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DEPARTMENT: MEDICINE AND SURGERY

COLLEGE: MEDICINE AND HEALTH SCIENCE

COURSE: PHYSIOLOGY

1. DISCUSS THE LONG TERM REGULATION OF MEAN ARTERIAL BLOOD PRESSURE

Kidneys play an important role in the long-term regulation of arterial blood pressure. When blood pressure alters slowly in several days/months/years, the nervous mechanism adapts to the altered pressure and loses the sensitivity for the changes. It cannot regulate the pressure any more. In such conditions, the renal mechanism operates efficiently to regulate the blood pressure. Therefore, it is called long-term regulation. Kidneys regulate arterial blood pressure by two ways: By regulation of ECF volume and Through renin angiotensin mechanism

**By the regulation of ECF volume** When the blood pressure increases, kidneys excrete large amounts of water and salt, particularly sodium, by means of pressure diuresis and pressure natriuretic. Pressure diuresis is the excretion of large quantity of water in urine because of increased blood pressure. Even a slight increase in blood pressure doubles the water excretion. Pressure natriuretic is the excretion of large quantity of sodium in urine. 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 level. When blood pressure decreases, the reabsorption of water from renal tubules is increased. This in turn, increases ECF volume, blood volume and cardiac output, resulting in restoration of blood pressure

1. WRITE SHORT NOTES ON THE FOLLOWING
2. PULMONARY CIRCULATION

Pulmonary circulation is also called lesser circulation. Blood is pumped from right ventricle to lungs through pulmonary artery. Exchange of gases occurs between blood and alveoli of the lungs at pulmonary capillaries. Oxygenated blood returns to left atrium through the pulmonary veins. Thus, left side of the heart contains oxygenated or arterial blood and the right side of the heart contains deoxygenated or venous blood.

1. CIRCLE OF WILLIS

The circle of Willis circle, loop of Willis, cerebral arterial circle, and Willis polygon is a circulatory anastomosis that supplies blood to the brain and the surrounding structures

The arrangement of the brain arteries into the circle of Willis creates redundancy for collateral circulation in the cerebral circulation. If one part of the circle becomes blocked or narrowed or one of the arteries supplying the circle is blocked or narrowed, blood flow from the other blood vessels can often preserve the cerebral perfusion well enough to avoid the symptoms of ischemia

1. SPLANCHNIC CIRCULATION

This describes the blood flow of abdominal gastrointestinal organs including the stomach liver spleen pancreas small and large intestine arranged in parallel with one another. The three major arteries that supply the splanchnic organs, cellac and superior and inferior mesenteric give rise to the smaller arteries that anastomose extensively. The circulation of some splanchnic organs is complicated by the existence of an intramural circulation. Redistribution of total blood flow between intramural vascular circuits may be as important as total blood flow. Numerous extrinsic and intrinsic factors influence the splanchnic circulation. Extrinsic factors include general hemodynamic conditions of the cardiovascular system, autonomic nervous system, and circulating neurohumoral agents. Intrinsic mechanisms include special properties of the vasculature, local metabolites, intrinsic nerves, paracrine substances, and local hormones. The existence of a multiplicity of regulatory mechanisms provides overlapping controls and restricts radical changes in tissue perfusion.

1. CORONARY CIRCULATION

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. Coronary arteries divide and subdivide into smaller branches, which run all along the surface of the heart. Smaller branches are called epicardiac arteries and give rise to further smaller branches known as final arteries or intramural vessels. Final arteries run at right angles through the heart muscle, near the inner aspect of the wall of the heart

1. CUTANEOUS CIRCULATION

 Arterioles arising from the smaller arteries reach the base of papillae of dermis Then, these arterioles turn horizontally and give rise to meta-arterioles from meta-arterioles, hairpin-shaped capillary loops arise. Arterial limb of the loop ascends vertically in the papillae and turns to form a venous limb, which descends down. After reaching the base of papillae, few venous limbs of neighboring papillae unite to form the collecting venule Collecting venules anastomose with one another to form the sub papillary venous plexus Sub papillary plexus runs horizontally beneath the bases of papillae and drain into deeper veins. Cutaneous blood flow performs two functions: 1. Supply of nutrition to skin 2. Regulation of body temperature by heat loss

1. DISCUSS THE CARDIOVASCULAR ADJUSTMENT THAT OCCURS DURING EXERCISE

During exercise, there is an increase in metabolic needs of body tissues, particularly the muscles. Various adjustments in the body during exercise are aimed at: 1. Supply of various metabolic requisites like nutrients and oxygen to muscles and other tissues involved in exercise 2. Prevention of increase in body temperature. When a person starts doing some exercise like jogging, bicycling or swimming, the muscles start utilizing energy. In order to have quick energy during the first few minutes, the muscles burn glycogen stored in them. During this period, fat is not burnt. Only glycogen is burnt and it is burnt without using oxygen. This is called anaerobic metabolism. Lactic acid is produced during this period. Presence of lactic acid causes some sort of burning sensation in the muscles particularly the muscles of arms, legs and back. Muscles burn all the muscle glycogen within 3 to 5 minutes. If the person continues the exercise beyond this, glycogen stored in liver is converted into glucose, which is transported to muscles through blood. Now the body moves into aerobic metabolism. The glucose obtained from liver is burnt in the presence of oxygen. No more lactic acid is produced. So the burning sensation in the muscles disappears. Proper breathing is essential during this period so that adequate oxygen is supplied to the muscles to extract the energy from glucose. The supply of glucose from liver in combination with adequate availability of oxygen allows the person to continue the exercise. Utilization of all the glycogen stored in liver is completed by about 20 minutes. If the exercise is continued beyond this, the body starts utilizing the fat. The stored fat called body fat is converted into carbohydrate, which is utilized by the muscles. This allows the person to do the exercise for a longer period.