Original research

Outcome of sublay mesh repair in non-complicated umbilical hernia with liver cirrhosis and ascites

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A R T I C L E   I N F O

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A B S T R A C T

Background: Umbilical hernia repair is often accompanied by complications in patients with liver cirrhosis and ascites. It appears that the early elective repair of umbilical hernias in these patients is safer and can be considered for selected patients. The objective of this study is to evaluate the feasibility, safety, complications and technical aspects of sublay mesh repair of umbilical hernia in cirrhotic patients with ascites.

Methods: Between October 2010 and April 2013, 70 patients with non-complicated umbilical hernia, liver cirrhosis and ascites were enrolled in this study. All patients underwent sublay mesh repair. Demographic data, preoperative variables, peri-operative course, and postoperative complications were recorded and analyzed.

Results: A total of 38 women and 32 men underwent operation at an average age 51.24 years. The patients mean MELD score was 18 (range 12–25). The mean operative time was 67.45 min and the average hospital stay was 3.8 days. 2 patients had wound infection, 3 patients developed seroma and 1 patient had an ascitic fistula. Recurrence occurred in 1 (1.4%) patient and no mortality related to the procedure.

Conclusion: Elective sublay umbilical hernia mesh repair is a safe approach and feasible technique in selected non-complicated cirrhotic patients with ascites.

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1. Introduction

Fibrosis of the liver parenchyma often results in portal hypertension, leading to the dramatic complications of esophageal and gastric varices, uncontrolled ascites, or encephalopathy.1 Up to 20% of cirrhotic patients have either umbilical or inguinal hernias in the course of their disease2 due to elevated intra-abdominal pressure from ascites, muscle wasting, fascial weakening from nutritional deficiencies3 and the dilated umbilical vein enlarging the preexistent supra-umbilical fascial opening in patients with portal hypertension,4 which all contribute to the widening of the umbilical ring.5 Complications of untreated umbilical hernias in cirrhotic patients include bowel incarceration or strangulation, ascitic fluid leakage, and spontaneous rupture. If such a complication is present, there is a high mortality rate after surgical repair.6

The optimal treatment of umbilical hernia in the setting of cirrhosis poses unique and specific management problems due to the pathophysiology of cirrhotic ascites and still under debate.7 The prevention and strict control of ascites is the most effective way to avoid development of abdominal wall hernias.2

It appears that the early repair of umbilical hernias in patients with cirrhosis and ascites is safer than it was in the past and can be considered for selected patients. This may avoid increased morbidity and mortality associated with urgent repair later on.8 We advocate the technique of retrorectus preperitoneal sublay mesh repair in that patient group. This is the first report of prospective data of its outcome.

The objective of this study is to evaluate the technical aspects, feasibility, safety and complications of retrorectus preperitoneal sublay mesh repair of umbilical hernia in cirrhotic patients with ascites.
2. Patients and methods

70 patients with umbilical hernia, liver cirrhosis and ascites (Fig. 1) were recruited for this study and consecutively operated upon during the period from October 2010 to April 2013 at the department of general surgery of Theodor Bilharz Research Institute (TBRI). Liver failure with cirrhosis was diagnosed on clinical, biochemical, or histological findings. Liver cirrhosis in all patients involved in our study was related to hepatitis C viral infection. Ascites was diagnosed with ultrasonography or computed tomography, and umbilical hernia was diagnosed on clinical examination.

Patients excluded from the study included those of complicated umbilical hernia (spontaneous rupture, leakage, recurrence, incarceration, obstruction and strangulation); patients with spontaneous bacterial peritonitis proved by preoperative routine ascitic fluid sample for total leukocyte count and those with patent umbilical vein in the wall of their hernia sac diagnosed by routine preoperative ultrasonography (US) or computed tomography (CT). Patients with disseminated malignant tumor, congestive heart failure, and renal failure requiring dialysis were also excluded to ensure that ascites was not caused by conditions other than portal hypertension from liver cirrhosis.

Preoperative optimal management of ascites was performed by a hepatologist with 2 diuretics (spironolactone and furosemide), early nutritional support, intravenous albumin and/or paracentesis. After the preoperative evaluation, all patients were classified according to Child–Pugh–Turcotte (CPT) classification, model for end-stage liver disease (MELD) score, and American Society of Anesthesiologists (ASA) score.

All patients were invited for clinical examination to diagnose recurrence after a minimum follow-up of 6 months.

Demographic data, preoperative variables, peri-operative course, and postoperative complications were analyzed.

This study was submitted and approved by the Ethics Committee of TBRI. Data were collected and organized in electronic spreadsheet (Microsoft excel®). For all patients the main author was part of the surgical crew and surgical technique had been standardized.

3. Surgical technique

Spinal anesthesia was used when thrombocytes >50,000 per mm² and prothrombin concentration (PC) > 40% under an umbrella of platelets and plasma intravenous infusion, otherwise general anesthesia was done. All patients received a single dose of intravenous antibiotics just before incision (1.5 g cefuroxime). The skin around the hernia was infiltrated with 20 mL of ropivacain 7.5 mg/mL (Fig. 2).

An elliptical incision including hernia and umbilicus was made and the subcutaneous tissues were dissected off the rectus sheath and linea Alba to expose the hernia sac (Fig. 3). The sac was incised at its neck and adhesions from the omentum or bowel were divided and the contents are returned to the peritoneal cavity (Fig. 4). The rectus sheath was dissected on its anterior surface so that a 1.5- to 2.0-cm margin was visible around the defect. Similarly, adhesions on the peritoneal surface, just inside the fascial defect, were cleared for 360° to allow visualization of the suture repair. Then, a proper blunt dissection of the retro-muscular space was done in all directions with isolation of the posterior layer. This dissection was stopped when an overlap of 3–4 cm in all directions was reached. The peritoneum and adherent posterior rectus sheath was then closed using running slowly absorbable sutures (PDS 2/0) (Fig. 5). The mesh was placed in the space between the posterior layer and the rectus muscle, with at least 3 cm overlap in all directions (Fig. 6). Because of the self-fixation of the mesh in pre-peritoneal position, only some absorbable stitches (Vicryl 2/0) were used at the corner edges of the mesh to the posterior layer. The anterior rectus sheath was closed over the mesh in all cases using non-absorbable sutures (Prolene 2/0) (Fig. 7). Absorbable sutures were used to close subcutaneous tissue and skin was clipped (Fig. 8). Drain usage was not standardized and was dependent on the surgeon’s preference.

4. Results

A total of 38 women and 32 men with an average age 51.24 (range 37–63) diagnosed as umbilical hernia, liver cirrhosis and ascites, undergone retrorectus preperitoneal sublay mesh repair during the study period. The patients had an average MELD score of 18 (range 12–25), in which 46 (65.7%) classified as CPT grade B and 24 (34.3%) as grade C while none of the patients classified as grade A. According to ASA score, 12 (17.2%) patients were of class II, 43 (61.4%) of class III, and 15 (21.4%) of class IV, while none of class I. Patient’s demographics and preoperative characteristics are shown in Table 1.

The defect size was an average of 3.05 cm (range 1.5–6 cm) for which a mesh size of an average of 50.6 cm² (range 28–72 cm²) was used for its repair. The use of subcutaneous drain was at surgeon’s
discretion and done in 12 (17.2%) patients. The mean operative time was 67.45 min (range 52–83 min). The mean hospital stay was 3.8 days (range 2–9 days). Peri-operative data are shown in Table 2.

Two (2.9%) of patients had wound infection controlled by local wound care, three (4.3%) of patients developed wound seroma responded to needle aspiration under complete aseptic conditions and one patient(1.4%) had an ascitic fistula which controlled by repeated local application of tissue adhesive (Histoacryl) and tight dressing over the surgical incision. Postoperative data are shown in Table 3.

Recurrence occurred in only one of the patients (1.4%) after a period of 9 months. This patient developed refractory ascites which required synchronous Deniver shunt and onlay mesh repair for the recurrent umbilical hernia. During follow up; Three (4.3%) of patients were admitted to the ICU because of hepatic encephalopathy (two) and hepato-renal failure (one). Two (2.9%) of patients died at the 4th and 5th months postoperatively but, this mortality was not attributable to hernia repair surgery.

5. Discussion

Umbilical hernia (UH) is the most frequent abdominal wall complication of ascites in cirrhotic patients. Early elective hernia repair in these patients should be advocated considering the hepatic reserve and patient’s condition. Previous retrospective studies have demonstrated that conservative treatment of umbilical hernia in cirrhotic patients is associated with considerable morbidity and mortality.

Optimizing the patients with liver cirrhosis before elective umbilical hernia repair is crucial to minimizing postoperative complications and reducing recurrence. Such optimization includes low salt intake, free water restriction, and use of diuretics, large volume paracentesis and intravenous infusion of salt-poor albumin.
can help to control ascites. Other more invasive interventions for perioperative ascites control include transjugular intrahepatic portosystemic shunting (TIPS) for control of portal hypertension which has been evolved considerably and have been suggested as an addition to hernia correction. Another option is a temporary peritoneal dialysis catheter at the time of umbilical hernia repair to control ascites postoperatively. Peritoneo-venous shunt, once popular in the past, is no longer commonly used because of the effectiveness of other modalities and complications of the peritoneo-venous shunt, such as disseminated intravascular coagulation and occlusion of the shunt. This study was dependant on non-invasive modalities by a hepatologist in the management of the ascites which yields good results. Our final endpoints of preoperative optimal management of ascites were to minimize as much as possible the grade of that ascites as judged by abdominal clinical examination and abdominal sonography rather to completely get rid of the ascites which is a very difficult task in those patients as well as, to elevate preoperative serum albumin level above 3g/ml. However we used concomitant peritoneo-venous shunt with the repair of our single recurrent case.

In normal individuals regarding the comparison of umbilical hernia repair using direct suture and mesh it was found that a slightly increased risk of postoperative local complications following mesh repair is offset by a reduced rate of recurrence in comparison to suture repair. While in cirrhotic patients it was found that elective onlay mesh repair of non-complicated umbilical hernia with ascites in cirrhotic patients is a safe and effective technique with minimal wound-related morbidity and a significantly lower rate of recurrence. The selection criteria of this technique of repair were even extended to include the complicated umbilical hernias with liver cirrhosis and ascites.

With any emergent technique, a very careful patient selection by using a strict inclusion and exclusion criteria, is of great importance. So in this study, we limit it to elective non-complicated patients in order to assess the efficacy of the surgical technique without the added morbidities of the complicated cases. In addition we excluded patients with a patent umbilical vein as the repair of an umbilical hernia necessitates the ligation of a possibly patent umbilical vein which 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.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Patient demographics &amp; preoperative data.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean age (years old)</strong></td>
<td>51.24</td>
</tr>
<tr>
<td><strong>Gender, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>32 (45.7%)</td>
</tr>
<tr>
<td>Female</td>
<td>38 (54.3%)</td>
</tr>
<tr>
<td><strong>CPT classification, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>B</td>
<td>46 (65.7%)</td>
</tr>
<tr>
<td>C</td>
<td>24 (34.3%)</td>
</tr>
<tr>
<td><strong>MELD score, mean</strong></td>
<td>18</td>
</tr>
<tr>
<td><strong>ASA score, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>II</td>
<td>12 (17.2%)</td>
</tr>
<tr>
<td>III</td>
<td>43 (61.4%)</td>
</tr>
<tr>
<td>IV</td>
<td>15 (21.4%)</td>
</tr>
<tr>
<td><strong>Co-morbidities, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>6 (8.6%)</td>
</tr>
<tr>
<td>Malignancy</td>
<td>4 (5.7%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>11 (15.7%)</td>
</tr>
<tr>
<td>BMI &gt; 35</td>
<td>8 (11.4%)</td>
</tr>
<tr>
<td>COPD</td>
<td>5 (7.2%)</td>
</tr>
</tbody>
</table>

CPT, Child—Pugh—Turcotte.  
MELD, model for end-stage liver disease.  
ASA, American Society of Anesthesiologists.  
BMI, Body Mass Index.  
COPD, Chronic Obstructive Pulmonary Disease.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Peri-operative data.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation time (mean in min)</strong></td>
<td>67.45</td>
</tr>
<tr>
<td><strong>Type of anesthesia, n</strong></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>13</td>
</tr>
<tr>
<td>Spinal</td>
<td>57</td>
</tr>
<tr>
<td><strong>Defect size (mean in mm)</strong></td>
<td>3.05</td>
</tr>
<tr>
<td><strong>Mesh size (mean in cm²)</strong></td>
<td>50.62857</td>
</tr>
<tr>
<td><strong>Subcutaneous drain, n (%)</strong></td>
<td>12 (17.2%)</td>
</tr>
<tr>
<td><strong>Hospital stay (mean in days)</strong></td>
<td>3.8</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Table 3</th>
<th>Postoperative sequelae.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wound infection, n (%)</strong></td>
<td>2 (2.9%)</td>
</tr>
<tr>
<td><strong>Wound seroma, n (%)</strong></td>
<td>3 (4.3%)</td>
</tr>
<tr>
<td><strong>Ascitic fistula, n (%)</strong></td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td><strong>Hernia recurrence, n (%)</strong></td>
<td>1 (1.4%)</td>
</tr>
<tr>
<td><strong>ICU admission, n (%)</strong></td>
<td>3 (4.3%)</td>
</tr>
<tr>
<td><strong>Mortality, n (%)</strong></td>
<td>2 (2.9%)</td>
</tr>
</tbody>
</table>

ICU, Intensive Care Unit.
In the present study, we had complications in 7 patients (10%); all of them had an average MELD score > 25, and were CPT classified of grade C. This comes with other studies demonstrated that postoperative outcome in cirrhotic patients is correlated with the patient’s CPT classification and, especially, with their MELD score.20,21

In normal non-cirrhotic patients; effectiveness of surgical repair of umbilical hernia depends in part on reducing tension at the site of wound.22 The tension free method preferred by most of the surgeons nowadays is placement of prosthetic mesh at the site of hernia as it creates little or no tension and has lower recurrence rate as well as faster recovery with minimal pain.23 There are three alternative levels for placement of mesh: Onlay (anterior to the aponeurosis and the defect), Sublay/Retrorectus (between Rectus muscle & posterior rectus sheath), Inlay/Intrapерitoneal (inside the peritoneum). Mesh can also be used to plug the hernial defect1. However, there is still controversy regarding the best site of mesh placement.20

Considering the surgical technique, it is well accepted among hernia surgeons to use an overlap of the mesh of ~2–3 cm for umbilical hernia repair. Using a sublay retrorectus repair, this issue is not a problem, as the mesh size can be perfectly adjusted to the hernia size. The critical point of dissection in this type of repair is the border of the dissection area at the level of the linea alba.25 In terms of post-operative low risk of wound related complications and recurrence, it has been concluded that sublay mesh repair was superior to other techniques.26–28

Because of lack of studies using the same technique in the same patient group, we could not compare our results with others. However we compared it with studies used other techniques of umbilical hernia repair. Our results in terms of wound infection (2.9%) was significantly less than other studies on 30 patients sample using onlay mesh repair (16.2%) and primary surgical repair (8.5%).12 In one randomized trial of 80 patients with liver cirrhosis and umbilical hernia repair, the hernia recurrence rate was significantly less in the onlay mesh group than in the primary repair group with at least 6 months of follow-up (14.2% vs 2.7%),15 this was compared to our study in which we had a recurrence rate of 1.4%

In conclusion, elective retrorectus preperitoneal sublay umbilical hernia mesh repair is a feasible and safe approach in selected non-complicated cirrhotic patients with ascites. 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.

**Ethical approval**

This study was submitted and approved by the Ethics Committee of Theodor Bilharz Research Institute (TBRI).

**Funding**

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**Author contribution**

**Dr. Ahmed Mohamed Abdelaziz Hassan:** main author, study design, data collection, data analysis, and writing.

**Dr. Asaad Fayrouz Salama:** study design, data collection, and data analysis.

**Dr. Hussam Hamdy:** study design, data collection, and data analysis.

**Prof. Dr. Magdy Mohamed Elsebae:** study design, data collection, data analysis, and writing.

**Dr. Ayman Mohamed Abdelaziz:** study design, data collection, and writing.

**Dr. Wessam Abdelrahman Elzayat:** study design, data collection, and writing.

**Conflict of interest**

All authors have no conflicts of interest or financial ties to disclose.

**References**


