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Assessment of Structural and Functional Heart Changes in Patients with Diabetes Mellitus with Diastolic Heart Failure

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The problem of chronic heart failure (CHF) remains one of the most important for the health care of many countries of the world. Recently, interest in diastolic heart failure has increased, as the number of patients in whom symptoms of decompensation develop against the background of intact left ventricular function has increased [1 , 2]. According to the Euro Heart Survay HF Study (2001), the number of patients with diastolic CHF is 30% [3].
The high prevalence of diastolic heart failure dictates the need for early diagnosis and timely initiation of effective therapy.

Difficulties in identifying diastolic CHF in patients with concomitant pathology are very great. This is due to the fact that the minimal manifestations of diastolic heart failure are often "masked" by the symptoms of the underlying disease (essential hypertension, type 2 diabetes) and its complications.

In turn, the success and effectiveness of treatment of diastolic CHF is determined by early and timely diagnosis of structural and functional changes in the heart.

Purpose of the research: To study structural and functional changes in the heart in patients with diabetes mellitus with diastolic heart failure . Echo - before plerocardiography is one of the most informative and accessible non-invasive methods for studying the structural and functional parameters of the heart.

Research materials and methods:
A total of 82 patients with heart failure were examined , which were divided into three groups. Of these, 49 patients had type 2 diabetes in combination with primary hypertension (type 2 diabetes + hypertension) and constituted the main group. The second group of patients (17 people) had type 2 diabetes without hypertension and the third group consisted of 16 patients with hypertension without diabetes. The age of the patients ranged from 40 to 68 years (mean age 52). According to the anamnesis, the average duration of hypertension was 15 years, the duration of type 2 diabetes was 2 years. To objectify and more accurately determine the FC of CHF, we used a scale for assessing the clinical state - SHOKS modified by V.Yu. Mareeva (2000) [1] and a test for determining the distance of a 6-minute walk [1 , 4]. The criteria for the inclusion of patients in the study were the following: the presence of diastolic heart failure, age from 35 to 70 years, the presence of sinus rhythm, the absence of ACE inhibitors and / or ß- blockers for 2 or more weeks . The following groups were examined as comparison groups: 12 patients with type 2 diabetes without hypertension, aged 41 to 62 years (mean age 49 [5; 6] years), disease duration 1.5 years; 11 patients with essential hypertension without diabetes, aged 43 to 62 years (mean age 53 years), disease duration 14.5 years.The diagnosis of type 2 diabetes and the degree of compensation, carbohydrate metabolism were established according to WHO recommendations and national standards for the diagnosis and

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treatment of diabetes mellitus (2002). AH was assessed according to the GFCF criteria (2004 and 2008). Diastolic CHF was diagnosed according to the recommendations of the Working Group of the European Society of Cardiology (2002).

At the initial stage of the study, a general clinical examination of patients was carried out, including: collection of complaints, anamnesis of the disease, study of the objective status, anthropometric data (calculation of BMI, kg / m2), measurement of blood pressure was carried out according to the recommendations of the All-Union Society of Education and Science by the method of N.S. Korotkov under standard conditions (average of three measurements in a sitting position, after a 5-minute rest); standard laboratory and instrumental techniques (general blood and urine analysis, urine analysis for ketone bodies, biochemical blood analysis for glucose, urea, creatinine , bilirubin, transaminases ; ECG, etc.). All patients underwent echocardiographic examination with Doppler ultrasonography in order to study the structural parameters of the heart, systolic and diastolic functions of the heart. All patients were divided into three groups: group 1 - patients with type 2 diabetes + AH, group 2 - patients with type 2 diabetes without hypertension, and group 3 included patients with hypertension without diabetes

Discussion of the results . Comparison of the studied groups of patients in terms of structural and functional parameters of the echocardiogram is presented in Table 1.

Comparative characteristics of EchoC G parameters in the studied groups

table 1.

Indicator	1st group (SD + A T) n = 49	2nd group (SD without AG) n = 17	Group 3 (AG without SD) n = 16
E, m / s	0.61 ± 0.1 5	0.71 ± 0.1 6	0.68 ± 0.1 2
A, m / s	0.77 ± 0.1 6	0.65 ± 0.1 1	0.79 ± 0.1 8
E / A	0.78 ± 0.0 8	1.08 ± 0.2 9	0.87 ± 0.1 2
D Those sec	0.215 ± 0.0 3	0.213 ± 0.0 4	0.213 ± 0.01
IVR T, sec	0.098 ± 0.0 5	0.082 ± 0.0 2	0.090 ± 0.0 7

When analyzing the EchoCG data, the most pronounced changes in the myocardium were observed in patients of the main group (type 2 diabetes in combination with essential hypertension). Patients in this group had significantly ($p < 0.05$) higher values of EDV LV, ESV LV, TMZhPd , TZSVZh , RTS LV, MMLZh , LVMI, MAP compared with patients in the comparison group (type 2 diabetes without AH). Also, statistically significant ($p < 0.05$) higher values of LV dimensions in diastole, LV EDV, LV CSR, LVMM and LVMI were obtained in the main group when compared with the parameters of the comparison group (essential hypertension without diabetes).

In turn, in the control group of patients with essential hypertension without diabetes, the above indicators were also statistically significantly ($p < 0.05$) higher than in patients with type 2 diabetes without hypertension.

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Obviously, these structural changes in the heart are primarily associated with the presence of essential hypertension, which is considered one of the main triggering factors for activating myocardial remodeling processes , since changes in normotensive patients with type 2 diabetes were less pronounced.

Indicators of LV myocardial contractile function (FS, EF) in patients of the main group (type 2 diabetes + AH), as, indeed, in the other studied groups, were within the normal range, which once again confirms the high prevalence of CHF with preserved ejection fraction.

Comparative characteristics of transmitral

diastolic flow in the surveyed groups

Table 3

Indicator	Type 2 diabetes + AH (1) n = 86	Type 2 diabetes without hypertension (2) n = 29	AH without DM (3) n = 28
E, m / s	0.61 ± 0.16	0.71 ± 0.17	0.68 ± 0.14
A, m / s	0.77 ± 0.17	0.65 ± 0.10	0.79 ± 0.19
E / A	0.78 ± 0.09	1.08 ± 0.28	0.87 ± 0.11
DTe , sec	0.215 ± 0.02	0.213 ± 0.03	0.213 ± 0.01
IVRT , sec	0.098 ± 0.04	0.082 ± 0.01	0.090 ± 0.08

When analyzing the indicators of diastolic flows on the MC (table 2) and MC (table 3), the most pronounced changes in diastolic function were identified in patients with combined pathology (main group).

Comparative characteristics of the indicators of tricuspid

diastolic flow in the surveyed groups

table 4

Indicator	Type 2 diabetes + AH (1) n = 86	Type 2 diabetes without hypertension (2) n = 29	AH without DM (3) n = 28
E, m / s	0.50 ± 0.13	0.57 ± 0.11	0.48 ± 0.12
A, m / s	0.62 ± 0.16	0.50 ± 0.083	0.46 ± 0.12
E / A	0.8 ± 0.08	1.14 ± 0.16	1.08 ± 0.26
DTe , sec	0.198 ± 0.01	0.194 ± 0.02	0.195 ± 0.01

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The peak E, which characterizes early, passive diastolic filling of the LV and RV, and the E / A ratio, were statistically significantly ($p < 0.05$) lower than in the control group of type 2 diabetes without AH. Statistically significant ($p < 0.05$) were higher peak A, which characterizes later active diastolic filling of LV and RV, time of isovolumetric relaxation of the LV (IVRT), time of deceleration of peak E (DTe) and diastolic pressure of LV and RV at the end of diastole in comparison with a group of type 2 diabetes without hypertension. There is also a statistically significant ($p < 0.05$) difference in the E / A ratio of both LV and RV between the main and control (AH without DM) groups. These changes are consistent with literature data [7 , 8 , 2 , 4 6 , 9 , 10 , 11 , 12 , 13 , 14] on the effect of essential hypertension and diabetes mellitus on the development of diastolic dysfunction of the heart, followed by the formation of diastolic CHF.

When assessing the tricuspid diastolic blood flow, we noted that in patients with type 2 diabetes in combination with essential hypertension, without pathology of the respiratory system, the diastolic function of the RV is impaired along with the diastolic function of the LV. This once again confirms the close functional relationship between the left and right ventricles of the heart.

According to the Echo-DPKG spectra of TMDP and TKDP, diastolic dysfunction of the LV "hypertrophic" (first) type (according to the criteria: E / A < 1.0; DTe > 0.220 sec; IVRT > 0.094 ce k **)** was diagnosed in all examined patients with primary and in the control (AH without DM) groups, as well as in 20 of 29 (68.9%) patients in the comparison group with type 2 diabetes without AH. " Restrictive " or the second type of diastolic dysfunction in the patients examined by us was not identified, as well as the " pseudonormal " or transitional type. The latter was excluded according to the criteria: E / A > 1.0 **,** but less than 2.0, an increase in the anterior-posterior LA size (37-43 mm), the presence of signs of hypertrophic LV remodeling , and proposed by H. Feigenbaum (1999), V.Kh. ... Vaizov , I.I. Fedosov (2001), Yu.V. Belousov, N.Yu. Demidova (2002) criterion "violation of the closure function of the MC" (regurgitation of 1-2 tbsp.). RV diastolic dysfunction of the first type in the main group was observed in 50 out of 86 (58.1%), in the control (hypertension without diabetes) group in 16 out of 28 (57.1%) patients and in 3 out of 29 (10.3%) patients in the comparison group type 2 diabetes without hypertension.

According to the classification of A. Oapai et al . types of myocardial remodeling 7 out of 86 (8.1%) patients in the main group had normal LV geometry, 22 out of 29 (75.8%) in the majority of patients in the control (type 2 diabetes without AH) group and 1 out of 28 (3.5%) surveyed in the group of AH without DM. The next type of LV geometry - concentric remodeling was found in 6 (7.1%) of the main group and in 2 (7.2%) patients in the comparison group of AH without DM. The main part of the altered LV geometry consisted of the types of concentric LV hypertrophy in 40 (46.5%) and non-dilated eccentric LV hypertrophy in 33 (38, 3%) patients with concomitant pathology, in 18 of 28 (64.3%) and 7 (25%)) of the control group AH without diabetes, respectively (table 4).

The s waters. Thus, when analyzing the Echo-DPKG data, in patients with type 2 diabetes and essential hypertension, more pronounced structural changes in the myocardium were observed, as well as violations of the diastolic function of the heart, compared with the control groups (type 2 diabetes without hypertension and hypertension without diabetes).

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