

Incidence and outcomes of postoperative complications after liver cirrhosis – related surgery

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ABSTRACT

Aim: To investigate incidence and outcomes of postoperative complications after cirrhosis-related surgery.

Materials and Methods: Retrospective review of medical records of 344 liver cirrhosis (LC) patients who underwent cirrhosis-related surgical treatment was done. Types and incidence of postoperative complications, causes of death in operated patients, incidence of postoperative complications and mortality based on type of surgery were determined.

Results: Postoperative complications developed in 108 (31.4%) patients. Acute-on-chronic liver failure (ACLF) developed in 60 (17.4%) patients was the most common complication. ACLF was the main cause of death - 28 (49.1%) patients with developed complications died. The lowest number of postoperative complications and the lowest mortality were observed after extraperitonization of right hepatic lobe with intraoperative laser irradiation: complications developed in 3 (9.1%) patients, 1 (3.0%) patient died. Complications after endoscopic interventions developed in 10 (15.4%) patients, 6 (9.2%) died, after roentgen-endovascular interventions complications developed in 10 (15.4%) patients, all of them died. Devascularization and transection interventions complications developed in 31 (31.0%) patients, 21 (21%) died. In patients, who underwent distal splenorenal shunt - complications developed in 54 (66.7%) patients, 19 (23.4%) patients died.

Conclusions: The most common complication of the early postoperative period after LC-related surgery is ACLF, which develops in 17.4% of patients and is the cause of death in 49.1% of cases. The incidence and outcomes of postoperative complications of cirrhosis-related surgery, depends on the liver function, timing and type of surgery.

KEY WORDS: liver cirrhosis, postoperative complications, mortality, adverse outcomes, cirrhosis-related surgery

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INTRODUCTION

Liver cirrhosis (LC), a complex and progressive disease, imposes a significant global health burden, characterized by irreversible liver tissue scarring and various life-threatening complications, is one of the leading causes of morbidity and mortality [1,2].

Patients with LC have an increased risk of in-hospital mortality or postoperative complication after surgery [3-13]. This increased risk is attributed to adverse effects of liver disease, encompassing coagulation dysfunction, altered metabolism of anesthesia and sedatives, immunologic dysfunction, hemorrhage related to varices, malnutrition and frailty, impaired wound healing, as well as diminished portal blood flow, overall hepatic circulation, and hepatic oxygen supply during surgical procedures [14].

Patients with cirrhosis had significantly higher 30-day mortality than noncirrhotic patients with chronic hep-

atitis B (4.4% vs 1.3%), or with no chronic liver disease (0.8%), postoperative mortality was almost 6 times higher after emergent rather than elective surgery (17.2% vs. 2.1%) [15].

Patients with cirrhosis have significantly higher mortality rates after emergency surgery, more surgical complications and reoperations, and reduced days-alive-out-of-hospital at 90-days [16, 17]. Among gastrointestinal surgeries, the highest postoperative mortality is after colorectal resection (13%–37%), esophagectomy (11%–25%), and pancreaticoduodenectomy (11.9%–17%). The lowest postoperative mortality is after laparoscopic cholecystectomy and elective uncomplicated hernia repair (0% in most studies). High mortality was reported after coronary artery bypass graft and valvular heart surgery, whereas low mortality was reported after elective hip and knee

replacements. Patients with Child-Turcotte-Pugh class C disease or high MELD score had very high mortality across all surgical procedures [18,19].

AIM

The aim of our study was to investigate incidence and outcomes of postoperative complications after cirrhosis-related surgery.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of 344 liver LC patients who underwent curative cirrhosis-related surgical treatment in the clinical bases of the Department of Surgery No. 4 of Kharkiv National Medical University and Zaitsev Institute of General and Emergency surgery of the National Academy of Medical Sciences of Ukraine. The age of the patients ranged from 9 to 66 years. The average age of the patients was 43.5 years. By gender, the patients were categorized as follows: 206 (59.9%) males and 138 (40.1%) females. In 81 (23.5%) patients distal splenorenal shunt (DSRS) was done, in 33 (9.6%) patients - extraperitonealization of right hepatic lobe with intraoperative laser irradiation (ERHLILI), devascularization and transection interventions (DTI) - in 100 (29.1%) patients ((gastrotomy with gastroesophageal varices (GOV) suturing- in 36 (10.4%) patients, skeletonisation of the abdominal part of the esophagus and cardia with extra-organs GOV suturing and esophagophrenofundoplication - in 14 (4.1%) patients, devascularisation of the Lesser curvature of the stomach by highly selective vagotomy type, pyloroplasty - in 7 (2.1%) patients, proximal gastric resection with removal of GOV conglomerate - in 2 (0.6%) patients, ligation of left gastric artery and vein, splenic artery - in 41 (11.9%) patients)), endoscopic interventions (EI) - in 65 (18.9%) patients ((endoscopic sclerotherapy (ES) - in 56 (16.3%) patients, endoscopic variceal ligation (EVL) - in 9 (2.6%) patients)), roentgen-endovascular interventions (REI) - in 65 (18.9%) patients - ((splenic artery embolization (SAE) in 43 (12.5%) patients, SAE and left gastric artery embolization - in 17 (4.9%) patients, SAE and common hepatic artery embolization - in 5 (1.5%) patients)).

Indications for DSRS were various manifestations of portal hypertension (PH): bleeding from GOV, ascites, hypersplenism syndrome. Indications for ERHLILI was clinically significant PH and ascites. DTI were done in patients with persistent GOV bleeding and ineffective conservative means and sclerotherapy. EI were done in high degree of surgical risk patients and ineffective

conservative means to stop acute GOV bleeding or to prevent the recurrence of bleeding. REI were indicated in cases of acute GOV bleeding and clinical manifestations caused by increased activity of the reticuloendothelial system (hypersplenism).

Types and incidence of postoperative complications, causes of death in operated patients, incidence of postoperative complications and mortality based on type of surgery were determined. IBM SPSS Statistics 29.0.2.0 (IBM Corp, NY) was used for statistical analysis. Categorical data were summarized and presented as numbers and percentages of a group.

ETHICS

The authors adhered to the ethical principles of the Helsinki Declaration of the World Medical Association and international standards for publications in medical journals, including the recommendations of the ICMJE (International Committee of Medical Journal Editors).

RESULTS

Postoperative complications developed in 108 (31.4%) patients. The most common complication was acute - on - chronic liver failure (ACLF), which developed in 60 (17.4%) patients, from which 8 (2.3%) patients developed hepato-renal failure (Table 1).

In 11 (3.1%) patients, ACLF manifested itself without other complications, and in 30 (8.7%) patients with other complications. The combination of ACLF with DSRS thrombosis was observed in 3 (0.9%) patients, with thrombosis of the veins of the portal system in 2 (0.4%), with intra-abdominal bleeding in 3 (0.9%), with spontaneous bacterial peritonitis (SBP) in 3 (0.9%), with acute gastric ulcers in 4 (1.2%), with abdominal eventeration in 3 (0.9%), with pneumonia in 15 (4.3%) patients. DSRS thrombosis in 2 (0.6%) cases was diagnosed postmortem at autopsy - hepatic coma dominated in the clinical course. In the remaining 3 (0.9%) patients, variceal bleeding on the background of hepatic failure was a sign of DSRS thrombosis and veins of the portal system. At the same time, acute gastric ulcers were the cause of bleeding in 4 (1.2%) patients due to ACLF.

Recurrent variceal bleeding developed in 35 (10.1%) patients. Ascites developed in 10 (2.9%) patients, indicating liver failure and impaired liver function in the postoperative period. 3 (0.9%) patients postoperatively developed SBP.

Hematoma in the site of DSRS was diagnosed in 4 (1.2%) patients on the basis of a decrease in the level of hemoglobin and erythrocytes of the blood, the

Table 1. Postoperative complications in LC patients

Complication	Number of patients	%
ACLF	60	17.4
Recurrent variceal bleeding	35	10.1
Pneumonia	24	6.9
Ascites	10	2.9
Hematoma of laparotomy wound	6	1.8
Thrombosis of DSRS, veins of the portal system	5	1.4
Acute gastric ulcers	4	1.2
Hematoma in the site of DSRS	4	1.2
Intra-abdominal bleeding	3	0.9
Spontaneous bacterial peritonitis	3	0.9
Abdominal eventeration	3	0.9
Postoperative pancreatitis	3	0.9
Acute fibrinolysis	3	0.9
Ischemic stroke	1	0.3

Source: compiled by the authors of this study

presence of a palpable infiltrate in the left hypogastrum (anastomosis), and blood discharge through the drainage tube leading to the anastomosis zone.

Hematoma of the postoperative wound developed in 6 (1.8%) patients. In 3 (0.9%) patients, the combination of ascites and hematoma of the laparotomy wound caused eventeration.

Acute fibrinolysis complicated the course of the postoperative period in 3 (0.9%) patients. In 1 (0.3%) case fibrinolytic bleeding developed during surgery and, despite treatment, resulted in patient death. In 2 (0.6%) patients, intra-abdominal bleeding was stopped during relaparotomy performed first 24 hours following surgery.

Pneumonia in the postoperative period was diagnosed in 24 (6.9%) patients. At the same time, in 7 (2.0%) patients it was an independent complication, and in the remaining 17 (4.9%) it was a manifestation of pulmonary injury as a result of multiple organ failure. Postoperative pancreatitis as a consequence of pancreatic traumatization during splenic vein isolation was diagnosed in 3 (0.9%) DSRS patients.

In 1 (0.3%) patient in the postoperative period the development of acute appendicitis was observed, in 1 (0.3%) - acute cholecystitis, which required surgical treatment. In both cases, the diagnosis was confirmed histologically.

Of the 108 patients who developed postoperative complications, 57 (52.8%) died. The most common cause of death was ACLF, which caused death of 28 (49.1%) patients (Table 2).

At the same time, at autopsy in 3 (0.9%) patients SBP was diagnosed, and in 2 (0.6%) – DSRS thrombosis.

In 24 (42.1%) patients, the cause of death was recurrence of bleeding from GOV. The development of bleeding causes decompensation of a liver function and rapid patient's death.

In 3 (5.2%) patients, bleeding from acute gastric ulcers on the background of liver failure caused their death. At the same time, bleeding from acute ulcers developed on the 2nd-4th day postoperatively on background of severe liver failure.

In 1 (1.8%) patient, the cause of death was acute fibrinolysis, in 1 (1.8%) - ischemic stroke.

The incidence of postoperative complications and mortality were different depending on the type of surgical intervention performed (Table 3).

The lowest number of postoperative complications and the lowest mortality were observed after ERHLILI surgery: complications developed in 3 (9.1%) patients, 1 (3.0%) patient died. EI complications developed in 10 (15.4%) patients, 6 (9.2%) died. REI complications developed in 10 (15.4%) patients, all of them died. DTI complications developed in 31 (31.0%) patients, 21 (21%) died. The largest number of postoperative complications and the highest mortality were observed in patients, who underwent DSRS surgery - complications developed in 54 (66.7%) patients, of which 19 (23.4%) died.

DISCUSSION

Patients with cirrhosis are at increased risk of perioperative morbidity and mortality. Severity of liver

Table 2. Causes of deaths in LC patients in the postoperative period

Cause of death	Number of patients	%
ACLF	28	49.1
Recurrent variceal bleeding	24	42.1
Bleeding from acute gastric ulcers secondary to liver failure	3	5.2
Acute fibrinolysis	1	1.8
Ischemic stroke	1	1.8
Total	57	100

Source: compiled by the authors of this study

Table 3. Incidence of postoperative complications and mortality in LC patients based on type of surgery

Type of surgery	Number of patients	Postoperative complications		Mortality	
		n	%	n	%
DSRS	81	54	66.7	19	23.4
ERHLILI	33	3	9.1	1	3.0
DTI	100	31	31.0	21	21.0
EI	65	10	15.4	6	9.2
REI	65	10	15.4	10	15.4
Total	344	108	31.4	57	16.6

Source: compiled by the authors of this study

dysfunction, medical comorbidities and the type and complexity of surgery, including whether it is elective versus emergent, are all determinants of perioperative mortality and morbidity in patients with cirrhosis. There are major limitations to the existing clinical research on risk assessment and perioperative management that warrant further investigation [20-23].

In our study, postoperative complications developed in 108 (31.4%) patients. ACLF, the most common complication, developed in 60 (17.4%) patients, while recurrent variceal bleeding developed in 35 (10.1%) patients, pneumonia - in 24 (6.9%) patients, ascites - in 10 (2.9%) patients, hematoma of the postoperative wound - in 6 (1.8%) patients, thrombosis of DSRS, veins of the portal system - in 5 (1.4%) patients, acute gastric ulcers, as well as, hematoma in the site of DSRS - in 4 (1.2%) patients, intra-abdominal bleeding, SBP, abdominal eventration, postoperative pancreatitis, acute fibrinolysis - in 3 (0.9%) patients each, ischemic stroke 1 (0.3%) patient. In our opinion, ACLF was related to extra-hepatic precipitating event (major surgery) in the context of a pre-existing liver condition (LC).

ACLF also was a leading cause of death in postoperative period - 28 (49.1%) of patients, who developed complications died. 24 (42.1%) patients died because of recurrent variceal bleeding, which causes decompensation of a liver function. Bleeding from acute gastric ulcers on the background of liver failure caused death in 3 (5.2%) patients, acute fibrinolysis, as well as, ischemic stroke - in 1 (1.8%) patient.

Morbidity and mortality vary between types of surgery with further studies required in patients with more advanced liver disease. Patient-specific considerations and practicing precision medicine may allow for improved postoperative outcomes [22].

The severity of liver decompensation, timing of surgery, and type of surgery are the most important determinants of the surgical outcome in patients with cirrhosis [24].

The results of published studies indicated that the postoperative mortality rate for patients with cirrhosis is 8.3–25% [23, 25, 26]. In our study, the in-hospital mortality of the LC patients was 16.6%.

The incidence of postoperative complications and mortality were different depending on the type of surgical intervention performed. The lowest number of postoperative complications and the lowest mortality were observed after ERHLILI surgery: complications developed in 3 (9.1%) patients, 1 (3.0%) patient died. This result was due to the fact that only compensated LC patients underwent this type of surgery, the ERHLILI itself is not highly traumatic and prolonged.

EI complications developed in 10 (15.4%) patients, 6 (9.2%) died. REI complications developed in 10 (15.4%) patients, all of them died. Although these surgical interventions do not belong to the category of major surgery and are short in duration, we can explain such outcomes by the fact that they were performed in patients with decompensated LC to stop acute variceal bleeding as an emergency.

DTI complications developed in 31 (31.0%) patients,

21 (21%) died. This type of surgery, belongs to major surgery, was done in emergency only for decompensated LC patients with acute variceal bleeding.

The largest number of postoperative complications and the highest mortality were observed in patients, who underwent DSRS - complications developed in 54 (66.7%) patients, of which 19 (23.4%) died. Such adverse outcomes also can be explained as DSRS is a major surgery, taking long time, which was done for mainly decompensated patients.

CONCLUSIONS

Thus, when analyzing the immediate results of surgical treatment of liver cirrhotic patients, it was found that the most common complication of the early postoperative period is ACLF, which develops in 17.4% of patients and is the cause of death in 49.1% of cases. The incidence and outcomes of postoperative complications of cirrhosis-related surgery, depends on the liver function, timing and type of surgery.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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