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STRUCTURAL AND FUNCTIONAL CARDIAC CHANGES IN OLDER ADULTS WITH CORONARY ARTERY DISEASE

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Abstract: Coronary artery disease in older adults is frequently accompanied by progressive structural and functional alterations of the myocardium and heart valves. This study evaluated echocardiographic features of myocardial remodeling and valvular abnormalities in elderly patients with coronary artery disease. A total of 128 patients underwent comprehensive cardiac assessment, including conventional echocardiography, tissue Doppler imaging, and 2D speckle-tracking analysis. Older patients demonstrated more pronounced left ventricular remodeling, impaired global longitudinal strain, and a higher prevalence of aortic valve calcification and combined valvular lesions. Comprehensive echocardiographic evaluation may improve early detection of cardiac remodeling and optimize risk assessment in elderly patients with coronary artery disease.

Keywords: coronary artery disease; echocardiography; myocardial remodeling; heart valve disease; elderly patients.

СТРУКТУРНО-ФУНКЦИОНАЛЬНЫЕ ИЗМЕНЕНИЯ СЕРДЦА У ПАЦИЕНТОВ ПОЖИЛОГО ВОЗРАСТА С ИШЕМИЧЕСКОЙ БОЛЕЗНЬЮ СЕРДЦА

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Аннотация: Ишемическая болезнь сердца у пациентов пожилого возраста нередко сопровождается прогрессирующими структурными и функциональными изменениями миокарда и клапанного аппарата сердца. Целью исследования была оценка эхокардиографических особенностей ремоделирования миокарда и клапанных изменений у пациентов с

коронарной патологией. В исследование включены 128 пациентов, которым выполнено комплексное кардиологическое обследование с использованием стандартной эхокардиографии, тканевой доплерографии и метода 2D speckle-tracking. У пациентов старшей возрастной группы выявлены более выраженное ремоделирование левого желудочка, снижение глобальной продольной деформации, а также более высокая частота кальциноза аортального клапана и сочетанных клапанных поражений. Комплексная эхокардиографическая оценка способствует раннему выявлению сердечных изменений и более точной оценке сердечно-сосудистого риска у пациентов пожилого возраста с ишемической болезнью сердца.

Ключевые слова: ишемическая болезнь сердца; эхокардиография; ремоделирование миокарда; клапанные пороки сердца; пожилой возраст.

Introduction: Coronary artery disease remains one of the leading causes of cardiovascular morbidity and mortality worldwide, particularly among older adults. Population aging has resulted in a steady increase in the number of elderly patients presenting with chronic coronary pathology accompanied by multiple cardiovascular risk factors and age-related structural changes. Progressive myocardial remodeling, impaired ventricular function, and degenerative alterations of the cardiac valves frequently develop with advancing age and may significantly influence clinical outcomes. In many cases, these abnormalities remain asymptomatic during the early stages and become evident only after the development of heart failure or other cardiovascular complications. Modern echocardiography has become an essential noninvasive method for evaluating cardiac structure and function in elderly patients. In addition to conventional measurements, tissue Doppler imaging and 2D speckle-tracking echocardiography provide detailed information regarding myocardial deformation and ventricular mechanics. Assessment of global longitudinal strain has been shown to identify subtle myocardial dysfunction before a significant reduction in left ventricular ejection fraction occurs. Furthermore, comprehensive evaluation of valvular

morphology allows early recognition of degenerative changes commonly observed in elderly individuals with coronary artery disease. Early detection of these abnormalities is important for improving cardiovascular risk stratification, selecting appropriate therapeutic strategies, and optimizing long-term patient outcomes.

Aim of the study: To evaluate structural and functional myocardial changes and heart valve abnormalities in elderly patients with coronary artery disease using modern echocardiographic techniques and to determine their clinical significance for cardiovascular risk assessment.

Materials and methods. A prospective observational study included 128 patients with confirmed coronary artery disease who were admitted for comprehensive cardiovascular evaluation. The mean age of the participants was 82.4 ± 10.6 years, ranging from 65 to 90 years. According to the World Health Organization age classification, patients were divided into 2 groups: 41 individuals aged 65–74 years and 87 individuals older than 75 years. Clinical examination included medical history, physical assessment, laboratory investigations, 12-lead electrocardiography, transthoracic echocardiography, tissue Doppler imaging, 2D speckle-tracking echocardiography, and coronary angiography. Standard echocardiographic measurements included left ventricular dimensions, wall thickness, left ventricular mass index, ejection fraction, left atrial volume, and indices of diastolic function. Global longitudinal strain was measured from apical 2-, 3-, and 4-chamber views using dedicated software. Valvular morphology, calcification, stenosis, regurgitation, and combined valve lesions were evaluated according to current echocardiographic recommendations. Coronary angiographic findings were analyzed to determine the severity of coronary artery involvement. Statistical analysis was performed using standard statistical software, and differences between groups were considered statistically significant at $p < 0.05$.

Results. The study demonstrated that elderly patients older than 75 years had significantly more advanced structural and functional cardiac abnormalities than

patients aged 65–74 years. Multivessel coronary artery disease, previous myocardial infarction, and arterial hypertension were more frequently observed in the older age group. Echocardiographic examination revealed greater left ventricular wall thickness, increased myocardial mass index, larger ventricular volumes, and impaired diastolic function among older patients. Global longitudinal strain values were significantly reduced, indicating the presence of subclinical systolic dysfunction despite relatively preserved left ventricular ejection fraction. Degenerative changes of the heart valves were common in both groups but became more pronounced with advancing age. Aortic valve calcification, isolated aortic stenosis, and combined aortic-mitral valve disease occurred more frequently in patients older than 75 years. Concentric left ventricular hypertrophy remained the predominant pattern of remodeling, whereas eccentric hypertrophy was observed mainly in the oldest patients. These findings indicate that progressive myocardial remodeling and degenerative valvular disease are closely associated with aging and the severity of coronary artery disease. Advanced echocardiographic techniques improved the detection of subtle myocardial dysfunction and provided valuable information for comprehensive cardiovascular assessment.

Conclusions: Older patients with coronary artery disease demonstrate progressive myocardial remodeling, impaired ventricular function, and increasing prevalence of degenerative heart valve disease. Conventional echocardiography combined with tissue Doppler imaging and 2D speckle-tracking provides a comprehensive assessment of structural and functional cardiac abnormalities. Evaluation of global longitudinal strain enables earlier identification of subclinical myocardial dysfunction than left ventricular ejection fraction alone. Routine use of advanced echocardiographic techniques may improve cardiovascular risk stratification, facilitate individualized treatment planning, and contribute to better long-term clinical outcomes in elderly patients with coronary artery disease.

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