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Anatomical and Functional Organization of the Human Nervous System: Clinical Significance of the Central and Peripheral Divisions

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Annotation. This article describes in detail the anatomy of the human nervous system, its central and peripheral departments, nervous tissue, functions of the reflex and vegetative systems, development of the nervous system, transmission of information through synapses, and the clinical significance of the nervous system. The article scientifically analyzes the structure, functional properties, and changes that occur in pathological conditions of the nervous system. Thus, the article provides a theoretical basis for the diagnosis and effective treatment of neurological diseases.

Keywords: nervous system, central nervous system, peripheral nervous system, brain, spinal cord, neuron, neuroglia, autonomic nervous system, reflex, innervation, synapse, action, dendrite, reflex pathways, myelin sheath, afferent, efferent

Introduction. The nervous system is the most complex and highest level control system of the human body. It coordinates the activities of all body systems and provides an integral connection with the external and internal environment. Through the nervous system, sensory, reflex and conscious processes are carried out, actions and responses occur. Human consciousness, memory, thinking, speech and voluntary movements, as well as the activity of internal organs are controlled by the nervous system. In medical practice, a deep study of the anatomy of the nervous system is of great importance for understanding neurological diseases, making the correct diagnosis and choosing effective treatment methods. At the same time, knowledge of the developmental features of the nervous system allows you to identify congenital pathologies and prevent them.

Main part. The nervous system is anatomically divided into central and peripheral departments. The central nervous system consists of the brain and spinal cord, which is the center for receiving, processing and forming responses to nerve impulses. The brain consists of the cerebral hemispheres, the diencephalon, the midbrain, the pons, the medulla oblongata and the cerebellum. The cortex of the cerebral hemispheres controls consciousness, thinking, memory, speech and voluntary movements. Subcortical structures coordinate vegetative and instinctive activity. The cerebellum is responsible for coordination, coordination and maintaining balance. The diencephalon regulates reflex and vegetative activity, and the midbrain performs functions related to eye and head movements, hearing and visual pathways.

The spinal cord performs reflex and conductive functions. The gray matter forms a reflex center in the center, and the white matter directs impulses up and down. The segments of the spinal cord are connected to various parts of the body, providing motor and sensory functions. Information exchange occurs between the central and peripheral nervous systems through reflex arcs. Each reflex is carried out through a receptor, afferent pathway, central department, efferent pathway and executive organ.

The peripheral nervous system connects the central nervous system with all parts of the body. The cranial nerves supply the head and neck regions, and the spinal nerves supply the trunk and limbs. Nerve fibers are divided into sensory, motor and mixed types. The fibers are covered with a myelin sheath, which helps to transmit nerve impulses quickly and efficiently.

Nervous tissue consists of neurons and neuroglial cells. Neurons have the ability to generate and transmit impulses and consist of a body, dendrites and axons. Information is exchanged between neurons through synapses. Neuroglia, in turn, perform the functions of support, nutrition, protection and elimination of toxins. The nervous system ensures reflex activity, maintenance of homeostasis and the emergence of adaptive responses. The autonomic nervous system controls the activity of internal organs, blood vessels and glands. The sympathetic department prepares the body for activity, accelerates the heartbeat, increases blood pressure and increases energy expenditure. The parasympathetic department maintains the body's activity in a calm state, activating restorative processes.

The mutual balance of the autonomic nervous system ensures the stable functioning of the cardiovascular, digestive and respiratory systems.

The development of the nervous system begins in the embryonic period. A neural plate is formed from the ectoderm, from which the central and peripheral nervous systems are formed. During this period, neurons and neuroglial cells are interconnected, forming synapses. The maturity of the nervous system ensures the optimal development of consciousness, motor and sensory functions. In modern medicine, MRI, CT and functional imaging technologies are of great importance in identifying anatomical and pathological changes in the nervous system.

The nervous system is one of the complex and vitally important parts of the human body, and the central and peripheral parts function in an interconnected manner. The nervous system provides reflex, sensory and conscious processes, helping the body adapt to the external and internal environment. A thorough study of its anatomical and functional state is important for understanding neurological diseases, making the correct diagnosis and developing effective treatment measures. Knowledge of the developmental features of the nervous system allows you to identify congenital pathologies and prevent them.

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