

AGE-RELATED AND PREGNANCY PARITY-RELATED PATHOMORPHOLOGICAL FEATURES OF THE MYOCARDIUM IN PERIPARTUM CARDIOMYOPATHIES DEVELOPED DURING PREGNANCY

Narbaeva Sh.Z.
Andijan State Medical Institute Department of Otorhinolaryngology.
Kodirov K.
Andijan State Medical Institute Department of Otorhinolaryngology.
Narbaev K.P.
Andijan State Medical Institute Department of Otorhinolaryngology.
Narbaev Z.K.
Andijan State Medical Institute Department of Otorhinolaryngology.
E-mail: zafarnarbaev69@gmail.com
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Abstract: This article provides a scientific and theoretical analysis of the pathomorphological characteristics of the myocardium in cases of peripartum cardiomyopathy developing in the late period of pregnancy or the postpartum period, the mechanisms of disease development, and the possible relationship between morphological changes and the woman's age and pregnancy parity. The etiopathogenesis of peripartum cardiomyopathy is highlighted, including impaired angiogenic balance, oxidative stress, pathological prolactin breakdown, inflammatory processes, and the influence of genetic predisposition on myocardial structure.

Keywords: peripartum cardiomyopathy, myocardium, pathomorphology, pregnancy, age factor, parity, cardiomyocytes, myocardial hypertrophy, interstitial fibrosis.

Introduction

In modern medicine, cardiovascular diseases developing during pregnancy and the postpartum period are considered a significant problem posing a serious threat to maternal health and life. Particularly, peripartum cardiomyopathy (PCMP) is a severe clinical condition that occurs in women in the last months of pregnancy or in the first months after childbirth, accompanied by impaired systolic heart function. The peculiarity of this disease is that it can also develop in women who have not previously been diagnosed with heart disease. According to the 2025 recommendations of the European Society of Cardiology, peripartum cardiomyopathy is a form of heart failure that occurs during the peripartum period and is characterized by a left ventricular ejection fraction below 45 percent, which is not due to other causes[1]. The clinical course of this disease varies, with some patients recovering heart function within a few months, while in other cases, it can lead to chronic heart failure, severe arrhythmias, thromboembolic complications, and even death.

The pathogenesis of peripartum cardiomyopathy is a complex and multifactorial process. Hormonal changes, imbalance of angiogenic factors, oxidative stress, immune-inflammatory reactions, genetic predisposition, and increased hemodynamic load play an important role in its development. These factors negatively affect the metabolic activity of myocardial cells, the intercellular matrix, capillary circulation, and the contractile capacity of the heart muscle.

[1] European Society of Cardiology. 2025 ESC Guidelines for the management of cardiovascular disease and pregnancy. European Heart Journal, 2025. DOI: 10.1093/eurheartj/ehaf193.

In this pathology, the study of the woman's age and pregnancy parity is of particular scientific importance. This is because the functional load on the cardiovascular system, metabolic adaptation, and hormonal changes in women with a first pregnancy, repeated pregnancies, and multiple births may differ. At the same time, with increasing maternal age, the likelihood of additional risk factors such as arterial hypertension, metabolic disorders, and preeclampsia also changes. In this regard, the study of pathomorphological changes in the myocardium in peripartum cardiomyopathy in relation to age and pregnancy parity allows for a deeper understanding of the disease's developmental mechanisms, the identification of risk factors, and the improvement of diagnostic criteria.

Purpose of the research

To study the main pathomorphological changes in the myocardium in women with peripartum cardiomyopathy, to analyze the possible relationship of these changes with age and pregnancy parity based on international and domestic scientific sources.

Research objectives

Studying modern scientific views on the etiology and pathogenesis of peripartum cardiomyopathy. Description of macroscopic and microscopic changes in the myocardium during the disease. Analysis of the possible influence of the age factor on structural changes in the heart muscle. Assessment of the relationship between pregnancy parity and recurrent births and pathological processes in the myocardium. Comparative study of the research of Uzbek and foreign scientists on peripartum cardiomyopathy. Justification of the diagnostic and prognostic significance of pathomorphological examinations.

Peripartum cardiomyopathy is a cardiac muscle disorder observed in women of reproductive age that is time-dependent on the final period of pregnancy or the puerperium. Its main clinical sign is a decrease in left ventricular systolic function and the appearance of symptoms of heart failure.

The progression of the disease is often manifested by symptoms such as shortness of breath, rapid fatigue, rapid heartbeat, swelling in the legs, and a decrease in resistance to physical activity. However, some of these symptoms can also be observed during physiological pregnancy. Therefore, early detection of the disease is a clinically complex issue.

J. Bauersachs et al. explain the development of peripartum cardiomyopathy by the interaction of several pathological mechanisms. According to them, impaired angiogenic balance, oxidative stress, pathological breakdown of prolactin, and inflammatory processes play an important role in the pathogenesis of the disease[2].

In the final stages of pregnancy, the load on the mother's cardiovascular system increases. An increase in blood volume, an increase in the heart's minute volume, and changes in peripheral vascular resistance place additional demands on myocardial activity. In a healthy body, the heart adapts to these changes. However, in women with certain genetic or metabolic predispositions, these adaptive mechanisms may be disrupted.

[2] Bauersachs J., König T., van der Meer P. et al. Pathophysiology, diagnosis and management of peripartum cardiomyopathy: a position statement from the Heart Failure Association of the European Society of Cardiology Study Group on peripartum cardiomyopathy. European Journal of Heart Failure. 2019;21(7):827–843. DOI: 10.1002/ejhf.1493.

One of the important pathogenetic mechanisms of peripartum cardiomyopathy is the disruption of angiogenesis. Certain biologically active substances secreted from the placenta during pregnancy, including antiangiogenic factors such as sFlt-1, can negatively affect the function of the vascular endothelium. As a result, functional disorders occur in the microcirculatory system of the myocardium. Furthermore, under the influence of oxidative stress, a 16 kDa fragment of the prolactin molecule can be formed. This fragment damages endothelial cells, inhibits angiogenesis, and creates conditions for myocardial dysfunction. In the 2025 ESC recommendations, oxidative stress, angiogenic factors, and prolactin-related mechanisms are also noted as important pathogenetic directions of peripartum cardiomyopathy[3].

Genetic predisposition also plays an important role in the development of the disease. In particular, certain pathogenic variants of the TTN, FLNC, BAG3, and DSP genes were found to be associated with peripartum cardiomyopathy. This indicates that the disease may develop in some patients against the background of hereditary heart muscle weakness.

Consequently, peripartum cardiomyopathy is not only a result of the physiological stress of pregnancy but also a complex result of the interaction of hormonal, immunological, genetic, metabolic, and hemodynamic factors.

The myocardium is the primary functional layer of the heart, containing cardiomyocytes, connective tissue, capillaries, and nerve elements. In peripartum cardiomyopathy, varying degrees of damage to these components may be observed. Pathomorphological manifestations of the disease are not uniform. The degree of their manifestation may depend on the duration of the pathological process, the severity of heart failure, the presence of inflammatory processes, and comorbidities.

In peripartum cardiomyopathy, hypertrophic changes in the heart muscle cells may be ob served. Such changes are formed as an adaptive response of the myocardium to an increasing hemodynamic load. Histological examination may reveal enlarged cardiomyocytes, enlargement and deformation of the nucleus in individual cells, and densification or granularity of the cytoplasm.

Although cardiomyocyte hypertrophy initially has a compensatory character, as the pathological process progresses, the energy demand of the cells increases. This can lead to an imbalance between oxygen supply and metabolic need.

As a result, the contractile activity of the cells decreases, and the systolic function of the heart is impaired.

In women of adult reproductive age, the adaptive capabilities of the cardiovascular system, metabolic status, and vascular function have individual characteristics. The presence of ar terial hypertension, metabolic syndrome, and other cardiovascular risk factors in this group may exacerbate structural changes in the myocardium. Pregnancy parity is an important obstetric indicator characterizing the number of previous pregnancies and births in a woman. Taking parity into account when studying peripartum cardiomyopathy helps to correctly assess the clinical course and risk factors of the disease. During pregnancy, the cardiovascular system undergoes reorganization in accordance with the body's physiological needs. During each preg nancy, hemodynamic loads, hormonal changes, and metabolic adaptation processes occur. Re-

[3] European Society of Cardiology. 2025 ESC Guidelines for the management of cardiovascular disease and pregnancy. European Heart Journal, 2025. DOI: 10.1093/eurheartj/ehaf193.

peated pregnancies can have different effects depending on the individual characteristics of the woman's body and the course of previous pregnancies.

In medical science of Uzbekistan, research is being conducted on the clinical course, diagnosis, prognosis, and treatment of peripartum cardiomyopathy. In particular, the work of scien tists from the Republican Specialized Scientific and Practical Medical Center of Cardiology is of great importance in studying this pathology.

T.A. Abdullaev, S.T. Mirzarakhimova, and I.A. Tsoi conducted scientific research on the clinical course, diagnosis, and prognosis of peripartum cardiomyopathy. Their work focuses on the clinical manifestations of the disease, the severity of heart failure, and patient management algorithms. In the works published in 2021, these scientists discussed treatment approaches and patient management algorithms related to prolactin levels in peripartum cardiomyopathy[4].

International research on peripartum cardiomyopathy serves as an important scientific basis for studying the pathogenesis, genetic basis, structural changes in the myocardium, and clinical prognosis of the disease. In a scientific report published in 2019 by J. Bauersachs et al., the principles of pathophysiology, diagnosis, and treatment of peripartum cardiomyopathy are described in detail. The authors consider the interaction of oxidative stress, angiogenic disor ders, pathological prolactin breakdown, and genetic factors to be important in the development of the disease. These views indicate that it is insufficient to explain pathological changes in the myocardium solely by hemodynamic load[5].

Electron microscopy allows for the assessment of the ultrastructural state of cardiomy ocytes. This method is used to study changes in mitochondria, myofibrils, cell membranes, and other intracellular structures. Mitochondrial dysfunction and energy metabolism disorders in peripartum cardiomyopathy can be an important component of the pathological process. It is important to note that myocardial biopsy is not a routine diagnostic method in all cases of peri partum cardiomyopathy. Diagnosis is usually made based on clinical signs, echocardiography, electrocardiography, and other examinations. Endomyocardial biopsy is considered only in specific clinical situations, such as determining an alternative diagnosis or when a specific form of myocarditis is suspected[6].

Research findings and discussion:

An analysis of the literature shows that pathomorphological changes in the myocardium in peripartum cardiomyopathy are formed as a result of multifactorial processes. These changes can manifest at the level of cardiomyocytes, interstitial tissue, the microcirculatory sys tem, and the intercellular matrix. In the analyzed scientific sources, myocardial hypertrophy, in

[4] Abdullaev T., Mirzarakhimova S., Tsoi I. Algoritm diagnostiki i lecheniya bolnykh s peripartalnoy kardiomiopatiey. O‘zbekiston kardiologiyasi. 2021.

[5] Bauersachs J., König T., van der Meer P. et al. Pathophysiology, diagnosis and management of peripartum cardiomyopathy: a position statement from the Heart Failure Association of the European Society of Cardiology Study Group on peripartum cardiomyopathy. European Journal of Heart Failure. 2019;21(7):827–843. DOI: 10.1002/ejhf.1493.

[6] Kawano H., Kawamura K., Ishijima M. et al. Pathological features of biopsied myocardium in patients clinically diagnosed with peripartum cardiomyopathy. Medical Molecular Morphology. 2023;56(1):58–68. DOI: 10.1007/s00795-022-00340-x.

terstitial fibrosis, inflammatory infiltration, cellular damage, and microcirculatory disorders are noted as morphological signs associated with the disease[7].

Thus, existing scientific evidence confirms that structural damage to the myocardium in peripartum cardiomyopathy is formed by various mechanisms. Age and pregnancy parity are important clinical and demographic factors that must be taken into account when assessing these processes. However, special morphological studies are required to determine their independent pathomorphological effects.

The study of perinatal cardiomyopathy and the organization of healthcare, diagnostic, and treatment services for pregnant women are related to the regulatory legal acts of the Republic of Uzbekistan on healthcare and reproductive health.

In conclusion, peripartum cardiomyopathy is a complex pathological process that develops during the final period of pregnancy or the postpartum period, significantly affecting the structural and functional state of the heart muscle. An important role in the development of the disease, along with increased hemodynamic load, is played by impaired angiogenic balance, oxidative stress, pathological breakdown of prolactin, immune-inflammatory processes, and genetic predisposition. Thus, age and pregnancy parity should be evaluated not as an independent morphological cause of peripartum cardiomyopathy, but as important clinical and demographic factors that can influence the development and clinical course of the disease. This approach serves to increase the efficiency of early detection of the disease, the formation of risk groups, and the provision of individualized medical care to pregnant women.

References / Foydalanilgan adabiyotlar / Литература

1. European Society of Cardiology. 2025 ESC Guidelines for the management of cardiovascular disease and pregnancy. European Heart Journal, 2025. DOI: 10.1093/eurheartj/ehaf193.
2. Bauersachs J., König T., van der Meer P. et al. Pathophysiology, diagnosis and management of peripartum cardiomyopathy: a position statement from the Heart Failure Association of the European Society of Cardiology Study Group on peripartum cardiomyopathy. European Journal of Heart Failure. 2019;21(7):827–843. DOI: 10.1002/ejhf.1493.
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4. Abdullaev T., Mirzarakhimova S., Tsoi I. Algoritm diagnostiki i lecheniya bolnykh s peripartalnoy kardiomiopatiey. O‘zbekiston kardiologiyasi. 2021.

[7] Kawano H., Kawamura K., Ishijima M. et al. Pathological features of biopsied myocardium in patients clinically diagnosed with peripartum cardiomyopathy. Medical Molecular Morphology. 2023;56(1):58–68. DOI: 10.1007/s00795-022-00340-x.