

Case Report

Multi-slice computed tomography diagnosis of left paraduodenal hernia in an adult complicated by volvulus: a case report

Haifei Li¹, Xia Wang², Keping Tan¹, Gaofeng Yi¹, Peiyuan Wang^{1,3}

¹Department of Radiology, Yantai Affiliated Hospital of Binzhou Medical University, Yantai, PR China; ²Department of Pathology, ³Medical Imaging Research Institute, Binzhou Medical University, Yantai, PR China

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Abstract: Internal hernia is an uncommon cause of intestinal obstruction, of which paraduodenal hernias are the most common. It is difficult to diagnose this entity clinically, as symptoms tend to be nonspecific; computed tomography (CT), however, is diagnostic. A case of 29-year-old female with 11 hours of progressive, severe, and sharp left sided abdominal pain was retrospectively studied. The diagnostic value of preoperative multi-slice computed tomography (MSCT) was evaluated. On MSCT, a cluster of small bowel loops to the left of the fourth portion of the duodenum, within the fossa of Landzert was demonstrated. And a reverse C-shaped significant expansion loop, filled with fluid and a small amount of air was shown on multiplanar reformation imaging (MPR). The distal afferent, proximal efferent and both sides of the C-shaped loop were concentrated to a point and showed irregular blind ends. The first jejunal arterial branch was in drumstick congestion with twisted terminal branches on MPR and CT angiography images. The CT diagnosis of left paraduodenal hernia and volvulus with obstruction was made, and confirmed by laparotomy. With regards to the patients presenting with intestinal obstruction, focus should be made on the changes around the herniation, including supplying vessels, as well as afferent and efferent loops anatomy using the multi post-processing technique, to determine the etiology of the obstruction and to plan the surgical approach.

Keywords: Internal hernias, intestinal obstruction, multi-slice computed tomography, paraduodenal hernias, volvulus

Introduction

Internal hernia is an uncommon cause of intestinal obstruction. Paraduodenal hernias, the most common type of internal hernia, account for approximately 53% of all cases [1, 2]. Paraduodenal hernias are rare congenital anomalies in which the small intestine is completely or partially trapped beneath the mesentery of the developing colon. Nearly 75% occur on the left and the majority involves the paraduodenal fossa of Landzert [3, 4]. The clinical signs and symptoms of left paraduodenal hernias lack specific characteristics and may vary from asymptomatic to acute or chronic small bowel obstruction. Due to their high mortality rate (approximately 20%, as a result of complete obstruction, strangulation, bowel ischemia and volvulus), accurate and prompt preoperative diagnosis is critical [5]. Multi-slice computed tomography

(MSCT) plays an important role in the diagnostic workup of these hernias. Herein, we reported a case of intestinal obstruction complicated by volvulus, secondary to a left paraduodenal hernia, and diagnosed preoperatively by MSCT with intravenous contrast.

Case presentation

A 29-year-old female with 11 hours of progressive, severe, and sharp left sided abdominal pain presented to the emergency room. The pain was associated with non-bilious vomiting and purulent bloody diarrhea. She was not distended, nor did the pain radiate. She had no history of previous abdominal surgery or trauma, and had never had this type of pain in the past.

On physical examination, her abdomen was flat with weak bowel sounds; moderate tenderness

MSCT diagnosis of left paraduodenal hernia



Figure 1. Axial contrast-enhanced computed tomography shows a cluster of dilated small bowel loops (B) to the left of the fourth portion of duodenum, behind the stomach (S), below the pancreas, and anterior to the left kidney (LK). A small amount of exudation could be seen between loops (arrow).



Figure 3. Axial MPR image shows the first jejunal arterial branch from the superior mesenteric artery extending laterally and posteriorly to the sac with a drumstick appearing, congested trunk (arrowhead) and twisting shape of the terminal branches (arrow).



Figure 2. Oblique-coronal MPR shows a reverse C shaped (arrow) clearly dilated loop (diameter 3.5 cm) filled with fluid. The distal afferent, proximal efferent, and bilateral C shaped loops (star) were concentrated to a point and showed irregular blind ends.

without rebound was appreciated in the left upper abdomen. There was no abdominal mass. On laboratory investigation, she was found to have a normal leukocyte count with increased neutrophil granulocytes (81.9%) and no other abnormal findings. A small air-fluid level in the left mid-abdomen indicated a proximal small bowel obstruction on plain radiographs and a small amount of lower abdominal intraluminal air. There was no evidence of perforation.

Abdominal MSCT was performed before and after intravenous injection of nonionic contrast. On MSCT, a cluster of small bowel loops to the left of the fourth portion of the duodenum (ret-

rogastric and retropancreatic, anterior to the left kidney) was demonstrated (**Figure 1**). The small bowel loops caused mild to moderate displacement of the posterior wall of the stomach and the anterior pancreatic body and tail. The mass had a sharp and smooth, left convex lateral border within the fossa of Landzert, and showed a reverse C-shaped significant expansion loop (diameter 3.5 cm), filled with fluid and a small amount of air on multiplanar reformation (MPR) imaging (**Figure 2**), and a small amount of exudation between loops. The computed tomography (CT) diagnosis of a left paraduodenal hernia with bowel obstruction was made. The sac connected with the duodenum through a narrow neck. The afferent loop (proximal jejunum) was on the right of the efferent loop but both loops had no direct connection to the sac. The distal afferent, proximal efferent, and both sides of the C-shaped loop were concentrated to a point and showed irregular blind ends (**Figure 2**). On the arterial phase of the dynamic contrast-enhanced CT scan, the coexisting variant of the hepatic arteries (superior mesenteric artery) was clearly demonstrated and the superior mesenteric artery was shown to be orthotopically left to the superior mesenteric vein. The proximal jejunal venous tributaries of the superior mesenteric vein, as well as the first jejunal arterial branch of the superior mesenteric artery, were visualized to be extending left and posterior to the abnormally positioned bowel in the sac. The first jejunal arterial branch from the superior mesenteric artery was in drumstick congestion with twisted termi-



Figure 4. Oblique-coronal MPR image shows the first jejunal arterial branch with a drumstick appearing, congested trunk (arrowhead) and twisting shape of the terminal branches (arrow).

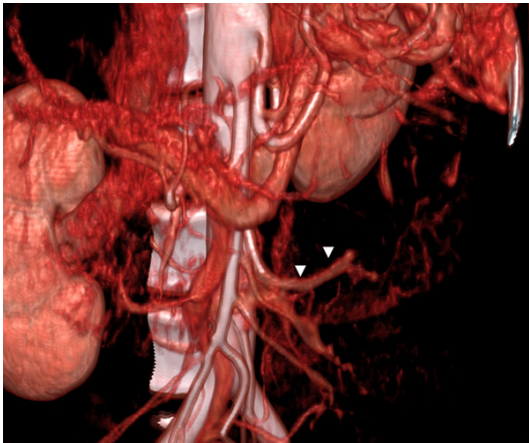


Figure 5. CTA shows the congested trunk (arrowhead) of first jejunal arterial branch from the superior mesenteric artery.

nal branches on MPR (**Figures 3, 4**) and CT angiography (CTA) images (**Figure 5**), the second and third arterial branches extending lateral and inferior to the displaced jejunum, around the anterior wall of the sac. All of the above signs indicated the possibility of a volvulus with a rotation of greater than 180°. Although there was exudation in the sac, the densities of the loops in the sac on plain and contrast-enhanced CT scan were uniform with those outside of the sac, indicating that no intestinal necrosis had occurred but the ischemic changes was possible. The transverse and descending colon were located in the lower abdomen and the splenic flexure was located



Figure 6. Axial contrast-enhanced CT shows the left branch of the middle colic artery, ascending left colic artery (arrow), and inferior mesenteric vein (arrowhead) to be located in the posterior wall of the hernia.



Figure 7. Oblique-sagittal MPR shows the inferior mesenteric vein (arrowhead) was medially and posteriorly displaced by the sac.

under the left kidney, posterior to the hernia sac. The left branch of the middle colic artery, ascending left colic artery, and inferior mesenteric vein were located in the posterior hernia wall (**Figure 6**), with slight medial and posterior displacement by the sac (**Figure 7**).

Emergency laparotomy was performed and the diagnosis left paraduodenal hernia and volvulus with obstruction was confirmed. Approximately 30 cm of proximal jejunum, with 360° rotation and extensive adhesions, was found to be entrapped by the hernia. The herniated bowel was dilated with vascular congestion of the bowel wall due to venous compression caused by the volvulus. The first jejunal arterial branch from the superior mesenteric artery

demonstrated drumstick congestion with stranding; the second and third arterial branches showed the same appearance as on the CT. The inferior mesenteric vein was located at the superior edge of the hernia orifice without dilation and the inferior mesenteric artery was closed to the posterior wall of the sac. The small bowel was released and its blood supply was restored after hernia reduction; the orifice was closed. The postoperative recovery was uneventful and there was no relapse during the 12 month follow-up period.

Discussion

Internal hernia, an uncommon cause of intestinal obstruction (5.8%) [3], refers to an abdominal organ protruding through a normal or abnormal aperture in the mesentery or peritoneum, located within the scope of the peritoneal cavity [6]. The hernial orifice can be congenital or acquired (due to prior abdominal surgery, trauma, or peritoneal inflammation). Meyers described the following types of internal hernia based on location: paraduodenal, primeval, foramen of Winslow, transmesenteric and transmesocolic, intersigmoid, retroanastomotic, and paravesical hernia [7].

Paraduodenal hernias are the most common type of internal hernias and account for approximately 53% of all internal hernia cases [1, 2]. Nearly 75% of paraduodenal hernias occur on the left and the majority involve the paraduodenal fossa of Landzert [3, 4]. Landzert's fossa is located lateral to the fourth portion of the duodenum, posterior to a fold of peritoneum, and associated with the left colic artery and inferior mesenteric vein, and is present in approximately 2% of autopsies [3]. Other associated causes may be other fossa (superior duodenal fossa, fossa of Waldeyer, fossa of Brosike, etc.) abnormalities of bowel fixation, an unusual separated peritoneal membrane or mesocolic fossa [8-10]. The current hernia case involved the fossa of Landzert.

Paraduodenal hernias usually occur in adulthood at an average age of 38.5 years, and are three times more common in males [11, 12]. The clinical signs and symptoms lack specific characteristics, and vary from asymptomatic to intermittent or severe abdominal pain lasting a few hours to several years.

In the elderly, the small intestine may be herniated and reduce spontaneously and repeated onset may lead to progressive thinning and enlarging of the hernia orifice, which possibly results from an ischemic insult or mechanical expansion. The enlargement of the orifice may result in more intestinal loops entrapped into the sac that are difficult to reduce spontaneously, leading to persistent abdominal discomfort even for small bowel obstruction, strangulation, and volvulus. With regards to new emergency cases without similar histories, a strictured hernia orifice may suppress the loops and lead to the intestinal obstruction; symptoms appear gradually and worsen, as in the present case. The high mortality rate (approximately 20%) is primarily due to complete obstruction, strangulation, bowel ischemia, and volvulus; mortality can be as high as 50% in untreated strangulation [5]. Therefore, accurate and prompt preoperative diagnosis is vital.

The diagnosis of asymptomatic left paraduodenal hernia is difficult, and often occurs incidentally at laparotomy, autopsy, or during radiological investigation for unrelated diseases [11, 12]. Symptomatic patients are more likely to be diagnosed preoperatively [3, 6].

Abdominal plain radiographs, small bowel follow-through barium examination, ultrasound, celiac arteriography, CT, and magnetic resonance imaging have been used to diagnose paraduodenal hernias. CT, especially MSCT with oral or intravenous contrast plays an important role in the diagnosis and evaluation of suspected paraduodenal hernias [2, 6, 13].

On CT, the specific findings include a well-circumscribed clustering of small bowel loops lateral to the fourth portion of the duodenum, within the fossa of Landzert, with or without bowel obstruction. Mesenteric vessel abnormalities, such as engorgement, crowding, stretching and displacement of the trunk [3, 14, 15], and the evidence of bowel ischemia (mural thickening and low enhancement) can be seen on CT [14-16]. These findings are helpful in establishing the preoperative diagnosis of paraduodenal hernia, as in the present case.

In paraduodenal hernia, the jejunal branches of the superior mesenteric vessels supplied the herniated loops, converging to a point in the hernial orifice and stretched within the sac. In

addition, the afferent and efferent bowel loop may be visualized at the hernial orifice in continuity with the hernia bowel loops, which may appear as a beaked appearance on barium study. In our case, the proximal jejunal arterial branch of the superior mesenteric artery was of drumstick congestion, with twisting terminal branches on CTA and MPR. The afferent and efferent loops were detected at the hernial orifice on MPR, but the afferent and efferent loops showed no direct connection with the sac loops. These findings indicate a suspected volvulus, which was confirmed intraoperatively. These signs should be clearly identified in a patient presenting with bowel obstruction.

Normally, the inferior mesenteric vein runs along and above the lateral side of Landzert's fossa, and is associated with the peritoneal fold; in left paraduodenal hernia, the inferior mesenteric vein can be located in the hernia neck and lateral-posterior wall of the hernia sac, spread outwards, or upwards, or both [6, 11]. Schaffler *et al.* [17] reported a left paraduodenal hernia with anterior and upward displacement of the inferior mesenteric vein, and postulated that its presence may be a new diagnostic clue to left paraduodenal hernia. In Nishida's study [18], the inferior mesenteric vein showed no anterior and upward displacement; in our case, slight medial and posterior displacement occurred and both cases differed from that of Schaffler *et al.* [17]. By comparing CT images, we regard sac size as the possible reason. Seya *et al.* [12] reported an incidentally diagnosed left paraduodenal hernia, described the hernia sac located between the shifted left branch of the middle colic artery and ascending left colic artery, and considered finding the ascending left colic artery at the lateral edge of the sac as diagnostic of left paraduodenal hernia. In the present case, the transverse and descending colon were located in the lower abdomen and the ascending left colic artery was located behind the hernia sac, which did not aid in the diagnosis. Therefore, the absence of an ascending left colic artery at the lateral edge of the sac cannot exclude the diagnosis of a left paraduodenal hernia, which may be caused by low lying transverse and descending colon.

In summary, the preoperative diagnosis of left paraduodenal hernia by specific CT findings is

not difficult. We reported a case of left paraduodenal hernia accompanied by bowel obstruction due to volvulus, and aimed to remind the readers of how to further recognize this entity. With regards to the patients presenting with intestinal obstruction, focus should be made on the changes around the herniation, including supplying vessels, as well as afferent loop and efferent loop anatomy using the multi post-processing technique, to determine the etiology of the obstruction and to plan the surgical approach.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Peiyuan Wang, Department of Radiology, Yantai Affiliated Hospital of Binzhou Medical University, 717 Jinbu Road, Yantai 264100, Shandong, PR China. Tel: +86 535 4770 409; Fax: +86 535-4770 406; E-mail: wangpeiyuan1640@163.com

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