

**FUNCTIONAL DIAGNOSIS
OF VARIOUS TYPES OF DIASTOLIC DYSFUNCTION**

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ABSTRACT: The analysis of the parameters of the transmittal flow (TMF) underestimates the severity of left ventricular diastolic dysfunction (LVD). The purpose of the work is to compare the informative value of various echocardiographic (EchoCG) techniques in verifying types of LV DD. The study included 120 people with chronic heart failure (CHF) with preserved systolic function. The control group consisted of 30 healthy patients. To verify the types of DD, the pulse Doppler echocardiography method was used to study the flow in the pulmonary veins, at rest, during the Valsalva test and the isometric load test (IN). The data obtained were compared with the results of tissue Dopplerography (TKDG). Among patients with type I DD according to the GMP data, type II DD was detected in 22 (34%) during TSH, in addition, 6 people with type III DD according to the GMP data did not show signs of DD. The Valsalva sample allowed us to differentiate Type II DD only in 39% of cases, standardization of the sample increased the information content to 55%. Sample with IN with The assessment of the diastolic reserve is comparable in its informativeness with the data of TDH in the identification of types II and III of DD.

Key words: arterial hypertension, diastolic function, diastolic dysfunction of the left ventricle, tissue doppler, echocardiography, pseudonormalization.

INTRODUCTION

A complication or outcome of cardiovascular diseases in general, and coronary heart disease (CHD) and arterial hypertension (AH) in particular, is the development of chronic heart failure (CHF), which still remains one of the most common, progressive and prognostically unfavorable diseases. According to epidemiological studies, 85 % of outpatient patients with clinical manifestations of CHF have an ejection fraction the left ventricle (LV) exceeds 45%, which indicates the presence of CHF with preserved systolic function. Thus, early diagnosis of diastolic disorders is an important and urgent task. There are three main types of LV diastolic dysfunction — type of impaired relaxation (type I), "pseudonormal" (type II) and restrictive (type III). Restrictive types (types II and III) of LV diastolic dysfunction (DD) have The worst prognosis in patients with CHF is the most important predictor of cardiovascular mortality. Therefore, identifying the "pseudonormal" type as a predictor of the restrictive type of DD is an important task. The purpose of this study is to compare the informative value of the assessment of transmittal flow (TMF), pulmonary vein flow, Valsalva samples, isometric load samples with tissue Doppler echocardiography (TDEOCG) data in the verification of various types of DD and to determine the frequency of their detection among patients of cardiological departments.

MATERIALS AND METHODS OF RESEARCH

120 patients (103 men and 17 women) were examined. The average age of the patients was 56.8 ± 8.2 years. According to the medical history, all patients had hypertension (GB), 84 (70%) had a combination of GB and coronary heart disease. Postinfarction cardiosclerosis was detected in 25 people (30%), of which 6 patients had a history of 2 myocardial infarctions. Type 2 diabetes mellitus The type was diagnosed in 5% of patients, and one third of patients were obese. In all examined patients CHF was detected: in 30 patients (25%) — functional class I (FC), in 76 (63.3%) — II FC, in 14 (11.7%) — III FC, the average value of FC CHF was 2.3 ± 0.86 . The study did not include patients with CHF on the background of an active inflammatory process in the heart (myocarditis, rheumocarditis, infectious endocarditis, pericarditis), with severe cardiac arrhythmias, myocardial infarction or stroke that developed during the last 6 months, with hemodynamic significant primary valvular lesion (rheumatism, infectious endocarditis, sclerodegenerative changes), as well as concomitant pathology of internal organs, which could significantly affect the prognosis of patients (oncological diseases, severe renal failure, bronchial asthma, decompensated diabetes mellitus, etc.), poor echovisualization of the heart. The control group consisted of 30 people with no signs of heart failure, similar in age and gender to the main group, as well as having normal TMV corresponding to the age norm. All patients underwent a clinical examination with an assessment of their clinical condition on the SHOCK scale, an ECG at rest, a bicycle ergometric test (according to indications), and complex echocardiography (Echocardiography) using tissue Dopplerography (TDEhoKG). Exercise tolerance, as well as the effectiveness of therapy, were determined using a 6-minute walk (6-MX) test. FC CH was evaluated in accordance with the NYHA classification. LV diastolic function was assessed using Doppler TMP assessment. The following values were determined: maximum flow rate of rapid filling (E), m/s; maximum flow rate of atrial filling (A), m/s; E/A ratio, conl. units; isovolumetric relaxation time (IVRT), ms; deceleration time of early LV diastolic filling (DTe), ms. A decrease in the peak E, the E/A ratio, was considered a manifestation of a violation of the DFLF by the type of "relaxation disorder" < 1 ; DTe > 200 ms, IVRT > 100 ms; violation of DF by type "pseudonormalizations" were considered $E > A$, $E/A > 1$, DTe — 150-200 ms, IVRT < 100 ms; according to the "restrictive" type — with an E/A ratio > 2 ; DTe < 150 ms, IVRT < 60 ms. $E/A > 1$, DTe — 150-220 ms, IVRT < 100 ms were taken as normal LV TMP parameters. During the standardized Valsalva test, patients exhaled a stream of air into a mouthpiece attached to a conventional sphygmomanometer, maintaining a pressure of 40 mmHg for 10-30 seconds. During the test (straining with a deep breath and a pinched nose), the venous return of blood to the heart decreases, as a result of which it decreases pressure in the LP, which contributes to the transition of the "pseudonormal" diastolic flow into a spectrum with impaired relaxation. Thus, the presence of LDL was discussed in cases where, when performing the Valsalva test, the initial ratio the E/A changed by more than 40%. Venolegular blood flow was examined in all patients. The following parameters were measured: S — peak systolic flow rate, D — peak rate of early diastolic flow, and R — peak rate of late diastolic (reverse) flow. The criteria for pseudonormalization were considered to be an increase $aR > 35$ cm/sec, peak ratio $S/D \leq 1$.

THE RESULTS AND THEIR DISCUSSION

All patients in the study group underwent an echocardiogram study with an assessment of TMP and TDEhoCG indicators. According to the DECHO CG data, 65 patients (54%) had a type of impaired relaxation, 44 patients (36.6%) had a "pseudonormal" type, and 11 patients (9.2%) had a restrictive type. During TDEO CG, the distribution of patients by types of DD

had different ratios, for example, type I was detected in 49 people (40.8%), type II in 49 people (40.8%), type III in 5 people (4.2%), and a group with normal DF — 17 indicators was identified people (14.2%). It is noteworthy that among patients with type I DD, according to the TMP data, 22 (33.8%) had a more prognostically unfavorable "pseudonormal" type of DD during TDEOCG. In addition, the TMK analysis did not allow for a clear differentiation of the restrictive type of DD. Thus, in 6 people with type 3 DD according to the GMP data, normal DF indicators were revealed during the TDEhoCG. These turned out to be patients with high cardiac output. In comparison with TDEhoCG, the assessment of TMP, taking into account the proposed criteria, underestimates the severity and does not allow differentiating the normal and the "pseudo-normal" type of DD. Therefore, according to the data TMP 44 people can be classified both in the group of patients with a "pseudonormal" type of DD, and in patients with normal diastolic function. Thus, based on the analysis of TMJ, DD was diagnosed without difficulty in 49 (40.8%) patients. 43 of them had a type of impaired relaxation, 5 had a restrictive type of TMP. Difficulties in interpreting the nature of TMV (normal, "pseudonormal", unclassifiable) were encountered in 71 (59.2%) patients. 17 of them, taking into account the TDEOCG, have a normal the type of LV filling, 49 were diagnosed with "pseudonormal" TMV, 5 had a restrictive type. However, the study cannot be called technically simple, only in 17.5% of cases we managed to obtain a flow suitable for calculations. Our data do not differ significantly from the literature. The technique can be used in patients undergoing echocardiography, when the flow in the pulmonary veins is clearly visualized. During the Valsalva maneuver (straining test), the TEMPO rate in the patients we examined significantly decreased, but without a clear connections with the type of TMP. According to our data, the Valsalva test made it possible to differentiate type II DD only in 38.5% of cases (19 people), which is 60% less frequent compared to the data of the TDEOCG. Obviously, this is due to the lack of standardization in the conduct of the sample. Standardization of the sample allowed to increase the information content of this technique to 55.1 %. It is not always possible to distinguish between the normal and the "pseudonormal" type of TMP without using additional research methods and/or techniques. Therefore, we have attempted to find simpler and more accessible methods that allow us to reliably identify the "pseudonormal" type of DD. Such methods include assessment of the flow in the pulmonary veins and stress tests: maneuver Valsalva, an isometric load test. According to the study, 43 (35.8%) people had type II DD, the average value of DD was $16.3 \pm 4.7\%$; type III DD was 5 (3.4%) people, the average value of DD was $5.3 \pm 3.8\%$; normal indicators of DF — 12 (10%) people, the average value of DR is $43.2 \pm 4.2\%$. The remaining 60 (50%) people were classified by us as type I DD. According to the assessment of the DR, this group turned out to be heterogeneous, so, in 24 (40%) people, its decrease was detected, and the average value of the DR was $23.6 \pm 2.3\%$. Table 5 presents comparative data on the use of a sample with IN and TDEhoCG in the verification of various types of LDL. Our study showed that the IN sample is comparable in its informativeness with the data of TDEOCG in detecting restrictive types of DD, amounting to 40.0% and 45.0%, respectively. Also, the IN test allows us to verify the absence of diastolic dysfunction, the information content is comparable to TDEhoCG and corresponds to 10.0 and 14.2%.

CONCLUSIONS

1. Among the examined patients with a cardiological profile according to the data of TMF indicators The main proportion of 54.2% were patients with type I DD. The use of tissue

pulse Dopplerography of the IFC in equal proportions revealed types I and II of DD (40.8%); type III was registered in 4.2%.

2. The use of TMP indicators does not allow to distinguish type II of DD, which is more prognostically unfavorable. So, even in the identification of type III In almost 50% of cases, the assessment of TMF turns out to be uninformative.

3. The isometric load test is comparable in its informative value in detecting restrictive types (type II and type III) of diastolic dysfunction LV with tissue dopplerography data of the movement of the fibrous ring of the mitral valve, amounting to 40.0% and 45.0%, respectively.

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