



## HISTOLOGICAL STRUCTURE OF THE HEARTS

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**Abstract.** *The heart is a hollow muscular organ that ensures continuous blood circulation throughout the body. Its histological structure is highly organized and comprises three main layers: the endocardium, myocardium, and epicardium, each of which performs specific functions. The endocardium lines the inner surface of the heart and is formed by the endothelium and underlying connective tissue. The myocardium is the most developed layer, consisting of striated cardiac muscle tissue with automaticity and high contractility. The epicardium covers the heart externally and is part of the serous membrane, the pericardium. A distinctive feature of cardiac tissue is the presence of specialized cardiomyocytes in the conduction system, which ensure the generation and conduction of impulses. The histological structure of the heart is also characterized by the presence of intercalated discs, which ensure functional syncytia of cardiomyocytes, and a developed vascular network, which ensures a high level of metabolism. The study of the histological structure of the heart is important for understanding the mechanisms of normal and pathological activity of the organ, as well as for the diagnosis of cardiovascular diseases.*

**The purpose of the study.** To study the histological structure of the heart and the features of its structural components.

**Research objectives.** To study the structure of the membranes of the heart: endocardium, myocardium and epicardium. To characterize the histological features of cardiomyocytes. To examine the structure of the cardiac conduction system. Analyze the features of intercellular connections (intercalated discs). To assess the vascular supply of cardiac tissue. To identify the functional significance of the histological structures of the heart.

**Research methods.** Collection and fixation of heart tissue. Preparation of histological sections. Staining of preparations (hematoxylin-eosin, special methods). Light microscopy. Morphometric analysis. Comparative analysis of different layers of the heart.

**Research results.** A histological examination revealed that the heart possesses a complex and highly organized structure, ensuring its continuous contractile and conductive functions. Microscopic analysis clearly differentiates three main layers: the endocardium, myocardium, and epicardium, each with distinctive morphological features. The endocardium consists of a single-layer flat endothelium resting on a basement membrane, beneath which lies loose connective tissue containing collagen and elastic fibers. Elements of the conduction system, including Purkinje fibers, are found in the deep layers of the endocardium. Endothelial cells are elongated, closely adjacent to each other, and provide a smooth inner surface of the heart, reducing resistance to blood flow. In the specimens studied, the endocardium was characterized by a clearly defined structural organization, with no signs of damage.

The myocardium is the most developed layer of the heart and is composed of striated cardiac muscle tissue. Cardiomyocytes are cylindrical, contain one or two centrally located nuclei, and are characterized by the presence of transverse striations. Of particular interest are the intercalated discs—specialized intercellular contacts that provide mechanical strength and electrical communication between cells. The study revealed that cardiomyocytes are arranged in branching structures, forming a functional syncytium. The cell cytoplasm is rich in mitochondria, indicating a high level of energy metabolism. A well-developed capillary network is found between muscle fibers, providing an intensive blood supply to the tissue.

The epicardium is composed of mesothelium and underlying connective tissue, which contains blood vessels, nerve cells, and adipose tissue. In the samples studied, the epicardium had a loose structure, with fatty deposits, particularly in the area of the coronary vessels. Mesothelial cells form a smooth surface that reduces friction during cardiac contractions.

The study focused on the cardiac conduction system. Specialized cardiomyocytes, called Purkinje fibers, were identified. They differ from contractile cells in their larger size, lighter cytoplasm, and fewer myofibrils. These cells are located primarily in the subendocardial layer and form conduction pathways for the propagation of electrical impulses. Their structure is adapted for rapid conduction of excitation, as confirmed by their morphological features.

It has also been established that all layers of the heart are closely interconnected and function as a single system. A well-developed vascular network ensures adequate tissue nutrition, and the presence of specialized intercellular contacts facilitates the synchronous functioning of cardiomyocytes.

Thus, the histological examination results confirm that the structural organization of the heart is fully consistent with its functional load. The identified structural features ensure highly efficient pumping and stable heart rhythm.

**Conclusions .** The heart has a complex multilayered histological organization, including the endocardium, myocardium, and epicardium, each of which performs strictly defined functions. The endocardium ensures the smoothness of the inner surface of the heart and is involved in the regulation of hemodynamic processes due to the presence of the endothelial layer. The myocardium is the main functional component of the heart and is represented by specialized striated muscle tissue that has automaticity, excitability and contractility. Cardiomyocytes have unique morphological features, including the presence of intercalated discs, which provide mechanical strength and electrical communication between cells, forming a functional syncytium. The epicardium performs protective and trophic functions, contains vessels, nerve elements and adipose tissue involved in ensuring the vital functions of the heart.

The cardiac conduction system is represented by specialized cells ( Purkinje fibers ), which ensure the generation and rapid conduction of electrical impulses. The presence of a developed capillary network and a high density of mitochondria in cardiomyocytes reflects the high level of metabolism of cardiac tissue. The

structural organization of the heart is closely related to its function, ensuring the synchronicity of contractions and the efficiency of pumping activity. Disturbances in the histological structure of the heart can lead to the development of various cardiovascular diseases, including arrhythmias, ischemic damage and heart failure.

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