

Imaging Findings of Midgut Volvulus Associated with a Large Small-Bowel Diverticulum in an Adult Patient: Case Report¹

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Although most patients with jejunoileal diverticulum are asymptomatic, a large, small-bowel diverticulum can be associated with midgut volvulus in an adult. We present a rare case of midgut volvulus that was associated with a large, small-bowel diverticulum in a 77-year-old woman presenting with chronic recurrent abdominal pain. The CT showed the characteristic whirl sign of twisted mesentery, the small bowel loops along the superior mesenteric artery and a large sac-like small-bowel diverticulum. A small bowel series also demonstrated a corkscrew appearance of proximal jejunum, a finding suggestive of midgut volvulus, and a large jejunal diverticulum.

During the laparotomy, the small bowel was seen twisted counterclockwise 270°. The mesenteric root was very shortened. A 4 cm sized diverticulum was seen on the mesenteric border of jejunum, on the portion about 40 cm distal from the Treitz ligament.

Index words : Intestines, CT

Intestines, diverticula

Intestines, stenosis or obstruction

Midgut volvulus is a very uncommon cause of acute abdominal distress in adults (1). Midgut volvulus is mostly related to intestinal malrotation, and it is rarely associated with postoperative adhesions and a bulky diet after fasting (2). Although acquired jejunoileal diverticula are uncommon and asymptomatic in the majority of patients, the association of midgut volvulus and a large small-bowel diverticulum has been mentioned only in a radiologic report (3). To the best of our knowledge, this condition has never been reported in the Korean literature. Therefore, we present our imaging findings of midgut volvulus associated with a large,

small-bowel diverticulum in an adult, together with a review of the literature.

Case Report

A 77-year-old woman presented with acute, cramping epigastric pain and she had bilious vomiting for 1 day. She had a history of severe abdominal pain persisting for several hours, and these symptoms occurred two or three times for a year during the past 30 years. The physical examination revealed epigastric tenderness without any peritoneal signs. The laboratory findings were all within normal limits.

A contrast-enhanced abdomen CT showed the typical whirl sign of the mesenteric root resulting from loops of bowel and mesenteric vessels twisted several times around the superior mesenteric artery (Fig. 1A). The diagnosis of midgut volvulus was suggested, but the severe abdominal pain of a cramping nature subsided sev-

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Received December 24, 2003 ; Accepted February 27, 2004

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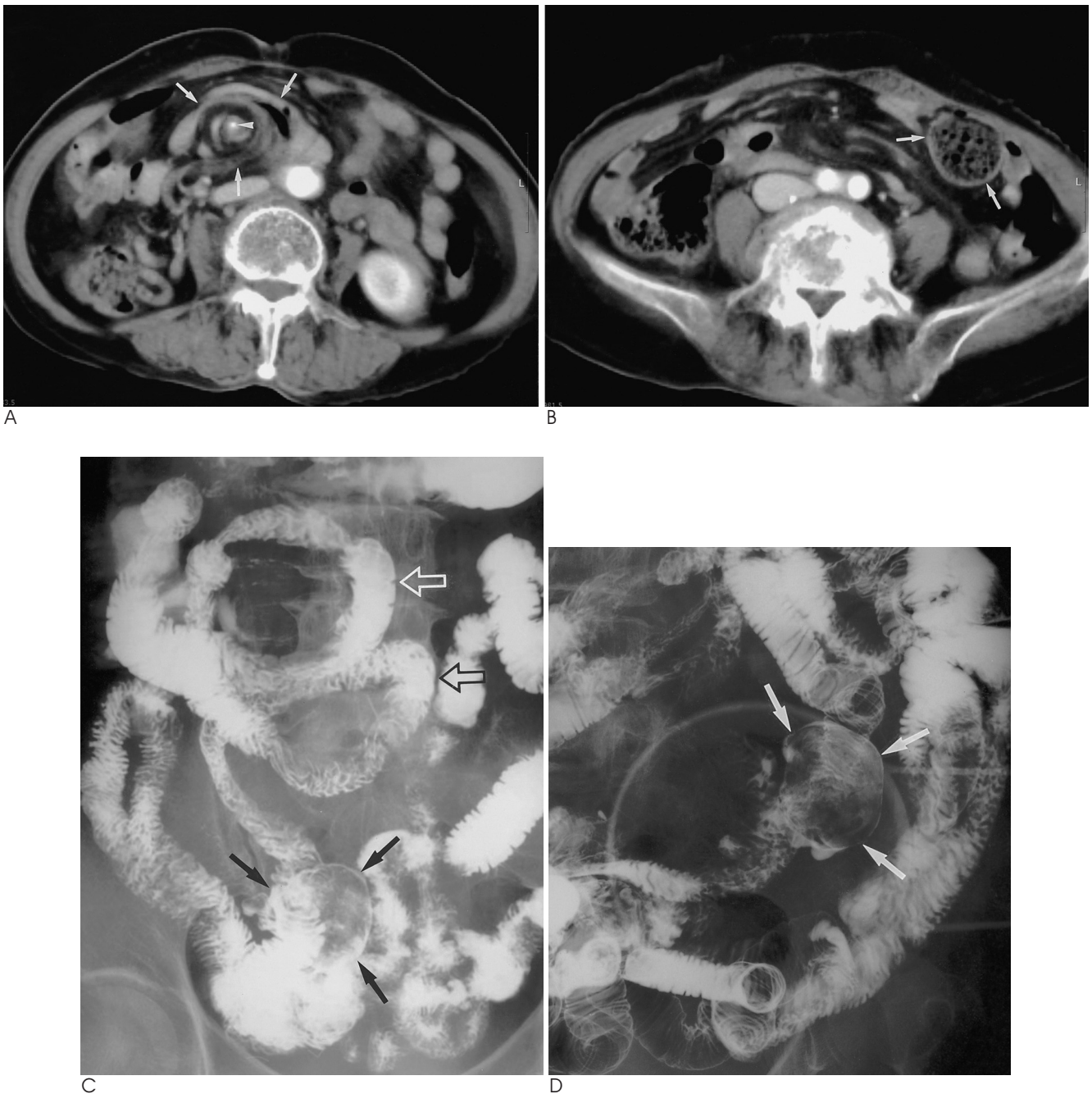


Fig. 1. Midgut volvulus associated a large small-bowel diverticulum in a 77-year-old woman.

A. Contrast-enhanced CT scan shows the typical whirl sign (arrows) of the mesenteric root. This is resulting from twisted loops of bowel and mesenteric vessels several times around the superior mesenteric artery (arrowhead).

B. Contrast-enhanced CT scan, 5 cm below A, reveals a large sized sac-like structure (arrows) filled with a stool-like mass of digested food in the left side of lower abdomen. This is a finding of a large, small-bowel diverticulum.

C. Small bowel series shows typical corkscrew appearance (open arrows) of the proximal small bowel loops, a characteristic finding of midgut volvulus. The duodenojejunal junction is located just to the left of midline and to the right of its expected position, a finding suggestive of intestinal malrotation. About a 5.5×4 cm sized diverticulum (arrows) is also showing in the mesenteric border of distal jejunum.

D. Spot radiograph of a small bowel series showing a large diverticulum (arrows) filled with a large well-defined mass lesion, which might be a bezoar or impacted fecal material.

eral hours after CT, and only the mild intermittent periumbilical pain persisted.

A small bowel series was performed during the next 6 days and these tests demonstrated the typical corkscrew appearance of the proximal small bowel loops, a characteristic finding of midgut volvulus. The duodenojejunal junction was located to the right of its expected position, a finding that is very suggestive of intestinal malrotation. In addition, about a 5.5 × 4 cm sized diverticulum was shown in the mesenteric border of distal jejunum (Fig. 1C). The lumen of the diverticulum was filled with a large well-defined mass-like lesion, which might have been a bezoar, or possibly impacted fecal material (Fig. 1D). The retrospective analysis of the CT revealed a large sized sac-like lesion filled with stool-like mass of digested food in the lower abdomen (Fig. 1B).

Surgical exploration confirmed midgut volvulus and a large jejunal diverticulum. There was no bowel necrosis present. The adhesions from recurrent episode of volvulus were lysed, the small bowel was untwisted and excision of the diverticulum was performed. The patient did well after the operation and she has had no return of symptoms upon follow-up for 1 year.

Discussion

Midgut volvulus is the torsion of a segment or of all of small bowel and its mesentery, leading to a closed-loop obstruction and the vascular compromise to the bowel. It is a potentially fatal surgical emergency. Midgut volvulus is mostly related to intestinal malrotation, and it's rarely associated with pregnancy, postoperative adhesion, bulky diet after fasting and mass lesions, such as mesenteric lipoma or large pedunculated subserosal myoma that may act as a leading mass. Any disturbance in the normal 270 ° counterclockwise return of the intestine into the abdominal cavity could produce a range of rotational and attachment abnormalities. The lack of normal peritoneal attachment predisposes the bowel towards development of a volvulus, with the twisting occurring around its attachment point and fulcrum, the superior mesenteric artery (4). In infancy, intestinal malrotation almost always presents with a high intestinal obstruction as a result of duodenal compression, obstruction and often volvulus. However, intestinal malrotation in adults is usually an incidental finding, and it presents as chronic nonspecific gastrointestinal tract symptoms and chronic intermittent midgut volvulus, or less commonly, as acute abdominal pain (5, 6). The nonspecific

clinical manifestations of midgut volvulus make diagnosis difficult in adults. In this regard, imaging studies play an important role in the diagnosis.

Diagnosis of midgut volvulus can be made by means of ultrasound, CT and small bowel series. A gray-scale ultrasound finding of midgut volvulus is a whirl-like mass in the right upper abdomen and color Doppler ultrasound shows a whirl sign with a clockwise rotation of the SMV around the SMA (7). CT is also very useful in diagnosis of midgut volvulus, as well as its complication of ischemia. CT reveals the characteristic whirl sign; twisted loops of bowel and the branching mesenteric vessels create swirling strands of soft-tissue attenuation within a background of mesenteric fat attenuation, giving the appearance of a hurricane on a weather map (8, 9). The volvulus causes the mesenteric veins and lymphatics to become congested. Thickening of bowel wall and intraperitoneal fluid or gas in the bowel wall can also suggest the associated bowel infarction. A small bowel series may demonstrate a spiral or corkscrew appearance resulting from a small bowel's wrapping around the superior mesenteric artery, which is diagnostic of midgut volvulus.

The incidence of jejunoileal diverticula is 1.1 to 2.3%, and it is found upon enteroclysis, at postmortem by insufflating the intestine with air or during major abdominal surgical procedures (10). Jejunoileal diverticula are asymptomatic in the majority of patients, but they may be the underlying cause of vague, chronic symptoms and such acute complications that include obstruction, hemorrhage and perforation. Mechanical intestinal obstruction occurs in 2.3% to 4.6% of the cases of jejunoileal diverticulosis (11). This may be the result of pressure on the intestinal wall from distended diverticula, inflammatory mass associated with diverticulitis, stricture or adhesions from diverticulitis, intussusception at the site of the diverticulum, enteroliths developed within the diverticula, or volvulus of the diverticula-containing segment (10).

In 1998, Chou et al. reported CT findings of a large small-bowel diverticulum in five cases (3). It was interesting that in all five cases, the CT demonstrated that midgut volvulus coexisted with a large, small bowel diverticulum, as was seen in our case. All the diverticula were larger than 3 cm and located in the jejunum. The authors mentioned that it was not clear whether these two conditions have any direct relationship or not. However, a large, small-bowel diverticulum might play a predisposing role in the occurrence of a midgut volvu-

lus for the following reasons. (1) It may act as a leading mass if it were filled with fluid, and (2), it may interfere with the returning of an abnormally moved small-bowel loop and make the small-bowel rotate still further until a volvulus occurs.

In our case, both CT and a small bowel series showed the typical imaging findings of midgut volvulus. In addition, a small bowel series showed the underlying intestinal malrotation and a large jejunal diverticulum (more than 3 cm). A retrospective CT analysis can also detect a large jejunal diverticulum, because of its large size (> 3 cm), its different intraluminal contents as compared with the surrounding small-bowel loops and the absence of valvular conniventes (3). Indeed, the size of the diverticulum may play an important role in inducing small-bowel volvulus.

Considering the patient's past history of recurrent cramping abdominal pain, the chronic abdominal symptoms are thought to be from a chronic intermittent midgut volvulus precipitated by intestinal malrotation and a large jejunal diverticulum.

In summary, a midgut volvulus associated with intestinal malrotation is uncommonly seen in adults, especially with a large small-bowel diverticulum. Awareness of the imaging findings and the clinical significance of a large small-bowel diverticulum associated with midgut

volvulus can be helpful for the exact diagnosis and the management of this rare condition when it presents in the adult with recurrent abdominal pain.

References

1. Pelucio M, Haywood Y. Midgut volvulus: an unusual cause of adolescent abdominal pain. *Am J Emerg Med* 1994;12:167-171
2. Rowsom JT, Sullivan SN, Girvan DP. Midgut volvulus in the adult. A complication of intestinal malrotation. *J Clin Gastroenterol* 1987; 9:212-216
3. Chou CK, Mak CW, Hou CC, Chang JM. CT of large small-bowel diverticulum. *Abdom Imaging* 1998;23:132-134
4. Fisher JK. Computer tomographic diagnosis of volvulus in intestinal malrotation. *Radiology* 1981;140:145-146
5. Bernstein SM, Russ PD. Midgut volvulus: a rare cause of acute abdomen in an adult patient. *AJR Am J Roentgenol* 1998;171:639-641
6. Izes BA, Scholz FJ, Munson JL. Midgut volvulus in an elderly patient. *Gastrointest Radiol* 1992;17:102-104
7. Yeh WC, Wang HP, Chen C, Wang HH, Wu MS, Lin JT. Preoperative sonographic diagnosis of midgut malrotation with volvulus in adults: the "whirlpool" sign. *J Clin Ultrasound* 1999;27: 279-283
8. Puvaneswary M, Rajaratham S. Midgut volvulus in adult. *Australas Radiol* 2003;47:83-84
9. Khurana B. The whirl sign. *Radiology* 2003;226:69-70
10. de Bree E, Grammatikakis J, Christodoulakis M, Tsiftsis D. The clinical significance of acquired jejunoileal diverticula. *Am J Gastroenterol* 1998;93:2523-2538
11. Palder SB, Frey CB. Jejunal diverticulosis. *Arch Surg* 1988;123:889-894

2004;50:365 - 368

