**Name:Bello Ubaidu Usman**

**Matricno:17/MHS05/008**

**Department: Medicine and Surgery**

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Q1)Discuss the long term regulation of mean arterial pressure.

Mean arterial pressure (MAP) is the average arterial pressure throughout one cardiac cycle, systole, and diastole. MAP is influenced by cardiac output and systemic vascular resistance, each of which is under the influence of several variables.

A common method used to estimate the MAP is the following formula:MAP = DP + 1/3(SP – DP) or MAP = DP + 1/3(PP)

Where DP is the diastolic blood pressure, SP is the systolic blood pressure, and PP is the pulse pressure. This method is often more conducive to measuring mean arterial pressure in most clinical settings as it offers a quick means of calculation if the blood pressure is known.

mean arterial pressure regulation is on the cellular level through a complex interplay between the cardiovascular, renal, and autonomic nervous systems

When mean arterial pressure is elevated, increasing baroreceptor stimulation, the nucleus tractus solitarius decreases sympathetic output and increases parasympathetic output. The increase in parasympathetic tone will decrease myocardial chronotropy and dromotropy, with less pronounced effects on inotropy and lusitropy, via the effect of acetylcholine on muscarinic receptors in the myocardium. M2 receptors are Gi-coupled, inhibiting adenylate cyclase and causing a decrease in cAMP levels within the cell. The result is a decrease in cardiac output and a subsequent decrease in mean arterial pressure.

Conversely, when the mean arterial pressure decreases, baroreceptor firing decreases and the nucleus tractus solitarius acts to reduce parasympathetic tone and increase sympathetic tone. The increase in sympathetic tone will increase myocardial chronotropy, dromotropy, inotropy, and lusitropy via the effect of epinephrine and norepinephrine on beta1 adrenergic receptors in the myocardium. Beta1 receptors are Gs-coupled, activating adenylate cyclase and causing an increase in cAMP levels within the cell. In addition to this, epinephrine and norepinephrine act on vascular smooth muscle cells via alpha1 adrenergic receptors to induce vasoconstriction of both arteries and veins. Alpha1 receptors are Gq-coupled and act via the same mechanism as the ET-1 receptor mentioned above. The combination of these events increases both cardiac output and systemic vascular resistance, effectively increasing mean arterial pressure.

Q2)Write short notes on the following

**a)Pulmonary Circulation:** Also called lesser 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.

**b)Circle of Willis:** 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; this crossing is important for binocular vision), infundibulum of the pituitary stalk and the hypothalamus. This arterial ring provides blood to the brain and neighbouring structures. Polygonal anastomotic shape offers the possibility of alternate pathways for the blood flow, which is essential for the brain functioning, since it is the structure that is mostly sensitive to hypoxia.

**C)Splanchnic Circulation:** The splanchnic circulation is composed of gastric, small intestinal, colonic, pancreatic, hepatic, and splenic circulations, arranged in parallel with one another. The three major arteries that supply the splanchnic organs, cellac and superior and inferior mesenteric, give rise to 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.

**d)Coronary Circulation:** Coronary circulation is the circulation of blood in the blood vessels that supply the heart muscle (myocardium). Coronary arteries supply oxygenated blood to the heart muscle, and cardiac veins drain away the blood once it has been deoxygenated. Because the rest of the body, and most especially the brain, needs a steady supply of oxygenated blood that is free of all but the slightest interruptions, the heart is required to function continuously. Therefore its circulation is of major importance not only to its own tissues but to the entire body and even the level of consciousness of the brain from moment to moment.

**e) 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** instead of capillaries. Arteriovenous s serve a role in temperature regulation. In this article we shall consider the different adaptations of the cutaneous circulation, and its role in body temperature control.

Q3)Discuss cardiovascular changes that take place during Exercise

Response to severe exercise 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. The full role of the Frank-Starling mechanism is masked by the concomitant tachycardia. The reduction in end-systolic dimensions can be related to increased contractility, mediated by beta adrenergic stimulation. Beta adrenergic blockade prevents the inotropic response, the decrease in end-systolic dimensions, and approximately 50% of the tachycardia of exercise.