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The Significance of Viral Load in Viral Hepatitis B and D

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Abstract The article presents the indicators of viral load in viral hepatitis B and D. To achieve this goal, an analysis of medical records of 65 patients with viral hepatitis B and D, who were registered at the dispensary, was carried out. Of the patients examined, 45 were with HBV and 20 with HDV infection. The results obtained indicate that there is a relationship between the viral load DNA HBV, RNA HDV and the progression of chronic hepatitis B and D to liver cirrhosis. The risk of developing cirrhosis of the liver increases with an increase in the concentration of the virus in the blood. A high level of HBV DNA and HDV RNA may be a predictor of the progression of CHB and hepatitis D to liver cirrhosis.

Keywords Viral hepatitis B, Viral hepatitis D, Viral load, Chronic hepatitis B, Chronic hepatitis D, Liver cirrhosis

1. Introduction

The widespread prevalence and high incidence of viral hepatitis represent a serious medical and social problem for public health. According to WHO estimates, in 2015 there were 257 million people living with chronic hepatitis B infection worldwide and 887,000 people died from liver cirrhosis (LC) and hepatocellular carcinoma as a result of hepatitis [1].

The main problem of the complexity of detecting liver diseases is associated with the peculiarities of its innervation, which results in the absence of any patient complaints and symptoms of the disease. Particular difficulties, in view of the meager clinical picture, are the determination of the degree of liver damage, namely the nature of morphological changes in the liver [2,3]. The outcome of liver diseases is liver fibrosis and LC with the development of portal hypertension and hepatocellular failure [4,5,6].

In some patients, it is impossible to conduct this study. Low sensitivity (66%) of elastography at the stages of liver fibrosis F0-F1 dictates the need to use other tests to clarify the degree of liver fibrosis [7]. Determination of viral load in chronic hepatitis B in blood serum is extremely important for clinical practice. Certain factors of the virus and the body are associated with an increased risk of developing LC.

The aim of the study was to determine the indicators of viral load in viral hepatitis B and D.

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2. Materials and Methods

The analysis of medical records of 65 patients with viral hepatitis B and D, who were registered at the hepatological center of the Research Institute of Virology, was carried out. The selection of patients was carried out by random sampling. Of the patients examined, 45 were with HBV infection and 20 with HDV infection. The patients were between 35 and 73 years old, 38 men (58.5%), 27 women (41.5%). Detection of HBV DNA in blood plasma and determination of viral load was carried out by PCR using the kits "Ampli-Sens HBV-Monitor-FRT" and "Ampli-Sens HDV-Monitor-FRT" (Russia) with a certified lower detection limit of 15 IU/ml in the Reference Laboratory of the Research Institute of Virology. Statistical analysis of the results was carried out using the Chi-square test.

3. Results of the Study

For our studies, we divided the viral load into low, medium, and high. Conducted a retrospective observation of the indicators of the concentration of HBV in the blood serum. Initial HBV DNA levels were 15 to 10^2 (10 people), $>10^2$-10^5 (14 people), $>10^5$-10^7 HBV IU/ml (11 people).

In patients with a high concentration of the virus in the blood, after a year, LC was noted in 1 (9.1%) of 11 people. After 2 years, LC of HBV etiology was detected in 7.1% of cases in the group with medium viral load and in 9.1% with a high concentration of the virus in the blood. After 3, 4 and 5 years in patients with medium viral load, LC was diagnosed in 14.3%, 21.4%, 28.6% of patients, respectively, while a

high concentration of the virus in the blood was diagnosed in 18.2%, 27.3% and 36.4% and low virus content in 0%, 10%, 20% of cases, respectively. (Fig 1).

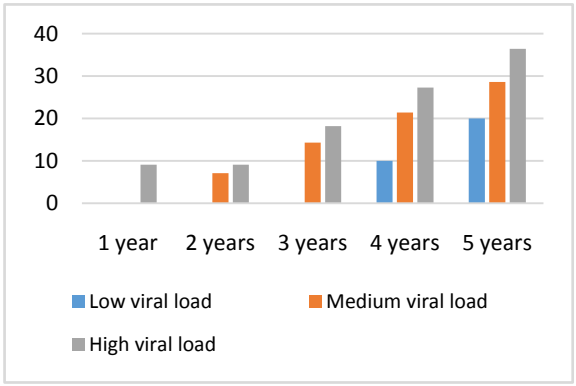

Figure 1. Dependence of the risk of developing LC on viral load

There was an increase of the risk of LC from an increase in the level of HBV DNA in the blood serum and from the duration of the disease, but there was no significant difference in any observation group due to a small sample of patients.

In 20 patients with HDV infection, the viral load increased and LC developed within 2 years in 5 (25%) patients, within 4 years in 2 (10%), and within 5 years in 1 (5%) patients. In 3 cases, the viral load changed from 10^2-10^4 HBV IU/ml, but there was no transition to LC, in 1 (5%) patient within 2 years the viral load reached 10^5-10^6 HBV IU/ml. In 7 (35%) cases, the viral load did not change within 2 years and the liver damage did not increase.

It should be noted that advanced stages of liver fibrosis (with signs of cirrhosis) were characteristic only for patients who had hepatitis D. These patients had moderate and high viral loads (within 10^4-10^7 IU/ml). Only in one case of hepatitis D the level of viral load was low (10^2-10^3 IU/ml), and the activity of the necroinflammatory process was pronounced.

4. Discussion

The main problem of the complexity of detecting liver diseases is associated with the peculiarities of its innervation, which results in the absence of any patient complaints and symptoms of the disease. Disease manifestations can range from a completely asymptomatic clinical picture or mild signs, and to severe clinical manifestations. Recognition of liver pathology presents certain difficulties for specialists due to the meager clinical picture [8,9,10]. The outcome of liver diseases is liver fibrosis and liver cirrhosis with the development of portal hypertension and hepatocellular failure. The introduction of molecular diagnostic methods of research made it possible to obtain more in-depth information about the hepatitis B and D viruses. With the help of PCR, it became possible to determine not only the phase of the biological activity of the virus, but also the viral load of HBV DNA and HDV RNA in blood plasma. Chen C., 2006; Iloeje U., 2006, it was proved that the level of viral load is a predictor of the progression of the pathological process in the liver of patients with chronic hepatitis B [11,12]. In connection with the above, the determination of the viral load in chronic hepatitis B and D in the blood serum is extremely important for clinical practice. We were able to establish a relationship between the level of HBV DNA and the progression of chronic hepatitis B and D in the LC.

The result of our studies coincided with a population study conducted in Taiwan, lasting 11 years, which found that the cumulative incidence of LC increased with an increase in the level of HBV DNA in the blood serum and ranged from 4.5% in patients with HBV DNA level <300 copies/ml to 36.2% - in patients with a DNA level >10^6 copies/ml. Moreover, the risk of developing LC did not depend on HBsAg and ALT levels [12].

5. Conclusions

1. These results indicate that there is a relationship between the viral load of DNA HBV, RNA HDV and the progression of chronic hepatitis B and D to liver cirrhosis.
2. The risk of developing cirrhosis of the liver increases with an increase in the concentration of the virus in the blood.
3. A high level of HBV DNA and HDV RNA may be a predictor of the progression of chronic hepatitis B and hepatitis D to LC.

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