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Evaluation of Diastolic Dysfunction in Patients with Chronic Heart Failure

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Abstract The results of epidemiological studies in recent years have shown that in 30-50% of patients with a clinically confirmed diagnosis of CHF, systolic cardiac function is preserved and an average of 3 to 20 people per thousand of the population have asymptomatic left ventricular dysfunction. According to the European Society of Cardiology (EOK), systolic dysfunction of the myocardium (without clinical signs of CHF) can reach 5-6% in the population, which makes up another 20 million in Europe with a population of about 900 million.

Keywords Chronic heart failure, Diastolic dysfunction

1. Introduction

In the development of CHF (chronic heart failure) attach importance to the violation of the diastolic function of the heart. Decreased myocardial compliance leads to an increase in the end-diastolic pressure, which can be detected at an early stage of heart failure even before the onset of systolic dysfunction. The mechanical properties of the myocardium, which are characterized by elasticity, compliance and stiffness, affect LV (left ventricle) filling processes: hypertrophy, fibrosis or myocardial infiltration increase its stiffness, which leads to a sharp increase in LV filling pressure. LV compliance decreases with dilatation [3, 5]. Violation of active relaxation is one of the earliest manifestations of myocardial dysfunction in most cardiovascular diseases. Fibrosis of the ventricular myocardium (increase in the content of collagen in them) is the most important risk factor for worsening heart function. Clinico-anatomical comparisons and experimental data on hypertensive rats show that the severity of fibrosis and the development of collagen in the myocardium corresponds to the severity of heart failure [1, 2]. Fibrosis is a determinant of myocardial stiffness and diastolic dysfunction, it also favors systolic dysfunction and arrhythmogenicity. Fibrosis is initially an adaptive process for necrosis after a heart attack, ischemia, and inflammatory processes in the myocardium.

The aim of the study. To study left ventricular remodeling processes in patients with postinfarction cardiosclerosis complicated by chronic heart failure.

2. Materials and Methods of Research

We examined 219 men with PICS, complicated with CHF, aged 40-60 years (mean age 53.42 ± 6.2 years). Patients according to TSH according to the New York classification of cardiologists are divided into the following FC of CHF: 31 (18.8%) patients with I FC, 92 (36.6%) patients with II FC and 96 (44.6%) patients with III FC CHF. Depending on the severity of diastolic disturbances, three types of LV filling are distinguished: delayed relaxation, pseudonormalization and restriction. Detection and analysis of variants of diastolic LV dysfunction have an important clinical significance, since they indicate the degree of severity of diastolic disorders contributing to the formation of CHF.

Evaluation of the diastolic function indices showed that in patients with CHF, the normal E/A values can be observed with increased values of the isovolumic relaxation time (IVRT) and the delay of the early diastolic filling (DT) of the left ventricle, which should be taken into account when diagnosing.

The analysis of the obtained results revealed the following types of diastolic LV disturbances: of 219 patients with CHF, relaxation disorders were determined in 48.4% of cases, pseudonormalization in 23,7%, restrictive changes in 15,1% of cases and normal diastolic function values in 12,4% (28) patients.

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Patients, depending on the severity of diastolic dysfunction of the left ventricle, were divided into 3 groups: I (n = 106) - with relaxation disturbance, II (n = 52) - with pseudonormal type, III (n = 33) - with restrictive type of filling. To evaluate the relationship between left ventricular contractility and diastolic left ventricular dysfunction, 191 patients with CHF were divided into 2 groups: a group with preserved left ventricular systolic function (ejection fraction ≥50%) and a group with a reduced ejection fraction <50%).

An analysis of the prevalence of different types of diastolic left ventricular dysfunction showed that severe diastolic left ventricular function - pseudonormal and restrictive type - was significantly more frequent in the group of patients with reduced left ventricular systolic function. The analysis of the main indices of myocardial contractility and LV geometry in the examined patients, depending on the type of diastolic dysfunction, revealed that the volume parameters of the left ventricle - the end-diastolic volume and the end-systolic volume in the group with pseudonormal and restrictive type - were significantly higher in comparison with group of patients with disturbed relaxation. The PV index was also significantly lower in the group of patients with a restrictive type of LV diastolic dysfunction.

3. Discussion

The diastolic function of the LV depends on both the relaxation of the myocardium and its mechanical properties. Relaxation of the myocardium of the LV is an active process, depending on the functioning of the sarcoplasmic reticulum of cardiomyocytes. As a rule, the basis of such CHF is the violation of diastolic LV function, i.e. his inability to adequately fill without increasing the average pulmonary venous pressure.

The results of epidemiological studies in recent years have shown that in 30-50% of patients with a clinically confirmed diagnosis of CHF, systolic cardiac function is preserved and an average of 3 to 20 people per thousand of the population have asymptomatic left ventricular dysfunction. According to the European Society of Cardiology (EOK), systolic dysfunction of the myocardium (without clinical signs of CHF) can reach 5-6% in the population, which makes up another 20 million in Europe with a population of about 900 million [7]. According to F.T. Ageeva [4, 6], the prevalence of I-FC CHF is 4 times greater than II-IV FC and more than 55% of patients with HF have practically normal myocardial contractility and the number of such patients will increase steadily. An analysis of the prevalence of different types of diastolic left ventricular dysfunction showed that severe diastolic left ventricular function - pseudonormal and restrictive type - was significantly more frequent in the group of patients with reduced left ventricular systolic function. The analysis of the main indices of myocardial contractility and LV geometry in the examined patients, depending on the type of diastolic dysfunction, revealed that the volume and geometric parameters of the left ventricle in the group with pseudonormal and restrictive type were significantly higher in comparison with the group of patients with disturbed relaxation. The results are consistent with data from multicenter studies of PEP-CHF, CHARM, Aldo-DHF, which show the prognostic significant role of diastolic dysfunction in patients with CHF.

4. Conclusions

Postmyocardial LV leads not only to LV structural reorganization, accompanied by dilatation of the cavity, thinning of the wall, a decrease in the contractility of the myocardium, but also to a change in the geometric shape of the LV. LV remodeling in patients with CHF was characterized by a violation of the diastolic function of the heart, which manifested itself more in violation of relaxation. An analysis of the prevalence of different types of diastolic left ventricular dysfunction showed that severe diastolic left ventricular function - pseudonormal and restrictive type - was significantly more frequent in the group of patients with reduced left ventricular systolic function. With the progression of the disease, there was an increase in the number of patients with an eccentric type of remodeling, as well as a restrictive type of diastolic LV dysfunction.

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