Cardiovascular system

The cardiovascular system, also known as the circulatory system, is a complex network of organs, vessels, and cells that work together to transport blood, nutrients, oxygen, hormones, and waste products throughout the body. It plays a vital role in maintaining homeostasis, delivering essential substances to cells, and removing waste products from tissues. The cardiovascular system consists of several key components:

Heart: The heart is a muscular organ responsible for pumping blood throughout the body. It has four chambers: two atria (upper chambers) and two ventricles (lower chambers). The right side of the heart receives deoxygenated blood from the body and pumps it to the lungs for oxygenation. The left side receives oxygenated blood from the lungs and pumps it to the rest of the body.

Blood Vessels: Blood vessels are the pathways through which blood flows. They can be categorized into three types:

Arteries: These vessels carry oxygenated blood away from the heart to various parts of the body. They gradually branch into smaller arterioles. Capillaries: Capillaries are tiny, thin-walled vessels where exchange of gases, nutrients, and waste products occurs between the blood and the surrounding tissues. Veins: Veins transport deoxygenated blood back to the heart. Smaller veins, called venules, merge to form larger veins. Blood: Blood is a fluid connective tissue that carries nutrients, oxygen, hormones, and immune cells throughout the body. It consists of red blood cells (erythrocytes) that transport oxygen, white blood cells (leukocytes) that play a role in immunity, platelets (thrombocytes) for clotting, and plasma, the liquid portion containing water, electrolytes, and proteins.

The functions of the cardiovascular system include:

Oxygen and Nutrient Transport: Oxygen-rich blood is pumped from the lungs to the rest of the body, delivering oxygen to cells for energy production. Nutrients obtained from digested food are also transported to cells via the bloodstream.

Waste Removal: Deoxygenated blood and waste products, such as carbon dioxide, are carried away from cells and transported to the lungs and kidneys for elimination.

Hormone Distribution: Hormones produced by various glands are released into the bloodstream to regulate various physiological processes, including metabolism, growth, and stress response.

Temperature Regulation: Blood helps regulate body temperature by redistributing heat from warm areas to cooler ones.

Immune Response: White blood cells in the bloodstream help defend the body against infections and diseases by identifying and neutralizing pathogens.

Maintenance of pH and Electrolyte Balance: The cardiovascular system helps maintain the body's acid-base balance and electrolyte levels, ensuring optimal physiological functioning.

Clotting and Wound Healing: Platelets in the blood play a crucial role in forming clots to prevent excessive bleeding when blood vessels are damaged.

Proper functioning of the cardiovascular system is essential for overall health and well-being.

Disruptions to this system can lead to various cardiovascular diseases, such as hypertension, coronary artery disease, heart failure, and arrhythmias. Lifestyle factors like diet, exercise, and avoiding smoking can have a significant impact on maintaining cardiovascular health.

Unlike the cardiovascular system, the lymphatic system is not a closed system. The human circulatory system processes an average of 20 litres of blood per day through capillary filtration, which removes plasma while leaving the blood cells. Roughly 17 litres of the filtered plasma are reabsorbed directly into the blood vessels, while the remaining three litres remain in the interstitial fluid. One of the main functions of the lymph system is to provide an accessory return route to the blood for the surplus three litres.

The cardiovascular system is under deep sympathetic influence in children with epilepsy. Although VNS seems to provide a substantial improvement by achieving increased parasympathetic effects in short-term therapy, the levels were still lower than those of healthy children after either short- or long-term therapy. Therefore, impaired cardiovascular autonomic regulation may be associated with the epileptic process itself as well as with the contribution of some additional factors. Overall, different aspects such as age, epilepsy duration, epileptic focus, seizure frequency, and AEDs should also be considered for their further possible effects on HRV during VNS therapy [1].

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Hirfanoglu T, Serdaroglu A, Cetin I, Kurt G, Capraz IY, Ekici F, Arhan E, Bilir E. Effects of vagus nerve stimulation on heart rate variability in children with epilepsy. Epilepsy Behav. 2018 Feb 17;81:33-40. doi: 10.1016/j.yebeh.2018.01.036. [Epub ahead of print] PubMed PMID: 29462779.