CASE REPORT

Paraduodenal hernias are unusual causes of intestinal obstruction and do not have specific manifestations. The majority of these hernias are left-sided and typically involve the fossa of Landzert just lateral to the fourth portion of the duodenum. Right paraduodenal hernias, which are relatively rarer than left paraduodenal hernias, involve the fossa of Waldeyer located in the first part of the mesentery of the jejunum. Although paraduodenal hernias have been reported to be diagnosed using plain abdominal films, ultrasonography, small bowel series, abdominal computed tomography (CT) and angiography, preoperative radiological diagnosis of paraduodenal hernia is generally elusive and difficult. We report a patient with right paraduodenal hernia who presented with right lower abdominal pain. Preoperative diagnosis of paraduodenal hernia was made by multidetector CT (MDCT). After surgical intervention, the patient recovered without any complications.

Case Report

A 15-year-old boy presented at the emergency department with epigastric pain initially, but then the pain shifted to the lower right quadrant. He was afebrile and reported having had a few episodes of nausea and vomiting but no diarrhea. He had no history of abdominal surgery. Physical examination revealed right lower quadrant rebounding tenderness with muscle guarding. Bowel sounds were hypoactive. Laboratory findings, including those from an automated chemistry analysis system, were within normal limits except for a mildly increased white blood cell count (13,980/mm³). No specific findings were obtained.
were noted on abdominal X-ray (Figure 1) except that there was no obvious ascending colonic gas seen in the right abdomen. The patient also underwent an abdominal MDCT scan to rule out the possibility of appendicitis. Surgical intervention and appendectomy was scheduled.

However, the abdominal MDCT images were reviewed by an experienced radiologist later. They revealed packing of small bowel loops in the right side of the abdomen and displacement of the ascending colon to the left side of the abdomen. Furthermore, they showed that the superior mesenteric artery (SMA) and superior mesenteric vein (SMV) were in the free edge of the hernial sac (Figure 2) and revealed looping of the venous branches behind the SMA into the hernia sac (Figure 3). Therefore, right paraduodenal hernia was diagnosed and the scheduled appendectomy was changed to exploratory laparotomy.

The operative findings showed a paraduodenal hernia on the right side (Figure 4). The entire small bowel was contained in the hernial sac to the right of the spine and behind the ascending colon. Two 4-cm openings allowed the intestine to enter the peritoneal cavity. The inlet over the second portion of the duodenum and the outlet were near the ileocecal valve. The second portion of the duodenum was mildly distended and distal portions of the small bowel and colon were noted to have collapsed. A large volume of clear ascites flowed out after we divided the anterior wall of the sac. The ileocecal artery was de-twisted and bowel reduction was performed. The axis of the mesentery was smooth and the posterior wall of the

Figure 1. Abdominal radiograph shows no remarkable findings except for a lack of ascending colonic gas in the right abdomen.

Figure 2. Axial computed tomography reveals grouped small bowel loops (dotted line) in the right abdomen. The descending colon (D) is visible over the left abdomen but the ascending colon (A) is displaced to the left. Furthermore, the superior mesenteric artery (a) and superior mesenteric vein (v) are in the free edge of the sac. Looping of venous branches (arrows) is also noted.

Figure 3. Multidetector computed tomography with coronal reformation demonstrates encapsulation of all small bowel loops in the right abdomen (dotted line) with displacement of the ascending colon (A) to the left abdomen, parallel with the course of the descending colon (D).
hernial sac was separated. The cecum was in the normal position without an obvious Ladd’s band. The appendix was removed and later shown by pathology to be normal. The patient’s postoperative course was uneventful and he was discharged on the 6th postoperative day.

Discussion

Paraduodenal hernia accounts for about 30–53% of all internal hernias, and was defined by Treitz in 1857. However, the origin of this intestinal defect was not discovered until Andrews reported in 1923 that it is the result of malrotation of the ascending colon and cecum. It can present at any age, but most occur between the fourth and sixth decades of life. It is three times more frequent in males than in females, and the ratio of right-sided to left-sided paraduodenal hernia is 1:3. Right paraduodenal hernias represent a hernial sac entrapping the small bowel through the fossa of Waldeyer behind the ascending mesocolon and the right half of the transverse mesocolon. The fossa of Waldeyer is the first part of the mesentery of the jejunum, located immediately behind the SMA and inferior to the transverse duodenum. Its orifice faces to the left, and its blind extremity to the right and downward, directly in front of the posterior parietal peritoneum. The SMA and ileocolic arteries are then located in the free edge of the sac. Because both afferent and efferent loops pass through the hernial orifice, right paraduodenal hernias are usually more massive and fixed than those occurring on the left side.

More than 60 clinical cases of right paraduodenal hernia have been reported. Paraduodenal hernia results in either bowel obstruction in the sac or impingement of the sac and its contents on adjacent structures. The symptoms of paraduodenal hernia, caused by either partial or complete intestinal obstruction, include nausea, vomiting and abdominal pain. A history of chronic intermittent abdominal discomfort is common among patients with paraduodenal hernia. On abdominal examination during an acute episode, a tympanic mass or tenderness in the right upper quadrant and/or hyperperistalsis over this region of fullness may be found. Because of the nonspecific symptoms and signs associated with hernia, gastritis, pancreatitis, cholecystitis and peptic ulcer are always considered initially. Our patient’s medical history revealed that he had presented with nausea, vomiting and abdominal pain 2 years prior to this admission, but he had recovered several days later after supportive treatment. That symptomatic episode may have been due to right paraduodenal hernia or possibly a different etiology, such as acute gastritis. This time, he presented with vomiting and right lower quadrant tenderness, so appendicitis was suspected.

The small bowel series of the right paraduodenal hernia showed a circumscribed mass containing the small bowel loops in a sac, resulting in images of grouped dilated small bowel loops, lateral and inferior to the descending duodenum with its main axis lateral to the midline and its inferior border convex downward. Stasis of the contrast material and dilatation of the herniated loops may also be evident. During fluoroscopic manipulation, the hernial sac prevents separation or displacement of the individual loops from the rest of the hernial contents. On barium enema studies, the ascending colon always lies lateral to a right paraduodenal hernia; even so, the cecum

Figure 4. Operative findings show the hernial sac in the right abdomen. A = ascending colon; T = transverse colon; I = entrapment of the small intestine in the right retroperitoneal fossa. White arrow indicates the superior mesenteric artery.
is found in its normal position. Angiography reveals mesenteric branches originating normally from the left side but abruptly changing their direction behind and toward the right of the parent vessel to accompany the herniated bowel loops. Both of these imaging modalities can provide a preoperative diagnosis of right paraduodenal hernia.\textsuperscript{11,12} However, these imaging studies might not be arranged if paraduodenal hernia is not first suspected. Furthermore, angiography is an invasive procedure.

Abdominal CT is an alternative method for diagnosing paraduodenal hernia.\textsuperscript{13,14} The characteristic signs of right paraduodenal hernia on abdominal CT include: the clustering or encapsulation of small bowel loops in the right abdomen; the looping of branches of the SMA and SMV to the right and posterior side of the main trunk; rotation of the SMV toward a more leftward orientation than normal; and absence of normal horizontal duodenum.\textsuperscript{15,16}

Magnetic resonance imaging (MRI) is rarely used for diagnosing intestinal disease due to motion artifacts from respiration and bowel movement. However, the fixed bowel loops in the retroperitoneum and adherence to the hernial sac overcome the motion artifacts. MRI, like MDCT, not only demonstrates similar findings to small bowel series, but also the relationship to the surrounding organs and hernial sac with a multiplanar display. Also, noninvasive magnetic resonance angiography may be able to provide information similar to that obtained from angiography.\textsuperscript{17} MRI is, however, a time-consuming and expensive examination for paraduodenal hernia since early surgical intervention to prevent gangrenous change of herniated bowel loops is recommended.\textsuperscript{18} We performed unenhanced MDCT in our patient; however, the surgeon did not find these signs of right paraduodenal hernia. The correct diagnosis was made later by an experienced radiologist. Unenhanced MDCT with multiplanar reformation has the advantage of faster scanning time and better image quality than conventional CT. Although it is easier to trace the vascular course in unenhanced MDCT than in conventional CT, MDCT with CT angiography (CTA) reformation was not performed in this patient because a paraduodenal hernia was not suspected initially. Three-dimensional CTA provides clear images of the vascular course, allowing surgeons to diagnose a paraduodenal hernia more easily. Furthermore, CTA imaging clearly shows the anatomic structure during surgical intervention.

Proper repair of right paraduodenal hernia has been described by Bartlett et al.\textsuperscript{18} Several other methods used to repair variable sizes of hernia have also been reported by Turley.\textsuperscript{4} In general, the procedure involves carefully separating the sac, placing the intestines in the correct position, and avoiding injury to the mesenteric vessels. Appendectomy should also be performed, particularly in children.\textsuperscript{9} The mortality rate in patients with gangrenous obstruction is reported to be as high as 20%\textsuperscript{5,18}; early exploratory laparotomy is mandatory as soon as paraduodenal hernia is suspected. Laparoscopic repair of right paraduodenal hernia has also been reported and may be a feasible practice in the future.\textsuperscript{19}

In conclusion, right paraduodenal hernia is a rare cause of small bowel obstruction and is a diagnostic challenge. The mortality associated with the development of intestinal obstruction, gangrene and perforation can be avoided by diagnosing the disorder early with MDCT followed by prompt surgical intervention.

Acknowledgments

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References