



# Multi Parameter Approach at the Diagnosis of the Stage and Severity of Chronic Hepatitis

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## Abstract

**Study relevance:** The chronic hepatitis, especially with viral etiology are considered to be valuable problem of the public healthcare due to the wide spread, long lasting course and adverse complications. The main aim of this study was determining the multi parameter ultrasound approach at the validation of stage activity of the disease in patients who has a verified diagnosis of chronic hepatitis.

**Materials and methods:** There were three groups formed from 172 people for the investigation. The first group consisted of 80 patients with verified diagnosis of chronic hepatitis, who have no any clinical laboratory data for the signs of liver cirrhosis. The second group consisted of 72 patients with different somatic pathologies without chronic hepatitis. The third group consisted of 20 professional sportsmen. The complex investigation, liver ultrasound and elastography of the patients of all groups were conducted. By the standard methodic the doppler ultrasound conducted to investigate the blood circulation of the portal vein.

**Results and discussions:** According to our study, ultrasound signs were present in 35% of patients with chronic hepatitis in a seroscale ultrasound examination. The echo graphical signs, mentioned in the literature as typical for chronic hepatitis, were even observed in young healthy people in 2 cases (11%). In the group of patients without liver disease, the described symptoms occurred in 8 (10.5%) cases. The most common symptom was the liver parenchyma echogenicity. In all patients of the chronic hepatitis group with weak liver fibrosis, the portal vein diameter did not significantly change. The doppler graphical data more clearly showed the difference between the groups. In all patients with mild hepatic fibrosis, the portal vein diameter increased, but the changes were not significant. As the severity of the liver parenchyma fibrosis increased, a varied change in blood flow velocity in the portal vein was noted. In patients with severe fibrosis, a decrease in the average blood flow velocity in the portal vein was noted. The presence and stage of fibrosis do not significantly affect the frequency of manifestation of each of the studied symptoms; however, the frequency of absence of echographic changes in the liver is significantly lower in healthy people than in hepatitis with severe fibrosis. The ultrasound liver examination is not considered to be sufficient to diagnose the chronic hepatitis, and assess its stages and activity. The doppler graphic study is informative for the differential diagnosis of stages of liver fibrosis.

**Conclusions:** The ultrasound liver examination is not considered to be sufficient to diagnose the chronic hepatitis, and assess its stages and activity. The Doppler graphic study is informative for the differential diagnosis of stages of liver fibrosis.

**Keywords:** Chronic hepatitis, Ultrasound, Dopplerography, Echo structure, Echogenicity, Fibrosis

## Introduction

**Actuality:** Chronic hepatitis (hepatitis), especially of viral etiology, are a significant problem of public health care owing to widespread occurrence, long clinical course and adverse consequences. As recorded by World Health Organization viral hepatitis B and C affected 325 million people worldwide leading to 1.4 million deaths a year. By death rate of infectious disease, this illness is the second major killer after tuberculosis, and 9 times more people are infected with hepatitis than HIV. The majority of people, with a chronic hepatitis C do not suspect about an infection until the virus lead to severe damage of a liver. In this connection, the matter of early testing of activity and stage of chronic hepatitis for timely adequate treatment is remaining. Currently many researches on evaluation of diagnostic techniques of activity and stage of chronic hepatitis conducted [1].

There are various opinions on specificity and sensitivity of each of these techniques/methods of evaluation of stage and severity of the disease. There is a considerable amount of studies of evaluation of sensitivity and specificity of gray scale ultrasound (ultrasonography) examination, Dopplerography and laboratory analyses in diagnosing of chronic hepatitis available.

Purpose of the research was multiparametric ultrasound approach in the evaluation of activity and stage of patients with verified diagnosis

of chronic hepatitis. Researched informativeness of the methods of gray scale ultrasound exam, Dopplerography and flexography in differentiation of severity of the disease [2].

## Materials and methods

Three groups of 172 people formed for research work. The first group (Patients with Chronic Hepatitis, PCH) consisted of 80 patients aged 18-72 with verified diagnosis of chronic hepatitis, 42 of them diagnosed with virus hepatitis C, 38 of them diagnosed with virus hepatitis B, without having clinic-laboratory data for cirrhosis.

The second group (Patients without Liver Disease, PWLD) consisted of 72 patients aged 20-67 with various somatic pathologies without a chronic hepatitis [3].

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The third group (Healthy, H) included 20 professional sportsmen aged 18-25 living a healthy life-style, not having clinic-laboratory displays of any diseases and data of liver disease in the anamnesis.

Patients of all the three groups had been fully examined with application of clinic biochemical and immunoferment laboratory analyses [4].

Ultrasound liver examinations conducted for all patients, based on standard techniques with ultrasound device «ESAOTEMYLAB 7» (Italy) with convex transducer of frequency 3.5 MHz. On gray scale echogram evaluated the frequency of revealing of signs of the most typical for a chronic hepatitis: hepatomegaly, splenomegaly, changes of echogenicity of parenchyma, granulosity, and presence of hyperechoic inclusions and diameter of a portal vein.

Dopplerographyally examined blood-flow in portal vein by standard technique. For elimination of influence of various factors on hemodynamic, Doppler indicators measured on an empty stomach, at breath-holding without an additional inspiration and expiration. The mode of Dopplerography impulse wave for collecting of quantitative characteristics of the blood-flow was used. Base on B-mode (Brightness) data and an evaluation of Doppler curve estimated diameter, average velocity of blood-flow and the form of Doppler spectrum [5].

Data of biochemical studies of blood, quantitative data of ultrasound examination and elastography have been statistically processed. Qualitative ultrasound characters/signs such as echogenicity, granularity and periportal fibrosis were conditionally numbered from 1- 3 by intensity degree.

Patients of third group with verified diagnosis of chronic virus hepatitis had been examined by elastography by “Fibroscan” device for evaluation of presence and stage of fibrosis by METAVIR scale [6].

## Results and Consideration

Based on our research by gray scale ultrasonic examination 35% of patients with a chronic hepatitis had its echographic signs. Echographic signs mentioned in the literature as typical for chronic hepatitis were observed even among young healthy people in two cases (11%). Patients of PWLD group (Patients without Liver Disease), described signs occurred in 30 cases (40%). The prevailing sign was increase of echogenicity of liver parenchyma. 10 % of healthy people had moderate increase of echogenicity. Patients of the second group without chronic hepatitis registered moderate increase of echogenicity in 40 % cases. The granularity sign of liver parenchyma in the H (Healthy) group was not detected. Patients of the PWLD group (Patients without Liver Disease) had moderately expressed granularity of liver parenchyma in 34% cases. Patients with a chronic hepatitis in 88% of cases ultrasound (US) detected granularity of liver parenchyma. 78% of patients had moderately expressed form and 10% had expressed form of granularity.

Nine patients did not have this sign. The sign of hyperechoic inclusions in the first group was not observed. In the PWLD group (Patients without Liver Disease); this sign was defined among 8 patients (11%). In the third group of patients with a chronic hepatitis, this sign was defined among 64 patients (80 %). The sign of periportal fibrosis in the first and second group was not defined. In the group with a chronic hepatitis this sign was defined among 85 % of cases in varying degree of expressiveness.

Based on Dopplerography examination in groups H and PWLD diameter of the portal vein in area of porta of liver was  $1.02 \pm 0.03$  cm. In these groups, slow continuous hepatolienal blood-flow was defined. Average velocity of the blood-flow has made  $19.3 \pm 1.03$ /second.

All patients (24) of the group with a chronic hepatitis with low fibrosis of hepatic tissue of 6.4-7.5 kPa, based on data of flexography diameter of portal veins positively did not change. Considerable increases of velocity of blood-flow in portal vein were defined. Average velocity of blood-flow reached  $25.4 \pm 1.2$ /second. All patients (28) with moderate fibrosis of hepatic tissue based on flexography 7.9-8.7 kPa diameter of portal vein increased, but changes were not authentic.

Flow indicators were not dramatically differed from indicators of the first and second group of patients. Average velocity of blood-flow was up to  $17.1 \pm 1.05$ /second.

In process of increase of severity of fibrosis liver parenchyma, by METAVIR scale up to 11.2-22 kPa (28 patients), various change of velocity of blood-flow in portal vein was observed. Among 19 patients with severe fibrosis, decrease of average velocity of blood-flow in portal vein down to  $8.2 \pm 2.4$ /second was observed. Among nine patients, increase of average velocity of blood-flow up to  $21.3 \pm 2.5$ /second was observed. Among all of 19 patients with heavy fibrosis reduction of wave of spectrum, Doppler curve was observed. Permanent increase of the diameter of portal vein was also observed.

As findings show, echographic signs mentioned in the literature as typical for chronic hepatitis, can take place even in the absence of it as even among young healthy people some cases of change echogenicity were observed. Among patients of PWLD group, described signs were observed in 30 % cases [7].

Prevailing sign of chronic hepatitis was increase of echogenicity liver parenchyma. The most sensitive an echo sing of chronic hepatitis is presence of inclusions, and specific – irregularity of the echo structure. During analysis, it was not revealed significant differences in frequency of displaying of echographic signs among the studied groups of patients with absence of (groups H, PWLD) and presence of chronic hepatitis.

The statistical analysis of frequency of revealing of echographic signs of patients with chronic hepatitis has shown that characteristic ultrasound signs for this disease are presence of inclusions, increases of echogenicity and heterogeneity of echo structure of the liver.

Frequency of increase of liver echogenicity has no statistical valid differences between groups (H, PWLD and PCH).

Among patients with a chronic hepatitis positively often, than at its absence inclusions are revealed, however their frequency does not depend on the stage and activity of pathological process.

Structural irregularity reveal at a chronic hepatitis positively often, than at its absence and statistically significantly differs in groups with various activity of a chronic hepatitis [8].

Thereby, the most sensitive to presence or absence of a chronic hepatitis and its degree and a stage is such echo sign as structural irregularity. Presence and stage of fibrosis authentically do not influence frequency of reveal of each of studied signs, however frequency of absence of echographic liver changes is positively lower among healthy people than and with hepatitis with severe fibrosis.

Findings testify to insufficient diagnostic value of ultrasound examination for revealing of chronic hepatitis, ascertainment of its stage and activity.

Based on data of Dopplerography it is necessary to notice, that this method is more informative in evaluation of early stages and severity of chronic hepatitises. Dopplerography data have more accurately revealed distinction between groups. Increase of blood-

flow in portal vein in a stage of pathological process with minor fibrosis is effective compensatory mechanism during development of chronic inflammatory process. If there is an obstacle to blood-flow (fibrosis of hepatic tissue), an organism finds possibility to provide inflow of a constant volume of blood along portal vein and ensures its detoxication. To the mechanisms providing inflow of constant volume of blood along portal vein, can be related increase in blood-flow at later stages of development of illness that is connected with decrease of the tone of vascular wall. Decrease in linear velocity of the blood-flow of portal vein correlates with development degree of collateral and severity of disease. Linear velocity of the blood-flow of portal vein of patients with severe fibrosis and splenorenal shunting lower than of patients without splenorenal shunting. It is registered that decrease of linear velocity of the blood-flow of portal vein of patients with severe fibrosis, as development of esophageal collaterals [9].

In addition, increase of linear velocity of the blood-flow of portal vein of patients with severe fibrosis with rechanneling umbilical vein was revealed.

Thereby the findings testify that porta-hepatic haemodynamics changes depending on degree of fibrosis process. Changes are characterized

-in the stage of expressed fibrosis by increase of linear velocity of the blood-flow of portal vein

-in the stage of moderated fibrosis by absence of considerable changes of comparative studied group

-in the stage of expressed fibrosis with various changes of velocity of blood-flow, decreasing of waviness of spectrum Doppler curve and positive increase of the diameter of portal vein [10].

## Conclusion

Results of our research have shown that echographic signs mentioned in the literature as typical for chronic hepatitis, can take place even with absence of that even with young healthy people.

Based on our research ultrasound examination of a liver is not sufficient for diagnostics of chronic hepatitis, evaluation of its stage and activity but, owing to its noninvasive, harmlessness and availability, it can be useful for determination of indications for further examination.

Dopplerography examination is informative for differential diagnostics of stages fibrosis of liver that is allow in due time correct treatment tactics.

When revealing echographic liver changes, complex examination, including application of Dopplerography and flexography is necessary.

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