УДК 616.149-008.341.1-089.168
DOI: https://doi.org/10.17816/PAVLOVJ624780

Ближайшие и отдаленные результаты порто-кавального шунтирования при портальной гипертензии: 10-летний клинический опыт регионального отделения сосудистой хирургии

Ю. В. Червяков[1, 2] ✉, А. В. Борисов[2], И. Н. Староверов[1, 2], С. Н. Пампутис[2], Д. В. Завьялов[2], А. Г. Баранов[3]

[1] Ярославский государственный медицинский университет, Ярославль, Российская Федерация;
[2] Областная клиническая больница, Ярославль, Российская Федерация;
[3] Российский университет медицины, Москва, Российская Федерация

АННОТАЦИЯ

Введение. Количество больных циррозом печени (ЦП) составляет 20–40 случаев на 100 тыс. населения и при этом неуклонно увеличивается. Пятилетняя выживаемость пациентов при ЦП в стадии компенсации 50–62%, в стадии декомпенсации — 11–40%. У подавляющего количества пациентов (80–90%) ЦП приводит к компенсаторному формированию варикозно-расширенных вен пищевода (ВРВП) и желудка, что в дальнейшем осложняется угрожающим жизни кровотечением у 30% пациентов.

Цель. Оценить 5-летние результаты парциальных порто-кавальных шунтирующих операций.

Материалы и методы. В работе изложен 10-летний клинический опыт отделения сосудистой хирургии ГБУЗ ЯО ОКБ по хирургическому лечению пациентов с ЦП с клиникой портальной гипертензии, состоявшимися кровотечениями из варикозных вен пищевода и желудка. В исследование включены пациенты (n = 26, из них 11 мужчин; средний возраст 48 ± 7,3 года) с ЦП (А и В классов по шкале Child-Pugh), которым в плановом порядке выполнены реконструктивные операции на портальной системе. По виду анастомозов больные были распределены на 3 группы: 1 группа — мезентерико-кавальный (n = 6); 2 группа — дистальный сплено-ренальный с сохранением селезенки (n = 10); 3 группа — сплено-ренальный H-образный шунт. Первичными конечными точками исследования явились: выживаемость пациентов, наличие рецидивов кровотечения из ВРВП, проходимость анастомозов. Вторичные конечные точки: динамика размеров ВРВП, изменения размеров селезенки, динамика размеров воротной и селезеночной вен, направления кровотока в портальной системе, наличие печеночной энцефалопатии. Послеоперационная летальность составила 3,8%.

Результаты. Выживаемость на рубеже 1, 3 и 5 лет составила 96%, 90% и 58% соответственно, проходимость анастомозов — 96%, 96% и 91% соответственно. Рецидивы кровотечения через 1 год — 4% (n = 1), через 3 года — 0, через 5 лет — 17% (n = 2). Зарегистрированы изменения гемодинамики портальной системы после всех видов формирования анастомозов: уменьшение диаметра воротной вены в среднем на 5 мм, селезеночной вены на 3 мм, уменьшение размеров селезенки на 210 см^3. Тромбоз шунта возник у двух из 26 больных (7,7%) через 1 год (сплено-ренальный H-образный шунт с использованием протеза) и 4 года (сплено-ренальный H-образный аутовенозный шунт) соответственно.

Заключение. Формирование парциальных порто-кавальных анастомозов у пациентов с портальной гипертензией и эпизодами кровотечений из ВРВП является надежной профилактикой рецидивов кровотечения. Первый эпизод кровотечения является показанием для открытой операции при невозможности осуществить трансъюгулярное интра-печеночное стентирование. Выживаемость пациентов после порто-кавального шунтирования определяется исходной степенью печеночной недостаточности и проходимостью сформированных анастомозов.

Ключевые слова: *портальная гипертензия; порто-кавальные анастомозы; 5-летние результаты*

Для цитирования:
Червяков Ю.В., Борисов А.В., Староверов И.Н., Пампутис С.Н., Завьялов Д.В., Баранов А.Г. Ближайшие и отдаленные результаты порто-кавального шунтирования при портальной гипертензии: 10-летний клинический опыт регионального отделения сосудистой хирургии // Российский медико-биологический вестник имени академика И. П. Павлова. 2024. Т. 32, № 3. С. 379–388. DOI: https://doi.org/10.17816/PAVLOVJ624780

Рукопись получена: 18.12.2023 **Рукопись одобрена:** 15.07.2024 **Опубликована:** 30.09.2024

ЭКО•ВЕКТОР

DOI: https://doi.org/10.17816/PAVLOVJ624780

Immediate and Long-Term Results of Portacaval Shunt Surgeries in Portal Hypertension: 10-Year Clinical Experience of a Regional Vascular Surgery Department

Yuriy V. Chervyakov[1, 2] ✉, Aleksandr V. Borisov[2], Il'ya N. Staroverov[1, 2], Sergey N. Pamputis[2], Dmitriy V. Zav'yalov[2], Grigoriy A. Baranov[3]

[1] Yaroslavl State Medical University, Yaroslavl, Russian Federation;
[2] Yaroslavl Regional Clinical Hospital, Yaroslavl, Russian Federation;
[3] Russian University of Medicine, Moscow, Russian Federation

ABSTRACT

INTRODUCTION: The number of patients with liver cirrhosis (LC) makes 20–40 cases per 100 thousand populations and rises steadily. A five-year survival rate of patients with LC in the compensation stage is 50%–62%, in the decompensation stage — 11%–40%. In the overwhelming majority of patients (80%–90%), LC leads to the compensatory formation of esophageal and gastric varices (EV and GV, respectively), which is further complicated with a life-threatening bleeding in 30% of patients.

AIM: To evaluate 5-year results of partial portacaval shunt surgeries.

MATERIALS AND METHODS: The paper describes a 10-year clinical experience of the vascular surgery department of Yaroslavl Regional Clinical Hospital in surgical treatment of patients with LC with a clinical presentation of portal hypertension, with recorded esophageal and gastric variceal bleeding. The study included 26 patients (of them 11 men; the mean age 48 ± 7.3 years) with LC (A and B classes on Child-Pugh scale), who underwent planned reconstructive surgery on the portal system. By the type of anastomosis, the patients were divided into 3 groups: group 1 — mesocaval anastomosis (n = 6); group 2 — distal splenorenal anastomosis with preservation of spleen (n = 10); group 3 — splenorenal H-shaped shunt. The primary end points of the study were survival of the patients, rebleeding from EV, shunt patency. Secondary end points were dynamics of EV size, changes in the spleen size, dynamics of the portal and splenic veins size, blood flow directions in the portal system, the presence of hepatic encephalopathy. Postoperative mortality was 3.8%.

RESULTS: Survival at 1, 3 and 5 years was 96%, 90% and 58, respectively, and patency of anastomoses was 96%, 96% and 91%, respectively. Rebleeding at 1 year made 4% (n = 1), at 3 years — 0, at 5 years — 17% (n = 2). Changes in the hemodynamics of the portal system were recorded after formation of all types of anastomoses: reduction of the diameter of the portal vein by on average 5 mm, of the splenic vein by 3 mm, of the spleen size by 210 cm^3. Shunt thrombosis occurred in two of 26 patients (7.7%) at 1 year (splenorenal H-shaped shunt with use of prosthesis) and 4 years (splenorenal autovenous shunt), respectively.

CONCLUSION: The formation of partial portacaval anastomoses in patients with portal hypertension and episodes of bleeding from esophageal varices is a reliable prevention of rebleeding. The first bleeding episode is an indication for an open surgery in case the transjugular intrahepatic stenting is impossible. Survival rate of patients after portacaval shunt surgeries is determined by the initial degree of hepatic failure and patency of the formed anastomoses.

Keywords: *portal hypertension; portacaval anastomoses; 5-year results*

For citation:
Chervyakov YuV, Borisov AV, Staroverov IN, Pamputis SN, Zav'yalov DV, Baranov GA. Immediate and Long-Term Results of Portacaval Shunt Surgeries in Portal Hypertension: 10-Year Clinical Experience of a Regional Vascular Surgery Department. *I. P. Pavlov Russian Medical Biological Herald.* 2024;32(3):379–388. DOI: https://doi.org/10.17816/PAVLOVJ624780

Received: 18.12.2023 **Accepted:** 15.07.2024 **Published:** 30.09.2024

ECO•VECTOR

LIST OF ABBREVIATIONS

ALT — alanine aminotransferase
AP — alkaline phosphatase
AST — aspartate aminotransferase
CI — confidence interval
DSRA — distal splenorenal anastomosis with spleen preservation
EVs — esophageal varices
FGDS — fibrogastroduodenoscopy
GGTP — gamma-glutamyl transpeptidase
GIT — gastrointestinal tract
IMV — inferior mesenteric vein
LC — liver cirrhosis
LRV — left renal vein
MCA — mesocaval anastomosis
MSCT — multispiral computed tomography
PH — portal hypertension
PTFE — polytetrafluoroethylene
PV — portal vein
RRV — right renal vein
SMV — superior mesenteric vein
SRS — splenorenal shunt
SV — splenic vein
TIPS — transjugular intrahepatic portosystemic shunt
US — ultrasound examination

INTRODUCTION

According to the data of the World Health Organization as of 2015, chronic liver diseases caused death in more than 1.5 million people, of which 800 thousand died from liver cirrhosis (LC) [1]. The five-year survival rate of patients in the compensated stage, according to Russian authors, makes 50%–62%, and in the decompensated stage — 11%–40% [2, 3]. The number of patients with LC steadily grows and reaches 20–40 cases per 100 thousand population [4].

In a vast majority of patients (80%–90%) the disease leads to compensatory formation of esophageal and gastric varices, which in 30% of cases complicate with a life-threatening bleeding. The overall mortality after the first episode of bleeding from esophageal varices (EVs) ranges from 40% to 60% [4]. At the contemporary stage of development of medicine, a sufficient arsenal of surgical techniques have been developed, primarily endoscopic, which permitted to significantly reduce mortality after the first bleeding to 10%–20%. But it should be noted that in the next 1–2 years, 70% of these patients develop rebleeding with survival less than 40% [5, 6].

The life expectancy of patients with decompensated cirrhosis without any correction of portal hypertension (PH) on average does not exceed 19 months [4], but surgical treatment aimed at reducing the phenomena of PH (open shunt and devascularization operations, transjugular intrahepatic portosystemic shunt (TIPS), endoscopic interventions for ligating the esophageal and gastric varices), carries a high risk of complications in itself and can lead to death. Postoperative mortality in class A cirrhosis in Child-Pugh classification is 10%, in class B — 31%, in class C — 76% [4–7].

The choice of surgical technique for PH treatment depends on many factors, including the experience of a particular clinic, possibility of using endovascular and endoscopic technologies. According to most researchers, distal splenorenal anastomosis is the most adequate method for correcting this pathology giving the best long term outcomes [4, 8, 9]. This surgical intervention not only reduces pressure in the portal vein system, but also preserves hepatorenal blood flow through the portal vein (PV), which significantly reduces the risk of 'post-shunt' encephalopathy. Besides, this does not worsen the clinical manifestations of hepatic insufficiency after the surgery [4, 9]. The functioning distal splenorenal anastomosis (DSRA) permits to reduce the gradient of portal pressure between the portal vein and the inferior vena cava to 10–12 mm Hg, thus reducing the likelihood of rebleeding [8, 9].

Transjugular intrahepatic portosystemic shunt (TIPS) surgeries are increasingly used in treatment of this group of patients [1, 4, 7], but their number is limited by a high cost of the method. It is noted that 2–5-year survival of patients after these interventions is lower than after portacaval shunting [4, 7]. In this context, open interventions in patients with PH with a high risk of rebleeding have not lost the importance in the abdominal surgery [8–10].

The **aim** of this study to evaluate the results of portacaval shunting surgeries in patients with portal hypertension with episodes of bleeding from esophageal varices in the periods up to 5 years.

MATERIALS AND METHODS

The paper presents a 10-year clinical experience of the Department of vascular surgery of Yaroslavl Regional Clinical Hospital. From 2010 to 2021, 26 reconstructive interventions were performed in patients (11 men; age median 48.0 ± 7.3 years) with PH with formation of portacaval shunts. The surgeries were performed on a planned basis not less than 1 month after an episode of gastric hemorrhage.

Depending on the etiology of portal hypertension, the patients were divided into the following groups:

• *Intrahepatic form* — 11 patients, of them 7 with alcoholic LC, 4 with viral LC;

• *prehepatic form* — 7 patients, of them 5 patients with history of PV thrombosis, 2 — with congenital abnormality of PV;

• *mixed form* — 8 patients.

The number of episodes of bleeding preceding the intervention:

• *one* — 6 patients;

• *two* — 12 patients;

• *three and more* — 8 patients.

On examination, all the patients were diagnosed with III-IV degree variceal dilation of esophageal and gastric veins. On the neurological examination, the diagnosis of I and II stages of hepatic encephalopathy was established in all cases. The first episode of bleeding from esophageal varices was considered by us a direct indication for the surgery.

The initial severity of the liver dysfunction was determined by Child-Pugh classification:

• *class A* — 10 patients;

• *class B* — 16 patients;

• *class C* — surgical treatment was not performed on account of low postoperative survival.

Before surgical treatment, all patients underwent treatment with diuretics (spironolactone, furosemide) and non-selective beta-blockers to prevent recurrent bleeding.

The obligatory examination methods to clarify the diagnosis and determine indications for the intervention included:

1. Multispiral computed tomography (MSCT) of the PV to clarify its patency, of the splenic vein (SV), superior and inferior mesenteric veins (SMV and IMV), left and right renal veins (LRV and RRV), with determination of their sizes and anatomy. *Thrombosis of the PV and SV and their post-thrombotic alterations were considered contraindications for the open reconstruction*.

2. Ultrasound examination (US) of the abdominal organs to determine the size of the liver, spleen, kidneys, and the presence of ascites. *The presence of ascitic fluid in the amount of more than 1 liter was considered a contraindication for surgery*. Initially, it was recommended to conduct a course of conservative therapy from a gastroenterologist using hepatoprotectors and diuretics. To combat hypoalbuminemia, we prescribe protein drugs and intravenous infusions of fresh frozen plasma. The presence of ascitic fluid in a larger amount leads to poor healing of the laparotomy wound, prolonged flow of ascitic fluid through the drains, and, accordingly, to a large loss of protein, which also complicates the healing of the postoperative wound.

3. Ultrasound angioscanning of the portal vein system with determination of the sizes of the PV, SV, SMV and IMV, LRV, the direction and velocity of blood flow in these vessels. The indications for surgery were PV diameter > 18 mm, SV diameter > 10 mm, hepatofugal direction of blood flow through the PV.

4. Fibrogastroduodenoscopy (FGDS) to verify the degree of expansion of the esophageal varices.

5. Clinical blood test with a detailed determination of the quantity and quality of platelets, red blood cells and hemoglobin. All patients showed signs of hypersplenism in the form of moderate or severe thrombocytopenia. With the platelet level < 50×10^9/L, platelet transfusions were performed before surgery and during the intervention.

6. Coagulogram.

7. Biochemical blood test — alanine aminotransferase (ALT), aspartate aminotransferase (AST), bilirubin, gamma-glutamyl transpeptidase (GGTP), alkaline phosphatase (ALP), potassium, sodium, creatinine, albumin, urea.

The clinic does not possess technical capacities for TIPS. The type of portacaval anastomosis was selected intraoperatively individually depending on the following factors. In case of 'close' position of SV, when its extensive mobilization from the pancreas was not needed, DSRA with spleen preservation was performed (Figure 1).

Traumatic mobilization of SV from the pancreas may lead to a serious postoperative complication — pancreatitis, even to pancreatic necrosis. The development of this complication is associated with a probable injury of the pancreas during extensive mobilization of SV. This may be a cause of a high mortality — up to 70% [5]. Another probable complication of traumatic pancreatitis is thrombosis of portacaval anastomosis with the risk of its occurrence in up to 27% of cases [5]. In case of 'deep' position of SV, H-shaped splenorenal shunt was formed (SRS) (Figure 2).

When mobilization of SV was technically infeasible due to pronounced thinning of its wall or initial inflammatory process in the zone of pancreas, mesocaval anastomoses were used.

At the first stage of the surgery, a complete devascularization of the large curvature of the stomach was always conducted with ligation of the right gastroepiploic artery.

By kinds of anastomoses, the patients were divided into 3 groups:

• ***group 1*** — mesocaval anastomosis (n = 6);

• ***group 2*** — distal splenorenal anastomosis with spleen preservation (n = 10);

• ***group 3*** — splenorenal H-shaped shunt (n = 9, of them 8 autovenous shunts and 1 synthetic prosthesis).

In all cases, pressure in the SV was determined intraoperatively. The mean value of the parameter

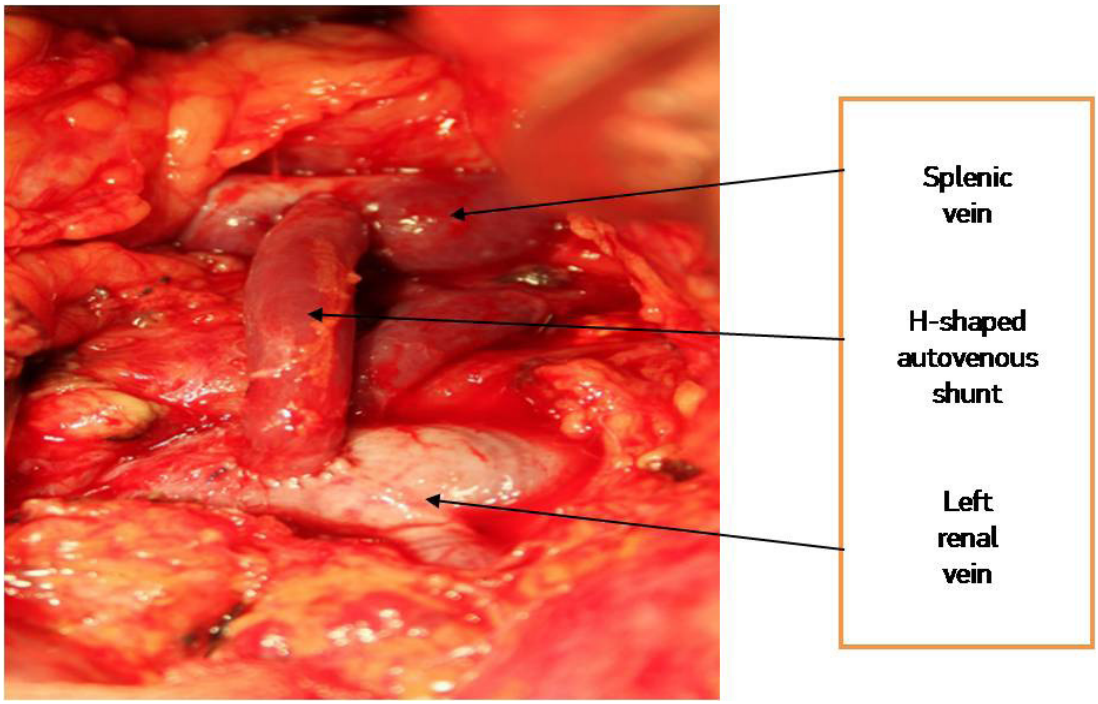

Fig. 1. Formed distal splenorenal anastomosis, patient Sh.

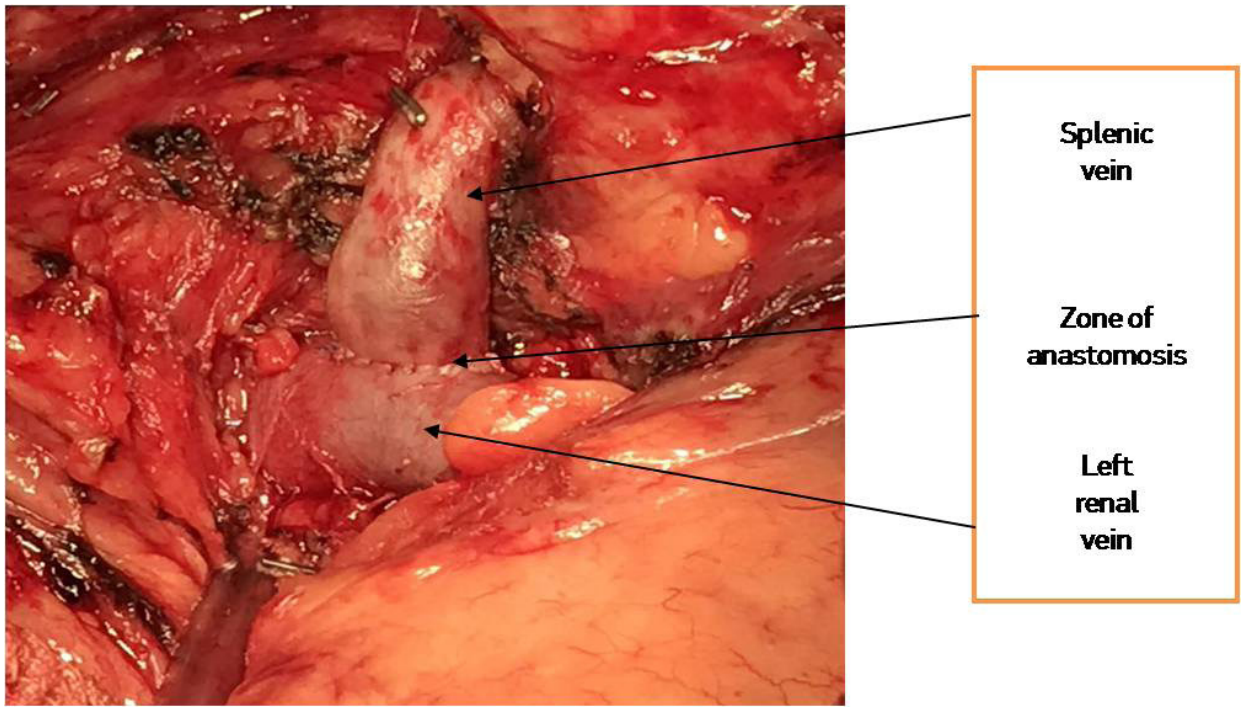

Fig. 2. Formed splenorenal H-shaped shunt, patient N.

was 344 ± 71 mm water (from 215 mm to 480 mm; confidence interval (CI) 95 mm). In one case formation of portacaval anastomosis was technically impossible (in the existence of post-thrombotic alteration of SV, SMV and IMV), the operation ended only with the devascularization of the large curvature of the stomach.

Taking into account the initial severe condition of the patients, large volume of vascular reconstruction and duration of the surgical intervention, there exist a fairly large number of possible postoperative complications, some of which were described in the literature: bleeding into the abdominal cavity against the background hypocoagulation, postoperative pancreatitis, progressive liver failure, recurrent esophageal variceal bleeding, thrombosis of a vascular shunt, as well as prolonged leakage of a large amount of ascetic fluid [5, 9].

In our work, we encountered two complications: one was intra-abdominal diffuse bleeding against the background coagulopathy. Relaparotomy and additional hemostasis in the surgical area were required. Despite the cancellation of anticoagulants and the use of large doses of fresh frozen plasma, bleeding continuing with the underlying DIC syndrome ended in death. Postoperative mortality was 3.8%. In two observations (7.6%, with initial ascites more than 1 l), a prolonged (up to 3 weeks) leakage of ascitic fluid (1–2 l/day) from the abdominal cavity through the drainage was noted. Multiple transfusions of protein drugs and the use of diuretics were required. The drainage was removed when the discharge decreased to less than 500 ml/day. The subsequent postoperative period proceeded smoothly. To prevent postoperative pancreatitis in patients of groups 2 and 3, octreotide 300 mg/day was used in all cases for 5–7 days. Anticoagulant therapy (sodium heparin) was used in all cases for 10–12 days (target activated partial thromboplastin time 1.5 times the baseline value).

Primary end points of the study were:

- survival of patients;
- esophageal rebleeding;
- patency of anastomoses.

Secondary end points:

- dynamics of size of esophageal varices;
- change in the size of spleen;
- dynamics of PV and SV sizes and of blood flow direction in the portal vein system;
- existence of renal encephalopathy.

During statistical processing of data, the correspondence of the data to normal distribution was assessed in Statistica 12.0 program (Stat Soft Inc., USA). Descriptive statistics included the following parameters: number of observations (n), mean (M), standard deviation (SD). To determine the significance of differences in quantitative variables in the case of a distribution close to normal, Student's t-test was used. In cases where the distribution differed from normal, analysis was performed using nonparametric Wilcoxon tests and Mann–Whitney U-test. A p value ≤ 0.05 was considered statistically significant.

RESULTS

The results of treatment at 1 year were monitored in all patients. Survival rate was 96%. One female patient died from esophageal variceal rebleeding 9 months after the formation of a mesocaval anastomosis. She was examined 2 months before death. The anastomosis was patent, but the diameters of the esophageal varices according to FGDS did not decrease. To note, before the operation the patient had 4 episodes of bleeding.

Patency of the reconstruction zone was noted in 96% of cases (in 22 of 23 patients). One case of thrombosis of a splenorenal H-shaped shunt using a synthetic PTFE prosthesis has been reported. The patient did not experience any recurrent bleeding; the diameter of the esophageal varices decreased from 3 to 2 degree, which may indicate a certain effectiveness of gastric devascularization. In the rest of observations, no rebleeding from the gastrointestinal tract (GIT) was noted.

The size of esophageal varices decreased to 1–2 degree in 78% of cases (18 of 23; 3 from group 1, 9 from group 2, 6 from group 3). Reduction of the size of spleen and hypersplenism phenomena was noted in 70% of cases (16 of 23; 0 in 1 group 1, 9 in group 2, 7 in group 3).

Progression of hepatic encephalopathy was noted in 22% (5 from 23; all patients from group 1). The quantitative parameters of changes in the size of PV and SV, blood flow direction, dynamics of the size of spleen are given in Table 1.

Results of 3-year follow up were recorded in 80% (20 out of 25) patients, survival rate was 90%. The cause of death in one case was an oncological process in the lungs and in the other — progression of hepatic failure (with the underlying shunt occlusion after 1 year of follow-up).

In the remaining patients, no thrombosis of the reconstruction zone was found. No recurrences of gastrointestinal bleeding in this follow-up period were recorded by us. The vast majority (94%) of patients showed a decrease in the size of the esophageal varicose veins to 1–2 degree. In 15 of 18 (83%) patients, a significant decrease in the splenic index and in the phenomena of hypersplenism were determined compared to the baseline values. However, the size of the spleen practically did not differ from the values recorded 1 year after the operation. This is the evidence of the maximum changes in the size of the spleen occurring in the first year after surgery; subsequently, the organ's condition stabilized. There were also no changes in signs of hepatic encephalopathy compared to 1 year of follow-up in all groups of patients. Quantitative indicators of changes in the

sizes of PV and SV, the direction of blood flow, and the dynamics of the size of the spleen are presented in Table 1.

Long-term results of treatment (at 5 years) were analyzed in 12 of 18 (67%) patients, in 4 patients of group 1; 5 in group 2 and 3 in group 3. Survival rate was 58%, the cause of death of two more patients was progression of liver failure. They also had rebleeding from the gastrointestinal tract and buildup in the clinical symptoms of hepatic encephalopathy — 29% (n = 2; one patient with shunt thrombosis, the second with gastric devascularization). Patency of anastomosis was 86%. Shunt thrombosis was registered in 1 patient of group 3.

Table 1. Changes in Sizes and Hemodynamic Parameters of the Portal Vein System in Different Observation Periods after Reconstruction

Parameter	Before Surgery	After Surgery		
		1 year	3 years	5 years
Portal vein diameter, M ± SD, mm	19 ± 2.3	16 ± 2.1 *p = 0.04*	14 ± 2.4 *$p_1 > 0.05$*	14 ± 3.8 *$p_2 > 0.05$*
Splenic vein diameter, M ± SD, mm	12 ± 2.4	10 ± 2.1 *p = 0.05*	9 ± 2,5 *$p_1 > 0,05$*	9 ± 2.7 *$p_2 > 0.05$*
Blood flow type, %: hepatofugal hepatopetal bidirectional	 100 0 0	 4 87 9	 5 90 5	 0 86 14
Spleen size (splenic index), M ± SD, cm^3	679 ± 147	475 ± 103 *p = 0.02*	449 ± 107 *$p_1 > 0.05$*	465 ± 138 *$p_2 > 0.05$*

Notes: p — difference between baseline data and values 1 year after surgery, p_1 — difference between values 1 year and 3 years after surgery, p_2 — difference between values 3 years and 5 years after surgery

Table 2. Comparison of Primary and Secondary Study Points Depending on the Reconstructions Performed in Different Follow-Up Periods

Parameter	Group 1 (MCA)			Group 2 (DSRA)			Group 3 (SRS)		
	1 год	3 года	5 лет	1 год	3 года	5 лет	1 год	3 года	5 лет
n	5	4	4	10	10	5	9	9	3
Survival rate									
%	80	80	50	100	90	80	100	89	50
n	4	4	2	10	9	4	9	8	2
Recurrent bleeding									
%	20	20	50	0	0	0	0	0	33
n	1	1	2	0	0	0	0	0	1
Patency Anastomosis									
%	100	100	50	100	100	100	89	89	67
n	4	4	2	0	0	0	8	8	2
Reduction of EVVD size to 1–2 degree									
%	60	60	25	90	89	80	67	75	67
n	3	3	1	9	8	4	6	6	2
Progression of hepatic encephalopathy									
%	100	100	100	0	0	0	0	0	33
n	5	4	4	0	0	0	0	0	1

Notes: MCA — mesocaval anastomosis, DSRA — distal splenorenal anastomosis, SRS — splenorenal shunt, EVVD — esophageal varicose vein dilatation

A decrease in the size of the esophageal varicose vein dilation to 0–1 degree was noted in all observations with a functioning shunt — 86%. We did not note any further significant reduction in the size of the spleen (compared to the 3rd follow-up year). The dimensions of the PV and SV, the direction of blood flow, and the dimensions of the spleen are presented in Table 1.

In Table 2, comparison of primary and secondary study points in different follow-up periods is presented depending on the performed reconstruction.

DISCUSSION

Portacaval shunt operations permit to reliably reduce the pressure in the PV leading to a number of positive aspects, first of all, reduction in the size of EVs. With the patent vascular reconstruction zone at 5 years, in all patients only 0–1 degree EVs were recorded. This fact significantly reduces the risk of gastrointestinal rebleeding. In our work, this complication occurred in only 11.5% of patients within 5-year follow-up. This, in turn, also affects the long-term survival of patients. According to our data, this indicator made 58%, and according to the literature, 2-year survival in bleeding recurrences without surgical treatment does not exceed 40% [1,3,4].

As a result of the study, changes in the hemodynamics of the portal system were noted — a decrease in the diameters of the PV and SV, a change in the character of blood flow, and a decrease in the size of the spleen. Shunt thrombosis occurred in two of 26 patients (7.7%) after 1 year (SRS using a prosthesis) and 4 years (autovenous SRS). *The small sample size did not allow this study to identify the advantages of a particular method of portacaval shunt, but according to the criterion of progression of hepatic encephalopathy, splenorenal reconstructions have an obvious advantage*. In our work, during the formation of the distal splenorenal anastomosis, we did not note such complications as acute liver failure and progression of encephalopathy reported by other authors [4, 5, 9].

The type of vascular anastomosis in most cases was selected intraoperatively. Autovenous SRS was performed in case of appropriate size of the external jugular or great saphenous vein (with the diameter after bougienage at least 8 mm). In case of 'close' location of the SV, DSRA was performed.

Mesocaval anastomosis was formed in the following conditions:

- technical difficulties in mobilization of the splenic vein;

- diameter of SMV or IMV more than 8 mm, pressure in the vein above 250 mm of water.

Devascularization of the greater curvature of the stomach with ligation of the right gastroepiploic artery was performed in all cases.

We consider it necessary to conduct a control endoscopic examination with a patent anastomosis, no earlier than 6 months after surgery. In case of shunt thrombosis, an earlier examination (at 3 months) is indicated to determine the risk of recurrent bleeding and further tactics for patient management. Life expectancy after vascular reconstructions in PH is directly related to the initial severity of liver dysfunction, so we perform reconstructions only in cases of Child-Pugh class A and B liver dysfunction. Liver failure class C, according to most researchers, is the main factor influencing the high mortality in this group of patients [2–4], which is consistent with our data.

CONCLUSION

The clinical guidelines of the Ministry of Health of 2021 'Cirrhosis and fibrosis of the liver' do not provide information on the advantages/disadvantages of a particular option of portacaval shunt surgeries in this group of patients, and their comparison with endovascular interventions.

The obtained results of treatment in the immediate and long-term periods of up to 5 years permit to conclude that partial portacaval vascular reconstructions have not lost their importance in the prevention of rebleeding from esophageal varices in portal hypertension, especially in regional centers without conditions for performing transjugular intrahepatic portosystemic shunt.

ADDITIONALLY

Funding. The authors declare that there is no funding for the study.
Conflict of interests. The authors declare no conflicts of interests.
Patient consent. The article uses anonymized clinical data of patients in accordance with their signed informed consents
Contribution of the authors: *Yu. V. Chervyakov* — concept and design of study, collection and processing of material, writing the text; *I. N. Staroverov, S. N. Pamputis* — concept and design of study, editing; *A. V. Borisov, D. V. Zav'yalov* — collection and processing of material, writing the text; *A. G. Baranov* — concept and design of study, statistical processing. The authors confirm the correspondence of their authorship to the ICMJE International Criteria. All authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

Финансирование. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.
Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.
Согласие на публикацию. В статье использованы обезличенные клинические данные пациентов в соответствии с подписанными ими добровольным информированным согласием.
Вклад авторов: *Червяков Ю. В.* — концепция и дизайн исследования, сбор и обработка материала, написание текста; *Борисов А. В.* — сбор и обработка материала, написание текста; *Староверов И. Н.* — концепция и дизайн исследования, редактирование; *Памputис С. Н.* — концепция и дизайн исследования,

редактирование; *Завьялов Д. В.* — сбор и обработка материала, написание текста; *Баранов А. Г.* — концепция и дизайн исследования, статистическая обработка. Авторы подтверждают соответствие своего авторства международным критериям ICMJE (все авторы внесли существенный вклад в разработку концепции и подготовку статьи, прочли и одобрили финальную версию перед публикацией).

СПИСОК ИСТОЧНИКОВ

1. Goral V., Yilmaz N. Current Approaches to the Treatment of Gastric Varices: Glue, Coil Application, TIPS, and BRTO // Medicina (Kaunas). 2019. Vol. 55, No. 7. P. 335. doi: 10.3390/medicina55070335
2. Mercado M.A. Surgical treatment for portal hypertension // Br. J. Surg. 2015. Vol. 102, No. 7. P. 717–718. doi: 10.1002/bjs.9849
3. Ивашкин В.Т., Маевская М.В., Жаркова М.С., и др. Клинические рекомендации Российского общества по изучению печени и Российской гастроэнтерологической ассоциации по диагностике и лечению фиброза и цирроза печени и их осложнений // Российский журнал гастроэнтерологии, гепатологии, колопроктологии 2021. Т. 31, № 6. С. 56–102. doi: 10.22416/1382-4376-2021-31-6-56-102
4. Yao O., Chen W., Yan C., et al. Efficacy and Safety of Treatments for Patients with Portal Hypertension and Cirrhosis: A Systematic Review and Bayesian Network Meta-Analysis // Front. Med. (Lausanne). 2021. Vol. 8. P. 712918. doi: 10.3389/fmed.2021.712918
5. Van Praet K.M., Ceulemans L.J., Monbaliu D., et al. An analysis on the use of Warren's distal splenorenal shunt surgery for the treatment of portal hypertension at the University Hospitals Leuven // Acta Chir. Belg. 2021. Vol. 121, No. 4. P. 254–260. doi: 10.1080/00015458.2020.1726099
6. Котив Б.Н., Дзидзава И.И., Бугаев С.А., и др. Мини-инвазивные способы лечения и профилактики пищеводно-желудочных кровотечений портального генеза // Анналы хирургической гепатологии. 2022. Т. 27, № 2. С. 48–57. doi: 10.16931/1995-5464.2022-2-48-57
7. Chen Y., Qiu H., Zhang X. Transjugular intrahepatic portal shunt in the treatment of portal hypertension due to cirrhosis: single center experience // BMC Surg. 2019. Vol. 19, No. 1. P. 191. doi: 10.1186/s12893-019-0659-5
8. Дидзава И.И., Котив Б.Н., Онницев И.Е., и др. Лапароскопический дистальный спленоренальный анастомоз // Высокотехнологическая медицина. 2020. № 1. С. 4–16.
9. Котельникова Л.П., Мухамадеев И.С. Эффективность спленоренального шунтирования в коррекции портальной гипертензии и гиперспленизма в отдаленном периоде // Экспериментальная и клиническая гастроэнтерология. 2023. № 6. С. 72–78. doi: 10.31146/1682-8658-ecg-214-6-72-78
10. Анисимов А.Ю., Андреев А.И., Ибрагимов Р.А., и др. Клинико-анатомическое обоснование доступа к селезеночной и левой почечной венам при операции дистального спленоренального анастомоза // Журнал им. Н.В. Склифосовского «Неотложная медицинская помощь». 2021. Т. 10, № 2. С. 293–302. doi: 10.23934/2223-9022-2021-10-2-293-302

REFERENCES

1. Goral V, Yilmaz N. Current Approaches to the Treatment of Gastric Varices: Glue, Coil Application, TIPS, and BRTO. *Medicina (Kaunas).* 2019;55(7):335. doi: 10.3390/medicina55070335
2. Mercado MA. Surgical treatment for portal hypertension. *Br J Surg.* 2015;102(7):717–8. doi: 10.1002/bjs.9849
3. Ivashkin VT, Maevskaya MV, Zharkova MS, et al. Clinical Recommendations of the Russian Scientific Liver Society and Russian Gastroenterological Association on Diagnosis and Treatment of Liver Fibrosis, Cirrhosis and Their Complications. *Russian Journal of Gastroenterology, Hepatology, Coloproctology.* 2021;31(6):56–102. (In Russ). doi: 10.22416/1382-4376-2021-31-6-56-102
4. Yao O, Chen W, Yan C, et al. Efficacy and Safety of Treatments for Patients with Portal Hypertension and Cirrhosis: A Systematic Review and Bayesian Network Meta-Analysis. *Front Med (Lausanne).* 2021;8:712918. doi: 10.3389/fmed.2021.712918
5. Van Praet KM, Ceulemans LJ, Monbaliu D, et al. An analysis on the use of Warren's distal splenorenal shunt surgery for the treatment of portal hypertension at the University Hospitals Leuven. *Acta Chir Belg.* 2021;121(4):254–60. doi: 10.1080/00015458.2020.1726099
6. Kotiv BN, Dzidzava II, Bugaev SA, et al. Minimally invasive ways to treat and prevent gastroesophageal portal bleeding. *Annals of HPB Surgery.* 2022;27(2):48–57. (In Russ). doi: 10.16931/1995-5464.2022-2-48-57
7. Chen Y, Qiu H, Zhang X. Transjugular intrahepatic portal shunt in the treatment of portal hypertension due to cirrhosis: single center experience. *BMC Surg.* 2019;19(1):191. doi: 10.1186/s12893-019-0659-5
8. Dzidzava II, Kotiv BN, Onnicev IE, et al. Laparoscopic distal splenorenal anastomosis. *Vysokotekhnologicheskaya Meditsina.* 2020;(1):4–16. (In Russ).
9. Kotelnikova LP, Mukhamadeev IS. The effectiveness of splenorenal shunt in the correction of portal hypertension and hypersplenism in the long-term period. *Experimental and Clinical Gastroenterology.* 2023;(6):72–8. (In Russ). doi: 10.31146/1682-8658-ecg-214-6-72-78
10. Anisimov AYu, Andreev AI, Ibragimov RA, et al. Clinical and Anatomical Substantiation of Access to the Splenic and Left Renal Veins in the Operation of Distal Splenorenal Anastomosis. *Russian Sklifosovsky Journal "Emergency Medical Care".* 2021;10(2):293–302. (In Russ). doi: 10.23934/2223-9022-2021-10-2-293-302

ОБ АВТОРАХ

***Червяков Юрий Валентинович**, д.м.н., профессор;
ORCID: https://orcid.org/0000-0001-5270-9968;
eLibrary SPIN: 9857-8974; e-mail: cheryurval@yandex.ru

Борисов Александр Владимирович, к.м.н.;
ORCID: https://orcid.org/0009-0000-6683-4241;
eLibrary SPIN: 5267-1479; e-mail: borisovokb@yandex.ru

Староверов Илья Николаевич, д.м.н., доцент;
ORCID: https://orcid.org/0000-0001-9855-9467;
eLibrary SPIN: 8011-7176; e-mail: istaroverov@mail.ru

Пампутис Сергей Николаевич, д.м.н., профессор;
ORCID: https://orcid.org/0000-0002-7880-1081;
eLibrary SPIN: 1844-2128; e-mail: pamputis@yandex.ru

Завьялов Дмитрий Вячеславович, д.м.н., доцент;
ORCID: https://orcid.org/0000-0002-9173-6878;
eLibrary SPIN: 8048-7985; e-mail: zavialoff@mail.ru

Баранов Григорий Александрович, д.м.н., профессор;
ORCID: https://orcid.org/0000-0003-1394-4185;
eLibrary SPIN: 3151-1800; e-mail: bga.prof@yandex.ru

AUTHORS' INFO

***Yuriy V. Chervyakov**, MD, Dr. Sci. (Med.), Professor;
ORCID: https://orcid.org/0000-0001-5270-9968;
eLibrary SPIN: 9857-8974; e-mail: cheryurval@yandex.ru

Aleksandr V. Borisov, MD, Cand. Sci. (Med.);
ORCID: https://orcid.org/0009-0000-6683-4241;
eLibrary SPIN: 5267-1479; e-mail: borisovokb@yandex.ru

Il'ya N. Staroverov, MD, Dr. Sci. (Med.), Associate Professor;
ORCID: https://orcid.org/0000-0001-9855-9467;
eLibrary SPIN: 8011-7176; e-mail: istaroverov@mail.ru

Sergey N. Pamputis, MD, Dr. Sci. (Med.), Professor;
ORCID: https://orcid.org/0000-0002-7880-1081;
eLibrary SPIN: 1844-2128; e-mail: pamputis@yandex.ru

Dmitriy V. Zav'yalov, MD, Dr. Sci. (Med.), Associate Professor;
ORCID: https://orcid.org/0000-0002-9173-6878;
eLibrary SPIN: 8048-7985; e-mail: zavialoff@mail.ru

Grigoriy A. Baranov, MD, Dr. Sci. (Med.), Professor;
ORCID: https://orcid.org/0000-0003-1394-4185;
eLibrary SPIN: 3151-1800; e-mail: bga.prof@yandex.ru

* Автор, ответственный за переписку / Corresponding author