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Physiology Assignment

Question 1

Discuss the long term mean arterial pressure?

The long-term regulation of BLOOD PRESSURE is believed to be dependent mainly on the blood volume and urine output balance which in turn is mainly influenced by the renin–angiotensine-aldosterone system. An increase in arterial blood pressure causes fluid output through the kidneys and a reduction in the extracellular fluid volume, blood volume and venous return. This will lead to a decrease in C.O which will result in blood pressure decrease. It should be noted that blood volume itself depends on a balance between fluid intake and fluid losses and that only very small changes in fluid volume are required to produce marked changes arterial blood pressure. Thus 2% increase in blood volume can result in an increase in arterial blood pressure of as much as 5%. Although the rapidly acting control system will serve to reduce this changes, the long –term adjustment will be by increased fluid loss by the kidneys. By reabsorbing 99% of the water and sodium filtered in the glomerulus per day, the kidneys help in conserving body water and therefore maintaining blood volume. By so doing, it ensures a long-term maintenance of normal blood pressure.

Question 2:

Write short notes on;

1. Pulmonary circulation.

The pulmonary circulation is the portion of the circulatory system which carries deoxygenated blood away from the right ventricle, to the lungs, and returns oxygenated blood to the left atrium and ventricle of the heart. The term pulmonary circulation is readily paired and contrasted with the systemic circulation. The vessels of the pulmonary circulation are the pulmonary arteries and the pulmonary veins.

1. Circle of willis:

The Circle of Willis is the joining area of several arteries at the bottom (inferior) side of the brain. At the Circle of Willis, the internal carotid arteries branch into smaller arteries that supply oxygenated blood to over 80% of the cerebrum.

1. Splanchnic circulartion:

The splanchnic circulation consists of the blood supply to the gastrointestinal tract, liver, spleen, and pancreas. It consists of two large capillary beds partially in series. The small splanchnic arterial branches supply the capillary beds, and then the efferent venous blood flows into the PV. The PV and hepatic artery supply blood flow to the liver.

1. Coronary circulation:

Coronary circulation is the circulation of blood in the blood vessels that supply the heart muscle. Coronary arteries supply oxygenated blood to the heart muscle, and cardiac veins drain away the blood once it has been deoxygenated.

1. 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.

Question 3:

Discuss the cardiovascular adjustments of that occur during exercise?

Muscular exercise constitutes the strongest physiologic stress on the human CVS. It demands a huge increase in the supply of O₂ and nutrients to the exercising muscles and a proportionate increase in the removal of metabolic waste products and excess heat generated during the exercise. Certain cardiovascular adjustments are made to enable the body cope with the above increased demands.

The cardiac function changes include; increase in stroke volume, heart rate and cardiac output. In exercise, cardiac output can increase from 5L to 30L per minute. It is important to note that change in stroke volume alone will increase cardiac output by only 50%. Hence, increased HR is the main mechanism by which increase of up to 60% in C.O is achieved in exercise.

There is usually also an increase in arterial pressure in exercise. The increase can be as little as 20mmHg or as great as 80mmHg depending on the type of exercise and condition under which the exercise is performed.

Also, blood flow to the exercising muscle increases enormously during maximal exercise from about 750ml/min to more than 20L per minute. The proportion of the cardiac output that goes to the exercising muscles may rise from the resting value of 15% to 85%. The increase is due to marked arteriolar dilation in the exercising muscles, cardiac output are strongly vasodilated by the local vasodilator substances such as low O₂ tension, K⁺, acetylcholine ATP, lactic acid and CO₂ in the muscles themselves when most of the arterioles of the peripheral circulation are strongly contracted.

There is also increased supply of Oxygen to the rest of the body, this is achieved by the combined effects of the following:

1. Increased pulmonary ventilation-The rate and depth of breathing is increased
2. Increased CO-This ensures that more blood gets to the tissues. The combined effect of a and b bring about an enormous increase in the O₂ load transported to the tissues.
3. At the tissue level, the following adjustments ensure increased O₂ delivery to the tissues.

i)More capillaries are open and the capillaries are dilated.

ii)The dilated vessels reduce the distance of diffusion between the capillary walls and the body cells.

iii)Because the muscle cells are very active,PO₂ inside them could be 15mmHg or less. Since arterial PO₂ is 97mmHg, the diffusion gradient for O₂ is increased and this leads to a more rapid diffusion of O₂ to the tissues

iv)Increased temperature, increased CO₂ production, fall in pH and increase 2, 3-DPG{diphosphateglycerate} level cause the oxygen-haemoglobin dissociation curve to shift to the right thereby increasing O₂ release to the tissues.

And finally there is temperature regulation. This is achieved through increased heat loss via the lungs {due to increased pulmonary ventilation} and the skin. Most of the heat produced in the body is generated in the deep organs, especially in the liver, brain, heart& skeletal muscles during exercise. This heat is transferred from the deeper organs and tissues to the skin, where heat is lost to the air and other objects in the surrounding of the body.