Abstract

Objectives: Ascites represents an important event in the natural history of cirrhosis, portending increased 1-year mortality. Umbilical herniation with rupture is an uncommon complication of large-volume ascites that is associated with significant morbidity and mortality. The aim of this study was to describe predictors of outcomes in patients undergoing emergent repair for spontaneous umbilical hernia rupture.

Materials and Methods: We report a case series of 10 patients with decompensated cirrhosis (mean age 66 ± 9 years, mean Model for End-Stage Liver Disease score of 21 ± 7) who presented with a ruptured umbilical hernia and had emergent repair.

Results: Thirty percent (3/10) of patients died or required liver transplant. Factors associated with death or transplant included the development of bacterial peritonitis (P = .03) and the presurgical 30-day Mayo Clinic Postoperative Mortality Risk in Patient with Cirrhosis Score (P = .03).

Conclusions: Emergent repair after umbilical hernia rupture in patients with decompensated cirrhosis carries a poor prognosis with 30% of patients developing poor postsurgical outcomes.

Key words: Ascites, Liver transplant, Umbilical hernia rupture

Introduction

Ascites represents the most common complication of cirrhosis, manifesting to variable degrees in greater than 50% of cases.1 The development of ascites is associated with morbidity and mortality events in and outside of the surgical setting. As a result, ascites has been a useful parameter in a number of important assessments, including the Child-Turcotte-Pugh score, the D’Amico score, and, by proxy, through serum sodium in the recently modified Model for End-Stage Liver Disease (MELD) score (the MELD-Na score).2-4

Approximately 20% of patients with large-volume ascites will develop an umbilical hernia, representing a confluence of increased intra-abdominal pressure and a weakened abdominal wall.5-8 A small fraction of patients with large-volume ascites develop the severe complication of a ruptured umbilical hernia, also known as “Flood syndrome,” described by Dr. Frank B. Flood in 1961.9 The surgical treatment of a ruptured umbilical hernia in a patient with Child-Pugh class C cirrhosis is fraught with short- and long-term complications and high mortality.10 Advances in surgical care have improved outcomes of general surgery procedures in patients with cirrhosis. The aim of this case series was to describe outcomes of patients with a ruptured umbilical hernia who were treated at a liver transplant center and to identify clinical factors associated with death or decompensation requiring urgent transplant.

Materials and Methods

The study was approved by the Institutional Review Board at Loyola University Medical Center. The study cohort consisted of all patients with cirrhosis...
and tense ascites who presented with a ruptured umbilical hernia and had an emergent surgical repair at a single transplant center from January 1, 2011 through July 1, 2015.

Selection and description of participants
Data were collected retrospectively from the electronic medical records. Demographic data consisted of age and sex. Clinical variables included cause of liver disease, history of transjugular portosystemic shunt (TIPS) before surgery, history of bacterial peritonitis before or after surgery, and preoperative MELD-Na score based on sodium, creatinine, total bilirubin, and international normalized ratio. The Mayo Clinic Postoperative Mortality Risk in Patient with Cirrhosis Score was calculated preoperatively to determine the probability of death at postoperative day 30.11 Treatment date was defined as day of surgical intervention (umbilical hernia repair). Outcomes were dichotomized as postoperative recovery with hospital discharge or death or liver transplant within 30 days of surgery.

All surgeries were performed by a liver transplant surgeon. A primary repair was performed without mesh, and excessive necrotic skin was excised. A Jackson-Pratt drain was placed to control ascites postoperatively, and the patient was maintained on antibiotics at least until the drain was removed. The decision to perform a TIPS before surgery was based on clinical examination for encephalopathy, infection status, and MELD-Na score.

Statistical analyses
Descriptive statistics were used to assess for erroneous entries and to perform frequency counts. The Mann-Whitney U test was used to compare non-normally distributed continuous variables. Categorical data were compared by chi-square or Fisher exact test where appropriate.

Results
Clinical features of the 10 patients who presented with Flood syndrome during the study period are summarized in Table 1. The mean age was 66 ± 9 years. The most common cause of cirrhosis was alcohol (5/10). The mean preoperative MELD-Na score was 21 ± 7. Three Flood syndrome events (30%) resulted in 1 death and 2 cases of hepatic decompensation followed by urgent liver transplant. Time from umbilical hernia repair to death or transplant was 7 ± 2 days. Of the 7 patients who had favorable outcomes after Flood syndrome, 2 patients underwent TIPS placement before surgery. All 7 patients were alive at the end of the study period. One patient died 461 days after surgery from complications of non-Hodgkin lymphoma.

On admission, 3 patients were diagnosed with bacterial peritonitis defined by ≥ 250 neutrophils/mm³ on analysis of ascites. A fourth case of preoperative bacterial peritonitis secondary to a Staphylococcus aureus infection was diagnosed during hospitalization, despite the patient being given prophylactic antibiotics. All 4 patients were promptly initiated on appropriate antibiotic therapy before hernia repair. Two of the 4 patients with bacterial peritonitis also were found to have acute kidney injury on admission. Both patients were unresponsive to diuretic withdrawal in combination with colloid fluid resuscitation and were classified as having type 1 hepatorenal syndrome, which is defined as a 2-fold increase in serum creatinine to a level greater than 2.5 mg/dL.12

Postoperative death or need for urgent liver transplant were more common in patients who

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<th>Table 1. Characteristics of Patients Undergoing Surgical Repair After Spontaneous Umbilical Hernia Rupture</th>
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Abbreviations: ETOH, alcohol; F, female; HCV, hepatitis C virus; HRS, hepatorenal syndrome; M, male; MELD-Na, model for end-stage liver disease, sodium; NASH, nonalcoholic steatohepatitis; OLT, orthotopic liver transplant; PBC, primary biliary cholangitis.
developed bacterial peritonitis (3/4 vs 0/6; \( P = .03 \)) compared with patients without peritonitis. Both patients who developed hepatorenal syndrome subsequently progressed to death or liver transplant. Patients with poor postsurgical outcomes were found to have higher 30-day Mayo Postoperative Mortality Risk Scores compared with patients with favorable outcomes (median projected mortality of 55.8% and interquartile range [IQR], 27.8-82.4 vs 22.7% and IQR, 18-25.1) \(( P = .03 \)). There was a trend toward higher median MELD-Na scores in patients with death or liver transplant (29, IQR, 20-32) compared with those with favorable outcomes (19, IQR, 14-21) \(( P = .08 \)).

There were no statistically significant associations between patient age, sex, preoperative development of hepatorenal syndrome, or presurgical TIPS placement with the outcome of death or liver transplant.

### Discussion

Ascites represents an important event in the natural history of cirrhosis, regardless of cause. Within the subgroup of patients with large-volume ascites, the uncommon, but rather serious, complication of ruptured umbilical hernia can occur. Emergent surgical management is recommended in these patients given the increased risk of infection, acute kidney injury, and hepatic decompensation. In this small study of 10 patients with decompensated cirrhosis who presented with Flood syndrome, there was a 10% mortality rate and a 20% need for liver transplant. Bacterial peritonitis and the 30-day Mayo Clinic Postoperative Mortality Risk Score were associated with poor outcomes, and there was a trend toward an association between MELD-Na score and death or need for liver transplant.

The findings of the present study suggest that patients with ruptured umbilical hernia and bacterial peritonitis should have urgent evaluation for liver transplant, provided that they meet accepted criteria for transplant. A high 30-day Mayo Clinic Postoperative Mortality Risk Score should also prompt consideration of liver transplant, although a threshold score could not be determined due to the small sample size. Similarly, a larger study will be necessary to assess whether additional factors such as the MELD-Na score and the development of hepatorenal syndrome predict mortality or need for liver transplant or whether a preoperative TIPS procedure could improve outcomes in selected cases.

The high rate of death or liver transplant with ruptured umbilical hernia in the present study was similar to previous reports from tertiary centers. One series that evaluated 6 patients who presented with spontaneous umbilical hernia rupture reported no postoperative deaths and 2 cases of hepatic decompensation leading to transplant 12 and 16 days after herniorrhaphy.\(^ {13} \) No postoperative mortality occurred in a series of 11 patients, although liver transplant was required in 45% of patients postoperatively.\(^ {14} \) Neither study assessed the association between baseline characteristics and postoperative outcomes. The high proportion of patients with Flood syndrome who required liver transplant suggests that patients with cirrhosis who present with ruptured umbilical hernia should be transferred to a center that can provide transplant, when possible.

In the present series, patients who recovered from umbilical hernia repair had good long-term outcomes. Although this finding is encouraging, it might in part reflect the fact that 4 of 7 of these cases had liver disease due to alcohol, which often improves with abstinence. It would be expected that the cause of liver disease and the treatment of the liver disease and of the ascites would impact long-term outcomes of patients who survive surgical management of umbilical hernia repair.

In conclusion, 30% of patients undergoing emergent umbilical hernia repair after rupture developed poor postsurgical outcomes. Predictors of death or liver transplant included the presence of preoperative bacterial peritonitis and increased 30-day Mayo Clinic Postoperative Mortality Risk Score. The findings of this study indicate that, when possible, patients with Flood syndrome should be transferred to a tertiary center where liver transplant is available. Larger studies are needed to further define factors associated with death or liver transplant in patients with decompensated cirrhosis who develop a ruptured umbilical hernia.

### References


