



DIAGNOSIS OF CIRRHOTIC CARDIOMYOPATHY

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ABSTRACT

The purpose of the study: to establish the most significant indicators of echocardiography (EchoCG) and changes in the concentration of NUP for the diagnosis of CMC.

Materials and methods: 115 patients with cirrhosis of the liver (61 men and 54 women aged 20 to 60 years) who were treated in the cardiology department of SAMMU were examined. The control group (GC) consisted of 36 practically healthy people.

Exclusion criteria: chronic heart and lung diseases, arterial hypertension, kidney diseases, diabetes mellitus, metabolic syndrome.

It was found that in patients with CP in the group combining I (normokinetic) and II (hyperkinetic with a predominant increase in the linear velocity of blood flow in the portal vein (bb)) TPC, the level of N t -proBNP was significantly higher than in patients in group 2 with III (hyperkinetic with a predominant increase in Dvb), IV (hypokinetic) and V (pseudonormokinetic) TPC, respectively - (85 [68; 161] fmol/ml) and (43 [16; 82] fmol/ml) ($p < 0.001$). In patients with CP, EchoCG changes characteristic of CMC are naturally observed. Diastolic dysfunction of the left ventricle was the most frequent variant of cardiac disorders, noted in 71% of cases. Structural and functional disorders of the heart were closely related to changes in the Nt -proBNP cardiomarker, which together gives more accurate data on the presence of CMC. These changes depend on the features of the PC. The frequency of violations in the work of the left heart in patients with decompensated CP indicates the need for EchoCG in this category of patients to correct treatment.

Keywords: cirrhosis of the liver, portal blood flow, left heart, brain natriuretic hormone.

INTRODUCTION

Despite the successes achieved in the study of cirrhosis of the liver (CP), they remain an extremely important medical and social problem. C the continuous growth of persistent disability and, especially, mortality from chronic liver pathology, which is one of the "ten" most common causes of death of the population, is protected. At the same time, the severity and prognosis of CP are due not only to the increase in hepatic cell insufficiency, but also to the progression of portal hypertension (PG) and associated syndromes.

In recent years, considerable attention of clinicians has been attracted to the study of cardiohemodynamic disorders in liver pathology, especially in connection with the expanding



possibilities of its transplantation. It is important to improve the methods of early diagnosis of structural and functional changes of the heart, both for the prognosis of the course of the disease and the possible correction of treatment, including therapeutic and surgical approaches. The relevance of further study of the state of cardiohemodynamics in CP is also due to the need to clarify the proposed in 2005. at the World Congress of Gastroenterologists on the criteria of the so-called "cirrhotic cardiomyopathy" (CMC). This term refers to the presence of cardiac dysfunction in patients with CP, characterized by inhibition of contractile reactivity to stress and/or changes in diastolic relaxation, with typical electrophysiological manifestations in the absence of any other cardiac pathology.

It is considered recognized that in patients with CP in conditions of hypervolemia against the background of hemodynamic disorders, peripheral vascular resistance and blood pressure may decrease, electrical instability of the myocardium may develop, systolic and diastolic dysfunction of the left ventricle (LV) may form.

Most researchers consider the presence of signs of systolic dysfunction (DM) and diastolic dysfunction (DD) of the left ventricle to be the main diagnostic criteria of CMC. In addition, important additional criteria for CMC include prolongation of the QT interval, a decrease in the expected number of heartbeats (HR) per load, electromechanical dissynchrony, myocardial hypertrophy, an increase in the size of the left atrium (LP), an increase in the concentration of troponin I, a cerebral natriuretic peptide (NUP) in the blood.

The criteria of CMC are ambiguous and controversial, and their identification is necessary to correct the treatment of patients with CMC, which significantly worsens the prognosis of CP. The true prevalence of CMC has not yet been studied, which is due to both the lack of clear diagnostic criteria for this pathology and the lack of awareness of practitioners about the nature of changes in the cardiovascular system in CP.

The purpose of the study: to establish the most significant indicators of echocardiography (EchoCG) and changes in the concentration of NUP for the diagnosis of CMC.

MATERIALS AND METHODS

Materials and methods: 115 patients with cirrhosis of the liver (61 men and 54 women aged 20 to 60 years) who were treated in the cardiology department of SAMMU were examined. The control group (GC) consisted of 36 practically healthy people.

Exclusion criteria: chronic heart and lung diseases, arterial hypertension, kidney diseases, diabetes mellitus, metabolic syndrome.

In the diagnosis of CP, a complex of clinical, laboratory and instrumental data was used in accordance with the existing classifications of the disease. In accordance with the assessment of the degree of hepatic cell insufficiency according to the classification of CP (Child-Pugh), class "A" was established in 23%, class "B" - in 55% and class "C" – in 22% of patients. A high degree of disease activity was detected in 61% of the examined, a moderate degree – in 39%. In most cases, viral and mixed (virus + alcohol) etiology of the disease is diagnosed.

EchoCG was performed on an ultrasound scanner ALOKA -5500 ProSound (Japan) in one-dimensional (M), two-dimensional (B) modes, as well as using the modes of pulsed and constant wave spectral Doppler EchoCG and color Doppler mapping of blood flow. For the



examination of patients, a standard technique of parasternal (along the long and short axes) and apical approaches was used. The end-systolic (CSR) and end-diastolic (CDR) LV volumes, end-systolic (CSR) and end-diastolic (CDR) LV sizes, anteroposterior LP size in the diastole (PDR LP), thickness of the posterior wall of the left ventricle (LVL) in the diastole, ejection fraction (EF) were measured. The following indicators were calculated: E, A, E/A, isovolumetric relaxation time (IVRT) and isovolumetric contraction time (IVCT), LV expulsion time (ET), LV myocardial contractility index (Te i index). LV myocardial mass (MMLH) and LV myocardial mass index (and MMLH) were determined according to generally accepted formulas.

Comprehensive ultrasound examination (ultrasound) of the abdominal cavity was performed strictly on an empty stomach on an ultrasound scanner "ALOKA -5500 Prosaund" (Japan) with a 3.5 MHz convexic sensor and included real-time ultrasound in In-mode and pulse Dopplerography and color Doppler mapping of abdominal vessels. When analyzing the nature of changes in hepatic-portal circulation, the criteria for assessing the types of portal blood flow (PC) developed by us earlier were used.

The concentration of the N-terminal fragment of the prohormone BNP (BNP) (N-terminal fragment of the prohormone BNP – Nt - pro - BNP) in EDTA plasma was determined using a commercial enzyme immunoassay kit from Biomedica (Germany).

Statistical data processing was performed using the Statistica 6.0 application software package.

RESULTS AND DISCUSSION

During the study, data were obtained indicating a statistically significant increase in almost all EchoCG indicators in patients with CP compared with GC. There was a tendency to increase the size of both LP and LV, with signs of LV hypertrophy. There was an increase in CSR to 52 [30; 76] ml (GC – 34 [30; 36] ml) ($p < 0.05$) and BWW to 136 [91; 167] ml (GC – 120 [110; 131] ml) ($p > 0.05$), as well as ZSLZH and MZHP, respectively up to 11 [9; 12] mm (GC - 9 [8; 9]) ($p < 0.05$) and 10 [9; 13] mm (GC – 9 [8; 11]) ($p < 0.05$).

Signs of LV myocardial hypertrophy were found in 54 patients (33.5%). In the general group of patients with CP, there was an increase in MMLF to 241 g compared with GC: 179 g ($p < 0.05$). In 9 (16.7%) cases, a concentric type of LV hypertrophy was observed and in 45 (83.3%) – eccentric ($\chi^2 = 6.83$, $p = 0.01$). The eccentric type without LV dilation was recorded in 28 (62.2%) patients and with dilation – in 17 (37.8%).

71% of patients with CP had signs of LV diastolic dysfunction, while in combination with systolic dysfunction – in 21.7% of cases.

The presence of LV diastolic dysfunction was indicated by a statistically significant increase in A to 54 cm/s (GC – 42 [39; 47] cm/s) ($p < 0.05$) with a simultaneous decrease in E to 55 cm/s (GC – 64 [60; 71] cm/s) ($p < 0.05$) and the E/A ratio to a value of 1.09 (the norm is 1.5–1.7). Also, a violation of LV diastolic function was indicated by an increase in CDR to 51 [43; 58] mm (GC – 45 [42; 48] mm) and a statistically significant increase in IVRT to 83 ms (GC – 71 [68; 77] ms) ($p < 0.05$).

An increase in parameters such as CSR to 38 [29; 42] ml (GC – 30 [28; 34] ml) ($p < 0.05$) and IV From T to 77 [68; 88] ms (GC – 68 [66; 74] ms) ($p < 0.05$) to a greater extent the measure



indicated a violation of LV systolic function. We also took into account the values of the integral index – the Te i index, reflecting violations of LV systolic-diastolic function, which increased in patients with CP to 0.56 [0.49; 0.62] (GC 0.47 [0.44; 0.48]) ($p < 0.05$).

To confirm the significance of EchoCG indicators for the diagnosis of CMC in 80 patients with CP simultaneously with the structural and functional features of the left heart, a study of the concentration of cerebral pronatriuretic peptide (N t -proBNP) in the blood was conducted. This cardiomarker of chronic heart failure (CHF), which makes it possible to diagnose even latent heart failure, is one of the important predictors of CMC.

In the general group of patients with CP, the content of N t -proBNP significantly exceeded its values in GC: 51.2 [14.5; 123] fmol/ml, respectively, versus 11.3 [7.5; 16.2] fmol/ml ($p < 0.001$). 2-3-fold excess of N t -proBNP in CP, compared with GC, it was noted in 43.7% of patients, 3-5-fold – in 20% and more than 5-fold – in 15%.

The most significant differences of this marker were found between patients with CP of classes "A" (22.5%) and "C" (26.25%) according to Child-Pugh, in whom the values of the indicator were, respectively, 28 [14.2; 45] fmol/ml and 89 [65; 126] fmol/ml ($p < 0.005$). In patients with CP of class "B" (51.25%), this indicator was 46 [18; 79] fmol/ml.

A correlation analysis was carried out between the values of Nt - proBNP and the parameters of cardiac hemodynamics, indicating systolic-diastolic LV dysfunction, taking into account the fact that Nt - proBNP is secreted by myocytes in response to an increase in ventricular wall tension, an increase in ventricular volume and pressure [4,7]. Direct correlations were found between Nt - proBNP and the values of LP ($r = 0.41$), BWW ($r = 0.39$), MMLW ($r = 0.42$), MMLW ($r = 0.35$) and feedbacks with PV ($r = -0.42$), E ($r = -0.45$), E/A ($r = -0.41$). In all cases, the patterns were reliable ($p < 0.05$).

It turned out that in patients with CP in the presence of the values of the main criteria of CMC - E/A < 1 and IVRT > 80 ms ($n = 27$), the concentration of Nt - proBNP was 105 [69; 165] fmol/ml, while in the comparison group in patients with E/A ≥ 1 and IVRT ≤ 80 ms ($n = 53$) – 51 [16; 85] fmol/ml ($p = 0.002$) (Table 1).

Table 1. The level of Nt-proBNP depending on the presence of indicators of left ventricular diastolic dysfunction

Parameters	Nt-proBNP, fmol/ml	Parameters	Nt-proBNP, fmol/ml	p
Group 1 (34%)	105 [69; 165]	Group 2 (66%)	51 [16; 85]	0,002
E / A < 1		E / A > 1		
IVRT < 80 ms		IVRT > 80 ms		

Analysis of the data obtained indicates a close relationship of Nt - proBNP with changes in parameters reflecting LV diastolic dysfunction.



In addition, in patients with $PV < 55\%$ (13.7% of patients with CP), the values of Nt - proBNP significantly exceeded those in the subgroup of patients with $PV > 55\%$, respectively, 86 [35; 116] fmol/ml and 43 [14; 98] fmol/ml ($p < 0.01$).

Taking into account the data obtained on the increase in the concentration of Nt - proBNP with decompensated CP of class "C", the relationship of the protein level with the severity of changes in portal blood flow (PC) was analyzed. Previously, we conducted studies on the study of the features of the PC with the CPU, as a result of which 5 types of portal blood flow were identified.

The level of Nt - proBNP in patients with cirrhosis of the liver, depending on the type of portal blood flow

It was found that in patients with CP in the group combining I (normokinetic) and II (hyperkinetic with a predominant increase in the linear velocity of blood flow in the portal vein (bb)) TPC, the level of Nt - proBNP was significantly higher than in patients in group 2 with III (hyperkinetic with a predominant increase in Dvb), IV (hypokinetic) and V (pseudonormokinetic) TPC, respectively - (85 [68; 161] fmol/ml) and (43 [16; 82] fmol/ml) ($p < 0.001$) (figure).

The last two TPCs are considered the most unfavorable for the CPU forecast. The nature of the changes indicated the presence of pronounced portal hypertension (PG) and redistribution of blood flow in the portal vein system towards the spleen. Patients in these subgroups were in the stage of decompensation, with obvious signs of PG.

At the same III, IV and V TPC, more significant disturbances of the left heart and the formation of systolic-diastolic dysfunction were noted. Moreover, there were statistically significant differences ($p < 0.05$) between patients with I and II TPC compared to the other three. To a greater extent, they related to such indicators as CDR, CSR, ZSLZH, PZR LP. In addition, changes in parameters indicating a violation of LV systolic-diastolic function (A, E, E/A, IVRT, IVCT, Tei index) were detected.

LV diastolic dysfunction in patients with CP with III ($\chi^2 = 9.6$; $p = 0.02$), IV ($\chi^2 = 11.02$; $p = 0.001$) and V ($\chi^2 = 9.52$; $p = 0.002$) TPC was diagnosed significantly more often compared with I (normokinetic) TPC detected at the initial stage of CP.

CONCLUSION

In patients with CP, EchoCG changes characteristic of CMC are naturally observed. Diastolic dysfunction of the left ventricle was the most frequent variant of cardiac disorders, noted in 71% of cases. Structural and functional disorders of the heart were closely related to changes in the Nt - proBNP cardiomarker, which together gives more accurate data on the presence of CMC. These changes depend on the features of the PC. The frequency of violations in the work of the left heart in patients with decompensated CP indicates the need for EchoCG in this category of patients to correct treatment.

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