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## **SURGICAL TREATMENT OF COMPLICATIONS OF PORTAL HYPERTENSION IN PATIENTS WITH LIVER CIRRHOSIS**

**Petiunin Oleksii,**

Ph.D., Associate Professor

Kharkiv National Medical University,

Kharkiv Institute Of Medicine And Biomedical Sciences

[apetyunin72@ukr.net](mailto:apetyunin72@ukr.net)

**Sypliviy Vasil**

Doctor of Medicine, Professor

Kharkiv National Medical University,

[sypliviy@ukr.net](mailto:sypliviy@ukr.net)

**Background.** Liver cirrhosis (LC) is a chronic polyetiological progressive disease that occurs with damage to the parenchymal and interstitial parts of the organ with necrosis and dystrophy of hepatocytes, nodular regeneration and diffuse growth of connective tissue, and disruption of the architecture of the organ [1, 2]. A significant part of patients with LC seek medical help in the decompensation stage, when complications of portal hypertension (PH) ((bleeding from esophageal and gastric varices (BEGV), ascites, splenomegaly with hypersplenism syndrome)) already develop. The leading method of treatment of these LC complications is surgical [3]. At present, there are more than 300 operative methods of treatment of LC, which, for the most part, are aimed at correcting the PH syndrome and its complications, as well as the effect on the cirrhotic liver, however, this problem is still relevant today [1-4].

**The purpose** of this study is to define the efficacy and clinical consequences of distal splenorenal shunt by Warren (DSRS), extraperitonization of the right hepatic lobe with intraoperative laser irradiation (ERHL,LI), ligation of the left gastric artery and vein, splenic artery (LLGAV,SA) in liver cirrhotic patients with complications of PH.

**Methods and results.** The work was performed on the basis of examination and treatment of 121 patients with LC. DSRS was performed in 81 patients, ERHL,LI – in 22 patients, LLGAV,SA – in 18 patients with LC. By gender, the patients were distributed as follows: 90 (74.4%) males and 31 (25.6%) females. The age of the patients ranged from 9 to 66 years. The average age of the patients was 42.5 years.

In 52 (43.0%) patients, a viral etiology of LC was established, in 51 (42.1%) patients - alcoholic, in 5 (4.2%) patients LC occurred after malaria, in 4 (3, 3%) patients as a result of long-term contact with hepatotropic poisons, in 9 (7.4%) patients it wasn't possible to identify the etiological factor of the disease.

The diagnosis of LC in 17 (14.1%) patients was established for the first time after bleeding from the gastrointestinal tract, in 47 (38.8%) - after the development of ascites, in the remaining 57 (47.1%) patients - after the detection of splenomegaly on the background of dyspeptic disorders, weight loss, jaundice.

Indications for DSRS surgery in patients with LC were various manifestations of PH: BEGV, ascites, hypersplenism syndrome. Indications for ERHL, LI in patients with LC were the presence of PH symptoms and ascites. The indication for LLGAV, SA was II-III degree of gastroesophageal varices in combination with splenomegaly and hypersplenism.

Clinical and laboratory, biochemical, and instrumental methods of examination were used for patients upon admission to the hospital and in the postoperative period. The general clinical examination of the patients included a general blood count, differential blood count, general urinalysis, urine analysis according to Zimnytskyi, determination of blood group, Rhesus factor, electrocardiography, respiratory function tests. In addition, the daily diuresis, the amount of liquid taken, and the abdominal circumference were measured. The functional liver tests, which characterize protein, pigment, and carbohydrate metabolism, were studied. The activity of secretory, indicator and excretory enzymes, blood coagulation factors, urea, blood creatinine was determined.

Fiberoesophagogastroduodenoscopy was performed to examine the upper parts of the gastrointestinal tract for the detection of esophageal varices. At the same time, the degree of gastroesophageal varices was assessed by the diameter of the vessel during endoscopy according to the classification of A.G. Scherzinger [5].

For the study of hepatic blood flow, the rheohepatography method was used according to the V.I. Polishchuk [6]. During the analysis of rheohepatograms, along with the shape of the curve, quantitative characteristics were assessed: systolic rheographic index (SRI), systolic-diastolic index (SDI), the ratio of inflow time ( $\alpha$ ) to the duration of the descending part of the curve ( $\beta$ ), relative volumetric pulse (RVP), fast filling time (FFT), maximum fast filling speed (MFFS), slow filling time (SFT), average slow filling speed (ASFS).

To assess the state of vessels and organs of the hepatobiliary system, along with ultrasonography of abdominal organs, portal blood flow was determined by ultrasound doppler flowmetry of the portal and splenic veins. The linear portal vein blood velocity (LPVVBV), linear splenic vein blood velocity (LSVVBV), portal vein volumic blood flow (PVVBF), splenic vein volumic blood flow (SVVBF), and the portal congestion index (PCI) were determined according to the method of Moriyasu et al. [7].

Statistical analysis of the material was done using parametric and non-parametric criteria (Student, Pearson - Chi-square), multivariate correlation - regression analysis on a personal computer using Microsoft Excel 2000 and SPSS 10.0 for Windows.

The functional state of the liver in the early postoperative period was studied in 99 (81.8%) patients with LC. In the postoperative period, complications occurred in 58 (47.9%) patients with cirrhosis. The most frequent complication was acute-on-chronic liver failure (ACLF), which was observed in 41 (33.9%) patients, in 8 (6.7%)

of which hepatorenal failure developed. The combination of ACLF with thrombosis of DSRS was observed in 3 (2.5%) patients, with thrombosis of the veins of the portal system in 2 (1.65%), with intra-abdominal bleeding in 3 (2.5%), with spontaneous bacterial peritonitis in 3 (2.5%), with acute gastric ulcers in 4 (3.3%), with eventeration in 3 (2.5%), with pneumonia in 15 (12.4%) patients. The development of ascites was observed in 10 (8.3%) patients, in 3 (2.5%) patients spontaneous bacterial peritonitis developed, a hematoma in the area of the splenorenal shunt was diagnosed in 4 (3.3%), a hematoma of a postoperative wound - in 6 (4.9%), eventeration - in 3 (2.5%), acute fibrinolysis - in 3 (2.5%), pneumonia - in 24 (19.8%); postoperative pancreatitis - in 3 (2.5%) patients after DSRS. The most frequent cause of death was ACLF, which in 14 (11.6%) patients caused death in the early postoperative period. Spontaneous bacterial peritonitis was detected in 3 (2.5%) patients, and thrombosis of the splenorenal shunt was detected in 2 (1.7%). In 3 (2.5%) patients, the cause of death was a recurrence of bleeding from gastroesophageal varices due to thrombosis of the splenorenal shunt, in 3 (2.5%) - bleeding from acute gastric ulcers, in 1 (0.8%) - acute fibrinolysis, 1 (0.8%) - brain stroke.

The lowest number of postoperative complications and the lowest mortality was observed after ERHL,LI - complications occurred in 2 (9.1%) patients, 1 (4.5%) of them died. Complications occurred in 2 (11.1%) patients after LLGAV,SA, both of them died. The largest number of postoperative complications and the highest mortality rate were noted in patients who underwent DSRS surgery - complications occurred in 54 (66.7%) patients, 19 (23.4%) of them died.

To determine liver dysfunction, functional liver tests in the early postoperative period we analyzed. The study of the proteinogram of patients with LC in the early days after DSRS showed that in the first 7 days, in the surviving patients, there is a decrease in total protein, blood albumin by an average of 10-14% compared to the preoperative level, the level of fibrinogen and gamma globulins increases. When the patients were discharged from the hospital, the level of total protein reached preoperative values, albumin was decreased, blood fibrinogen was increased.

In patients after ERHL,LI, a decrease in total protein and blood albumin was observed in the first 7 days compared to preoperative values, and at the time of discharge from the hospital, the level of total protein increases slightly, the level of albumin remained practically unchanged. The level of fibrinogen and gamma globulins increases in the first 7 days after the operation.

After the operation of LLGAV,SA, a significant decrease in the level of total protein was observed up to 5-7 days of the early postoperative period, which was maintained at the time of discharge of the patients from the hospital. The level of albumin and gamma globulins also changed, but the differences were unreliable, and at the time of discharge of the patients from the hospital, they practically corresponded to the preoperative values. The level of fibrinogen gradually decreases and at the time of discharge of the patients from the hospital was lower, compared to the preoperative values.

As a result of the change in portal blood flow in the first days after DSRS, the concentration of bilirubin increases at the expense of both its fractions. At the time of discharge from the hospital, its concentration decreases and was lower than the

preoperative values. An increase in the activity of alanine- and asparagine aminotransferases (ALT and AST), alkaline phosphatase (AP) was observed. At the time of discharge of patients from the hospital, the activity of cytolytic enzymes decreases, reaching preoperative values. AP activity remains elevated even at the time of discharge from the hospital.

In the early postoperative period after ERHL,LI, an increase in the concentration of total bilirubin was observed, due to its indirect fraction and an increase in the activity of aminotransferases. The maximum level of bilirubin was observed 1-3 days after the operation. At the time of discharge of the patients from the hospital, the level of total bilirubin was lower than the preoperative values, but was increased compared to the physiological norm, the activity of cytolytic enzymes decreases, reaching normal values. When studying the indicators of pigment exchange after LLGAV,SA surgery, it was established that in the first 3 days of the early postoperative period, the concentration of total bilirubin increases due to both of its fractions. At the time of discharge of the patients from the hospital, the level of total bilirubin slightly decreases compared to the values obtained on the 7th day after the operation, but was higher compared to both the preoperative and physiological normal values. When studying the indicators of the activity of aminotransferases and AP in the blood serum of patients with LC, a decrease in their concentration was noted in the first 7 days of the postoperative period. However, at the time of the patients' discharge, the activity of AST was increased, and the activity of ALT decreased by half compared to the preoperative values and was within the normal range. AP activity gradually decreases throughout the early postoperative period and by the time patients were discharged from the hospital, it was 2.3 times lower, compared to preoperative values.

When analyzing peripheral blood parameters after DSRS, it was established that the content of RBC's remains stable after the operation. In the first three days after the operation, the WBC's increases, compared to the preoperative values, which then begins to decrease, reaching normal values by the time the patients are discharged from the hospital. At this time, the percentage of lymphocytes in the blood is also approaching the initial values. There are no changes in the platelet content in the first 7 days after the DSRS, and a significant increase in concentration occurs only at the time of discharge. The study of the composition of peripheral blood after ERHL,LI showed that leukocytosis and lymphopenia developed in the first 3 days, which persisted until the 5th day. No significant change in platelet content was observed in the early postoperative period.

In the first 3 days after the operation of LLGAV,SA in patients with LC, an increase in the content of RBC's, WBC's and platelets was observed in the peripheral blood, and the number of lymphocytes decreased. By the 7th day of the postoperative period, there was a further increase in the number of RBC's and platelets, and the number of WBC's decreases. At the time of discharge, the number of RBC's, WBC's and platelets in the peripheral blood was higher than before the operation, the level of lymphocytes was lower than the preoperative values.

The study of changes in hepatic blood flow after DSRS according to the data of direct rheohepatography revealed a significant decrease in SRI, RVP, a decrease in

SFT, ASFS, and an increase in FFT. The obtained results indicate that exclusion of blood from the splenic vein from the portal blood flow after DSRS worsens the hepatic blood circulation in the postoperative period. During the analysis of ultrasound data, it was established that in the postoperative period in patients with LC, both after ERHL,LI and after LLGAV,SA, signs of PH remain, which was manifested by an increase in the size of the spleen, as well as the diameter of the portal and splenic veins. Despite the fact that the diameter of the vessels of the portal system did not normalize in the postoperative period, its decrease was noted compared to the preoperative values, but the differences were not statistically significant ( $P < 0.001$ ). The LPBV in patients after both types of surgical interventions in the postoperative period increases significantly and amounted to  $15.0 \pm 0.74$  cm/s for patients after ERHL,LI and  $16.16 \pm 0.6$  cm/s for patients after LLGAV,SA. In accordance with the increase of LPBV in the postoperative period, the PVVBF also increased reliably. The increase in this indicator occurred only at the expense of an increase in the LPBV, since the diameter of the portal vein did not increase after the operation, but even had a tendency to decrease. In the postoperative period PCI in patients both after ERHL,LI and after LLGAV,SA was significantly lower compared to preoperative values, which indicated an improvement in portal blood flow.

Thus, it was established that ERHL,LI and LLGAV,SA lead to a decrease in the diameter of the vessels of the portal system, an increase in LPBV, PVVBF, and a decrease in PCI in patients with LC. This allows us to say that the manifestations of PH syndrome under the influence of surgical treatment stabilized and did not have a tendency to progress. An increase in LPBV, as well as PVVBF which occurred in parallel with a decrease in the diameter of the vessels of the portal system, a decrease in PCI, indicated an improvement in the functional state of the liver under the influence of surgical treatment.

**Conclusion.** 1. The most frequent cause of negative results of surgical treatment of patients with LC with complications of PH is ACLF, which complicates the postoperative period in 33.9% of patients and leads to death in 11.6% of cases.  
2. In the early postoperative period, in patients with LC, after various types of surgical interventions, there is a change in the functional liver tests, which is manifested by the development of hypo- and dysproteinemia, an increase in the concentration of bilirubin, the activity of aminotransferases, and alkaline phosphatase. Changes in the blood formula in the form of moderate anemia, leukocytosis, and lymphopenia, which occur in the first 7 days of the postoperative period, with a favorable course of the postoperative period, gradually normalize by the time the patients are discharged from the hospital.  
3. Exclusion of blood from the portal blood flow of the splenic vein after DSRS worsens the hepatic blood circulation in the postoperative period, which is manifested by a significant decrease in SRI, RVP, a decrease in SFT, ASFS, and an increase in FFT according to direct rheohepatography.  
4. ERHL,LI and LLGAV,SA lead to an improvement in the functional state of the liver and stabilization of the manifestations of PH, which is confirmed by a decrease in the diameter of the vessels of the portal system, increase in LPBV, PVVBF, and a decrease in PCI in patients with LC.

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