# The outcomes of elective versus emergency inguinal hernia repair in cirrhotic patients

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## Background

Cirrhotic patients with ascites and Child classification B or C impose certain limitations on decision making as regards the elective repair of their inguinal hernias. The aim of this study was to evaluate and compare the outcomes of inguinal hernia repair in cirrhotic patients undergoing elective intervention and in those undergoing emergency interventions.

Methods

Fifty-six cirrhotic patients (Child B or C) undergoing inguinal hernia repair were evaluated. They were classified into two groups based on the type of intervention, elective and emergency surgical intervention (28 patients in each group). Patients were followed up for 12 months after surgery. Operative and postoperative outcomes and quality of life of these patients were recorded and analyzed.

#### **Results**

A total of eight (28.5%) patients died within 30 days after emergency hernia repair. One mortality was recorded in the first 30 days postoperatively in the elective group. Moreover, patients who underwent emergency patients presented with a significantly higher number of perioperative class III–V complications according to the Clavien–Dindo classification (60% in the emergency group vs. 7% in the elective group).

#### Conclusion

Elective inguinal hernia repair for cirrhotic patients with ascites is a relatively safe procedure. The improvement in quality of life represents a clear indication for elective hernia repair.

#### Keywords:

ascites, cirrhosis, elective, emergency repair, inguinal hernia

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# Introduction

Liver cirrhosis (LC) is a major determinant of postoperative morbidity and mortality, and the presence of ascites is associated with poor surgical outcome due to an increased risk for infection and renal failure. Patients with LC and ascites exhibit peritoneal distension and frequently develop herniation of the weakest structures in the abdominal wall [1].

The incidence of abdominal wall hernias in cirrhotic patients is as high as 20%; in cases of major ascites, this number may increase up to 40% [2,3]. Several factors such as increased abdominal tension due to the presence of tense ascites, malnutrition, and worsening muscle wasting are major risk factors for the development of abdominal hernias in these patients [4]. Moreover, because of the presence of increased surgical risk factors in cirrhotic patients, high perioperative morbidity and mortality are often encountered [5].

It is commonly accepted that surgical correction of inguinal hernias in cirrhotic patients should not be performed electively. The more conservative 'wait-and-see' policy is frequently advocated because of high perioperative morbidity and mortality rates [6]. Conservative management of inguinal hernias in cirrhotic patients is not without risks. Incarceration, obstruction, strangulation, and rupture are all prone to occur. Some studies have shown risks of elective surgery in cirrhotic patients are not prohibitive even in the presence of refractory ascites, under the condition that such procedures are performed in a highly experienced liver center [7]. The model for end-stage liver disease (MELD) has been validated as a prediction tool for postoperative mortality, but its role in predicting morbidity has not been well studied. We sought to determine the role of MELD, among other factors, in predicting morbidity and mortality in patients with nonmalignant ascites undergoing hernia repair [8].

The objectives of our study were to evaluate the outcomes of hernia repair in cirrhotic patients, especially as regards the quality of life (QOL),

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postoperative complications, and morbidity in elective and emergency repair during a period of 12 months of follow-up for each patient.

# Methods

This prospective study was conducted on patients with documented cirrhosis Child B or C who underwent inguinal hernia repair at the Department of General Surgery, Menoufia University Hospital, and other private hospitals between May 2010 and October 2014. The study was approved by the ethical committee, and informed consent was obtained from each patient.

Patients with LC and ascites, those suffering from inguinal hernia, and those with Child classification B or C were included in the study. The presentation inguinal hernia is either elective of or emergency (e.g. irreducibility, obstruction, etc.). We excluded from this study patients with concomitant severe morbidity in other systems (e.g. pneumonia, heart failure, etc.). Patients received prophylactic broad spectrum antibiotic cefotaxime 1 g just preoperatively and it was continued for 1 week postoperatively, and ciprofloxacin 500 mg twice daily, metronidazole 500 mg was administered three times per day, together with analgesia (tramadol hydrochloride 50 mg twice daily and paracetamol 500 mg three times daily). Patients were advised to follow-up in the outpatient clinic every week for 1 month, and then monthly for 1 year. Patients were advised to avoid carrying heavy objects for 1 year postoperatively and to follow-up with the hepatologyst for at least 3 months postoperatively.

The outcome criteria evaluated were as follows: length of intensive care and hospital stays, morbidity, 30-day mortality rates, and MELD criteria at 12 months of follow-up.

Morbidity was classified according to the Clavien–Dindo classification (Table 1) [9] and class III–V events were considered to be major complications. Hernia recurrence was recorded during the follow-up period, which was diagnosed by means of physical examination, and in equivocal cases ultrasound and/or computed tomographic scan were used to confirm the diagnosis.

Liver disease severity was documented using the Child–Turcotte–Pugh (CTP) classification and MELD score [10].

MELD uses the patient's values for serum bilirubin, serum creatinine, and the international normalized ratio (INR) for prothrombin time to predict survival. It is calculated according to the following formula:

Full scale		
Grades	Definition	
Grade I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions Allowed therapeutic regimens are drugs such as	
	antiemetics, antipyretics, analgesics, diuretics and electrolytes, and physiotherapy	
	This grade also includes wound infections opened at the bedside	
Grade II	Cases requiring pharmacological treatment with drugs other than that allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included	
Grade III	Cases requiring surgical, endoscopic, or radiological intervention	
Grade III-a	Intervention not under general anesthesia	
Grade III-b	intervention under general anesthesia	
Grade IV	Life-threatening complication (including CNS complications) requiring IC/ICU-management	
Grade IV-a	Single organ dysfunction (including dialysis)	
Grade IV-b	Multiorgan dysfunction	
Grade V	Death of a patient	
Suffix 'd'	If the patient suffers from a complication at the time of discharge, the suffix 'd' (for 'disability') is added to the respective grade of complication. This label indicates the need for a follow-up to fully evaluate the complication	

CNS, central nervous system.

 $MELD = 3.78 \times \ln \left[ \text{serum bilirubin} \left( \text{mg} / \text{dl} \right) \right] + 11.2 \times \ln \left[ \text{INR} \right] + 9.57 \times \ln \left[ \text{serum creatinine} \left( \text{mg} / \text{dl} \right) \right] + 6.43 \times \text{aetiology}$ (0: cholestatic or alcoholic, 1: otherwise)

In interpreting the MELD score in hospitalized patients, the 3-month mortality is determined as follows:

- (1) 40 or more, 71.3% mortality
- (2) 30–39, 52.6% mortality
- (3) 20–29, 19.6% mortality
- (4) 10–19, 6.0% mortality
- (5) <9, 1.9% mortality.

# The surgical technique

Inguinal hernia repairs were performed with primary musculofascial closure and completed with the use of an on-lay prosthetic material (Prolene mesh) in elective cases after sac invagination in an intact pattern whenever possible, to avoid any loss of ascitic fluid during or after the procedure or transfixion and excision of the sac after reduction of the contents. An emergency procedure was defined as a surgical hernia repair that occurred up to 12 h after the diagnosis of ascites leakage due to ruptured hernia, irreducibility or incarceration with refractory pain, obstruction, and strangulation. Both general and local anesthesia was used in this study. Local anesthesia in the form of ilioinguial/iliohypogastric nerve block anesthesia were used in patients whenever general anesthesia is risky or life threatening (e.g. American Society of Anesthesiologists III and IV patients). Spinal anesthesia was used in few number of cases and was avoided in patients with prolonged prothrombin time to avoid hematoma in the spinal canal.

In suspected incarcerated emergency cases, we were obliged to open the sac to check for the viability of the contents with good care to minimize ascitic fluid loss from the hernia site; however, in elective cases, we attempted complete invagination without opening the sac (Figs 1–3). If an advert opening of the sac occurred, patient position was temporarily adjusted to Trendlenburg position, tilting the table to the contralateral side of the hernia to avoid ascitic fluid loss from the torn sac. Thereafter, the contents were reduced, the sac was rolled, followed by transfixion ligation at the neck, and then the sac was excised. Patients were observed by a hepatologist at least once daily until hospital discharge.

## Results

A total of 56 patients were included in the study. In terms of hernia repair urgency, 28 repairs were performed electively (group 1) and 28 repairs were considered emergency procedures (group 2).

All patients had a minimal follow-up of 12 months after surgery. The mean follow-up for patients included in this study either in the surgical outpatient clinic or the hepatology outpatient clinic was  $13 \pm 2.3$  months (range 1–28 months).

Surgery was performed as an emergency because of irreducibility (n = 16), incarceration (n = 6) and obstruction of intestine (n = 3), and strangulation (n = 3). A polypropylene mesh was used in all elective cases and in irreducible cases of the emergency group.

A total of eight (28.5%) patients died within 30 days after emergency surgical repair of their hernia. Unfortunately, CTP class A patients were not encountered in our study, despite it not being an exclusion criteria in the study. Seven (25%) patients died in the emergency group, and one patient (3.5%) died after elective repair; all of them were CTP class C patients. Six patients had local complications, including leaking ascites and wound infection. In contrast to

## Figure 1



Hepatic cirrhotic patient with inguinal hernia.

## Figure 2



Inguinal hernia sac containing ascitic fluid.

#### Figure 3



Attempts of sac invagination without its opening.

the emergency surgery group, only one mortality was recorded in the first 30 days postoperatively in the elective group.

Emergency patients also presented with a markedly higher number of perioperative class III–V complications according to the Clavien–Dindo classification (60% in the emergency group vs. 7% in the elective group).

## **Postoperative complications**

Complications occurred in 19 (68%) patients of the emergency intervention group and in four cases (14%) of the elective group. Notably, the complication rate for the emergency group was significantly higher than that for the elective group (P < 0.001).

# Postoperative mortality

Despite careful management in the hepatology ICU, seven patients of CTP class C and one patient of CTP class B died in the postoperative period in the emergency group. However, in the elective group, only one patient died. These patients were more affected by progression of the underlying decompensated liver disease in addition to the comorbidity added by emergency operation in unfit patient. There was a high statistically significant difference between the two groups in mortality (P < 0.001).

# Quality of life

The SF-36 questionnaire [11] was administered the day before and 12 months after surgery. Global analyses of the eight domains of SF-36 were performed. On analysis of these results, it was clearly evident that QOL was improved in the elective group than in the emergency group.

# Discussion

The number of patients with cirrhosis who require surgery is on the rise. At the same time, the types of medications and treatments aimed at increasing survival among patients with cirrhosis have been increasing. Therefore, it can be expected that a growing number of patients with liver disease, both known and as yet undiagnosed and asymptomatic, will undergo surgical intervention. In contrast to umbilical hernia [12], the incidence of inguinal hernia is not markedly influenced by ascites, and, in fact, severe complications of inguinal hernia, such as strangulation, are uncommon in cirrhotic patients [13]. However, surgical repair in patients with refractory ascites has been reported to be associated with high mortality and morbidity [14]. Although inguinal herniorrhaphy has been reported in patients with cirrhosis, relatively few studies had been conducted on this topic or on optimal management. Pere *et al* [15]. described three patients with stable cirrhosis and controlled ascites whose condition severely deteriorated after elective operation.

Furthermore, a Danish nationwide database study of postoperative death in LC patients who have undergone inguinal hernia repair showed an adjusted odds ratio for 30-day mortality of 4.4 [16].

It also became evident that the major component of success of this surgical procedure, especially when performed in an emergency situation, relates to the perioperative management of both ascites and renal insufficiency.

Advanced cirrhotic patients with major abdominal wall hernias should therefore be preferentially referred to specialized centers that also offer a hepatology intensive care, and hence an elective surgery could be performed at ease.

The difference in ascites leak was highly significant between the two groups (P < 0.001). Sac invagination was recently proved equally effective and safer compared with ligation [17]. Therefore, we made strong attempts to not open the sac during elective repair of inguinal hernia. We used the technique of invagination of the intact dissected sac rather than opening it whenever possible. Opening the sac was unavoidable whenever strangulation was doubtful, to check the viability of the contents and proper dealing with the it.

We identified emergency surgery as a factor of higher morbidity, postoperative mortality, uncontrolled ascites, or high MELD score, and we recommend elective repair. Therefore, we propose that patients with refractory ascites may be eligible for elective hernia repair in selected cases, such as patients with symptomatic hernias, thin skin, or skin ulceration.

Other studies on patients with decompensated cirrhosis have suggested that hernias may be safely repaired without increased surgical risk or any undue increase in recurrence [18]. Although the numbers of patients included were small and the follow-up durations were short in these series, recent studies clearly demonstrate that the presence of ascites does not contraindicate surgical repair, and that morbidity and recurrence rates are not clearly affected in elective hernia repair in cirrhotic patients. In addition, we were able to compare elective and emergency intervention for inguinal hernia repair in cirrhotic ascitic patients with respect to complication and recurrence rates. The inguinal nerve block provided a good chance to operate on patients who had very bad general condition and were not good candidates for the general anesthesia. The use of local anesthesia definitely widened the spectrum of operability for patients who were not a candidate for general anesthesia, but its impact on mortality could not be assessed because its use was limited to severely morbid patients. The overall recurrence rate after inguinal hernia repair in our series was 7% for both the elective and emergency groups (4/56). Our recurrence rate is within the acceptable range of recurrence rate (0-14.3%) reported for nonmesh open repair of inguinal hernia [19]. In this study, elective repair gave us a better preoperative chance to improve some important parameters described in MELD score. To achieve good results, we corrected serum electrolytes, impaired renal functions, prolonged prothrombin time, anemia, and low serum albumin. The correction of the above vital parameters need a considerable time; thus, the proper correction of these parameters was difficult in cases of emergency situations. Moreover, the high mortalities in the emergency group [eight patients (28.5%)] were actually a reflection of the concomitant disturbed vital parameters, which were described above. As regards the MELD score, patients with low MELD score showed good postoperative results and low morbidity and mortality. Given these results, we recommend that the laboratory MELD score to be considered a useful and objective tool to further refine the therapeutic algorithm of abdominal wall hernia repair in cirrhotic patients (Table 2), and

we also recommend downgrading the management of the MELD score preoperatively whenever possible.

As regards the CTP class, patients who were of class C showed high mortality (25%) in the emergency group but it was 3% in the elective group. Unfortunately, we did not encounter patients with CTP class A to evaluate the timing of hernia repair; however, as the liver disease is usually progressive, the concept of clinical observation in patients with inguinal hernia should be discouraged.

Our results indicate that elective inguinal hernia repair in patients with LC can be performed with an acceptable incidence of postoperative complications, as well as less hospital stay, reduced mortality, and lower recurrence rate regardless of CTP class, and that cirrhotic conditions do not increase operative risk, recurrence rate, or contralateral inguinal hernia development and patients showed improved QOL (Table 2).

This supports the contention that elective surgical repair of abdominal wall hernia should be electively performed, to prevent the development of life-threatening complications.

# Conclusion

Elective inguinal hernia repair for cirrhotic patients with ascites is a relatively safe procedure. The

Table 2 Comparisor	n between the demographic	characteristics and	postoperative course	in both groups
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	Elective group 1 (N=28)	Emergency group 2 (N=28)	P value
Age (mean (range)) (years)	41.6±12.4 (44-62)	40.2±14.7 (45-60)	>0.05
CTP class			
A	Not encountered	Not encountered	
В	18	13	>0.05
С	10	15	>0.05
Mean preoperative MELD	13 (8-23)	18 (9-25)	>0.05
Ascites leak	0/28 (0)	19/28 (68)	<0.001
Hospital stay (mean (range)) (days)	5±2 (3-11)	13±4 (7-27)	< 0.05
ICU stay (mean (range)) (days)	1.6±0.86 (1-2.5)	6.8±3 (3.5-8.5)	<0.001
Morbidity (n (%))	4 (14)	19 (68)	<0.001
Mortality (n (%))			
A			< 0.001
В		1 (3.5)	
С	1 (3.5)	6 (21.4)	
Clavien-Dindo classification			
I	5	4	>0.05
II	6	7	>0.05
111	4	3	>0.05
IV	5	5	>0.05
V	8	9	>0.05
Mean postoperative MELD (range)	15 (8-18)	24 (15-36)	<0.05
Hernia recurrence	0	4	

CTP, Child-Turcotte-Pugh; MELD, model for end-stage liver disease.

improvement in QOL represents a clear indication for elective hernia repair.

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## **Conflicts of interest**

There are no conflicts of interest.

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