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COMPARATIVE DESCRIPTION OF CYTOPENIC SYNDROME IN VIRUS ETIOLOGY LIVER CIRRHOSIS

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Abstract: General Background: Liver cirrhosis is a severe complication of chronic viral hepatitis, significantly impacting hematological parameters and leading to cytopenic syndromes. **Specific Background:** While both Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) are known to cause liver cirrhosis, the comparative hematological features associated with these viral etiologies remain inadequately explored. **Knowledge Gap:** Current literature lacks comprehensive analysis on the differences in cytopenic manifestations in patients with liver cirrhosis of HBV versus HCV origin. **Aims:** This study aims to evaluate and compare the cytopenic syndromes present in patients with liver cirrhosis attributed to HBV and HCV, with a focus on blood parameters, coagulation factors, and protein fractions. **Results:** The analysis included 50 patients diagnosed with viral etiology liver cirrhosis. Findings revealed significant decreases in blood platelets, blood coagulation factors, and protein fractions, alongside the presence of hemorrhagic syndromes of various origins. **Novelty:** This study provides a comparative perspective on the hematological implications of liver cirrhosis due to HBV and HCV, highlighting specific deficiencies in blood components linked to each viral etiology. **Implications:** Understanding the distinct cytopenic features in liver cirrhosis patients with HBV and HCV may guide more tailored clinical management strategies and improve patient outcomes by addressing the unique hematological challenges associated with each viral infection

Keywords: Cytopenic Syndrome, Anemia, Leukopenia, Thrombocytopenia, Liver Cirrhosis Of HBV, HCV Etiology

Introduction

Moderate level of cytopenia develops in patients who are in the decompensation stage of liver cirrhosis of viral etiology. Anemia, leukopenia, and thrombocytopenia are more common in virus undetected liver cirrhosis than in liver cirrhosis of viral etiology [2, 3].

Changes in hematopoiesis, such as a decrease in the number of hematopoietic cells due to various reasons, are observed in many diseases, including liver diseases [15, 19]. According to the literature, viral hepatitis is initially diagnosed in hematology centers in 4.5% of patients, and patients are treated on suspicion of various hematological diseases [1, 5, 10, 27]. Patients seeking medical help initially have symptoms of anemia, thrombocytopenia, other changes in the composition of peripheral blood, bleeding, and only after a comprehensive examination, they are diagnosed with chronic hepatitis or liver cirrhosis [7, 18, 39].

The problem of chronic liver diseases is currently attracting the attention of researchers [33, 38]. This is related to the wide spread of the pathology, severe, progressive course, insufficient efficiency of diagnosis, treatment, and prevention methods, and often unfavorable prognosis for the

patient [4, 6, 9].

The main mechanism of the development of splenic cirrhosis with cytopenic syndrome is recognized as the extensive destruction of peripheral blood cells in the spleen [8, 11, 30]. Due to the unique structure of blood vessels and the characteristic distribution of muscular elements in the walls of splenic vessels, the spleen is capable of accommodating 16-20% of peripheral blood. Hypersplenism often manifests as a decrease in peripheral blood cells due to the destruction of 2 or 3 cell lines in the spleen [13, 14, 41, 42].

Thrombocytopenia is defined as a decrease in the number of platelets to less than 150 × 10^9/L and can occur in both chronic and acute liver failure [12, 20, 28]. In patients with liver cirrhosis, the primary cause of thrombocytopenia is hypersplenism, which is characterized by increased sequestration of platelets in the spleen [26, 34]. Additionally, factors such as systemic intoxication, impaired platelet synthesis due to folic acid deficiency, decreased production of thrombopoietin in the liver, disseminated intravascular coagulation syndrome in liver disease, and the production of autoantibodies can be major causes of thrombocytopenia [21, 37]. In patients with decompensated liver cirrhosis, 90% of platelets are sequestered in the spleen [16, 25].

Platelets not only participate in blood coagulation but also produce many growth factors necessary for organ development and tissue repair. At the same time, they reduce the activity of hepatic stellate cells, which produce collagen and contribute to liver fibrosis. The regenerative effects of platelets are directly exerted on hepatocytes, liver sinusoidal endothelial cells, and Kupffer cells. This plays a crucial role in liver damage repair and is utilized in antifibrotic therapy [17, 24, 31]. Another study found that platelet transfusion improves liver function in patients with liver cirrhosis [28, 31]. However, in recent years, the treatment of hemostatic disorders has reduced the transfusion of blood components, which helps to prevent complications of hemocomponent therapy and the risk of transfusion-transmissible infections [35, 36, 40].

In liver diseases, endothelial dysfunction develops as a cause of many pathological processes [23, 29]. Endothelial dysfunction disrupts the balance between the production of vasodilatory, angioprotective, prothrombotic, and proliferative factors [22, 32]. Disruption of the functional state of the endothelium leads to an enhancement of cytolytic processes in the liver.

Purpose of the study: To evaluate the comparative characteristics of cytopenic syndrome in patients with viral etiology liver cirrhosis.

Methods

Between 2020 and 2022, 50 patients with viral etiology liver cirrhosis were examined, including 29 (44.6%) women and 21 (32.32%) men. The average age of the patients was 42.5 ± 3.05 years.

Group 1 consisted of 18 patients with HBV etiology liver cirrhosis; Group 2 included 17 patients with HCV etiology liver cirrhosis; and Group 3 comprised 15 patients with liver cirrhosis of unknown etiology. The control group consisted of 15 healthy individuals with no hepatitis B or C markers and no liver pathology.

The diagnosis of liver cirrhosis was based on the diagnostic criteria according to the Child-Pugh classification. A general blood test was performed using the Midray BC 5000 hematology analyzer with Human reagents. Additionally, a set of biochemical tests (ALT, AST, bilirubin, total protein) was included. To assess the state of the hemostatic vascular-platelet system, platelet count, platelet morphology in the general blood test, and platelet adhesion and aggregation, as well as retraction time, were measured.

The diagnosis of HCV and HBV hepatitis viruses was performed using enzyme-linked immunosorbent assay (ELISA) and polymerase chain reaction (PCR) methods. All patients underwent ultrasound examination of the liver and spleen, as well as computed tomography.

Results and Discussion

Research Results: Patients complained of bleeding from the gums, nosebleeds, menorrhagia, gastrointestinal bleeding from varicose veins, bruising on the skin, weakness, increased irritability, decreased work capacity, headaches, dizziness, and a feeling of heaviness in the epigastric region and under the right rib. The medical history indicated viral hepatitis, blood transfusions, parenteral therapy, and dental treatment.

Table1 Complaints of Patients with Liver Cirrhosis

Complaints	Groups		
	1-group (n=18)	2-group (n=17)	3-group (n=15)
Weakness	17 (94,4%)	14 (82,3%)	12 (80%)
Fatigue quickly	17 (94,4%)	14 (82,3%)	12 (80%)
Headache	15 (83,3%)	10 (58,8%)	7 (46,7%)
Dizziness	15 (83,3%)	10 (58,8%)	6 (40%)
Heart palpitations	12 (66,7%)	10 (58,8%)	6 (40%)
Shortness of breath	10 (55,6%)	6 (35,3%)	5 (33,3%)
Decreased vision	10 (55,6%)	6 (35,3%)	5 (33,3%)
Hair loss	15 (83,3%)	12 (70,6%)	10 (66,7%)
Bruises on the body	8 (83,3%)	5 (29,4%)	3 (20%)
Bleeding from the nose	7 (38,9%)	5 (29,4%)	4 (26,7%)
Bleeding from the nipples	5 (27,8%)	2 (11,8%)	-
Bleeding from esophageal varices	4 (22,2%)	2 (11,8%)	1 (6,7%)
Frequent sore throat	8 (83,3%)	5 (29,4%)	5 (33,3%)

From Table 1, it is evident that the examined patients exhibited characteristic symptoms associated with liver cell insufficiency, anemia, hemorrhagic syndrome, immune deficiency, and portal hypertension. These clinical signs were more pronounced in cases of liver cirrhosis with HBV etiology. In contrast, in the 15 patients suffering from liver cirrhosis of unknown hepatitis virus etiology, the clinical signs were considerably milder compared to those with viral etiology of liver cirrhosis**.**

A general blood test showed that patients of all groups had a tendency to cytopenia (Table 2). Thus, the number of red blood cells in patients with liver cirrhosis in group 1 was 2.75 ± 0.3 x1012/l**, in group 2 it was 2.89 ± 0.2 x1012/l*, in group 3 and it was 3.32 ± 0.3 x1012/l. In conclusion, it can be said that the severity of anemia in patients with liver cirrhosis of viral etiology is greater than in patients with liver cirrhosis without a virus. At the same time, anemia was more pronounced in liver cirrhosis caused by HBV than in cirrhosis caused by HCV.

Table 2 Cytopenic parameters in patients with liver cirrhosis

Groups	Erythrocytes x10^{12}/l	Leukocytes x10^{9}/l	Platelets x10^{9}/l
Control group (n=15)	4,05 ± 0,4	5,9 ± 1,6	222 ± 45
1-group (n=18)	2,75 ± 0,3**	3,0 ± 0,5***	106 ± 12***
2-group (n=17)	2,89 ± 0,2*	3,72 ± 0.8**	144 ± 14**
3-group (n=15)	3,32 ± 0,3	4,2 ± 1,2	168 ± 18*

Note, * p < 0.05, **p < 0.01, ***p < 0.001, compared to the control group.

Studies have shown that no changes in the number of leukocytes were detected in patients in the control group. The number of leukocytes in group 1 was 3.0 ± 0.5***, in group 2 the number of leukocytes was 3.72 ± 0.8** x109/l, and in group 3 it was 4.2 ± 1.2 x109 /l was determined to be.

In patients with liver cirrhosis of HBV etiology (group 1), the average number of platelets in the blood analysis was 106 ± 12 x109/l ***, while in patients with liver cirrhosis of HCV etiology (group 2) it was 144 Decreased to ± 14 x109/l**. In 3 groups, the average number of platelets in patients with liver cirrhosis of unknown etiology was 168 ± 18*.

Discussion. Cytopenia syndrome is characterized by a decrease in the number of hematopoietic cells, and is conditionally described as a one, two, or three-stage depression of hematopoiesis resulting from the reduction in erythrocytes, leukocytes, and platelets in the bone marrow. Disorders of hemostasis in chronic diffuse liver diseases have been recognized and described for over a century [4, 8].

Comparing the general blood test characteristics in patients with liver cirrhosis of various etiologies shows that cytopenic syndrome is present, manifested by erythrocytopenia, leukopenia, and thrombocytopenia. In patients with virus-induced liver cirrhosis, the severity of cytopenia is greater compared to those with cirrhosis of unknown viral etiology. It is important to note that in patients with HBV (Hepatitis B virus) induced liver cirrhosis, these hematodepressive changes are more pronounced.

The obtained results indicate the necessity of studying the blood status and conducting a general blood test in patients with liver cirrhosis.

Conclusion

1. Cytopenic syndrome, manifested by erythrocytopenia, leukopenia, and thrombocytopenia, was identified in patients with liver cirrhosis of various etiologies.
2. The severity of cytopenia in patients with virus-induced liver cirrhosis is greater compared to those with liver cirrhosis of unknown viral etiology.
3. In patients with HBV (Hepatitis B virus) induced liver cirrhosis, hematodepressive changes are more pronounced compared to those with HCV (Hepatitis C virus) induced liver cirrhosis.

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