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Echographic Structure of the Liver in Patients with Chronic Heart Failure

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Abstract: The importance of assessing the severity of chronic cardiac failure (CHF) by examining the condition of the liver and hepatic hemodynamics. Perivenular fibrosis is identified as the morphological substrate for congestive liver and cirrhosis development, which worsens the course of CHF. Ultrasonography is used to identify changes in liver size, structures, and blood flow abnormalities. However, there is a lack of literature describing ultrasonographic structural changes specific to cardiac fibrosis. The article also mentions a relationship between the pressure in the right atrium and pulsating blood flow in the portal vein. The state of the liver and hepatic hemodynamics plays an important role in assessing the severity of the condition and predicting the development of chronic heart failure

(CHF). Perivenular fibrosis, which is a morphological substrate of a congestive liver and spreads deep into the hepatic lobules, passes to the periportal zones, leading to the development of cirrhosis and portal hypertension, the clinical manifestations of which aggravate the course of CHF. Ultrasonography allows you to detect an increase in size, a change in the structure of the liver, an expansion of the hepatic and portal veins. We have not found any literature data describing the ultrasonographic structural changes of the liver parenchyma characteristic of cardiac fibrosis.Characteristic changes in blood flow, determined by Dopplerography, consist in a violation of the phase of the Doppler spectrum in the hepatic veins, as well as in a decrease in the average linear velocity of blood flow and the appearance of pulsating blood flow in the portal vein. The relationship between the pressure level in the right atrium and the severity of such pulsation has been established. However, these There are insufficient data to assess the significance of portal hemodynamic disorders for predicting the course of CHF.

Materials and Methods:The study included 110 patients with CHF and 33 control patients, and various examinations were conducted including echocardiography and ultrasound examination of the liver. The study aimed to assess the significance of portal hemodynamic disorders in predicting the course of CHF.

Summary:General clinical and laboratory examination, eleetrocardiography, echocardiography, ultrasound and doppler examination of the liver were carried out in 109 patients with chronic heart failure and 31 patients of the control group. Portal hemodynamics parameters in chronic heart failure of the I-II functional class did not differ from those in the control group and three types of portal system reactivity are revealed in the III-IV functional classes. The most

unfavorable type of portal system reaction, accompanied by progressive aggravation of state of patients by echocardiography and boderline videodensitometry is the third type of reaction.

Keywords: chronic heart failure, ultrasonography, perivenular fibrosis, doppler spectrum and others.

In assessing the severity of the condition and prognosis roving the development of chronic cardiac failure (CHF) plays an important role - the condition of the liver and hepatic hemodia- namiki. Perivenular fibrosis is morphological substrate congestive liver and spreading deep into the hepatic lobules, passes to the pe- riportal zones, leading to the development cirrhosis and portal hypertension ,cli- nic manifestations of which aggravate course of CHF. Ultrasonography allows identify an increase in size, change liver structures, enlargement of liver and portal veins . We have not found terature data describing ultra- sonographic structural changes liver parenchyma, characteristic specifically cardiac fibrosis. Characteristic changes blood flow abnormalities determined by doppler rography, consist in a violation of the phases of the Doppler spectrum in the liver veins , as well as in a decrease in the average blood pressure linear speed of blood flow and the appearance pulsating blood flow in the portal Vienna A relationship has been established between the levels the pressure in the right atrium and the increase the femininity of such pulsation. However, these data is insufficient to assess the significance these portal hemodynamic disorders for predicting the course of CHF.

110 patients with various stages of CHF and 33control patients groups. With I-II functional classes (FC) according to NYHA there were 20 patients, with III-G/ - 96 From this group under supervision in di- namike with a duration of one 13patients stayed for up to 3 years. At- causes of CHF development were ischemic heart disease, post- farctic cardiosclerosis (in 28), hypertensivenic disease (in 14), rheumatic defects heart , dilated cardiomyopa- tia, myocarditis, congenital heart defectstsa (at 8). All patients underwent general clinical and laboratory examinations, electrocardiography, chest radiograph echocardiography, as well as ultra- transonic and Doppler examination liver swelling.

Aloka machines were used for ultrasound

- SSD-650 and Aloka SSD-4000 with sector (2- 3.5 MHz) and convex (3.5 MHz) sensors

kami. Echocardiography assessed the new morphometric parameters -dimensions of the left and right atria, which end diastolic and systolic dimensions of the left ventricle (KDR, KSR), di- measures of the right ventricle, aorta and pulmonary arteries, the thickness of the interventricular towns and posterior wall of the left ventricle, as well as ejection fraction (EF) and contraction bridge (FS), end diastolic (EDS) and end systolic (ESR) left ventricular volumes, stroke volume (SV), systolic pressure in the pulmonary arteryteria (SDPA), pressure level in the right atrium . In addition, they calculated left ventricular myocardial mass and index mass (LV IMM). With ultrasonography the liver was determined by its size and structure, diameter of the portal vein and Dopplerography portal hemodynamic parameters ki - linear average (LSK) and volume - new (OSC) blood flow velocity in the portal Vienna (VV), as well as speed indicators blood flow in the hepatic artery and quality venous characteristics of Doppler spectrum in the hepatic veins. All parameters studied on an empty stomach. About quantitative indicators bodies of the portal blood flow were also judged after a food load test, use usually taken to assess functional reserve of the portal system for chronic some diffuse liver diseases .

In this case, the percentage of increase was calculated sizes BB, LSK and OSK. The structure of the oven neither studied by the threshold video density method tometry , based on preliminary calibration of the device according to anechoic reference medium (blood in the lumen of blood vessels basin of the inferior vena cava and hepatic vein at such a maximum value of the amplification condition in which the reference medium is still basic appears anechoic). After this we calculated quantitative parameters of amplitude hy- stographs characterizing echogenicity and liver structure. These parameters were predominant gray scale (PTSS), reflecting the average

amplitude image brightness (64-gradation scale), and dispersion (D), reflecting degree of liver tissue heterogeneity in % from the maximum number of gray gradations scale", distinguished by ultrasonic scaling ner When analyzing the data we received It was found that in patients with CHF 1-11 FC main initial parameters of the portal fasting hemodynamics were similar and coincided with those in the control group with literature data . In patients with CHF III-IV FC average additional Pler's indices of portal blood current on an empty stomach did not differ significantly from those in the control and in patients with CHF I-II FC. Moreover, in the majority of patients TII-TV FC, portal phasicity was observed blood flow corresponding to the 3-4-5th "gra- pulsating blood flow" according to the classification sifications of A.J. Duerrinckx et al. (Fig. 2).

In 54 (58%) patients, LSC and OSK in the portal

Rice. 1. Amplitude histogram of the liver.

Rice. 2. Spectrogram of pulsating blood current in the portal vein.

Vienna were within the normative indicators calves, in 14 (15%) significantly exceeded them, and in 25 (27%) they were reduced to 8.84± +0.47cm/s ($p<0.01$; Table 1).

Results of food load tests patients 1-11 FC did not differ significantly were given the data obtained during the examination research in the control group, while in patients III-1V FC, 3 types of reactants were identified - features of the portal system. In 24 (27%) pa- patients, the increase in TSC was similar to that in individuals in the control group and patients with 1st FC CHF, in 46(48%) - less than 70%, which corresponds to the latent portal phase hypertension [3], or its hypokinetic type [2], also detected in a number of other chronicnic diffuse liver diseases (hepatitis, cirrhosis). In 24 (25%) patients an initial decrease in the TSC of nato- with a significant (more than 2.5 times) its increase after testing with food burden, which is not typical for other concerns levania and specifically for CHF [5] (Table 2).

Comparison of dopplerography data liver and echocardiography showed significant true differences in a number of parameters between the indicated groups (Table 3).

When quantifying the structure liver parenchyma in patients with CHF ob- characteristic changes in histogram were found physical parameters characteristic of the name but cardiac fibrosis and different from options corresponding to different chronic diffuse diseases of pe- diseases (hepatitis, portal cirrhosis) [3]. AT 3

groups, these indicators also differed among themselves (Table 4).Indicators Control I-II FC 1st group 2nd group 3rd group

p/% 13 17 93/100 54/58 14/15 25/27

LSC in the BB, cm/s 14.71±0.61 13.9310.40 13.89±0.4b 14.23±0.23 20.2110.71 8.8410.47

BSC in IV, l/min 0.68±0.03 0.68±0.03 0.78±0.05 0.81+0.07 1.02+0.06 0.4810.04

Table 2 Types of portal blood flow response to food load Indicators Control I I I FC in-iv FC 1st TYPE 2nd type 3rd type

p/% 31 17 93/100 25/27 45/48 23/25

Increase in OSK, % 93.41 + 6.92 85.71 + 14.8 101.9 + 12.3 88.0 + 4.1 36,113.14 255,914.45

Table 3 Dependence of the type of portal blood flow reaction on echocardiography indicators

Reaction type 11

lek p vv

(on an empty stomach)

Increase in OSK KDR KSR FS SDLA imm lzh

1st 25 14.5210.85 70-115% 58.9612.16 43.9612.65 26.7812.20 48.7912.75 166.02112.82

2nd 45 14.7910.51 < 70% 53.6311.8 38.4911.86 28.8411.48 57.08+3.05 175.74110.02

3rd 23 10.14+0.81 > 115% 62.24+1.96 45.9012.11 24.8211.72 58.0512.69 216.25114.12

Table 4 Structural echographic parameters of the liver in patients with various types portal blood flow reactions

Indicators Control of CHF Type 1 Type 2 Type 3

n 31 109 25 45 23

PGSSH, "S 11.1010.32 17.7710.64 17.9611.15 17.7210.91 21.1411.80

d, % 35.1011.71 46.6511.08 48.0412.06 46.5311.67 51.4511.97based on clinical results examinations, echocardiographic data nal, quantitative parameters of the structure liver, as well as the results of dynamic We have established monitoring of patients it is assumed that the most unfavorable type reactions of the portal system, accompanied the ongoing progressive deterioration of the patient data, echocardiography data and threshold video densitometry, is 3rd type of reaction. The appearance of the 3rd type of reaction occur against the background of an increase in size volumes of the left ventricle, decreased reducing the contractility fraction, increasing systolic pressure in the pulmonary artery mass and IMM of the left ventricle, on-increasing structural changes in the liver according to the type of cardiac fibrosis. Patients with

Type 3 reactions require special treatment attention due to unfavorable pro- gnosis of the course of CHF.

Comparison of liver Dopplerography and echocardiography data showed significant differences in a number of parameters between these groups. The quantitative assessment of the liver parenchyma structure in patients with CHF revealed characteristic changes in geographical parameters peculiar to cardiac fibrosis and different from the variants corresponding to various chronic diffuse liver diseases (hepatitis, portal cirrhosis).

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