Incarceration of umbilical hernia: a rare complication of large volume paracentesis

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ABSTRACT

We present two cases of umbilical hernia incarceration following large volume paracentesis (LVP) in patients with cirrhotic ascites. Both patients became symptomatic within 48 hours after the LVP. Although being rare, given the significantly higher mortality rate of cirrhotic patients undergoing emergent herniorrhaphy, this complication of LVP is potentially serious. Therefore, it is recommended that patients be examined closely for the presence of umbilical hernias before removal of ascitic fluid and an attempt should be made for external reduction of easily reducible hernias, if a hernia is present.

CASE REPORT

CASE 1: A 65-year-old man one year after orthotopic liver transplant for hepatitis C cirrhosis and Model for End-Stage Liver Disease (MELD) score of 6 presented with tense ascites. He also had asymptomatic right inguinal, right flank and umbilical hernias (Fig 1). The patient had multiple prior paracenteses and had re-accumulated fluid in his abdomen. In view of persistent intractable ascites, the patient underwent transjugular intrahepatic portosystemic shunt (TIPS) placement and concomitant ultrasound-guided drainage of 8L of abdominal fluid using 5 French Yueh needle and vacuum container accompanied by intravenous administration of 50 grams of albumin. Within 24 hours after the procedure, the patient began to complain of severe periumblical pain accompanied by nausea and vomiting. His physical examination showed a tender irreducible umbilical hernia. He underwent surgical exploration and anatomical repair of the incarcerated umbilical hernia with an uneventful postoperative course. No bowel resection was performed, as the incarcerated bowel loop was viable. Over two years of follow up, the patient had three elective surgeries with mesh placement for recurrent umbilical hernia.

CASE 2: A 39-year-old man with decompensated liver cirrhosis due to autoimmune hepatitis, MELD score of 11 and prior history of esophageal variceal bleeding presented with refractory ascites. He also had an asymptomatic reducible umbilical hernia. The patient underwent an ultrasound guided large volume paracentesis of approximately 10 L using a 5 French Yueh needle placed in the right lower abdominal quadrant and vacuum container accompanied by subsequent uneventful placement of a TIPS catheter. He was given 50 grams of intravenous albumin during the paracentesis. Over the next 48 hours after the procedure, he did not have a bowel movement or passage of gas and developed abdominal pain and distension. Physical examination demonstrated a tender irreducible umbilical hernia. The patient underwent urgent laparotomy which showed a strangulated umbilical hernia (Fig 2). A 20 cm segment of ischemic small bowel was resected, an end-to-end anastomosis was performed, and the patient improved postoperatively.
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Etiology & Demographics

Cirrhotic patients who do not respond to initial medical treatments for ascites (salt and fluid restriction, diuretics), or who respond at first but subsequently lose their response, will require more invasive treatment such as serial therapeutic paracentesis, TIPS creation or shunt surgery. Large volume paracentesis (LVP), defined as removal of more than 5 L of ascitic fluid, is an effective therapy for patients with tense ascites [1].

Unlike large volume thoracentesis which is typically limited to 1.0 to 1.5 L due to chest discomfort and the risk for re-expansion pulmonary edema, LVP is a safe and effective treatment to relieve patients with tense or refractory ascites. LVP is also done commonly prior to TIPS placement in patients with massive ascites to decrease the radiation exposure to the patient and staff by decreasing patient’s size, to facilitate cannulation of the hepatic vein and puncture of the portal vein, and to facilitate management of the respiratory function, especially in those that are done under general anesthesia [2].

Patients with ascites secondary to cirrhosis have a 20-24% risk of developing umbilical herniation [3, 4]. This increased risk is due to the elevated intra-abdominal pressure which thrusts the peritoneum forward through the umbilical ring. Ventral abdominal muscle wasting resulting from protein-calorie malnutrition and sarcopenia also contributes to the increase incidence of umbilical hernia in these patients [5, 6]. As explained by Tan and Chang, the fascial defect in the abdominal muscles results in ventral abdominal muscle wasting resulting from protein-calorie malnutrition and sarcopenia which also contributes to the increase incidence of umbilical hernia in these patients [5, 6].

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Clinical & Imaging Findings

Physical examination of the patients before paracentesis often shows an asymptomatic reducible umbilical hernia. On radiographs, the hernia sac may be visualized as a density overlying the umbilical region. Computed tomography (CT) examination best shows the hernia, as a widened umbilical ring through which the abdominal structures are protruded. It may also contain ascitic fluid. If incarceration occurs after LVP, patients will complain of abdominal pain and distension, and demonstrate signs of bowel obstruction and eventually bowel ischemia. On physical examination, hernia sac will become irreducible, tender and inflamed. Hernia incarceration on CT may show proximal bowel loop dilatation from bowel obstruction, and signs of bowel strangulation at later stages which include mesenteric fat stranding, bowel wall thickening, pneumatosis and engorged mesenteric vessels.

In all cases described in the literature [5, 7-10], hernia incarceration developed within few days after LVP. This is in contrast to those incarcerations seen after TIPS placement without LVP which occurred several weeks to months after LVP [4, 11]. In our cases, both patients developed hernia incarceration within two days following large volume paracentesis. Therefore, it is unlikely that the TIPS had any causative relation to the hernia incarceration given the rapid time course in our two patients.

Treatment & Prognosis

Similar to general population, the treatment for non-reducible incarcerated hernia following LVP is surgical repair. However, patients with chronic liver disease who require surgery represent a significant clinical challenge to surgeons. Specific estimates of mortality rates in patients with ascites undergoing umbilical hernia repair range from 0% to 30% [13]. These estimates correlate well with patient’s MELD score, platelet and leukocyte counts and albumin level [14]. The mortality rates are even higher in urgent surgeries, and therefore, it is recommended that patients be examined closely for the presence of umbilical hernias before removal of ascitic fluid. If a hernia is present, the physician should be aware of this complication and an attempt should be made for external reduction of easily reducible hernias. Close follow up to assess for symptoms of a complicated hernia sac should be done post LVP.

Differential Diagnosis

Serious complications from abdominal paracentesis are uncommon. Known complications of paracentesis, however, include ascitic fluid leak from puncture site (5%), bleeding (0 - 0.97%), bowel perforation (0.6%) and infection (0.58 - 0.63%) [1, 15].

Ascitic fluid leak, the most common complication of paracentesis, can be prevented by performing a Z-track puncture using a small-bore needle and creation of a small skin incision. If a leak occurs, it is typically managed by placing an ostomy bag over the leak site and continued diuretic therapy. Placement of gauze dressings over the site usually leads to rapid soaking of the dressings and maceration of the skin. Occasionally, a repeat therapeutic paracentesis using proper technique is needed, if the leak is refractory to diuretic therapy [1, 15].

Hemorrhage from a vessel that is impaled by the needle can be managed by an external figure-of-eight suture surrounding the needle entry site. Rarely, a laparotomy is required to control the bleeding. Infection following paracentesis is rare unless the bowel is entered by the paracentesis needle. Bowel perforation by the paracentesis needle is often well tolerated and does not lead to clinical peritonitis [1, 15]. Post paracentesis circulatory dysfunction (PPCD) is a well know complication of LVP which may occur in up to 80% of patients if intravenous albumin is not administrated [16]. With appropriate treatment with albumin infusion, the incidence of PPCD decreases to 14-20% [17].
Incarceration of the umbilical hernia is a rare but potentially serious complication of large volume paracentesis, and therefore, it is recommended that patients be examined closely for the presence of umbilical hernias before removal of ascitic fluid. If a hernia is present, the physician should be aware of this complication and an attempt should be made for external reduction of easily reducible hernias. Close follow up to assess for symptoms of a complicated hernia sac should be done post LVP. Elective surgical repair of the hernia is also recommended when optimal control of ascites is achieved.

REFERENCES


TEACHING POINT

Incarceration of the umbilical hernia is a rare complication of large volume paracentesis, and therefore, it is recommended that patients be examined closely for the presence of umbilical hernias before removal of ascitic fluid. If a hernia is present, the physician should be aware of this complication and an attempt should be made for external reduction of easily reducible hernias. Close follow up to assess for symptoms of a complicated hernia sac should be done post LVP. Elective surgical repair of the hernia is also recommended when optimal control of ascites is achieved.
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**Figure 1:** 65-year-old man with tense ascites and asymptomatic umbilical hernia who developed severe periumbilical pain, nausea and vomiting, and a tender irreducible umbilical hernia on physical examination within 24 hours after removal of 8L of ascitic fluid. Surgical exploration showed incarcerated umbilical hernia. FINDINGS: (a) Axial non-contrast CT scan (GE LightSpeed Pro 16, Slice thickness: 5mm, kVP:120, mAS:90) of the abdomen few days before presentation shows fluid-filled umbilical (arrow) and flank (asterisk) hernias with no loops of bowel within the hernia sacs. (b) Axial contrast-enhanced CT scan (GE LightSpeed Pro 16, Slice thickness: 2.5mm, kVP:120, mAS:437, 100mL of Isovue-370, venous phase) of the abdomen few days after the surgery showing repaired hernias.
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**Etiology**
Decompression of the ascitic fluid decreases the tension and diameter of the hernia ring which leads to trapping of hernia sac contents

**Incidence**
Unknown

**Sex ratio**
No specific sex predilection

**Age predilection**
No specific age predilection

**Risk factors**
- Abdominal wall muscle wasting
- Higher volume and rapid paracentesis using large caliber needles and vacuum containers

**Treatment**
Urgent laparotomy and hernia repair

**Prognosis**
Up to 30% mortality rate in cirrhotic patients who undergo hernia repair

**Clinical findings**
Development of abdominal pain, tender and irreducible hernia and signs of bowel obstruction within few days after large volume paracentesis (LVP)

**CT Imaging findings**
- Widened umbilical ring through which the abdominal structures and ascitic fluid are protruded
- May show proximal bowel loop dilatation from bowel obstruction
- May show signs of bowel strangulation including mesenteric fat stranding, bowel wall thickening, pneumatosis and engorged mesenteric vessels

**Table 1:** Summary table of hernia incarceration after large volume paracentesis (LVP).

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**Figure 2:** 39-year-old man with asymptomatic reducible umbilical hernia and refractory ascites underwent a large volume paracentesis of 10 L. Within 48 hours after the procedure, he developed abdominal pain and distension and a tender irreducible umbilical hernia. Urgent laparotomy showed a strangulated umbilical hernia. FINDINGS: (a) Radiodense hernia sac (arrows) on preoperative supine radiograph of the abdomen. (b) Preoperative umbilical hernia sac on physical examination. (c) Intraoperative distended bowel loops in hernia sac with dusky discoloration reflecting non-viability. (d) Postoperative supine radiograph of the abdomen, showing resolution of the radiodense hernia sac.
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Table 2: Differential table for hernia incarceration after large volume paracentesis (LVP): Paracentesis complications [1, 15-17].

<table>
<thead>
<tr>
<th>Paracentesis Complications</th>
<th>Incidence</th>
<th>Prevention</th>
<th>Treatment</th>
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| Leak of ascitic fluid      | 5%        | • Performing a Z-track puncture  
• Using small-bore needle  
• Creation of small skin incision | • Placing an ostomy bag over the leak site  
• Repeat therapeutic paracentesis using proper technique |
| Severe hemorrhage          | 0 - 0.97% (higher if renal failure is present) | • Avoid arterial or venous puncture using ultrasound | • Using external figure-of-eight suture surrounding the needle entry site  
• Rarely, laparotomy |
| Bowel perforation          | 0.6%      | • Avoid bowel puncture using ultrasound | • Generally well tolerated  
• Treatment for peritonitis if symptomatic |
| Infection                  | 0.58 - 0.63% (rare unless the bowel is punctured) | • Avoid bowel puncture using ultrasound  
• Sterile technique | • Treatment for peritonitis if symptomatic |
| Post paracentesis circulatory dysfunction following LVP | • Up to 80% after LVP without albumin administration  
• 14-20% after LVP with albumin infusion | • Intravenous albumin infusion  
• Vasoconstrictors | • Intravenous albumin infusion  
• Electrolyte correction  
• Vasoconstrictors |
| Hernia incarceration following LVP | Unknown | • External reduction of easily reducible hernias  
• Elective surgical repair | • Urgent laparotomy and surgical repair |
| Death associated with paracentesis | 0 - 0.39% | | |

Table 2: Differential table for hernia incarceration after large volume paracentesis (LVP): Paracentesis complications [1, 15-17].