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CARDIAC ARRHYTHMIAS IN PATIENTS CIRRHOSIS OF THE LIVER

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Abstract

Cirrhosis of the liver (CP) is one of the urgent problems of medicine of the last decade. This is due to a large increase in viral liver diseases, especially caused by hepatitis B and C viruses. The CPU is characterized by hyperdynamic blood circulation, which manifests itself in the form of visceral vasodilation and increased cardiac output. These violations of the system circulations in combination with high intrahepatic resistance contribute to the development and progression of portal hypertension and often represent the main complications of cirrhosis in the form of varicose bleeding and ascites. The possibility of associated specific myocardial disorders in liver cirrhosis has been recognized relatively recently. These disorders include enlargement of the left ventricular cavity associated with its diastolic dysfunction and systolic incompetence during exercise. The combination of such violations is typical for the so-called cirrhotic cardiomyopathy . Meanwhile, the syndrome of cirrhotic cardiomyopathy has not yet been definitively classified and many mechanisms for the development of myocardial dysfunction in patients with CP are unknown. The absence of these data indicates insufficient awareness of practitioners about changes in the cardiovascular system in patients with cirrhosis of the liver. Early diagnosis and clinical intervention may possibly improve the survival of these patients. In patients with cirrhosis of the liver of viral etiology, an increase in the volume of the left atrium, a violation of rhythm and conduction, prolongation of the QT interval, a decrease in heart rate variability, global longitudinal systolic ventricular function, a violation of segmental diastolic ventricular function was found. These changes are more pronounced in patients with ascites

Keywords: cirrhosis of the liver, segmental diastolic function.

Introduction

To assess the function of the heart, much attention is currently being paid to the study of myocardial viability as a quantitative measure of contractility of the heart muscle (mainly local). Tissue Doppler echocardography is a method that allows

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quantifying the speed of movement of various segments of the myocardium and cardiac structures. Perhaps the use of this more sensitive diagnostic method will make it possible to predict the severity of myocardial

dysfunction in patients with viral CP. To date, a large amount of data has been collected indicating a close relationship between the state of autonomic regulation of heart rhythm and the risk of developing life-threatening ventricular arrhythmias. It is believed that increased sympathetic activity predisposes to the development of ventricular arrhythmias of the heart, then as an increase in parasympathetic tone, it has a protective effect. A decrease in heart rate variability is associated with sympathetic activation, myocardial hypertrophy, remodeling cardiac cavities, myocardial dysfunction, occurrence of ventricular arrhythmias, development and progression of heart failure. Meanwhile, the information available in the literature about such disorders in patients with CP is contradictory. In this regard, the purpose of our study was to study the frequency and nature of cardiac arrhythmias and some cardiohemodynamic parameters in patients with viral cirrhosis of the liver.

Goal. To study the effect of viral liver cirrhosis on the frequency, nature of arrhythmias and some cardiohemodynamic parameters

Material and Methods

The paper analyzes the results of examination of 25 patients (51% men, 49% women) with viral cirrhosis of the liver of class A, B, C according to the Child-Pugh criteria. The average age of patients was 40.2 (34;44) years, the duration of the disease was 3.7 (2.6;6.7) years. The diagnosis of CP was confirmed morphologically (laparoscopy with targeted biopsy) in 2 people, in the rest of the patients it was exposed on the basis of clinical, laboratory and instrumental data. The viral genesis of liver damage was confirmed by the presence of markers of viral hepatitis B (HBsAg, antibodies (AT) in the blood serum classes M and G to HbcorAg, HBV DNA, C (AT classes M and G to HCV, HCV RNA). Depending on the presence of ascites, patients were divided into 2 groups: 19 (52%) patients had no ascites (group 1), 18 (48%) patients were diagnosed with ascites of varying severity (group 2), the control group consisted of 9 healthy volunteers of the appropriate age without signs of liver pathology. The study did not include: patients older than 52 years with essential and symptomatic arterial hypertension, heart and lung diseases, chronic alcoholism and severe concomitant pathology. There were no pronounced signs of heart failure in the groups of examined patients.

Standard and tissue myocardial Doppler echocardiography was performed according to the standard technique with the determination of a complex of generally

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accepted morphofunctional parameters in the patient's position on the left side on the device “VIVID S5” (USA). Tissue Doppler echocardiography was performed from apical access at the level of two, four chambers, the Doppler spectrum was recorded from the fibrous rings of the mitral, tricuspid valves and ventricular segments, systolic and diastolic indices were calculated according to six measurements: the maximum speed of the first the positive peak (Sm1) reflecting isovolumetric systolic tension, the second peak (Sm2) the actual systolic contraction of the myocardium, the maximum speed of the first negative peak Em, maximum velocity of the second negative peak Am, Em/Am ratio, time before

myocardial contraction Ivs, relaxation time Ivr. Holter ECG monitoring was performed using the Astrocard complex. HRV was studied on the basis of statistical analysis obtained during Holter monitoring of a 24-hour recording ECG with the calculation of the following indicators:

1) time — the average heart rate in 1 min, the standard deviation from the average duration of sinus intervals RR (SDNN), the average standard deviation RR of all 5-minute fragments of recording (SDANN), the average standard deviation from the average values of the duration of intervals RR of all 5-minute sections of recording ECG (SDNN index), the standard deviation of the average sum of squares of the differences between the duration of adjacent intervals RR (RMSSD), the percentage of consecutive intervals RR differing by more than 50 ms (pNN50); 2) spectral data obtained by fast. The QT interval variance was calculated as the difference between the mean maximum and minimum values of the QT interval in six precordial ECG leads. To correct the variance of the QT interval depending on the heart rate (variance of the corrected QTc interval), a modified H. Bazett formula was used: where dQTc is the variance of the corrected QT interval; dQT is the variance of the QT interval; RR is the duration of the cardiac cycle. The coefficient of variability of the QT interval (QTvar) was calculated by the formula: QTvar = (QTc) / (QT cp) x 100%,

where QTsp is the average value of the QT interval.

Statistical data processing was carried out using a statistical software package Statistica 6.0. The distribution of almost all variation series did not comply with the criteria of normality, therefore, methods of nonparametric statistics were used in the analysis. The nonparametric Mann-Whitney criterion was used to assess the difference between the groups. The correlation analysis was performed using Spearman's rank correlation coefficient. In patients with viral cirrhosis of the liver,

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an increase in the average daily heart rate, a violation of the segmental diastolic function and a decrease in the global longitudinal systolic function of the ventricles, an increase in the volume of the left atrium with the formation of rhythm and conduction disorders: the QT interval lengthens, heart rate variability decreases, p <0.001. These disorders are more pronounced in patients with ascites. In all patients with viral cirrhosis of the liver, a study of the relationship between structural and functional indicators and heart rate variability.

Research Results and Their Discussion

According to the XM ECG, ventricular extrasystoles of various gradations were detected — from I to IV B class according to the Laun-Wolf classification, occurring in 8 (20%) patients of group 1 and 12 (33%) patients of group 2. When comparing the corrected QT interval in patients with viral cirrhosis of the liver, its lengthening was noted: for example, this indicator in patients of group 1 was

457.9[441;468], in group 2 - 478[433;501], in the control — 427.9[405;438], p<0.001.

Supraventricular arrhythmias were represented by supraventricular extrasystoles in 15 (38.4%) patients of group 1 and in 18 (50%) patients of group 2; paroxysmal form of atrial fibrillation

— in 2 (5%) patients and in 7 (19%), respectively. Considering that the size of the left atrium plays an important role in the etiology of rhythm disturbance [10], we analyzed the anatomical characteristics of the left

atrium (LP) taking into account the values of the body surface (LP/PPT, cm/m2). It was found that the maximum volume of LP was greater in patients with cirrhosis of the liver compared with the control, and in patients with ascites, this disorder is more pronounced, (p<0.001).

number of researchers point to the contribution of the left atrium to LV diastolic filling, which is necessary to maintain normal cardiac output. In this study, a decrease in early diastolic flow (Em) of the medial segment of the lateral wall of the left ventricle and the posterior part of the interventricular septum was found in patients of groups 1 and 2 compared with the control (p<0.001). Accordingly, the passive emptying of LP decreased, while the active emptying of LP increased, and we observed a decrease in the Em/Am ratio of the posterior interventricular septum and an increase in the segmental time of isovolumetric relaxation of the lateral LV wall in patients of both groups compared with healthy individuals, and the presence of ascites was accompanied by more pronounced changes in the diastolic function of the left ventricle, (p<0,001).

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The established changes suggest a violation of the “sucking” action of the left ventricle and a decrease in the function of the left atrium, which increases in the presence of ascites, which probably occurs as a result of chronic myocardial overload by pressure.

In addition, the peak systolic velocity (Sm) of the lateral wall (segments 3, 9) decreased in patients with ascites: it was lower by 23% and 25%, respectively, compared with group 1, $p<0.001$. It is likely that the global longitudinal systolic LV function in patients with ascites, unlike patients without ascites, it was reduced.

The myocardial performance index of Thei increased at the level of the tricuspid ring in patients with ascites, which characterizes a decrease in global pancreatic function compared to controls and patients without ascites ($p<0.001$).

Taking into account the fact that an important pathogenetic mechanism in the development of rhythm disturbances in various diseases of the cardiovascular system is a powerful activation of the sympathoadrenal system and taking into account fluctuations in the average daily heart rate in patients with viral cirrhosis complicated by ascites (84.3[81.7;90]) and patients without ascites (73[65;85]), we studied the main spectral, temporal and geometric parameters of heart rate variability in patients with viral CP. The SDNN parameter, reflecting the overall tone of the autonomic nervous system in patients with and without ascites, was lower by 45% and 52%, respectively, in comparison with the control. Similar patterns were observed for the SDNN index, and in the 2nd group it was 8% lower than in the 1st. The SDANN indicator, which characterizes slow changes in HRV, was significantly reduced in both groups compared to healthy individuals. The HF spectral parameter decreased (in groups 1 and 2 by 22% and 29%, respectively) reflecting the effect of the vagus nerve on the heart, the temporal the RMSSD index (by 66% and 66%, respectively) and PNN50 (by 78% and 81%, respectively). The LF/HF coefficient, which characterizes the balance of influence

on the heart of the parasympathetic and sympathetic divisions, was 62% and 10% higher in individuals of the 1st and 2nd groups compared with the control, ($p<0,001$). Thus, in patients with CP, a decrease in heart rate variability with a predominance of sympathetic tone was found, which, ultimately, can lead to electrical instability of the myocardium.

The study confirms the data on the presence of myocardial dysfunction in patients with viral CP, and the presence of ascites is accompanied by more pronounced disorders of cardiohemodynamics. Remodeling of the left atrium occurs with the formation of rhythm disturbances, prolongation of the QT interval, violation of LV diastolic function, decrease in

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heart rate variability. In patients with viral cirrhosis of the liver complicated by ascites, the contractility of the ventricular myocardium decreases.

The occurrence of arrhythmias in viral CP is probably facilitated by collateral circulation, leading to hypervolemia of the small circle with the development of dystrophic changes in the myocardium, leading to the formation of ectopic activity.

During the correlation analysis, a significant positive correlation was established between the peak systolic velocity (Sm) of the LV lateral wall, which characterizes the contractility of the LV myocardium, and the studied HRV indicators ($r=0.45–0.72$; $p<0.001$), while with HR — a significant negative relationship ($r=-0.52$; $p<0.001$). Consequently, a decrease in the global longitudinal systolic LV function was probably accompanied by a decrease in HRV and an increase in heart rate. Significant correlations were found between the final diastolic size of the left atrium, LV CSR and heart rate variability indicators. Consequently, HRV indicators naturally decreased with an increase in systolic volume Lies of the diastolic size of the left atrium.

Conclusions

Thus, cardiohemodynamic disorders have been established in patients with cirrhosis of the liver of viral etiology: an increase in the volume of the left atrium, rhythm disturbance, violation of segmental diastolic function of the left ventricle, and these changes are more pronounced in patients with ascites. The presence of ascites contributes to a decrease in the global longitudinal systolic function of the ventricles.

In patients with viral cirrhosis of the liver, ventricular extrasystoles and supraventricular cardiac arrhythmias were detected, which were more often recorded in patients with ascites.

The revealed cardiological disorders and cardiac arrhythmias may contribute to the deterioration of the clinical condition of patients with viral cirrhosis of the liver.

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