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*Changes in the constituents of blood cells among patients
with alcoholic cirrhosis*

Zmiany elementów morfotycznych u pacjentów z alkoholową marskością wątroby

INTRODUCTION

Chronic alcoholism and hepatitis B and C are the most common causes of cirrhosis, which is a consequence of chronic liver disease characterized by replacement of liver tissue by fibrosis, scar tissue and regenerative nodules that occur as a result of a process in which damaged tissue is regenerated, leading to loss of liver function. Ascites (fluid retention in the abdominal cavity) is the most common complication of cirrhosis and is associated with poor quality of life, increased risk of infection, and a poor long-term outcome. Other potentially life-threatening complications are hepatic encephalopathy, leading to confusion and coma, and bleeding from esophageal varices. The severity of cirrhosis is commonly classified with the Child-Pugh score, which assesses serum concentration of bilirubin and albumin, INR, ascites and hepatic encephalopathy. It is now used to determine the prognosis, as well as the required strength of treatment and the necessity of liver transplantation. In the course of cirrhosis the typical findings are changes in the constituents of blood cells: red blood cells, leucocytes and platelets.

The aim of the study was to assess separate constituents of blood cells in the patients with liver alcoholic cirrhosis.

MATERIAL AND METHODS

One hundred and fifty-two patients with alcoholic cirrhosis, who were hospitalized in the Internal Medicine Department of the Medical University of Lublin from January 2004 to March 2010, were qualified for the research. Diagnosis of liver cirrhosis was based on physical examination, laboratory investigations and ultrasonography of abdominal cavity. For the determination of the prognosis, Child-Pugh classification was used.

In all patients a complete blood count (WBC- *White Blood Cells*, RBC- *Red Blood Cells*, and PLT- *platelets*) was performed and other parameters were assessed, such as ascites, encephalopathy,

jaundice, esophageal varices, alcohol abuse, HBs antigen and HCV antibody bilirubin and albumin levels, prothrombin time, natrium, creatinine, alanine transaminase, aspartate transaminase and gamma-glutamyltransferase levels.

The patients were divided into 3 groups according to the Child–Pugh score. In the analyzed group, there were 22 persons in class A at the average age 61.4 (± 17.1) years, 56 in class B at the average age 57.5 (± 11.5) years and 74 in class C at the average age 54.9 (± 12.2) years.

The statistical differences between the examined parameters were assessed with the use of the Kruskal-Wallis, Lilliefors and Shapiro-Wilk tests. The level of statistical significance was assumed at $p < 0.05$.

RESULTS

In the examined group, persons in class A obtained the following results: average number of white blood cells was 8.8 (± 5.2) K/uL, average number of red blood cells was 4.2 (± 2.3) M/uL, average number of platelets was 158.9 (± 104.0) K/uL. Hemoglobin level was 10.7(± 2.5) g/dl.

Among patients in group B the following results were obtained: WBC – 7.6 (± 4.4) K/uL, RBC – 3.2 (± 0.8) M/uL, PLT - 157.8 (± 80.6) K/uL, Hb – 10.1 (± 2.8) g/dl. The analysis of persons in class C revealed results mentioned below: WBC – 10.7 (± 6.2) K/uL, RBC – 2.3 (± 0.7) M/uL, PLT - 121.2 (± 77.0) K/uL, Hb – 9.5 (± 3.3) g/dl.

An analysis of the influence of severity of cirrhosis on WBC levels was performed. It was proved that the number of leucocytes in groups A and B was statistically lower ($H=13.319$; $p=0.001$) than in group C. Relations between analysed groups are shown in figure 1. The influence of severity of cirrhosis on the amount of RBC was also analysed. Research showed that erythrocyte levels in group A were statistically higher ($H=10.457$; $p=0.005$) than in group C. Relations between the analysed classes of the Child-Pugh score are shown in figure 2.

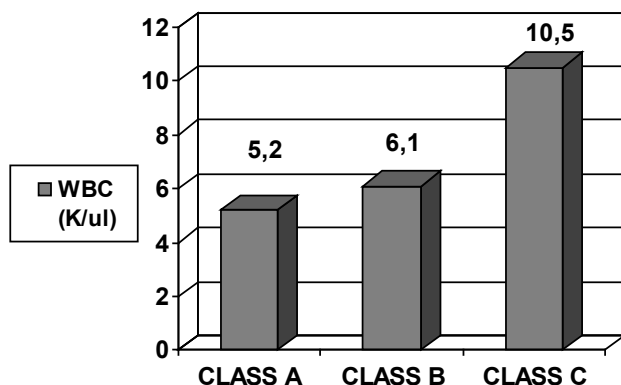


Fig. 1. The influence of severity of cirrhosis on WBC levels in group of patients with liver cirrhosis according to Child–Pugh score (A, B, and C)

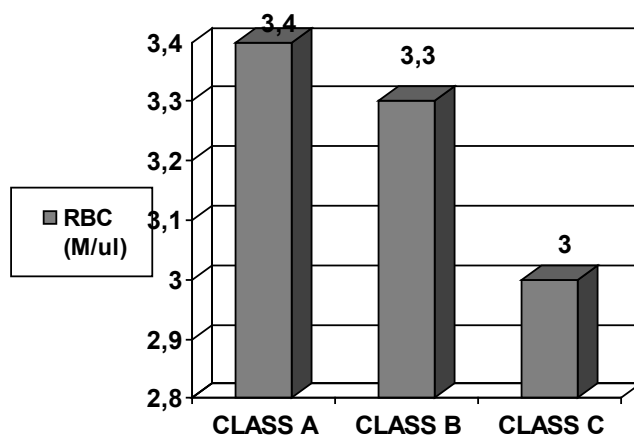


Fig. 2. The influence of severity of cirrhosis on RBC levels in group of patients with liver cirrhosis according to Child–Pugh score (A, B, and C)

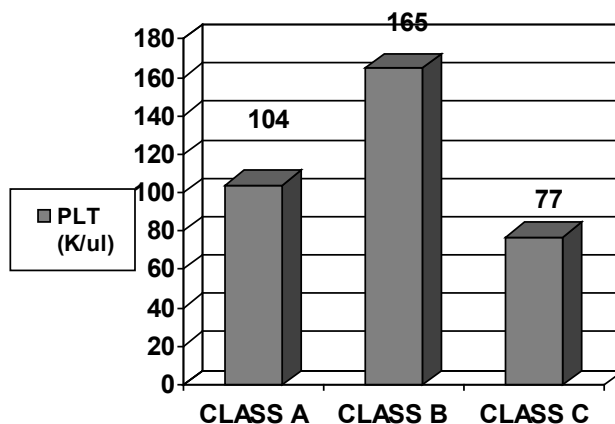


Fig. 3. The influence of severity of cirrhosis on PLT levels in group of patients with liver cirrhosis according to Child–Pugh score (A, B, and C)

Moreover, an analysis of the influence of severity of cirrhosis on the amount of platelet was performed. On the basis of the statistical analysis, it was proved that the amount of platelets was significantly higher ($H=13.087$; $p=0.001$) in group B than in patients belonging the group C. Figure 3 shows the relations between the analysed groups. The level of mean corpuscular volume (MCV) was increased in all patients who were admitted to the study ($MCV>90$ fL). There was no statistically significant difference in hemoglobin concentration between all patients ($H=3.405$, $p=0.182$).

DISCUSSION

In advanced alcoholic liver disease, abnormalities of laboratory tests are more common. Anemia and leukopenia are frequent manifestations of chronic liver diseases, particularly, liver cirrhosis [3]. Approximately 40 to 70% of the patients with liver cirrhosis are found to have anemia. It can be caused by acute and/or chronic bleeding from the upper gastrointestinal tract and hemorrhoid, but it is often observed despite no obvious bleeding. As the developing mechanism anemia in such patients, folate deficiency [5], hypersplenism [7] and hemolysis such as spur cell anemia have been described [9]. Sera of liver cirrhosis patients with anemia suppressed *in vitro* colony formation of normal marrow CFU-E (erythroid colony-forming units) and BFU-E (burst-forming units-erythroid), and the degree of suppression was correlated with severity of anemia [8]. The appearance of humoral inhibitors of hematopoietic progenitors plays a role in the development of anemia and granulocytopenia in liver cirrhosis. The neutropenia in the course of liver cirrhosis would appear to be a function of portal hypertension and splenomegaly since neutropenia of this order was present in seventeen out of twenty-one patients with extrahepatic portal hypertension. Our study showed that erythrocyte levels in group A were statistically higher ($H=10.457$; $p=0.005$) than in group C according to Child–Pugh score. The level of WBC was the highest in group C, because of inflammation, which occurs very often in this group of the patients with liver cirrhosis. The peripheral blood changes associated with cirrhosis and splenomegaly were first described by Banti in 1894 [2]. In 1929 King [4] found that in 20% of cirrhotic patients the platelet count was decreased although in only two out of fifteen patients were the bleeding and clotting times prolonged. Morlock & Hall in a survey of eighty consecutive patients with cirrhosis found that 17.5% have platelet count less than $100,000/\text{mm}^3$ [6]. The mechanism of thrombocytopenia associated with hypersplenism was studied by Aster using ^{51}Cr -labelled platelets [1]. The thrombocytopenia of hypersplenism may be due to trapping of platelets within a splenic pool without any change in the total platelet mass, life span or production rate of the platelets. In our work the level of platelets was the lowest in group C according to Child–Pugh score and was associated with severity of cirrhosis.

CONCLUSIONS

The severity of cirrhosis leads to the diminution of red blood cells and platelets in a complete blood count. The amount of white blood cells increases with the damage level of cirrhosis.

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SUMMARY

Chronic alcoholism and hepatitis are the most common causes of cirrhosis. The severity of cirrhosis is commonly classified with the Child-Pugh score. In the course of the disease the typical findings are changes in the constituents of blood cells. The aim of the study was to assess separate constituents of blood cells among patients with cirrhosis. 152 patients with alcoholic cirrhosis, who were hospitalized in the internal medicine ward, were qualified for the research. The patients were divided into 3 groups according to the Child-Pugh score. In the analyzed group, there were 22 persons in class A, 56 in class B and 74 in class C. In all patients a complete blood count was performed. The amount of white blood cells in classes A and B of the Child-Pugh score was significantly lower than in patients belonging to class C. The amount of red blood cells was statistically higher in group A than in group C. On the basis of the statistical analysis, it was proved that the amount of platelets was significantly higher in group B than in patients belonging to group C. There was no statistically significant difference in hemoglobin concentration between all patients. The severity of cirrhosis leads to the diminution of red blood cells and platelets in a complete blood count. The amount of white blood cells increases with the damage level of cirrhosis.

Key words: blood cells, liver cirrhosis

STRESZCZENIE

Do najważniejszych przyczyn marskości wątroby należą przewlekły alkoholizm i wirusowe zapalenie wątroby. Do oceny nasilenia zmian marskich w wątrobie służy klasyfikacja wg Childa-Pugha. W przebiegu marskości wątroby dochodzi do pojawienia się zmian w obrazie morfologicznym krwi obwodowej. Celem pracy była ocena poszczególnych elementów morfotycznych krwi obwodowej u pacjentów z marskością wątroby. Do badania zakwalifikowano 152 pacjentów z poalkoholową chorobą wątroby. Pacjentów podzielono na trzy podgrupy wg klasyfikacji Childa-Pugha. Pacjentów z marskością wątroby w stadium A było 22, w stadium B – 56, natomiast w stadium C – 74. U wszystkich pacjentów wykonano badanie morfologii krwi obwodowej. Liczba leukocytów w podgrupie pacjentów A i B wg Ch-P była istotnie niższa w porównaniu do podgrupy C. Natomiast liczba czerwonych krwinek krwi była statystycznie wyższa w grupie A w stosunku do podgrupy C. Na podstawie analizy statystycznej wykazano, że ilość płytek krwi jest istotnie wyższa w podgrupie

B w porównaniu do podgrupy C. Nie stwierdzono istotnych różnic pomiędzy podgrupami w zakresie stężenia hemoglobiny. Nasilenie zmian marskich wątroby prowadzi do zmniejszenia liczby krwinek czerwonych i płytek krwi w surowicy krwi. Natomiast liczba leukocytów wzrasta ze stopniem zaawansowania marskości wątroby.

Słowa kluczowe: krwinki czerwone, marskość wątroby