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# PLATELET-RICH PLASMA AS A CHANCE OF RECOVERY FOR LIVER CIRRHOSIS PATIENT

**O. L. Appelhans, M. M. Perepeliuk, O. I. Romak, L. A. Polukarova**

**Odessa National Medical University, Odessa, Ukraine**

## Abstract

The search for pathogenetic methods for treating cirrhosis of the liver continues. One of the promising areas of regenerative medicine is the use of platelet-rich plasma (PRP). Due to numerous publications on the efficacy of PRP in conditions of abnormal liver damage in the experiment, the work is devoted to the study of the possibility of manufacturing PRP from the blood of patients with liver cirrhosis (LC) for the purpose of proposals for further clinical use.

The study included 12 men suffering from CP-class B-C (average grade by Child-Pugh classification - 8.8) at the age of 45 ± 2.2 years. The comparison group consisted of 5 healthy men at the age of 44 ± 1.8 years. All men measured blood platelets in accordance with the usual method.

The manufacture of PRP was carried out according to the scheme, which includes the collection of blood from the elbow vein in a 9 ml syringe-flask, which contains an anticoagulant. The collected blood in the same test tube is centrifuged in two stages: on the first - within 12` at a speed of 4000 rpm. Then the formed plasma, namely, from the supernatant layer, is recruited into another tube without an anticoagulant and treated in a

centrifuge for 15` at a speed of 3600 rpm. After the removal of poor plasma platelets, the final product - a PRP aggregate in the volume of 0.3 ml - is obtained, which is used for the next determination of platelet count using an automated hemo-analyzer.

In patients with LC, both thrombocytopenia and thrombocytosis were observed. In the PRP, the increase in the total platelet count was 2.2-2.4 times, both in baseline thrombocytopenia and in baseline thrombocytosis, due to the absence of the mean platelet count and the platelet distribution width.

In the control group male, the average increase in the number of platelets was 3.37 times, in the absence of significant changes in the mean platelet count and platelet distribution width.

The fact is that the use of autologous PRP in patients with LC is likely to be ineffective. In the presence of initial thrombocytopenia - there is no possibility to reach a "critical" quantity of 1 million G/L, which is necessary for the implementation of regenerative potential of PRP. Concomitant presence of morpho-functional defects of these platelets practically makes it impossible for such a method of protection/regeneration of liver parenchyma in patients with lC.

In patients with LC there is a moderate increase in the concentration of platelets in the manufacture of PRP by standard method; therefore, it is necessary to find new methods for obtaining PRP for autologous use.

**Key words: liver cirrhosis; platelet-rich plasma; method; autologous use.**

**Introduction.** A patient with liver cirrhosis (LC) at stage B-C according to Child-Pugh has a poor prognosis for life and for recovery. As a rule, the life expectancy of these patients is limited to several years of severe dying [1]. Hepatoprotectors, aldosterone antagonists, sclerosis of the esophageal varicose veins do not significantly affect the prognosis [1]. Hope gives the opportunity to eradicate the leading etiological factor of cirrhosis in some patients (for example, the use of modern antiviral drugs in patients with active infectious viral hepatitis C) [2-3]. Suppression of pathological effects slows the progression of the central nervous system, and, in some cases, initiates a reverse process - that is, activates the natural regeneration of the organ, or, rather, stops it slow down.

One effective way to protect/regenerate the liver parenchyma is to use autologous platelet-rich plasma (PRP). Previously, several times [4], including us [5-6], demonstrated a regenerative potential in the application of PRP in pathological conditions. The main

limitations for the introduction of this method in the clinic are, in our opinion, thrombocytopenia and/or thrombocytopathy in LC patients [7].

**The aim of our study** was to evaluate the content and morphology of platelets in patients with LC by the results of automated general blood analysis before and after enrichment by twofold centrifugation in different modes [8].

**MATERIALS AND METHODS**

The study included 12 men with LC graded B-C (average grade according to Child-Pugh classification - 8.8) aged 45±2.2 years. The comparison group consisted of 5 healthy men aged 44±1.8 years. All men had their blood platelets measured according to conventional methods [9].

The PRP preparation was performed according to the scheme which includes blood sampling from the elbow vein with a syringe flask with a volume of 9 ml, which contains an anticoagulant. The selected blood in the same tube is centrifuged in two stages: the first - for 12 minutes at a speed of 4000 rpm. Then the resulting plasma, namely, from the supernatant, is taken into another tube without anticoagulant and treated in a centrifuge for 15 minutes at a speed of 3600 rpm. Removal of platelet-poor plasma in the supernatant gives the final product, platelet-enriched plasma in a volume of 0.3 ml [8], which is then used to subsequently determine platelet counts using an automated hemolayer.

**RESULTS**

The total number of platelets in the native blood between the two groups did not differ significantly amounting to 286±115,2 G/l for the experimental group vs 270±31,6 for the control. In this case thrombocytopenia (56-112 G/d) and thrombocytosis (608-723 G/l) registered in LC patients.

In the control group, the range of absolute platelet counts ranged from 162-345 G/l. Thrombocytosis in patients with LC was due to concomitant hepatocellular carcinoma (1 case) and the presence of such complications as spontaneous bacterial ascites-peritonitis (2 cases). According to the mean platelet volume (8.1±1.14% in the main group vs 8.5±0.96 in the control group) and platelet distribution width (13.7±1.46% in the main group vs 16.2±0,39 - in the control) no differences were determinated.

In PRP the increase in the total number of platelets was 2.2-2.4 times both at baseline thrombocytopenia and at baseline thrombocytosis due to lack of dynamics of average platelet volume and width of platelet distribution.

In men in the control group, the average increase in platelet count was 3.37 times, which absolutely was equal to 910±48.4 G/l in the absence of significant dynamics of the average platelet volume and the width of the distribution of platelets.

The main conclusion of our work is an understanding of the fact that the use of autologous CRP in patients with CP is likely to be ineffective. In the presence of baseline thrombocytopenia, it is not possible to achieve a "critical" amount of 1 million G/l which is necessary for the realization of the PRP regenerative potential [10]. The concomitant presence of morphofunctional defects in these platelets virtually prevents this method of protection/regeneration of liver parenchyma in patients with LC.

A less pessimistic view of platelet deficits in patients with LC has the authors [11-19], who having verified a number of morphofunctional defects nevertheless believe that platelets increase (we can assume - by improving the liver under the influence of etiopathogenesis or by the use of thrombopoetin) nullifies not expressed morphofunctional deficiency of a single platelet.

PRP administration in case of the initial thrombocytosis will only "trigger" the decompensation of the patient with concomitant hepatocellular carcinoma and/or spontaneous bacterial ascites-peritonitis, primarily by activating the mechanisms of disseminated intravascular coagulation.

## CONCLUSIONS

According to our data we believe PRP use in LC patients is possible in the following conditions:

1) In the absence of such serious complications as hepatocellular carcinoma and spontaneous bacterial ascites-peritonitis;

2) After preliminary thrombocytopenia correction by recombinant thrombopoetin;

3) In case if donor thromboconcentrate use.

Therefore, the question of PRP use in LC patients remains questionable and requires careful pre-clinical studies.

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