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# GENETIC FEATURES OF THE RISK OF ARTERIAL HYPERTENSION IN PATIENTS WITH ABDOMINAL OBESITY

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**Abstract.**

In recent years, researchers have been paying more and more attention to the study of molecular genetic factors of hypertension, the search for genes and the analysis of the association of their polymorphisms with various components of the metabolic syndrome. The ethnic features of predisposition to the development of hypertension have been revealed, which confirms the role of genetic factors. Significant changes in arterial hypertension within the framework of the metabolic syndrome are mutations of genes responsible for the balance of pressor and depressor pathogenetic links.

*Key words: arterial hypertension, genes, polymorphism, metabolic syndrome, obesity.*

# ABDOMINAL SEMIZLIK BILAN BEMORLARDA ARTERIAL GIPERTENZIYA RIVOJLANISH XAVFINI IRSIY XUSUSIYATLARI

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**Annotatsiya**

So'nggi yillarda tadqiqotchilar arterial gipertenziyaning molekulyar genetik omillarini o'rganishga, genlarni izlashga va ularning polimorfizmlarining metabolik sindromning turli tarkibiy qismlari bilan bog'liqligini tahlil qilishga tobora ko'proq e'tibor qaratmoqdalar. Gipertenziya rivojlanishiga moyillikning etnik xususiyatlari aniqlandi, bu genetik omillarning rolini tasdiqlaydi. Metabolik sindrom doirasida arterial gipertenziyadagi muhim o'zgarishlar pressor va depressor patogenetik bog'lanishlar muvozanati uchun javob beradigan genlarning mutatsiyasidir.

*Kalit so'zlar: arterial gipertenziya, genlar, polimorfizm, metabolic sindrom, semizlik.*

# ГЕНЕТИЧЕСКИЕ ОСОБЕННОСТИ РИСКА РАЗВИТИЯ АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИИ У БОЛЬНЫХ С АБДОМИНАЛЬНЫМ ОЖИРЕНИЕМ

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**Аннотация.**

Последние годы исследователи всё более пристальное внимание уделяют изучению молекулярно-генетических факторов артериальной гипертензии, поиску генов и анализу ассоциации их полиморфизмов с различными компонентами метаболического синдрома. Выявлены этнические особенности предрасположенности к развитию гипертонической болезни, что подтверждает роль генетических факторов. Значимыми изменениями при артериальной гипертензии в рамках метаболического синдрома являются мутации генов, ответственных за баланс прессорных и депрессорных патогенетических звеньев.

*Ключевые слова: артериальная гипертензия, гены, полиморфизм, метаболический синдром, ожирение*

Arterial hypertension (AH) remains a pressing problem in cardiology, occupying a leading position among diseases of the cardiovascular system due to its high prevalence. Currently, significant interest has represented correlation to the disease with metabolic disorders. The frequent combination of hypertension with abdominal obesity, disorders of carbohydrate and lipid metabolism, and the presence of a close pathogenic connection between them served as the basis for identifying the concept of “metabolic syndrome” (MS) [1].

The prevalence of this pathology in Europeans is 20–30% with an approximately equal distribution by gender. In the general population it ranges from 14 to 40%.In Russia, MS occurs among men under 40 with the percentage of 18.6 and women 7.3% and people under 40- 55 in 44,4% and 20.8 respectively [2,3].

According to the results of numerous epidemiological studies, one of the most common components of the syndrome is hypertension. The prevalence of hypertension in patients with MS is 30.5% [2,3]. The problem of high blood pressure (BP) as a component of MS is one of the most significant for modern medicine due to the predicted increase in the incidence of this pathology in the

future and the increasing proportion of mortality from cardiovascular pathology.

The pathogenetic links of hypertension in MS are determined by the development of hyperinsulinemia. It, in turn, activates the sympathetic-adrenal and renin-angiotensin-aldosterone systems (RAAS), proliferative processes in vascular smooth muscle cells, and increases sodium reabsorption in the proximal and distal tubules of nephrons. All this ultimately leads to vasospasm, an increase in total peripheral vascular resistance and an increase in blood pressure [5].

The most relevant are the polymorphisms of the genes for angiotensin converting enzyme (ACE), angiotensinogen (AGT), angiotensinogen receptor type 1 II (AGTR1), 5,10-methylenetetrahydrofolate reductase (MTHFR), endothelial NO synthetase type 3 (NOS3). Various polymorphic states of these genes are to a certain extent associated with hypertension, and these associations are largely autonomous in nature. However, the results of numerous studies of these polymorphisms in hypertension are ambiguous and often contradictory [8]. Therefore, population genetic studies emphasize the need to take into account the ethnicity, as well as the geographic area of residence of the studied patients [8].

The medical and social significance of hypertension within MS lies in the fact that a combination of factors leads to a higher risk of developing cardiovascular diseases and type 2 diabetes. The combination of hypertension with metabolic disorders in women is associated with an increase in the risk of diseases of the circulatory system by 5.9 times, in men - by 2.3 times [5]. On the other hand, MS is a reversible condition, and with appropriate treatment and strengthening of preventive measures, it is possible to achieve the disappearance or reduction of the severity of its manifestations [6].

According to statistical data, MS in patients with hypertension occurs in approximately 28.2% of cases. Similar results were obtained in a study conducted in Italy—34% [6]. In a survey of the Greek population, the prevalence of metabolic disorders among patients with high blood pressure was 23.6% [7]. Results close to those presented were also obtained in population studies in Spain, Turkey, and the USA, where the frequency of MS ranged from 20 to 40% [5].

Subclinical target organ damage in the form of LVH, IMT thickening, and AU are important markers that determine the prognosis in patients with hypertension [4]. Some authors argue that the presence of MS itself is a less

significant predictor of organ changes than specific individual components, in particular hypertension and obesity; others, on the contrary, indicate that MS enhances the effect of each components on the condition of the heart, blood vessels and kidneys [4,5]. Some studies have established an increase in the proportion of respondents with LVH and increased IMT thickness in the group of patients with hypertension as part of MS compared to the group with isolated hypertension. Similar results were obtained in an American sample (n=356): with an increase in the number of MS components, the frequency of detection of LVH and atherosclerotic plaques increased [9]. In one of the foreign studies (n=354), patients with hypertension and MS had higher AU (measured as the ratio of albumin to creatinine) and left ventricular myocardial mass index [7]. A survey of office workers in St. Petersburg aged 20 to 65 years revealed an increase in the percentage of detection of atherosclerotic plaques with an increase in metabolic disorders among patients with hypertension [10].

Since the formation of hypertension within MS may depend on genetic factors involved in the processes of blood pressure regulation, researchers have studied the contribution of candidate genes of the endothelial system to the development of this pathology. The high incidence of elevated blood pressure in MS confirms that hypertension is less likely to manifest itself in isolation and is more often combined with other components of MS - abdominal obesity or disorders of carbohydrate and lipid metabolism. An established genetic predisposition to the development of hypertension as part of MS will undoubtedly help in the development and implementation of population-based prevention programs. On the one hand, assessing the frequency of MS contributes to the provision of timely preventive measures in the group of respondents with a high risk of developing CVD; on the other hand, MS can be used as a control for the correction of its individual components in the treatment of patients with hypertension.

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