CASE REPORT

Mesenteric Defect with Internal Herniation in the Pediatric Emergency Department: An Unusual Presentation of Acute Abdomen

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Received Nov 7, 2011; received in revised form Jun 6, 2012; accepted Nov 20, 2012
Available online 20 January 2013

Key Words
abdominal pain; children; internal hernia; mesenteric defect

Internal herniation is a rare cause of intestinal obstruction, especially in the emergency department. We report a child with acute abdomen resulting from transmesenteric internal herniation of the small bowel. Radiographic findings revealed gaseous distension of the bowel loops in the upper abdominal area with a paucity of gas in the lower abdomen. Operative finding showed gangrenous small bowel due to mesenteric defect with an internal herniation. The gangrenous bowel was resected and the patient was discharged with an uneventful outcome. We emphasize that early recognition of internal herniation warrants further evaluation and appropriate management.

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1. Introduction

An internal herniation with small bowel strangulation due to a mesenteric defect is a rare cause of intestinal obstruction, especially in children. The incidence of internal hernia as a cause of acute intestinal obstruction was 0.9–1.78%,¹ and mesenteric hernia found in a series of autopsies reported by Shaffner and Tennel was 0.2–0.9%.² In children, transmesenteric hernias are thought to arise from a congenital defect in the small-bowel mesentery near the ileocecal region or ligament of Treitz rather than paraduodenal hernia due to a postoperative defect in adults.¹,³ The incidences of volvulus or strangulation due to transmesenteric herniation are as high as 30–40%, with mortality rates of 50% for treated cases and 100% for nontreated cases.⁴,⁵ Early diagnosis and prompt treatment in the pediatric emergency department (PED) are important. Here, we report an unusual case of a boy who exhibited intermittent abdominal pain in the PED, and provide images recorded during the early presentation of internal herniation with small bowel volvulus due to a mesenteric defect.

2. Case Report

An 8-year-old boy presented to the PED with a 6-hour history of cramping abdominal pain with epigastric tenderness. There was no abdominal rebounding pain, muscle guarding, vomiting, or fever. The abdominal X-ray showed bowel loop dilatation with fecal retention (Figure 1A). The abdominal pain was improved after fleet enema and he was discharged after 30 minutes’ observation in the PED.

The patient returned to the PED 9 hours later due to vomiting, fever, and progressive intermittent colicky abdominal pain over the epigastric area, which then shifted

![Figure 1](image1.png)

Figure 1  (A) Abdominal X-ray revealing bowel loop dilatation with fecal retention. (B) Abdominal X-ray revealing gaseous distension of the bowel in the upper abdominal area with paucity of gas in the lower abdomen.

![Figure 2](image2.png)

Figure 2  (A) Abdominal CT scan showing nonenhanced thickened bowel wall after contrast injection. (B) Twisted alignment of the superior mesenteric artery and superior mesenteric vein, and engorged superior mesenteric vein.
to the right lower quadrant area. Upon physical examination, his vital signs included a temperature of 37.4°C, respiratory rate of 19/min, blood pressure of 131/96 mmHg, and oxygen saturation of 97% on room air. An abdominal evaluation revealed muscle guarding and rebounding pain. Laboratory data included hemoglobin 101 g/L, leukocyte count $16.7 \times 10^9/L$ with 85% neutrophils and 3% band forms. The blood chemistry values were as follows: glucose, 1.69 g/L;

![Figure 3](A) Strangulated gangrenous small bowel. (B) Congenital mesenteric defect.

### Table 1: Characteristics of children with mesenteric defect.

<table>
<thead>
<tr>
<th>Age/sex</th>
<th>Clinical manifestation</th>
<th>Chest X-ray</th>
<th>Operative findings</th>
<th>Treatment</th>
<th>Outcome</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 y/M</td>
<td>Abdominal pain, vomiting, abdominal distension, fever, hypotension</td>
<td>Distended loops of bowels with a paucity of gas in the lower abdomen</td>
<td>Gangrenous distal ileum</td>
<td>Resection and repair of defect</td>
<td>Recovery</td>
<td>Current case</td>
</tr>
<tr>
<td>3 y/M</td>
<td>Abdominal pain, bilious vomiting, abdominal distension</td>
<td>Distended loops of bowels</td>
<td>Incarcerated distal ileum</td>
<td>Repair of defect</td>
<td>Recovery</td>
<td>6</td>
</tr>
<tr>
<td>1.8 y/F</td>
<td>Abdominal pain, nonbilious emesis, mildly distended abdomen</td>
<td>Dilated loops of small bowel with a question of lateralization of the ileum</td>
<td>Ischemic jejunum and ileum; infarcted sigmoid colon</td>
<td>Resection and repair of defect</td>
<td>Recovery</td>
<td>13</td>
</tr>
<tr>
<td>0 mo/M</td>
<td>Abdominal distension, bilious emesis, distended abdomen</td>
<td>Air in the decompressed stomach with a small amount of air in the colon</td>
<td>Twisted small intestine, herniated bowel</td>
<td>Repair of defect</td>
<td>Recovery</td>
<td>13</td>
</tr>
<tr>
<td>1.6 y/F</td>
<td>Bilious vomiting, abdominal pain, distended abdomen, decreased bowel sounds, diffuse tenderness of abdomen, shock like</td>
<td>Non-specific bowel gas pattern</td>
<td>Bowel incarceration and gangrenous change</td>
<td>Resection, repair of defect</td>
<td>Recovery</td>
<td>7</td>
</tr>
<tr>
<td>2.5 y/M</td>
<td>Abdominal pain, bilious vomiting, abdominal distension, shock like</td>
<td>Distended loops of bowel</td>
<td>Herniated bowel with gangrene</td>
<td>Resection, repair of defect</td>
<td>Recovery</td>
<td>8</td>
</tr>
<tr>
<td>3.2 y/M</td>
<td>Abdominal pain, bilious vomiting, abdominal distension</td>
<td>Distended loops of bowel</td>
<td>Herniated bowel</td>
<td>Reduction and repair of defect</td>
<td>Recovery</td>
<td>8</td>
</tr>
</tbody>
</table>

(continued on next page)
Table 1 (continued)

<table>
<thead>
<tr>
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<th>Operative findings</th>
<th>Treatment</th>
<th>Outcome</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2 y/M</td>
<td>Abdominal pain, bilious vomiting, palpable mass, shock</td>
<td>Distended loops of bowel</td>
<td>Volvulus of bowel with gangrene</td>
<td>Resection and ileostomy</td>
<td>Wound infection</td>
<td>8</td>
</tr>
<tr>
<td>5.4 y/F</td>
<td>Abdominal pain, bilious vomiting, abdominal distension</td>
<td>Distended loops of bowel</td>
<td>Herniated bowel</td>
<td>Reduction and repair of defect</td>
<td>Recovery</td>
<td>8</td>
</tr>
<tr>
<td>7 y/F</td>
<td>Abdominal pain, non-bilious vomiting, distended and muscle guarding</td>
<td>Increased intestinal gas, a circular defect of the gas shadow in the middle of the abdomen</td>
<td>Strangulated ileum</td>
<td>Resection and repair of defect</td>
<td>Recovery</td>
<td>9</td>
</tr>
<tr>
<td>5 y/F</td>
<td>Abdominal pain, nausea, non-bilious vomiting, abdominal guarding</td>
<td>Paucity of gas shadow, circular or oval in the midabdomen</td>
<td>Strangulated ileum</td>
<td>Relieved strangulation; repair of defect</td>
<td>Recovery</td>
<td>9</td>
</tr>
<tr>
<td>7 y/F</td>
<td>Intense diffuse abdominal pain, vomiting, abdominal distension, rebound tenderness</td>
<td>Multiple dilated loops of small bowel</td>
<td>Long segment gangrenous ileus</td>
<td>Resection and repair</td>
<td>Recovery</td>
<td>10</td>
</tr>
</tbody>
</table>

3. Discussion

In our literature review, including our case, all patients presented with abdominal pain, vomiting, and abdominal distension, and the plain abdominal radiograph showed distended bowels (Table 1). Bowel resection due to gangrene was identified in seven of 12 children (58.33%), and no cases of mortality occurred. Internal hernias can be asymptomatic or cause significant discomfort, ranging from constant vague epigastric pain to intermittent colicky periumbilical pain. Additional symptoms include nausea, vomiting, and recurrent intestinal obstruction. These symptoms may be altered or relieved by changes in patient position. Symptom severity relates to the duration and reducibility of the hernia and the presence or absence of incarceration and strangulation. Childhood transmesenteric hernia is more likely than adulthood to develop a volvulus or strangulation. Therefore, early recognition and familiarity with early signs of acute abdomen is important to pediatric emergency physicians, and might save the patient’s bowel.

A retrospective study revealed a small-bowel dilatation with a transition point, clustering of small-bowel loops, and mesenteric vessel abnormalities. A “closed loop” sign occurs if there is twisting of the mesenteric vessels and

amylose, 35 U/L; aspartate aminotransferase, 35 U/L; Ca, 89 g/L; Na, 139 meq/L; K, 4.4 meq/L; Cl, 109 meq/L; C-reactive protein, 17.16 mg/L; and creatinine, 4.2 mg/L. Abdominal radiography revealed gaseous distension of the bowel loops in the upper abdominal area with a paucity of gas in the lower abdomen (Figure 1B). Abdominal computed tomography (CT) revealed hypoperfusion or an ischemic bowel with a thickened bowel wall that was not enhanced after a contrast injection, and a midgut volvulus with a strangulated small bowel appearing as a twisted alignment of the superior mesenteric artery and superior mesenteric vein and engorged superior mesenteric vein (Figure 2).

A laparotomy performed within 3 hours after arrangement of abdominal CT revealed bloody ascites of 200 mL, and a gangrenous small bowel at about 130 cm from the ileocecal valve owing to the strangulated volvulus. The volvulus was ascribed to a mesenteric defect in association with an internal herniation of the small bowel (Figure 3). A resection of the small bowel with anastomosis, and repair of the mesentery was performed. A pathological examination revealed a gangrenous change in the small bowel with transmural hemorrhagic necrosis. The patient was discharged 10 days after admission with an uneventful outcome.
a whirl sign occurs if volvulus is present.\textsuperscript{11} Plain abdominal X-ray findings are essentially those of intestinal obstruction, such as consistent intestinal gas after an interval of several hours, suggesting the possibility of an internal hernia.\textsuperscript{9} Gaseous distension of the bowel loops in the upper abdominal area with a paucity of gas in the lower abdomen should alert the physician to the possibility of an internal hernia. The precise cause of a bowel obstruction related to a mesenteric defect with an internal hernia can be established only during surgery. Nevertheless, preoperative diagnosis of an internal hernia has been made by CT scan.\textsuperscript{12} Treatment is based on the operative findings. A gangrenous bowel should be resected with an end-to-end anastomosis to restore bowel continuity. A mesenteric defect, regardless of its size, should be closed with nonabsorbable sutures.

The most important step for the pediatric emergency physician is early recognition of the acute abdominal signs, including muscle guarding and rebounding pain, vomiting, and unexplained persistent or intermittent abdominal pain. Radiographic findings suggestive of internal herniation are gaseous distension of the bowel loops in the upper abdominal area with a paucity of gas in the lower abdomen. Internal herniation should be considered in differential diagnoses of acute abdomen in the PED.

**Conflicts of Interest**

The authors have no conflicts of interest relevant to this article.

**References**


