Concurrent Umbilical Hernia Repair at the Time of Liver Transplantation: A Six-Year Experience from a Single Institution

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ABSTRACT

Background: Umbilical hernias are common in patients with end-stage liver disease undergoing liver transplantation. Management of those persisting at the time of liver transplantation is important to define.

Objective: To evaluate the long-term results of patients undergoing simultaneous primary umbilical hernia repair (UHR) at the time of liver transplantation at a single institution.

Methods: Retrospective chart review was performed on patients undergoing simultaneous UHR and liver transplantation from 2010 through 2016. 30-day morbidity and mortality outcomes and long-term hernia recurrence were investigated.

Results: 59 patients had primary UHR at the time of liver transplantation. All hernias were reducible with no overlying skin breakdown or leakage of ascites. 30-day morbidity and mortality included 5 (8%) superficial surgical site infections, 1 (2%) deep surgical site infection, and 7 (12%) organ space infections. Unrelated to the UHR, 10 (17%) patients had an unplanned return to the operating room, 16 (27%) were readmitted within 30 days of their index operation, and 1 (2%) patient died. With a mean follow-up of 21.8 months, 7 (18%) patients experienced an umbilical hernia recurrence.

Conclusion: Despite the high perioperative morbidity associated with the transplant procedure, concurrent primary UHR resulted in an acceptable long-term recurrence rate with minimal associated morbidity.

KEYWORDS: Cirrhosis; Clinical decision-making; Liver disease; Tissue injury and repair; Surgical technique; Umbilical hernia; Liver transplantation

INTRODUCTION

Chronic liver disease (CLD) affects 4.5% to 9.5% of the general population worldwide [1]. Those patients with the most severe form of CLD, characterized by the presence of liver cirrhosis, portal hypertension, and ascites, are the patients who progress to liver transplantation. Of those patients being evaluated for liver transplantation, the incidence of umbilical hernia is estimated to be 20% [2]. To put this in perspective, it is estimated that less than 1% of the general population of the USA will develop an umbilical hernia in their lifetime [3]. The difference in the incidence of umbilical hernias between these patient populations is likely related to increased intra-abdominal pressure,
weakening of the abdominal wall fascia, and
muscle wasting due to poor nutritional status,
and portal hypertension leading to a dilated
umbilical vein enlarging the umbilical fascial
opening in patients with CLD [2, 4]. Never-
theless, despite the relatively high incidence
of umbilical hernias in the patient population
with CLD, there remains a paucity of litera-
ture directing the management of this com-
mon problem in patients planning to undergo
liver transplantation.

Approximately 7000 liver transplantations
were performed in the USA in 2015 [5]. It can
be estimated that 1400 of those liver trans-
plant patients will have developed an umbili-
cal hernia by the time of liver transplanta-
tion. Repairing the umbilical hernia prior to
the transplantation may increase the risk of
ascites leakage, bleeding due to uncontrolled
portal hypertension, mesh infections, and
eventual delay of liver transplantation due to
complications. However, if the hernia is not ad-
dressed at the time of transplantation, it could
result in acute incarceration of the hernia con-
tents, as a result of the rapid resolution of the
ascites post-transplantation. Furthermore, the
most appropriate approach to repairing an
umbilical hernia during liver transplantation
is complicated by the contamination inherent
to the procedure and the burst of immuno-
suppression, both of which are felt to be rela-
tive contraindications for synthetic mesh place-
mant. Most transplant surgeons, therefore, ei-
ther avoid repairing these hernias at the time
of transplantation or perform a primary repair
at the time of transplantation.

The management of umbilical hernias in pa-
tients on the liver transplant list is controver-
sial, with little published data to guide trans-
plant and general surgeons.

Our institution is a high-volume transplanta-
tion center with significant experience with
this patient population. Our group prefers to
perform a primary tissue repair of the um-
bilical hernia defect when present at the time
of liver transplantation. The objective of this
study was to evaluate 30-day morbidity and
mortality outcomes and long-term hernia re-
currence rates in those patients undergoing
concurrent primary umbilical hernia repair
(UHR) at the time of orthotopic liver trans-
plantation at a single institution.

PATIENTS AND METHODS

Consecutive adult patients undergoing pri-
mary UHR at the time of liver transplanta-
tion from January 2010 through June 2016 at
the Cleveland Clinic Foundation were identi-
fied within a prospectively-maintained, in-
stitutional liver transplantation database. All
umbilical hernias were repaired primarily via
exposure from the Chevron incision used for
the liver transplantation with the use of sim-
ple interrupted or figure-of-eight permanent
sutures by the transplant surgeon without
an additional incision over the site of the um-
bilical hernia. Patients undergoing only liver
transplantation and those patients undergoing
repair of abdominal wall hernias other than
umbilical hernias, including ventral/incisional
hernia repair or inguinal hernia repair, were
excluded from this analysis.

After obtaining Institutional Review Board
approval, retrospective chart review was per-
formed on all identified patients. Patient de-

demographic information, operative details, 30-
day post-operative outcomes, and long-term
hernia recurrence outcomes were collected. At
our institution, all patients undergoing liver
transplantation are followed at the transplant
clinic at one week, one month, three months,
six months, nine months, and one year, post-
operatively and then annually, thereafter.

Disease severity was assessed by the Charl-
son Comorbidity Index, the Model for End-
Stage Liver Disease (MELD) score, and the
Sodium-Adjusted MELD Score [6-8]. These
scores were calculated at the time the patients
admitted to the hospital for liver transplanta-
tion to most accurately reflect their associated
comorbidities and extent of CLD. Thirty-day
outcomes of interest included the incidence of
superficial surgical site infection (SSI), deep
surgical site infections, organ space infections,
wound dehiscence, unplanned return to the op-
erating room (OR), unplanned readmission to the hospital, and death. Long-term outcomes of interest included hernia recurrence, additional abdominal surgeries, and death. Hernia recurrence was defined as a defect in the fascia at the site of the umbilicus either on physical examination or radiographic imaging at any of the above-mentioned follow-up appointments. Kaplan-Meier survival analysis was used to determine the length of time to hernia recurrence, taking into account those patients who were lost to follow-up and those who died. All statistical analyses were performed using SAS (ver 9.4, Cary, NC, USA).

**RESULTS**

Approximately 135 patients are transplanted at our institution annually. From January 2010 through June 2016, 59 patients underwent primary UHR at the time of liver transplantation at our institution (Table 1). The majority of the patients were Caucasian (84%) and male (88%). With respect to the severity of illness, patients had an average Charlson Comorbidity Index of 5.2, a MELD Score of 18.1, and a Na-MELD Score of 21.3. Of note, 19 (32%) patients had hepatocellular carcinoma at the time of liver transplantation.

In terms of 30-day morbidity and mortality outcomes, five (9%) patients experienced a superficial SSI, one (2%) patient experienced a deep SSI, and seven (12%) patients experienced an organ space infection (Table 2). Of the five patients who developed a superficial SSI, one was at the site of the umbilical hernia repair; this patient went on to develop an umbilical hernia recurrence. No deep or organ space infections occurred at the site of the UHR.

Ten (17%) patients experienced an unplanned return to the OR; eight (80%) patients returned to the OR for coagulopathy-related intra-abdominal hemorrhage, one (10%) patient returned to the OR for repair of a biliary duct anastomotic leak, and one (10%) patient returned to the OR for emergent repair of an incarcerated inguinal hernia. Sixteen (27%) patients had an unplanned readmission to the hospital, all of which were unrelated to the UHR, and one (2%) patient died within 30 days of their index procedure due to multiorgan system failure following a biliary anastomotic leak.

With respect to long-term outcomes, patients were followed for a mean of 21.8 months. At the time of chart review, there were data available for 39 (66%) patients. Of the original 59 patients, there were nine (15%) patient deaths and 11 (28%) patients who were lost to follow-up. Seven (18%) patients had an umbilical hernia recurrence diagnosed by either physical examination (n=5) or radiographic imaging (n=2). The mean±SD time to recurrence was

| Table 1: Patients characteristics (n=59) |
|----------------------------------------|
| Variable                               | Mean±SD or n (%) |
| Age (yrs)                              | 58.0±9.8         |
| Sex                                    |                  |
| Male                                   | 52 (88%)         |
| Female                                 | 7 (12%)          |
| Race                                   |                  |
| Caucasian                              | 48 (81%)         |
| African-American                       | 5 (9%)           |
| Other                                  | 6 (10%)          |
| Charlson Comorbidity Index Score       | 5.2±1.6          |
| Age Adjusted Charlson Comorbidity Index| 6.5±1.9          |
| MELD Score                             | 18.1±9.1         |
| Na-MELD Score                          | 21.3±8.6         |
| Presence of HCC                        | 19 (32%)         |
| Presence of ascites                    | 57 (97%)         |

| Table 2: 30-day outcomes (n=59) |
|--------------------------------|
| Outcome                      | n (%) |
| Superficial SSI              | 5 (9%) |
| Deep SSI                     | 1 (2%) |
| Organ space infection        | 7 (12%)|
| Wound dehiscence             | 1 (2%) |
| Unplanned return to the OR   | 10 (17%)|
| Unplanned hospital readmission | 16 (27%)|
| Umbilical hernia recurrence  | 1 (2%) |
| 30-day mortality             | 1 (2%) |

SSI: Surgical site infection
4.3±2.5 months. The aforementioned UHR recurrence after superficial SSI was the only one of the seven recurrences to have developed a post-operative infection of any kind. Of the seven umbilical hernia recurrences, three patients underwent elective recurrent hernia repair and one had urgent primary repair for incarceration. Two patients had primary suture repair of their recurrent hernia, one was repaired using an open retrorectus placement of synthetic mesh, and another had an onlay repair of their umbilical hernia with Permacol mesh concurrently during primary repair of bilateral subcostal incisional hernias and a roux-en-y hepaticojejunostomy for biliary stricture.

Due to the inherent death and loss to follow-up over time, a Kaplan-Meier analysis was performed to determine the rate of hernia recurrence-free survival over time. Umbilical hernia recurrence was noted to occur early (within six months) following primary UHR at the time of transplantation (Fig 1).

**DISCUSSION**

The timing of UHR in patients with end-stage liver disease gives pause to many surgeons due to the inherent risk and comorbidities of the patient. Some surgeons choose to undertake an elective repair prior to transplantation; others choose a conservative “watch-and-see” approach with repair at time of symptom development, whether it is before or after transplantation, while others choose elective repair at the time of liver transplantation. In a retrospective review of 34 patients, Marsmen, et al, compared the outcomes of umbilical hernia management in patients with liver cirrhosis and ascites. Due to the high incidence of morbidity and mortality noted with conservative “watch-and-see” treatment, they advocated that all umbilical hernias be repaired electively prior to transplantation, if possible [2]. Despite this recommendation, there still remain patients with persistent umbilical hernias at the time of transplantation. Our findings suggest that umbilical hernias that do remain present at the time of transplantation can be primarily repaired at the time of orthotopic liver transplantation with minimal increased morbidity and with acceptable long-term results [9-12].

For persistent umbilical hernias, the risk of incarceration and strangulation has been observed to be the highest following liver transplantation due to the resolution of ascites and associated fluid shifts, necessitating emergency surgery shortly after liver transplantation [11]. Furthermore, the presence of incarceration or strangulation subjects the skin overlying the umbilical hernia to thinning, infection, and even rupture [15]. Therefore, with...
primary tissue repair of the umbilical hernia at the time of liver transplantation, the hernia can be fixed, if not, temporized so that the risk of incarceration, strangulation, and emergency surgery minimized. In the event of a recurrence, a more complex hernia repair with the use of mesh can be pursued following improvement in liver-associated impairments, including coagulopathy and malnutrition.

Our results demonstrated that repair of the umbilical hernia from within the abdomen using the same transplantation incision added very little to the operation time or the overall morbidity of the liver transplant surgery. Furthermore, we found that the long-term hernia recurrence rate in our series was 18%—a much more acceptable rate than that previously described by de Goede [14]. In this retrospective review of 27 patients who underwent concurrent UHR, either through a separate incision or the same transplant incision, at the time of liver transplantation, there was an alarming 40% recurrence rate with a 50% complication rate; this was however among a very small sample size of 10 patients undergoing same incision UHR [14].

Compared to the long-term umbilical hernia recurrence rates of 8%–54% mentioned for the general population, our recurrence rate of 18% was acceptable [15]. Our recurrence rate, which approached that of the general population, was a bit surprising given the considerable predisposing comorbidities for hernia recurrence in this patient population, including poor wound healing and coagulopathy in the setting of immunosuppression, impaired hepatic synthetic function, and malnutrition found among patients undergoing liver transplantation. The relatively low recurrence rate may be explained by the resolution of ascites and improvement in liver function after liver transplantation which likely plays a role in the durability of these UHRs due to the contraction of the tissues, decreased straining forces on the repair from the resolution of intra-abdominal ascites, and improvement in nutritional and wound healing parameters. Possibly, the “tissue expansion” resulting from the increased intra-abdominal pressure caused by the ascites prior to the transplantation may counterbalance the acute tension on the primary repair. Therefore, we support the concurrent primary repair of all umbilical hernias present at the time of liver transplantation.

Despite our results, our study did have limitations that are worth mentioning. First, this was a retrospective study with all of its inherent weaknesses. Second, this study was performed at a quaternary referral center. While this allowed for significant long-term follow-up, these results may not be reproducible amongst all centers performing liver transplantation. Finally, hernia-specific data including hernia size were not available for analysis. In the absence of these data, we were unable to comment specifically on the management of umbilical hernias with regard to the defect size.

In conclusion, we found that despite the high perioperative morbidity associated with the index transplant procedure, the long-term results of primary UHR from within the abdominal cavity without the use of a separate incision resulted in acceptable wound and hernia-related outcomes at our institution. These findings suggested that primary repair of asymptomatic umbilical hernias at the time of liver transplantation would be a safe and effective approach. Further hernia-specific data are required to determine patient populations that may benefit from alternative management strategies.

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