

# **A prospective study on elective umbilical hernia repair in patients with liver cirrhosis and ascites**

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## ABSTRACT

*Background:* Patients with both cirrhosis and ascites have a 20% risk of developing umbilical hernia. A retrospective study from our center comparing conservative management of umbilical hernia with elective repair in these patients showed a significant risk of mortality as a result of hernia incarceration in conservatively treated patients. The goal of this study was to assess the safety and efficacy of elective umbilical hernia repair in these patients prospectively.

*Methods:* Patients with liver cirrhosis and ascites presenting with an umbilical hernia were included in this study. For all patients, the expected time to liver transplantation was more than 3 months, and they did not have a patent umbilical vein in the hernia sac. The following data were collected prospectively for all patients: Child-Pugh-Turcotte (CPT) classification, model for endstage liver disease (MELD) score, kidney failure, cardiovascular comorbidity, operation-related complications, and duration of hospital stay. Mortality rates were registered in hospital records and verified in government records during follow-up. Mortality rates were registered in hospital records and verified in government records during follow-up. On completion of the study, a retrospective survey was performed to search for any patients who met the study inclusion criteria but were left out of the study cohort.

*Results:* In total, 30 patients (25 males) underwent operation at a mean age of 58 years (standard deviation [SD]  $\pm$  9 years). Of these 30 patients, 6 were classified as CPT grade A (20%), 19 (63%) as grade B, and 5 (17%) as grade C. The patients' median MELD score was 12 (interquartile range [IQR], 8–16). In 10 (33%) of the 30 patients hernia repair was performed with mesh. The median duration of hospital stay was 3 days (IQR, 2–4). None of the patients were admitted to the intensive care unit. Postoperative complications included pneumonia and decompensation of cirrhosis (1 case each), resulting in prolonged hospital stay for those 2 patients. After a median follow-up period of 25 months (IQR, 14–34), 2 (7%) of the 30 patients died; neither of the deaths were attributable to the umbilical hernia repair. A total of 2 patients suffered recurrence.

*Conclusion:* Elective umbilical hernia repair is safe and the preferred approach in cirrhotic patients with ascites.

## INTRODUCTION

Patients with liver cirrhosis and ascites have a risk of 20% of developing an umbilical hernia in the course of their disease.<sup>1</sup> Possible factors that contribute to the development of umbilical hernia in these patients include increased intra-abdominal pressure due to ascites, weakening of the abdominal fascia and muscle wasting as a result of poor nutritional status, and dilation of the umbilical vein that enlarges the preexistent supra-umbilical fascial opening in patients with portal hypertension.<sup>2</sup>

Although the incidence of umbilical hernia is high in cirrhotic patients, an optimal treatment strategy is unclear. For many years, surgical dogma dictated a “wait and see” approach, and surgical repair of umbilical hernia was limited to patients who developed complications.<sup>3-7</sup> Conservative management, however, can be complicated by bowel incarceration or spontaneous rupture from necrosis of overlying skin and subsequent peritonitis. Such conditions force emergency repair in patients who are then at a greater risk of developing complications in an emergency setting than after elective surgery.<sup>2,8-10</sup>

This scenario appears to be particularly true in circumstances of acute removal of large amounts of ascites, such as large-volume paracentesis after transjugular intrahepatic portosystemic shunt (TIPS) or liver transplantation. Both of these procedures result in an acute decrease in the diameter of the fascial defect. In these instances, abdominal contents inside the hernia sac can become incarcerated.<sup>7</sup>

Currently, the natural course of umbilical hernia in patients with ascites is largely unknown, particularly in patients waiting liver transplantation, and prospective studies in this field are lacking.<sup>6,8,11</sup> A recent retrospective study from our center comparing conservative management of umbilical hernia in these patients with elective repair showed a significant risk of mortality resulting from hernia incarceration in conservatively treated patients.<sup>8</sup>

After this study was completed, the treatment strategy of patients with liver cirrhosis and ascites with an umbilical hernia was changed at our center from “wait and see” to an elective repair protocol. The objective of this study was to evaluate the results of this protocol of elective umbilical hernia repair in patients with concurrent ascites and liver cirrhosis prospectively.

## METHODS

Between July 2004 and May 2010, all patients in the Erasmus University Medical Center with umbilical hernia, cirrhosis, and ascites were included in this study and followed prospectively. Liver failure with cirrhosis was diagnosed on clinical, biochemical, or histologic findings. Ascites was diagnosed with ultrasonography or computed tomography, and umbilical hernia was diagnosed on clinical examination.

All patients included in the study were scheduled for elective hernia repair unless their expected waiting time for a liver transplantation was less than 3 months or a patent umbilical vein was present in the wall of their hernia sac. Patients with an expected waiting time for transplantation of less than 3 months or in whom a patent umbilical vein was found on ultrasonography or computed tomography were excluded from the study.

Elective hernia correction was carried out after optimal management of ascites with 2 diuretics (spironolactone [Aldactone; GD Searle/Pfizer, New York, NY] and furosemide [Lasix; Sanofi-Aventis, Paris, France]), early nutritional support, and intravenous albumin to increase patients' serum albumin to greater than 30 g/L. No large-volume paracentesis was performed preoperatively. All patients who underwent elective and acute umbilical hernia repair within the study period at our institution were identified retrospectively to ensure that no patients who met the inclusion criteria were excluded from the final study cohort. The primary goal of the study was to investigate safety of elective umbilical hernia repair in cirrhotic patients.

The following data were collected prospectively for all patients: age, sex, nicotine and alcohol use, malignancy, chronic obstructive pulmonary disease, diabetes mellitus, chronic steroid use, primary or recurrent umbilical hernia, hernia size, serum bilirubin ( $\mu\text{mol/L}$ ), serum albumin (g/L), serum creatinine ( $\mu\text{mol/L}$ ), international normalized ratio, hepatic encephalopathy, Child-Pugh-Turcotte (CPT) classification, model for end-stage liver disease (MELD) score at the time of surgery, cardiovascular comorbidity, American Society of Anesthesiologists (ASA) score, presence of hernia strangulation or incarceration, use of mesh in hernia repair, mesh positioning, simultaneous liver transplantation, perioperative and postoperative complications, admission to the intensive care unit, and duration of hospital stay.

Mortality rates were registered in hospital records and verified in government records during follow-up. All patients were invited for clinical examination by 1 of the authors at the outpatient clinic to diagnose recurrence after a minimum follow-up

of 6 months. Statistical analyses were carried out with the SPSS statistical software package (SPSS Inc, Chicago, IL). The chi-square test and the Mann-Whitney U test were used for categorical and continuous variables, respectively. Values were considered statistically significant at 2-sided P values less than .05. Data were described as median and interquartile range (IQR).

## RESULTS

*Patient characteristics (Table 1).* A total of 30 consecutive patients (25 males, 5 females) at a median age of 58.3 years (IQR, 51–65) were included in the elective repair protocol. Of these 30 patients, 7 (23%) were classified as CPT grade A, 18 (60%) as grade B, and 5 (17%) as grade C. The median MELD score was 12 (IQR, 8–16). Of the 30 patients, 6 (20%) had an ASA score of class II, 20 (67%) were class III, and 4 (13%) were class IV. A total of 53% of the patients were on the waiting list for liver transplantation.

**Table 1.** Patient characteristics.

	N = 30
Male, n (%)	5 (83)
Median age, y	58.3 (51–65) <sup>*</sup>
Primary umbilical hernia, n (%)	28 (93)
Recurrent umbilical hernia, n (%)	2 (7)
CPT classification, n (%)	
A	7 (23)
B	18 (60)
C	5 (17)
MELD score, median	12 (8–16) <sup>*</sup>
ASA class, n (%)	
I	0 (0)
II	6 (20)
III	20 (67)
IV	4 (13)

IQR, Interquartile range; CPT, Child-Pugh-Turcotte; MELD, model for end-stage liver disease; ASA, American Society of Anesthesiologists. <sup>\*</sup>Data in parentheses represents interquartile range.

*Comorbidities of patients in the protocol (Table 2).* At the time of hernia repair, 6 (20%) of the 30 patients in the protocol reported smoking, and 7 (23%) had alcohol abuse noted in their medical history. Only 1 (3%) patients had a malignancy related to the liver. Of

the 30 patients, 6 (20%) reported chronic steroid use, and 6 (20%) suffered from type 2 diabetes mellitus.

**Table 2.** Comorbidities of patients included in the protocol.

	Elective repair (N = 30)
Smoking, n (%)	6 (20)
Alcohol abuse, n (%)	7 (23)
Malignancy, n (%)	1 (3)
Chronic steroid use, n (%)	6 (20)
Diabetes, n (%)	6 (20)

*Operation characteristics and postoperative course (Table 3).* All hernia repairs were performed in an elective setting with an open technique and under general anesthesia. In all patients, the presence of ascites was confirmed. In 10 (33%) of the 30 patients hernia repair was performed with a flat heavy weight polypropylene mesh. The use of mesh for hernia repair was at surgeon's discretion. Of these 10 repairs, 5 meshes were placed using the intraperitoneal (onlay) technique and 5 were placed with the preperitoneal (inlay) technique. Peritoneal tears that occurred during dissection of the hernial sac were closed with absorbable sutures.

**Table 3.** Perioperative outcomes.

	Elective repair (N = 30)
Operative time, min	79 (66–94)*
Defect size, mm	15 (9)‡
Mesh repair, n (%)	10 (33)
Duration of hospital stay, d	3 (24)*
ICU admission, n (%)	0 (0)

\* Data are presented as median (interquartile range).

‡ Data are presented as mean (standard deviation).

Postoperatively, 2 patients experienced complications that necessitated prolonged hospital stay: 1 developed pneumonia and the other patient underwent decompensation of cirrhosis. The median hospital stay was 3 days (IQR, 2–4). None of the patients were admitted to the intensive care unit.

At a median follow-up of 10 months, 2 (7%) of the 30 patients died: 1 died from bacteremia associated with cholangitis and hepatorenal syndrome, and the other patient

committed suicide during follow-up. None of the deaths were assumed attributable to the umbilical hernia repair. After a median follow-up of 25 months (IQR, 14–34), 2 (7%) of the 30 patients suffered a recurrence. Both underwent the primary hernia repair without the use of mesh. No notable correlations could be found between either CPT classifications or MELD scores with postoperative complications and recurrences ( $P = .06$  and  $P = .17$ , respectively).

*Retrospective review.* In the retrospective review, 163 patients were identified who underwent umbilical hernia repair at our institution during the study period. Of these 163 patients, 30 were in the protocol and are described above. Of the 133 patients not included in the protocol, 127 were not eligible for the study, but 6 of these patients had ascites and liver cirrhosis and should have been considered for inclusion in the protocol.

Of these 6 patients, 4 were not included in the study even though they met the inclusion criteria; they later underwent elective correction and did not experience any negative sequelae. The remaining 2 patients were excluded from the study because they were diagnosed with a patent umbilical vein and planned to undergo hernia correction during liver transplantation.

Unfortunately, the hernia correction proved to be unsuccessful for both patients. One of the patients developed an incarcerated umbilical hernia 3 months after transplantation, which was corrected successfully without negative sequelae, but the other patient was readmitted to the hospital 2 months after liver transplantation, also with an incarcerated umbilical hernia. In this case, the complication resulted in multiple organ failure and the patient's death.

## DISCUSSION

In this prospective single-center study, the safety of umbilical hernia repair in cirrhotic patients with ascites was investigated in a series of 30 consecutive patients. All patients underwent operations in an elective setting. Previous retrospective studies<sup>4,8</sup> have demonstrated that conservative treatment of umbilical hernia in cirrhotic patients is associated with considerable morbidity and mortality. Hence, prospective series, such as this one, are needed to assess the safety and efficacy of elective umbilical hernia repair in this specific group of patients.

Patients with an expected waiting time to liver transplantation of less than 3 months were excluded from this study. The risk of an additional operation for these patients who typically have high MELD scores was considered greater than the risk of waiting 3 months until transplantation, because the hernia would be corrected during the transplantation procedure. Furthermore, patients with a patent umbilical vein were also excluded from the study. The repair of an umbilical hernia necessitates the complete freeing of the umbilical ring and the ligation of a possibly reopened umbilical vein. This reopened umbilical vein can be an important outflow for the portal circulation in patients with severe portal hypertension. If the vein is ligated during umbilical hernia repair, the outflow of the portal circulation is hampered, which can lead to acute portal vein thrombosis, subsequent acute failure of the liver necessitating emergency liver transplantation.<sup>2,12</sup>

In our study group, the incidence of complications after elective repair was low (7%) compared to complication rates reported in the literature (43%).<sup>8</sup> Other studies also have demonstrated that postoperative outcome in cirrhotic patients is correlated with the patient's CPT classification and, especially, with their MELD score.<sup>11,13,14</sup> In our series, however, no significant correlations were found between either a patient's CPT classification or MELD score and their postoperative outcome, but this finding could be due to the relatively low number of patients in our study.

In this study, elective hernia correction was carried out after optimal management of ascites by the use of diuretics, early nutritional support, and intravenous albumin to increase the patient's serum albumin to greater than 30 g/L. More invasive interventions to optimize the condition of the patient are possible, such as staged and concomitant peritoneovenous shunting in combination with hernia repair, preoperative placement of TIPS to control portal hypertension, or mechanical ascites management by temporary placement of peritoneal dialysis catheters to allow drainage of postoperative ascites.<sup>1,15,16</sup> None of these more invasive therapeutic modalities, however, were used preoperatively in this study.

At long-term follow-up, recurrences were found in 2 patients, both of whom had undergone primary hernia repair without the use of prosthetic mesh. The incidence of recurrences after umbilical hernia repair can be diminished markedly by using mesh, as demonstrated in this patient group and other studies.<sup>17-19</sup>

With the use of mesh, the chance of leakage of ascites is increased in cirrhotic patients; such leakage can lead to infection of the mesh and, more rarely, bacterial peritonitis. As a result, many surgeons may be reluctant to use mesh for umbilical hernia repair

in this patient group. In most cases, bacterial infection of meshes made of polypropylene or polyester can be treated with antibiotics, and removal of the mesh is rarely required.<sup>20,21</sup> Infection of the mesh was not observed in our series, nor are we aware of any studies in the literature in which an increased risk of mesh infection was observed in cirrhotic patients.

Of the 6 patients identified from the retrospective check for missed patients at our institution, 2 were considered for inclusion but excluded because of they had a patent umbilical vein. Both patients should have undergone elective umbilical hernia repair during the liver transplantation procedure, but this was mistakenly not performed with devastating results in 1 of the 2 patients.

Performing umbilical hernia repair simultaneously with liver transplantation appears to be the optimal setting by avoiding complications associated with an extra admission and the use of general anesthesia. Due to organ shortages, however, the waiting time for transplantation has increased considerably, exposing patients on the waiting list to a greater risk of developing incarceration of the hernia. This situation leads to an increase in the need for emergency – rather than elective – repairs.

Considering this fact, one could argue that elective repair of symptomatic umbilical hernia even in patients on the waiting list for transplantation is the safer strategy. Randomized studies, however, must be performed to create sufficient evidence for such a policy. Our results of elective umbilical hernia repair in cirrhotic patients are very encouraging and provide sufficient evidence to set up a randomized, controlled trial on this topic.

Before such trials are undertaken, however, one needs to consider that the repairs carried out in our study were performed at a liver transplantation center with considerable experience with this patient group. The multidisciplinary approach of preoperative, perioperative, and postoperative care may be responsible for the positive results of our study. For this reason, implementation of umbilical hernia repair in cirrhotic patients in other centers should also focus on the overall management of care.

In conclusion, elective umbilical hernia repair is a safe approach and seems preferable over conservative treatment in selected cirrhotic patients. We have reported the first prospective data that advocate elective umbilical hernia repair in cirrhotic patients. A prospective, randomized clinical trial is needed to support our findings, and thereby reach a greater level of evidence to encourage implementation of this treatment strategy in other liver transplantation centers.

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