

RADIOLOGY FOR THE SURGEON

Soft tissue case 61

Lisa Aird, BSc*
Pari Tiwari, MBBS*†
Carl J. Brown, MD*‡

From the *University of British Columbia and the Departments of †Radiology and ‡Surgery, St. Paul's Hospital, Vancouver, BC

Correspondence to:
Dr. C.J. Brown
St. Paul's Hospital, Rm. C310
1081 Burrard St.
Vancouver BC V6Z 1Y6
fax 604 806-9604
cbrown@providencehealth.bc.ca

A 55-year-old man presented to the emergency department with a 12-hour history of severe crampy abdominal pain, nausea, vomiting and obstipation. The patient had a complex medical history, including coronary artery disease, lupus, hypothyroidism, epilepsy, pancreatitis and renal calculi. However, the patient had no history of a hernia or abdominal surgery. Physical examination revealed a temperature of 38.5°C and a soft distended abdomen that was diffusely tender without signs of peritonitis. The rest of the physical examination was unremarkable. Routine laboratory investigations including a complete blood cell count, electrolytes, liver enzymes and amylase were normal, with the exception of a decreased hemoglobin level of 116 g/L. We ordered a plain abdominal radiograph (Fig. 1) and a contrast-enhanced computed tomography (CT) scan of his abdomen. What is your diagnosis?

DIAGNOSIS*Midgut volvulus*

The abdominal radiograph showed multiple air–fluid levels in distended loops of proximal and mid–small bowel. Scant gas within the distal small bowel and colon was also evident. These findings were consistent with a mid or distal small bowel obstruction. Computed tomography scans of the abdomen and pelvis, with intravenous and oral contrast, revealed that the cecum and ileocecal valve were located in the right upper quadrant. A “whirl sign” caused by twisting of the terminal ileum about the superior mesenteric artery axis was also present (Fig. 2), causing a closed loop obstruction of the mid to distal ileum, which was indicative of midgut volvulus. We identified no areas of small bowel pneumatosis or mural thickening, and we observed no free air in the abdomen. We confirmed the radiological diagnosis on emergent laparotomy, during which we found the cecum to be located in the upper midline of the abdomen with Ladd bands crossing anteriorly over the duodenojejunal junction. We considered this congenital anatomic abnormality to be the source of the development of a midgut volvulus in our patient. In addition, we discovered multiple congenital adhesions of the proximal and mid jejunum in the upper left quadrant. We identified no gangrenous bowel, and we performed a Ladd procedure. The patient fully recovered.

Midgut volvulus, though rare, is thought to be responsible for 3.5%–6.2% of all small bowel obstructions.¹ Prompt diagnosis and appropriate treatment of midgut volvulus is essential, as mortality is strongly influenced by the development of gangrenous bowel.^{1,2} The etiology of small bowel volvulus can be categorized as primary or secondary.^{1,2} Primary small bowel volvulus transpires in the context of no identifiable predisposing anatomic abnormalities.¹ Secondary small bowel volvulus occurs in the presence of congenital or acquired anatomic abnormalities. These abnormalities include intestinal malrotation, adhesions, pregnancy, complications of abdominal surgery and Meckel diverticulum.²



Fig. 1. Plain erect abdominal radiograph of a 55-year-old man presenting with abdominal pain, nausea, vomiting and obstipation.

Clinical presentation of midgut volvulus in adults can be acute or chronic, and neither presents with pathognomonic clinical findings.¹ The typical presentation of acute midgut volvulus is similar to that of an acute small bowel obstruction: abdominal pain, bilious vomiting, fever, tachycardia and peritoneal findings.³ Chronic presentations relating to intestinal malrotation are often vague, including recurrent abdominal pain with associated nausea and vomiting, intermittent diarrhea, peptic ulcer disease, malabsorption, weight loss and headaches.⁴ Owing to the nonspecific nature of these symptoms, midgut volvulus is not diagnosed in 70% of adult patients for at least 6 months after their initial presentation, resulting in delay of definitive treatment.⁴

Diagnostic imaging is an important aid in the evaluation of a patient with suspected intestinal malrotation. Upper gastrointestinal studies with barium enema are considered to be the gold standard.³ Although commonly used in children, this method is rarely used in the adult population. Plain abdominal radiographs may provide evidence to support the diagnosis of a midgut volvulus, although the specificity is low.³ With increasing availability of expeditious CT scans, the diagnosis of volvulus can be made preoperatively when the anatomic features (i.e., misplaced cecum, “whirl” sign, reversed superior mesenteric artery and vein location) are identified.⁵ Angiography of the superior mesenteric artery may also reveal a “corkscrew” or “barber pole” sign, although this type of investigation is relatively invasive and lengthy and is seldom used.² Finally, the “whirl sign” can be identified on ultrasound, although ultrasonography is largely restricted to the pediatric setting.³

Early surgical diagnosis and treatment of symptomatic intestinal malrotation is essential. After appropriate resus-

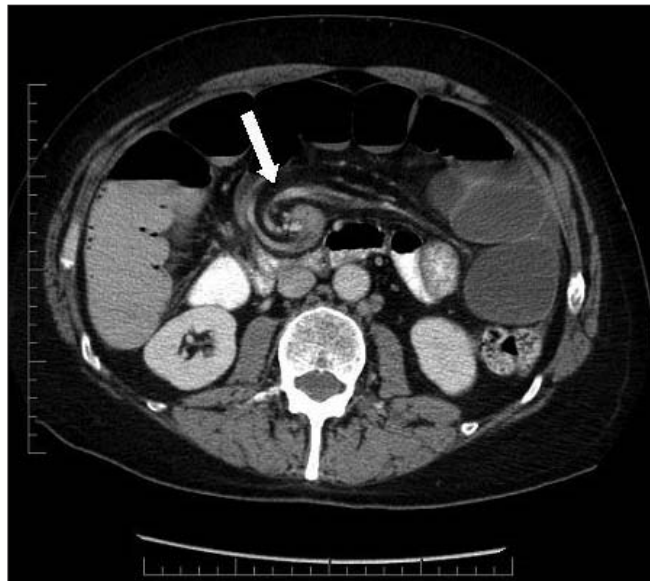


Fig. 2. Abdominal computed tomography scan of a 55-year-old man after the administration of oral and intravenous contrast. Fluid-filled, dilated small bowel loops are shown in the mid abdomen, consistent with obstruction. The collapsed terminal ileum is shown swirling 360° around the superior mesenteric vessel axis, giving rise to the “whirl sign” (arrow) seen in small bowel volvulus.

citation, the operative strategy involves resection of gangrenous bowel, lysis of adhesions, widening of the mesenteric base and prophylactic appendectomy (i.e., the eponymous Ladd procedure, which is the current standard of care).⁴ In patients who undergo laparoscopic exploration for bowel obstruction, the Ladd procedure can be performed by an experienced laparoscopist.³

Midgut volvulus is an uncommon but important cause of small bowel obstruction that requires diagnostic vigilance and urgent surgical intervention.

Competing interests: None declared.

References

1. Roggo A, Ottinger LW. Acute small bowel volvulus in adults. A sporadic form of strangulating intestinal obstruction. *Ann Surg* 1992; 216:135-41.
2. Huang JC, Shin JS, Huang YT, et al. Small bowel volvulus among adults. *J Gastroenterol Hepatol* 2005;20:1906-12.
3. Kapfer SA, Rappold JF. Intestinal malrotation — not just the pediatric surgeon’s problem. *J Am Coll Surg* 2004;199:628-35.
4. Durkin ET, Lund P, Shaaban AF, et al. Age-related differences in diagnosis and morbidity of intestinal malrotation. *J Am Coll Surg* 2008;206:658-63.
5. Matsumoto S, Mori H, Okino Y, et al. Computed tomographic imaging of abdominal volvulus: pictorial essay. *Can Assoc Radiol J* 2004;55:297-303.