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THE RELATIONSHIP BETWEEN HEART ACTIVITY AND BLOOD PRESSURE

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Annotation: this article systematically analyzes the complex physiological, hemodynamic and neurohumoral relationships between heart activity and arterial blood pressure. The role of the pumping function of the heart, cardiac output, peripheral vascular resistance and arterial elasticity in the formation of blood pressure is covered in depth scientific grounds. The integrative role of the sympathetic and parasympathetic nervous systems, the renin-angiotensin-aldosterone system and baroreceptor mechanisms in the regulation of heart activity and blood pressure is also considered. The results of the article serve as an important scientific basis for the pathogenesis of cardiovascular diseases and the development of strategies for their prevention.

Keywords: cardiac activity, arterial blood pressure, hemodynamics, cardiac output, peripheral resistance, baroreceptors, neurohumoral receptors, regulation, cardiovascular system.

Introduction: The cardiovascular system is one of the most important functional systems of the human body, the stable functioning of which is crucial for the duration of life and ensuring physiological balance. As the central element of this system, the heart serves as the main pumping mechanism that ensures the blood circulation process in the body. The hemodynamic pressure resulting from the activity of the heart, that is, arterial blood pressure, is an important physiological indicator that determines the level of oxygen and nutrient supply to the tissues. Arterial blood pressure is formed as a product of a complex interaction between cardiac output and peripheral vascular resistance. The frequency of contraction of the heart muscle, stroke volume, and the balance of systolic and diastolic phases have a direct impact on the dynamic fluctuations of blood pressure. At the same time, the elasticity of the vascular walls, their tone, and reflex responses are also inextricably linked with cardiac activity and regulate arterial pressure. In modern physiology and cardiology, there is a growing tendency to interpret the relationship between heart activity and blood pressure not only as a mechanical process, but as a complex multi-level regulatory system. In this process, the central nervous system, autonomic nervous system, endocrine glands and local autoregulatory mechanisms operate in an integrated manner. In particular, it has been proven in scientific studies that activation of the sympathetic nervous system increases the force and frequency of heart contractions, leading to an increase in arterial pressure, while parasympathetic influence, on the contrary, manifests itself as a pressure-lowering mechanism. In recent years, the global spread of arterial hypertension, heart failure and

ischemic heart disease has made a deeper study of the relationship between heart activity and blood pressure an urgent scientific problem. According to the World Health Organization, cardiovascular diseases are one of the leading causes of death in the world. Therefore, in this article, it is of great scientific importance to shed light on the relationship between the heart and blood pressure from a fundamental and practical perspective.

Literature review: The relationship between cardiac activity and arterial blood pressure has been studied at a fundamental level by many foreign scientists. In particular, Arthur C. Guyton, through his scientific works on cardiovascular physiology, explains blood pressure as a functional product of cardiac output and total peripheral resistance. According to his theory, the kidneys and fluid balance mechanisms play a decisive role in long-term arterial pressure regulation. Also, Norman M. Kaplan, in studying the pathogenesis of arterial hypertension, analyzed the interaction between cardiac activity, vascular resistance and neurohumoral factors as a complex system. In Kaplan's studies, cardiac overload is shown as one of the main pathophysiological mechanisms leading to a sustained increase in blood pressure. The scientific views of these two scientists allow us to explain the relationship between the heart and blood pressure based on an integrative model.

Methodological part: This article uses a comprehensive approach to systematic analysis, comparative literature review, physiological modeling, theoretical analysis of hemodynamic parameters, and deductive-scientific generalization methods.

Results: Theoretical analyses showed that an increase in cardiac output and peripheral vascular resistance leads to a sustained increase in arterial blood pressure, confirming the existence of a direct and indirect relationship between cardiac activity and blood pressure.

Discussion: There are various polemical views in scientific circles on the cause-and-effect relationship between heart activity and blood pressure. Arthur C. Guyton, evaluating heart activity as a secondary factor in the formation of blood pressure, attributes the kidneys. In his opinion, changes in cardiac output are temporary, and the long-term level of arterial pressure is determined by renal mechanisms. In contrast, Norman M. Kaplan sees the role of heart activity in the pathogenesis of arterial pressure as a more central factor. Kaplan emphasizes that hypertrophy of the heart muscle, increased systolic function, and increased activity of the sympathetic nervous system lead to the maintenance of a stable high level of blood pressure. In his opinion, it is impossible to effectively control arterial hypertension without controlling heart activity. This polemic shows that explaining the relationship between heart activity and blood pressure by only one mechanism is scientifically insufficient. On the contrary, modern cardiology requires interpreting this process as a multifactorial, dynamic, and interconnected system.

Conclusion: In conclusion, the relationship between cardiac activity and arterial blood pressure is a complex, multilevel and integrative physiological process, which is formed on the basis of the interaction of cardiac output, vascular resistance, neurohumoral regulation and renal mechanisms. A deep scientific understanding of this relationship serves as an important theoretical basis for the development of effective prevention and treatment strategies for cardiovascular diseases.

List of used literature:

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