valves forces blood into the coronary arteries and hence into musculature of the heart. Deoxygenated blood is retired to the chambers of the heart through the coronary veins, most of these converge to form the coronary venous sinus which drains into the right atrium. The heart normally, extracts 70-70% of the available oxygen from the blood during coronary circulation.

e. Cutaneous circulation : this is the circulation and supply of blood to the skin. The skin is not a very metabollicaly active tissue and has relatively small energy requirements, so it's blood supply is different to that of other tissues. Some of the circulating blood volume on the skin

flows through the arteriovenous anastomosis (AVAs) instead of capillaries. AVAs serves a role in temperature regulations. AVAs are low-resistance connections between the small arteries and small veins that supply and drain the skin. These allow the shunt of blood directly into the venous plexus of the skin, without it passing through capillaries.

3. Cardiovascular adjustments that occur during exercise : the enhanced cardiac output is distributed prefrentially to the exercising muscles including the heart. Blood from the heart increases four-five folds as well, mainly reflecting the augmented metabolic requirements of the myocardium due to near maximum increase in cardiac rate and contractility. Blood flow to the inactive viscera is maintained during severe exercise.it is suggested that the local auto regulatory mechanisms are responsible for maintained visceral flow in the face of neural and hormonal autonomic drive which acts to constrict renal and mesenteric vessels and to reduce blood flow.