

## Some Aspects of Chronic Heart Failure Pathogenesis

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### **Abstract**

The given review deals with the role of left ventricular diastolic dysfunction in chronic heart failure (CHF) pathogenesis. Left ventricular dysfunction, caused by disturbances in active relaxation of myocardium and ventricular blood filling, is indicated in 15-30% of patients with clinical manifestations of CHF and more than half of those aged above 75 years. The similarity of symptoms of left ventricular diastolic dysfunction and CHF caused by systolic dysfunction complicates diagnostics of the pathology. Due to this the timely diagnostics of patients with left ventricular diastolic dysfunction and seek for new approaches of treatment seems to be an urgent problem of modern clinical cardiology. The main method for studying diastolic dysfunction is Doppler echocardiography. Transmitral diastolic flow indicates diastolic function. Three types of diastolic dysfunction: hypertrophic, pseudonormal and restrictive are known nowadays. The restrictive type of left ventricular diastolic dysfunction causes the most severe course of heart failure. It is shown the necessity of elaboration of new methods of diagnostics and rational pharmacological correction of diastolic dysfunction at CHF, taking into consideration the severity of the disease.

**Keywords:** *chronic heart failure, diastolic dysfunction, Doppler echocardiography*

**C**hronic heart failure is polyetiologic syndrome of progressive character. It develops on the basis of practically all diseases of cardiovascular system and in 1-5 years the latent course of CHF may transform into hardly curable, most grave form of heart failure. Due to this an early diagnostics of CHF and, consequently, its timely treatment are the preconditions for further success.

The notion on both CHF pathogenesis and tactics of its treatment has significantly changed in the recent years [1,2,3]. It has been established that in 15-30% of patients clinical symptomatology of CHF is connected not with the disturbance of heart contractile function, but with left ventricular diastolic dysfunction due to deterioration of active relaxation of myocardium and its filling with blood [3,5,8].

The role of diastolic dysfunction in CHF pathogenesis has been established in connection with high incidence of arterial hypertension and heart ischemic disease as the main substrates of diastolic disturbances.

It is thought currently that the lowering of systolic function is always accompanied by even if minimum disturbances of diastolic function [4]. According to some data the deterioration of systolic function is preceded by diastolic dysfunction, which also may give rise to the development of CHF, while the indices of central haemodynamics (ejection fraction, stroke volume, minute volume, cardiac index) are not changed.

CHF developed on the basis of "pure" diastolic dysfunction according to some sources is indicated in 12% of patients [9].

Diastolic dysfunction often occurs without any clinical manifestations and the patients take medical advice when the dysfunction of left ventricle is already started.

Due to recommendations of the working group of European cardiologists the following factors may serve as indications of the presence of diastolic insufficiency:

1. Clinical indices of heart chronic failure;
2. Normal or slightly lowered systolic function of myocardium (ejection fraction >45%);
3. Disturbances of left ventricle relaxation.

Diastolic dysfunction is accompanied by the prolonged passing of Ca ions into sarcoplasmic reticulum, lowering of myocardium elasticity, the increase of left ventricle walls rigidity. Rapid filling of left ventricle may become more accelerated at such pathology. This is often coupled with III tone, which is registered at heart apex.

Out of causes of left ventricular diastolic dysfunction there should be noticed: local or diffuse cardiofibrosis, chronic ischemia, arterial hypertrophy, subaortal stenosis, defects of aorta, disturbances of intraventricular conductance, which lead to the change of left ventricle geometry and increase of myocardium rigidity at diastole [6,7].

Diastolic dysfunction is responsible for the increase of final diastolic pressure in left ventricle and the increase of pressure in left auricle, the subsequent dilatation of these chambers and stagnant events in pulmonary circle of blood circulation. These processes proceed especially rapidly in conditions of enhanced pre- and postloading.

In patients with simultaneously manifested systolic and diastolic dysfunction the primary mechanism is often impossible to establish. Due to this it is necessary to seek for new invasive and noninvasive methods while investigating these persons.

Diagnostics of diastolic dysfunction is often complicated since its clinical manifestation and symptoms are

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practically similar to those of heart failure caused by systolic dysfunction. Due to this application of standard therapy to these patients is ineffective and even harmful.

Left ventricular diastolic dysfunction takes place mainly in aged patients. This is connected with one more factor - the increase of the role of age-connected changes (the increase in mass of myocardium, decrease of its elasticity, worsening of diastolic filling, increase of rigidity). The aged patients are more susceptible to the factors conditioning diastolic dysfunction (tachicardia, hypertension, ischemia).

Similarity of clinical symptoms of systolic and diastolic insufficiency conditions a decisive role of Doppler echocardiography for the evaluation of diastolic function of left ventricle. Transmitral diastolic flow, evoked by the impulse wave strictly reflects left ventricle filling and allows judging on the duration of "acceleration" phase, which evaluation using other methods is impossible.

Three types of left ventricular dysfunction: hypertrophic, pseudonormal and restrictive are singled out at present. In patients with CHF the restrictive type of left ventricular diastolic dysfunction is characterized by the worst prognosis. It is shown that the functional class of heart failure (NYHA), tolerance to the physical load, life quality correlate with the restrictive type of diastolic disturbances but not with systolic function [5,10].

Treatment of diastolic dysfunction should be started as early as possible until irreversible structural changes and systolic dysfunction are developed. It should be mentioned that none of existing preparations is characterized by the "pure" diastolic action. It is advisable to apply the preparations affecting pre- and post loading, the rate of diastolic relaxation, and causing regression of left ventricle hypertrophy (ACE inhibitors, blockers of beta adrenoreceptors, Ca-antagonists).

Proceeding from the above discussed it may be concluded that the problem of heart diastolic dysfunction lies in complexity of its diagnostics and insufficiency of medicaments and thus requires more attention of investigators.

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## **Некоторые аспекты патогенеза хронической сердечной недостаточности**

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### **Р Е З Ю М Е**

Обсуждается роль диастолической дисфункции левого желудочка в патогенезе хронической сердечной недостаточности (ХСН), которая на сегодняшний день встречается у 1/3 больных ХСН и примерно у половины больных старше 75 лет. Диастолическая дисфункция левого желудочка часто не диагностируется, поскольку ее клинические признаки и симптомы практически не отличаются от таковых при ХСН с систолической дисфункцией. Поэтому своевременное выявление и поиск подходов к ведению пациентов с диастолической дисфункцией левого желудочка весьма важная проблема клинической кардиологии. Следовательно, необходимо проведение исследований, направленных на поиск путей рациональной фармакологической коррекции диастолической дисфункции при ХСН, которые в настоящее время не разработаны, в том числе с учетом типа этой дисфункции и тяжести ХСН.

**Ключевые слова:** *хроническая сердечная недостаточность, диастолическая дисфункция, доплерэхокардиография*