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Right paraduodenal hernia: characteristic MDCT findings

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Abstract

Right paraduodenal hernia is a very rare cause of abdominal pain. It can lead to bowel obstruction, ischemia, and perforation with a high mortality. A timely and correct diagnosis with a rapid diagnostic tool is mandatory. However, clinical diagnosis of right paraduodenal hernia is difficult for its nonspecific symptoms. Traditionally, paraduodenal hernia was diagnosed by small bowel series that was a time-consuming image study. We report a case of right paraduodenal hernia with pre-operative fast diagnosis by multidetector row computed tomography. Fortunately, the ischemic bowel loops were timely alleviated by reduction and resection was prevented.

Key words: Intestinal obstruction—Hernia—Internal hernia—Right paraduodenal hernia—Multidetector row computed tomography

Case report

A 45-year-old housewife without a history of previous abdominal surgery presented with sudden-onset epigastric pain for half a day. She denied any other symptoms. There was no history of recurrent abdominal pain. In the emergency department, physical examination revealed local tenderness with rebound in the epigastric area. Normal blood and biochemistry data such as white blood cell counts ($7.69 \times 10^3/\mu l$), red blood cell ($4.27 \times 10^6/\mu l$), hematocrit (42.4%), creatinine (0.7 mg/dL), blood urea nitrogen (17 mg/dL), alanine aminotransferase (18 IU/L), aspartate aminotransferase (22 IU/L), amylase (103 U/L), lipase (34 U/L), total bilirubin (0.5 mg/dL), alkaline phosphatase (69 IU/L) were noted. Besides, no elevation of C-reactive protein value (0.14 mg/dL) was also noted. Abdominal plain film was unremarkable. Due to acute abdomen with worsening symptoms and indeterminate diagnosis, intravenous contrast enhanced dual phase multidetector row computed tomography (MDCT) including abdomen and pelvis without oral contrast medium was performed. MDCT displayed clustered small bowel loops located in the right abdomen laterally and inferiorly to the third portion of the duodenum with left displacement of the ascending colon. Also, looping of the accompanying superior mesenteric vessels into a herniated sac and decreased bowel wall enhancement of some small intestine within the sac were noted (Figs. 1, 2). Right paraduodenal hernia with ischemic bowel change was diagnosed, and the patient underwent an exploratory laparotomy.

Operative findings showed a segment of ischemic ileum about 100 cm in length, which was herniated into the fossa of Waldeyer, 6 × 6 cm in size. The ischemic change of intestine was alleviated after reduction of the herniation. The paraduodenal sac defect was sutured with silk.

The post-operative course was uneventful, and the patient was discharged 10 days after operation. She was asymptomatic at follow-up 24 months postoperatively.

Discussion

The occurrence of abdominal internal hernia is reported in 0.2–0.9% of autopsies and in only 0.5–4.1% of cases of intestinal obstruction [1–4]. In the classification of Welch, internal hernias are classified on the basis of their topographic distribution in the abdominal cavity. The locations and relative frequencies of internal hernias are as follows: paraduodenal, 53%; pericecal, 13%; foramen of Winslow, 8%; transmesenteric and transmesocolic, 8%; pelvic and supravesical, 6%; sigmoid mesocolon, 6%; and transomental, 1–4% [2, 4, 5].

Paraduodenal hernia can occur at any age, but most between the fourth and sixth decades of life [6]. It is more

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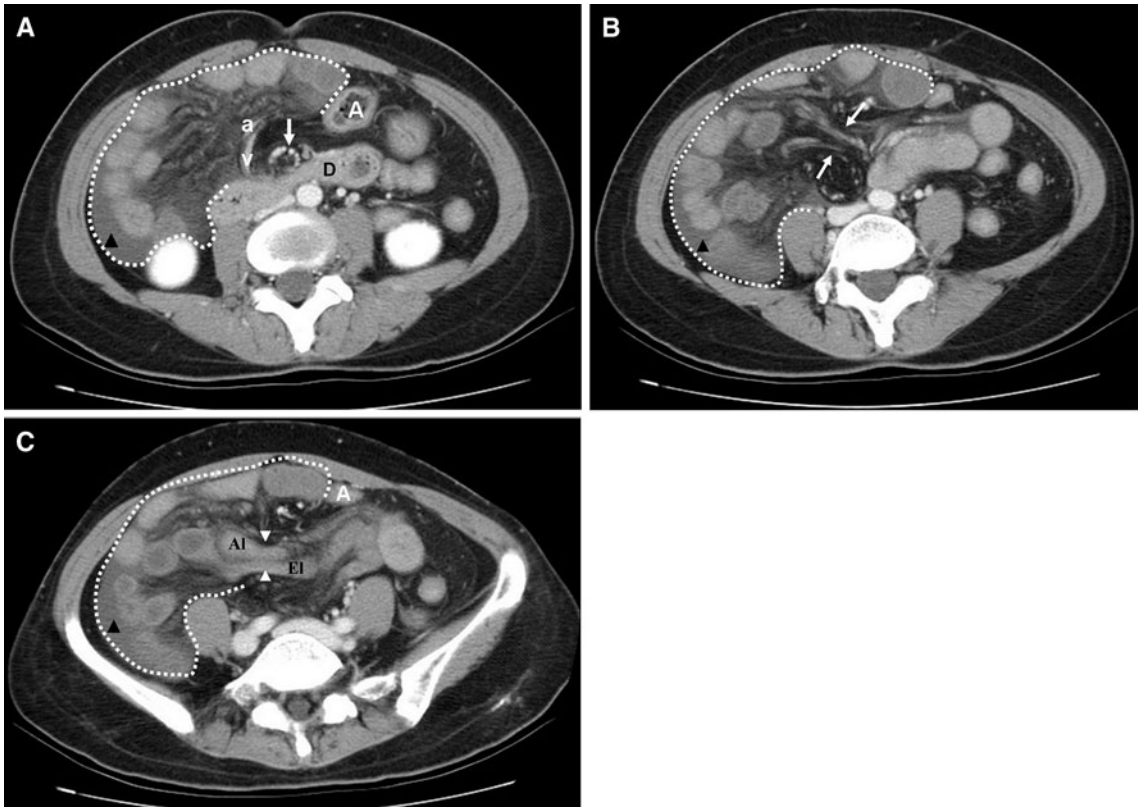

Fig. 1. Computed tomography (CT) in axial sections **A** at the level of the third portion of the duodenum (*D*) and **B** at the level about 3 cm below image (**A**) reveal looping of superior mesenteric vascular branches (*white arrow*) to supply the herniated small intestines in the right paraduodenal sac. The right colic artery (*a*) and right colic vein (*v*) are located at the medial margin of the encapsulated bowel loops. **C** CT image at the level of the hernial orifice about 3 cm below image (**B**) demonstrated both the afferent (*AI*) and the efferent loops (*EI*) are closely apposed, with an abrupt change of caliber (*white arrowheads*). Fat stranding of the mesentery with decreased enhancement of the bowel wall and fluid accumulation (*black arrowhead*) within the herniation sac (*dotted line*) are also noted in all three images. Note the ascending colon (*A*) is at the anterior medial margin of the encapsulated small intestine.

common in males than in females, with a ratio of 3:1 [1, 2, 4, 5]. Twenty-five percent of cases occur on the right side. Right paraduodenal hernia involves the protrusion of small intestine through a peritoneal defect termed "the fossa of Waldeyer". The fossa of Waldeyer is located inferior to the third portion of the duodenum, just behind the root of the small bowel mesentery and anterior to the posterior parietal peritoneum. It extends to the right and downward into the ascending mesocolon, causing anterior shift of the ascending mesocolon and right colic vein. The branches of the superior mesenteric artery (SMA) and superior mesenteric vein (SMV) loop to supply the herniated small bowel loops in the right paraduodenal sac with course behind their parent vessel. Thus, the main trunk of the SMA and right colic vein are located at the anterior medial border of encapsulated small bowel loops and are the important landmarks for a right paraduodenal hernia [4, 7, 8].

Pre-operative diagnosis of right paraduodenal hernia is difficult because of its non-specific clinical symptoms as indigestion, or postprandial epigastric pain [6]. If hernias reduce spontaneously and easily, the clinical symptoms may be transient and mild. During asymptomatic intervals, clinical evaluation or radiological studies may be normal.

Typically, abdominal plain film is the first image used to evaluate patients with bowel obstruction. However, the accuracy of abdominal plain film in diagnosing the site, the cause of obstruction, and the presence of strangulation is low. Abdominal plain film of a right paraduodenal hernia is unremarkable, as in our case, or only demonstrates a distended stomach or dilated small bowel loops in an ovoid mass on the right side of the abdomen. Thus, plain film easily misses the diagnosis.

Small bowel series is particularly helpful in detecting and grading the severity of partial obstruction and locating the obstruction sites. It may demonstrate encapsulated small intestine in the right abdomen in patients with right paraduodenal hernia. However, it is limited and contraindicated in patients with high suspi-

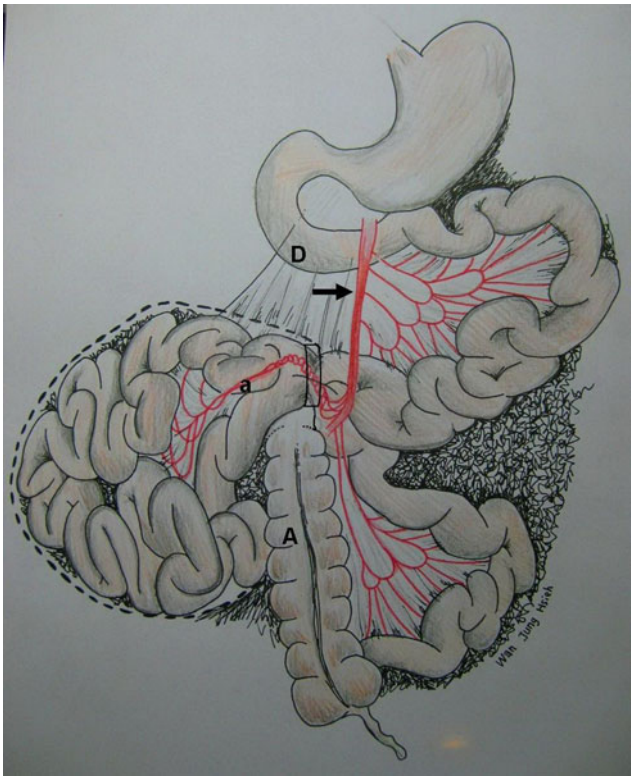

Fig. 2. The schematic anatomic drawing demonstrates the correlation between the CT findings and the pathophysiology of right paraduodenal hernia. A cluster of bowel loops herniates through the orifice of the fossa of Waldeyer (*curved band*), located behind the superior mesenteric artery (*black arrow*) and inferior to the third portion of the duodenum (*D*), with looping of branches of superior mesenteric artery (*a*) into the herniated sac (*dotted line*) and result in medial displacement of the ascending colon (*A*). Surgical treatment included reduction of the herniated small intestine and suture of the fossa of Waldeyer.

cion of acute complete bowel obstruction, bowel strangulation, or perforation. Small intestine series should also be avoided in patients with markedly diminished intestinal peristalsis [2, 9]. Further, it is a time-consuming image study and is not suitable in the evaluation of acute abdomen in the emergency department.

Ko et al. correctly predicted the cause of small bowel obstruction in 20% of cases by sonography and found it had advantages in the diagnosis of proximal small bowel obstruction because vomiting made lack of air in the dilated segment. However, sonography is generally unhelpful in diagnosing small bowel obstruction because air in the bowel loops can interfere with the diagnostic window of sonography [10].

The utility of computed tomography (CT) in the diagnosis of bowel obstruction has already been confirmed with a sensitivity of 94–100% and specificity of 90–95% [11, 12], and is suggested when clinical evaluation and initial image study are indefinite or strangulation is suspected [13]. It can better display the location, severity, and etiology of small bowel obstruction and identify ischemic change caused by strangulation. Generally we perform intravenous contrast enhanced dual phase MDCT, including arterial phase for CT angiography and a 60-s delay venous phase, scanning from abdomen to pelvis for patients with indeterminate acute abdominal pain.

Intravenous administration of contrast medium not only can accentuate the etiology but also can demonstrate bowel wall enhancement patterns, essential in diagnosing bowel ischemia associated with bowel obstruction. On the other hand, oral administration of contrast medium is not preferred because original low density fluid in the small intestine can help in assessing bowel wall enhancement after intravenous contrast medium administration. Oral contrast medium may obscure bowel wall enhancement and peripheral structure by artifacts due to inadequate concentrations [6]. It also interferes in the reconstruction of CT angiography. Therefore, oral contrast medium is not routinely used in our patients with acute abdomen.

Generally, conventional CT of right paraduodenal hernia demonstrates an encapsulated cluster of small bowel loops in the right mid abdomen; looping of the small bowel around the SMA and SMV at the root of small bowel mesentery is seen occasionally [14]. In comparison with traditional CT, MDCT can provide CT angiography and multi-planar reconstruction because they are fast and high-resolution imaging. In addition, CT angiography, a three-dimensional reconstruction of arterial phase images, can more clearly demonstrate the vasculature. With multi-planar reformation and maximal intensity projection of CT images, it can well show the relationship of small bowel loops to adjacent organs such as colon and vessels [6].

After diagnosis of paraduodenal hernia, an exploratory laparotomy with adequate incision, reduction of the hernia content, and repair of the defect should be prompt because the obstruction of entrapped bowel can lead to ischemia and perforation and is associated with a high mortality rate [15].

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