



Safety and effectiveness of inguinal hernia repair in patients with liver cirrhosis: a retrospective study and literature review

Jianfang Li¹ · Changfu Qin² · Dandan Lai¹ · Yueming Hu¹ · Lichao Wang¹

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Abstract

Purpose Inguinal hernia is a common feature of decompensated liver cirrhosis and a frequent cause of life-threatening complications. The traditional treatment of inguinal hernia in patients with liver cirrhosis includes non-operative management; however, emerging data suggest elective surgical repair as a preferable approach. Therefore, we aimed to assess the outcomes of inguinal hernia repair in patients with liver cirrhosis and describe their clinical characteristics.

Methods In this retrospective study, we included a total of 28 consecutive patients with liver cirrhosis who underwent inguinal hernia repair between March 2000 and May 2019 at the First People's Hospital of Xiaoshan, Hangzhou, China. We also reviewed the literature on inguinal hernia repair in patients with liver cirrhosis.

Results Emergency surgery for complicated hernia was performed in 17.9% of the study patients. Two patients developed major complications including wound hematoma in 1, who required reoperation, and gastrointestinal tract hemorrhage in the other patient, who required blood transfusion. Further, minor complications developed in 6 patients, including wound seroma in 1 and scrotal swelling in 5. Emergency hernia repair was found to be associated with a higher complication rate than elective surgery in patients with liver cirrhosis.

Conclusion Elective surgery for inguinal hernia repair in patients with liver cirrhosis appears to be successful and might be associated with a lower complication rate than emergency surgery. Inguinal hernia repair is recommended for patients with liver cirrhosis to prevent the development of life-threatening complications.

Keywords Inguinal hernia repair · Liver cirrhosis · Ascites · Complication rate

Introduction

Cirrhosis is a major determinant of postoperative morbidity and mortality in end-stage liver disease. Portal hypertension leads to refractory ascites and accounts for elevated intra-abdominal pressure with peritoneal distension, which results in a higher prevalence of abdominal wall hernia [1, 2]. In patients with liver cirrhosis accompanied by ascites, the

prevalence of umbilical hernia can be up to 20%, which is markedly higher than that observed in patients without liver cirrhosis. However, the incidence and natural history of inguinal hernia in patients with liver cirrhosis have not been clearly documented [3].

Surgical treatment of inguinal hernia was traditionally avoided in patients with liver cirrhosis because of the substantial recurrence rate and high postoperative morbidity and mortality [4]. Moreover, the watch-and-wait strategy is associated with a high mortality rate due to the necessity of emergency surgery associated with complications such as incarceration or strangulation. Thus, controversies regarding the treatment modality and timing of inguinal hernia repair in patients with liver cirrhosis persist [5]. Furthermore, high-level, randomized, controlled studies that can provide a basis for treatment protocols are lacking, and only 8 studies on inguinal hernia repair in patients with liver cirrhosis have been published in the English literature to date [6–13]. China has the highest number of patients with liver cirrhosis and

Jianfang Li and Changfu Qin contributed equally to this work.

✉ Changfu Qin
qin_pku2012@163.com

¹ Department of Hernia and Abdominal Wall Surgery, The First People's Hospital of Xiaoshan, Hangzhou 311200, China

² Department of Hernia and Abdominal Wall Surgery, Beijing Chaoyang Hospital, Capital Medical University, Beijing 100043, China

those with hernia worldwide. Many studies have been published on this topic in Chinese that cannot be found in the English literature. Thus, the objective of the present study was to investigate the safety and effectiveness of inguinal hernia repair in patients with liver cirrhosis and to compare the outcomes with those reported in other studies published in English and Chinese.

Methods

In this retrospective study, the medical records of a total of 28 consecutive patients, including 26 men and 2 women, with liver cirrhosis and inguinal hernia who underwent hernia repair between March 2000 and May 2019 at the First People's Hospital of Xiaoshan, Hangzhou, China, were thoroughly reviewed. These medical records were obtained from the hospital electronic medical databases. Liver cirrhosis was documented based on anamnestic data and confirmed through clinical, laboratory, and radiological findings. The severity of liver cirrhosis was classified according to the Child–Turcotte–Pugh (CTP) classification. The presence of ascites, which is a potentially important factor in determining surgical outcome, was confirmed by preoperative abdominal ultrasound or computed tomography. In addition, we reviewed the literature on inguinal hernia repair for patients with liver cirrhosis using the terms “inguinal hernia”, “groin hernia”, “cirrhosis”, “cirrhotic”, and “liver disease” between January 1950 and May 2019 in several databases including PubMed, EMBASE, and Chinese Biomedical Literature Database.

Results

Patient characteristics and published studies

Our search of the literature using the English and Chinese databases identified a total of 50 studies on inguinal hernia repair in patients with liver cirrhosis, including 8 and 42 studies published in English and Chinese, respectively. The Chinese studies could not be found in PubMed or EMBASE; therefore, they have not been listed in the references.

The characteristics of the study patients treated at the study institution and those reported in the 8 English studies are summarized in Table 1. The perioperative treatments of the patients are summarized in Table 2. In the English studies from 5 countries, the number of patients ranged from 3 to 256 and mean age ranged from 48.7 to 64.5 years. The most common causes of liver cirrhosis were hepatitis B virus infection in the studies from Asian countries and hepatitis C virus infection or alcohol abuse in the studies from Europe and America. Most patients had CTP class A

or B liver cirrhosis, and most patients had ascites at the time of surgery. The emergency surgery rate ranged from 0% to 13.2%. Surgeries were performed under local anesthesia in 2 studies [7, 9] and under spinal or general anesthesia in 3 studies [6, 8, 12]. Among the 6 studies [6–10, 13], mesh was used in 5 [7–10, 13]. Small hernia sacs were not opened in 3 studies [8–10], whereas drainage tubes were used in 2 studies, if required [6, 10]. In 4 studies [6, 8–10], patients preoperatively received antibiotic prophylaxis and adjunctive therapy. Two English studies [8, 10] and majority of the Chinese studies reported that surgeries improved quality of life, and most studies advocated that elective surgery is safe in patients with liver cirrhosis, including those with refractory ascites or advanced liver cirrhosis.

Postoperative complications and mortality

Postoperative complication and mortality rates of the 28 study patients and patients from 8 published English studies are summarized in Table 3. The complication rate ranged from 3.8 to 36.4%, and the majority of the complications were treated conservatively. A total of 11 patients reportedly died within postoperative 1 month in 4 studies [6, 8, 11, 12]; the majority of these patients had undergone emergency surgery. Further, 1-month postoperative mortality has been reported in 4 studies [7, 8, 12, 13]. Hur et al. reported that 13 (59.1%) patients in their cohort died during the follow-up period and 8 of these patients died within 1 year after hernia repair [7], but there was no 1-month postoperative mortality; mortality was related to cirrhotic complications, and there was no surgery-related mortality. Hurst et al. reported that approximately 75% of the patients in their study were alive for postoperative 2 years and that only 28% survived for postoperative 5 years; mortality was due to the complications related to the progression of the liver disease, and mortality was not attributable to the complications related to inguinal hernia or their management [13]. Five studies reported recurrence rates ranging from 0 to 9.1% [6–8, 10, 13].

In the present study cohort, 8 (29.63%) patients had postoperative complications including 2 major complications, i.e., wound hematoma requiring reoperation and gastrointestinal tract hemorrhage requiring blood transfusion. The other 6 complications were minor and included wound seroma in 1 patient and scrotal swelling in 5; all complications improved following conservative treatment. There were 2 (7.14%) postoperative mortality, including mortality in 1 patient who died within 1 year after hernia repair; however, there was no 1-month postoperative mortality. Mortality was related to cirrhotic complications in all patients and not to surgery. Recurrent hernia developed 6 years after the first hernia repair in 1 patient with CTP class B liver cirrhosis, which was successfully repaired.

Table 1 Characteristics of the 28 study patients and the patients from 8 studies published in English

	Present study	Oh et al. [6]	Hur et al. [7]	Park et al. [8]	Gubitosi et al. [9]	Patti et al. [10]	Hansen et al. [11]	Pere et al. [12]	Hurst et al. [13]
Country	China	Korea	Korea	Korea	Italy	Italy	Denmark	Finland	USA
Number of patients	28	129	22	53	52	36	256	3	11
Male sex (%)	26 (92.9%)	122 (94.6%)	21 (95.5%)	48 (90.6%)	47 (90.4%)	32 (100%)	NR	2 (66.7%)	10 (90.9%)
Mean age (years) (range)	61 (40–88)	59.9 (22–85)	58.4 ± 10.8 (30–72)	58 (27–81)	63.5 (45–80)	53.4 ± 10.5 (45–80)	NR	48.7 (42–54)	64.5 (42–81)
HBV	18 (64.3%)	91 (70.5%)	13 (59.1%)	45 (84.9%)	4 (7.7%)	4 (12.5%)	NR	1 (33.3%)	0
HCV	0	16 (12.4%)	1 (4.5%)	7 (13.2%)	39 (75.0%)	17 (53.1%)	NR	0	1 (9.1%)
Alcohol abuse	8 (28.6%)	15 (11.6%)	5 (22.7%)	1 (1.9%)	NR	9 (28.2%)	NR	2 (66.7%)	8 (72.7%)
Idiopathic	2 (7.14%)	4 (3.1%)	3 (13.6%)	0	NR	2 (6.3%)	NR	0	2 (18.2%)
CTP class A liver cirrhosis	16 (57.1%)	45 (34.9%)	0	17 (32.1%)	37 (71.2%)	10 (31.3%)	NR	NR	5 (45.5%)
CTP class B liver cirrhosis	8 (28.6%)	66 (51.1%)	15 (68.2%)	27 (50.9%)	12 (23.1%)	14 (43.8%)	NR	NR	3 (27.3%)
CTP class C liver cirrhosis	4 (14.3%)	18 (14.0%)	7 (31.8%)	9 (17.0%)	3 (5.8%)	8 (25.0%)	NR	NR	3 (27.3%)
Ascites	15 (53.6%)	81 (62.8%)	22 (100%)	53 (100%)	14 (26.9%)	10 (31.3%)	NR	3 (100%)	11 (100%)
Elective surgery	23 (82.1%)	127 (98.4%)	NR	46 (86.8%)	NR	32 (100%)	NR	3 (100%)	10 (90.9%)
Emergent surgery	5 (17.9%)	2 (1.6%)	NR	7 (13.2%)	NR	0	NR	0	1 (9.1%)
Quality of life	100%	NR	NR	100%	NR	100%	NR	NR	NR
Conclusions	Advocated	Advocated	Advocated	Advocated	Advocated	Advocated	NR	NR	Advocated

NR not reported, CTP Child–Turcotte–Pugh

Discussion

Liver cirrhosis, a late-stage progressive liver disease, is a considerable cause of mortality in many countries. This disease develops most commonly from viral hepatitis and alcohol abuse. The number of patients with liver cirrhosis presenting to emergency departments for care is increasing, with many patients requiring substantial management for complications related to liver cirrhosis [14].

Traditionally, hernia repair in patients with advanced liver cirrhosis and ascites has been associated with high rates of morbidity and mortality, prompting many surgeons to avoid elective surgery and to operate only on those presenting complications. Whether hernia repair should be performed remains controversial because of the risk of mortality due to the use of anesthetics and postoperative complications. Most patients with refractory ascites have CTP class C liver cirrhosis, and the prognosis of refractory ascites is extremely poor, considerably affecting the certainty of surgery decision. However, hernia and liver cirrhosis have detrimental

effects on quality of life. Most patients with liver cirrhosis accompanied by inguinal hernia experience severe pain and discomfort, particularly when standing or walking, as well as a considerable decrease in quality of life. The present study including 50 studies revealed that most patients with liver cirrhosis requiring surgery for hernia repair were middle-aged and old men with a mean age of 48.7–64.5 years. Two English studies [8, 10] and most Chinese studies reported that surgery for inguinal hernia improved the quality of life of patients. In the reviewed studies, most patients had CTP class A or B liver cirrhosis and the rate of patients with CTP class C liver cirrhosis ranged from 14.0 to 31.8%. Four English studies reported that all patients had ascites at the time of surgery [7, 8, 12, 13], whereas 4 English studies reported that their patients preoperatively received adjunctive therapy [6–8, 10]. Ascites control is essential to reduce perioperative complications and recurrence, and studies indicate that adequate preparation of patients with liver cirrhosis by controlling ascites as well as albumin and electrolyte levels ensures successful outcomes with elective surgery.

Table 2 Perioperative treatments of the 28 study patients and the patients from 8 studies published in English

	Present study	Oh et al. [6]	Hur et al. [7]	Park et al. [8]	Gubitosi et al. [9]	Patti et al. [10]	Hansen et al. [11]	Pere et al. [12]	Hurst et al. [13]
Antibiotic prophylaxis	18 (64.3%)	1 g of intravenous cefazolin	NR	53 (100%)	52 (100%)	36 (100%)	NR	NR	NR
Adjunctive therapy	16 (57.1%)	64 (49.6%)	NR	Perioperative supportive care	16 (30.8%)	Selectively	NR	NR	NR
Surgery	21 Mesh, 7 No mesh	McVay	Mesh	Polypropylene or polyester mesh	6 PHS, 37 Trabucco, 9 Lichtenstein	Lichtenstein	NR	NR	1 Mesh, 10 Bassini or McVay
Hernia sac not opened	Not open if small	NR	NR	Not open	51 (98.1%)	Not open if small	NR	NR	NR
Drainage tube	4 (14.3%)	Selectively	0	NR	NR	18 (50.0%)	NR	NR	NR
Local anesthesia	7 (25.0%)	0	22 (100%)	2 (3.8%)	50 (96.2%)	8 (25.0%)	NR	0	NR
Spinal anesthesia	5 (17.9%)	76 (58.9%)	0	26 (49.1%)	2 (3.8%)	0	NR	3 (100%)	NR
General anesthesia	16 (57.1%)	53 (41.1%)	0	25 (47.2%)	0	24 (75.0%)	NR	0	NR

NR not reported, PHS prolene hernia system

Table 3 Postoperative complication and mortality rates of the 28 study patients and patients from 8 published English studies

	Present study	Oh et al. [6]	Hur et al. [7]	Park et al. [8]	Gubitosi et al. [9]	Patti et al. [10]	Hansen et al. [11]	Pere et al. [12]	Hurst et al. [13]
Complications	8 (28.6%)	14 (10.9%)	3 (13.6%)	2 (3.8%)	5 (9.6%)	2 (5.6%)	NR	1 (33.3%)	4 (36.4%)
Treatment	1 reoperation 7 CM	CM	CM	NR	CM	CM	NR	CM	CM
Recurrence	1 (3.6%)	3 (2.3%)	0	1 (1.9%)	NR	0	NR	NR	1 (9.1%)
Postoperative mortality within 1 month	0	1 heart failure, 1 bleeding	0	1 class C septic shock related to incarceration	0	0	7 (5 Emergency)	1 cardiac arrhythmia	0
Postoperative mortality after 1 month	2 (7.1%)	NR	13 (59.1%)	0	NR	NR	NR	0	28% survived for post-operative 5 years

NR not reported, CM conservative management

Although inguinal hernia repair has been reported for patients with liver cirrhosis, relatively few studies have investigated this aspect or optimal management. A Danish nationwide database study reported that patients with liver cirrhosis undergoing surgery for umbilical or inguinal hernia were at a higher risk of mortality than individuals without liver cirrhosis (3.9- and 4.4-fold higher risk, respectively) [11]. However, other studies on the treatment

of hernia in patients with decompensated liver cirrhosis suggest that hernia is safely repaired without increased surgical risk or any undue increase in the recurrence rate [7, 8, 15]. Although the number of patients was small and follow-up durations were short, these recent studies have clearly demonstrated that the presence of ascites does not contraindicate surgical repair and that morbidity and recurrence rates were relatively low after inguinal hernia

repair in patients with liver cirrhosis. In a study on 129 patients with liver cirrhosis, Oh et al. showed that inguinal hernia repair was not associated with an increased risk of postoperative complications or recurrence compared to those in patients without liver cirrhosis. Moreover, complication and recurrence rates were similar irrespective of the CTP class [6]. Patti et al. found that there were no major complications after the repair of symptomatic inguinal hernia in 32 patients with liver cirrhosis [10].

The choice of anesthesia varied among the reviewed studies. Hur et al. performed hernia repairs under local anesthesia in all patients with liver cirrhosis and did not report anesthesia-related complications [7]. Gubitosi et al. reported that 96.2% of hernia repairs were performed under local anesthesia [9]. In the present study, we performed hernia repair under local, spinal, and general anesthesia in 7, 5, and 16 patients, respectively. An alternative option to conservative treatment is surgery under local anesthesia in patients who are initially ineligible for general or spinal anesthesia. In particular, high-risk patients are eligible for inguinal hernia repair under local anesthesia [16]. The approach to deal with the hernia sac varied among the reviewed studies. Although it was not necessary to open small hernia sacs in 3 studies [8–10], the hernia sac is extremely thin and can easily tear in patients with liver cirrhosis accompanied by ascites; therefore, careful dissection of the hernia sac is necessary to prevent the leakage of ascites. Hur et al. reported that the distal part of the sac in indirect hernia was not dissected excessively until the end and that the middle part of the hernia sac was dissected in patients with severe ascites accompanied hydrocele [7]. The proximal part of the hernia sac is inverted using mesh after ligation. In addition, the distal part of the hernia sac is cut vertically after the aspiration of ascites and fixation after eversion. Two studies reported that a drainage tube was used if necessary [6, 10], most reviewed studies used mesh to prevent recurrence, Lichtenstein was the most commonly used surgical method because the plat mesh was easier to place, and the operation time was less than that needed for open preperitoneal repair. Four studies reported that the patients preoperatively received adjunctive therapy [6, 8–10], including intramuscular vitamin K, fresh frozen plasma, platelet transfusion, diuretics, and antibiotic prophylaxis.

One reviewed study reported that all recurrent inguinal hernia developed in patients with ascites at the time of the first surgery and that there was no significant difference in the recurrence rate between patients with and without ascites (3.7% vs. 0%; $P=0.29$) [6]. Park et al. reported that there was no 1-month postoperative mortality or recurrence in their cohort of 17 patients with refractory ascites [8]. These findings indicate that elective surgery for abdominal wall hernia in patients with refractory ascites might be relatively safe and that recurrence might be rare despite the presence

of refractory ascites in patients with liver cirrhosis undergoing surgery for abdominal wall hernia.

Postoperative mortality was different among the different reviewed studies. Hur et al. reported that 13 (59.1%) patients died during follow-up and 8 died within 1 year after hernia repair [7]. However, there were no cases of 1-month postoperative mortality; mortality was related to cirrhotic complications and not to surgery. Hurst et al. reported that approximately 75% of their patients were alive for postoperative 2 years although only 28% survived for postoperative 5 years; mortality was due to complications related to the progression of liver disease, and no cases of mortality were attributable to complications or management of inguinal hernia [13]. Oh et al. revealed that 2 patients with CTP class C liver cirrhosis died during the postoperative period despite careful management in the hepatology intensive care unit for the correction of liver function [6]; the impact of the progression of the underlying decompensated liver disease reportedly played a major role than that of hernia repair. Park et al. reported 1-month postoperative mortality in a 52-year-old woman with CTP class C liver cirrhosis; the cause of mortality was septic shock related to preoperative incarceration in this patient who underwent emergency hernia repair due to unresolved preoperative incarceration and died after postoperative 10 days [8]. Hansen et al. reported that 5 of 113 patients with liver cirrhosis who underwent emergency inguinal repair and only 7 of 884 patients who underwent elective surgery died within postoperative 1 month; the adjusted odds ratio for 1-month postoperative mortality was 3.7 (95% confidence interval 1.2–12.2) [11]. These cases paradoxically support the contention that surgical repair of abdominal wall hernia should be elective even in patients with poor liver function to prevent the development of life-threatening complications.

Among the 3 reviewed studies [6, 8, 13] on 10 patients with incarcerated hernia who required emergency surgery, the emergency surgery rate ranged from 0 to 13.2%. Expectant treatment of patients with liver cirrhosis accompanied by abdominal wall hernia and ascites is associated with an increased rate of complications such as incarceration, evisceration, ascites drainage, and peritonitis. These complications require emergency surgical treatment, which is associated with increased morbidity and mortality. Salamone et al. reported that mortality in patients with cirrhosis undergoing elective and emergency surgery were 6.6% and 53.6%, respectively [1]. Patients and their relatives should be informed that expectant treatment has a high risk of incarceration and that emergency surgery is associated with higher complication and mortality rates than elective surgery. Conversely, elective surgery can be performed with fewer complications and should, therefore, be advocated.

In conclusion, elective surgery for inguinal hernia repair in patients with liver cirrhosis might be associated with

lower complication rates than emergency surgery. Furthermore, preoperative refractory ascites should be managed with paracentesis and appropriate intervention to correct serum albumin/electrolyte levels and coagulation abnormalities. Inguinal hernia repair is recommended for patients with liver cirrhosis to prevent the development of life-threatening complications.

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Compliance with ethical standards

Conflict of interest Jianfang Li, Changfu Qin, Dandan Lai, Yueming Hu, and Lichao Wang declare that they have no conflict of interest.

Research involving human participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Human and animal rights This article does not contain any studies with animals performed by any of the authors.

Informed consent Informed consent was waived for this retrospective study.

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