

# Primary Midgut Volvulus in Adults: Report of Two Cases and Review of the Literature

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## Abstract

**Introduction** This is a report of two male patients (35 and 54 years old, respectively) admitted to our surgical department with signs of small-bowel obstruction.

**Case Presentations** Diagnostic workup with plain abdominal radiographs and, more specifically, computed tomography suggested the possibility of bowel rotation. In order to exclude any possibility of associated intestinal ischemia, both patients underwent exploratory laparotomy, which revealed a midgut volvulus without any associated obvious cause or pathology.

**Discussion** Both patients had an eventful outcome. Epidemiologic characteristics, clinical presentation, diagnostic workup, surgical treatment, and morbidity–mortality rates of small-bowel volvulus have been reviewed and thoroughly discussed.

**Keywords** Midgut volvulus · Small-bowel obstruction · Malrotation · Intestinal ischemia

## Introduction

Twisting of the small bowel around its mesenteric artery axis is termed midgut volvulus, frequently causing luminal obstruction and most importantly compromising blood flow to and from the bowel wall threatening intestinal viability.<sup>1–3</sup> Midgut volvulus can be primary, without finding any associated underlying cause, or secondary to other congenital or acquired conditions. It is frequent in geographical areas, such as Middle East, Asia, and Central Africa, related to factors such as lower socioeconomic status, fiber consump-

tion after prolonged fasting (Muslims during the Ramadan), parasitic infections and diabetic autonomous neuropathy, while it has a low incidence in Western countries.<sup>1,4</sup> Small bowel volvulus is considered an emergency necessitating prompt operative intervention, in order to prevent or treat the development of intestinal ischemia which is associated with high morbidity and mortality. Primary midgut volvulus is more frequent in children and young adults and is rarely present in adults in whom secondary volvulus is more prevalent. In this report, we present two cases of primary small bowel volvulus in adults.

## Case Presentations

### Case 1

A 54-year-old male patient, with a past medical history of irritable bowel syndrome and laparoscopic cholecystectomy, was admitted to our surgical department complaining of colicky epigastric and periumbilical pain radiating diffusely to the abdomen, diarrhea, and bilious vomiting. Similar milder symptoms presented 1 week before admission and were conceived as gastroenteritis, unsuccessfully relieved by spasmolytic medication. Clinical examination revealed abdominal distension and diffuse tenderness without signs of peritonitis. Abdominal radiograph showed air-fluid levels of the small intestine (Fig. 1a). An abdominal computed tomography (CT)

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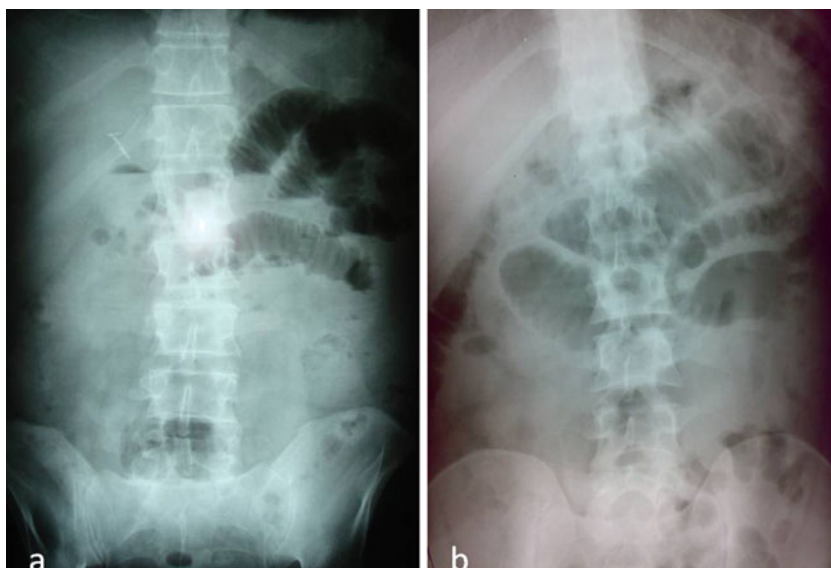
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**Fig. 1** Abdominal films in an upright position showing **a** distended and **b** air-filled small-bowel loops, with findings indicating a small-bowel obstruction



scan was performed which demonstrated dilatation of the small intestine, mesenteric and bowel wall thickening, and a “clockwise” rotation of the mesentery around the mesenteric vessels, possibly due to intestinal volvulus (Fig. 2). The exploratory laparotomy showed a volvulus of the small intestine without any obvious underlying cause or pathology, and an untwisting of the bowel was performed. Prolonged ileus for 5 days which resolved spontaneously was followed by an uneventful recovery, and the patient was discharged on the 11th postoperative day.

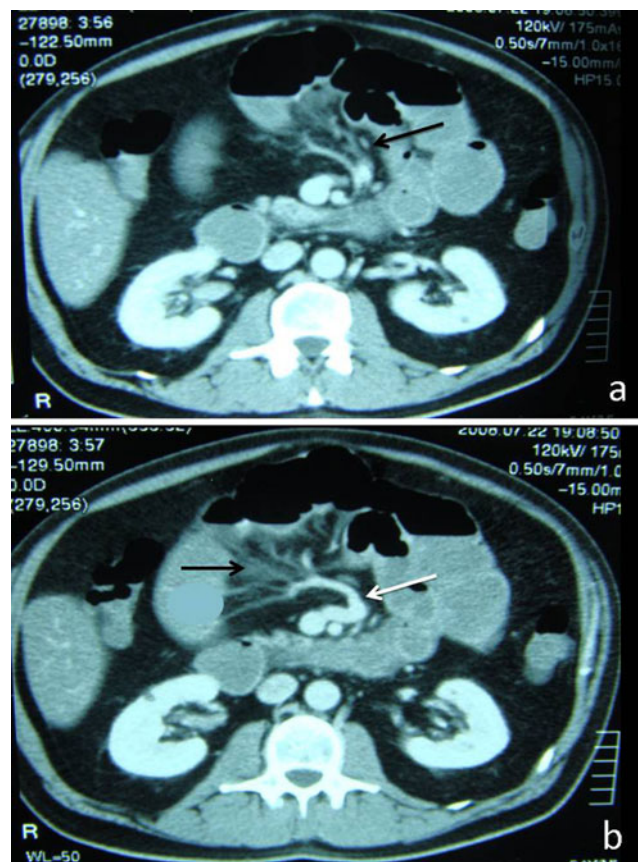
## Case 2

A 35-year-old male patient, with a negative past medical history, was admitted to our surgical department with colicky abdominal pain and diarrhea in the preceding 4 days, conceived to be gastroenteritis, complaining of diffuse and severe abdominal pain and vomiting. The abdominal films showed distended air-filled bowel loops (Fig. 1b). Abdominal computed tomography scan demonstrated distension of the midgut with air-fluid levels, thickening of the bowel wall, and the associated mesentery and mesenteric fat. Exploratory laparotomy revealed a midgut volvulus without evidence of bowel ischemia or any underlying pathology, and the small intestine was untwisted. The patient postoperatively suffered of a prolonged ileus for about 1 week, which gradually resolved and was finally discharged on the 14th postoperative day.

## Discussion

The term volvulus is derived from the Latin word *volvere*, which means to turn or roll.<sup>1</sup> Pathophysiologically, a

greater than 180° twisting of the small bowel about its mesentery occurs, resulting in intestinal obstruction and in vascular inflow and outflow compromise, leading subse-



**Fig. 2** Abdominal computed tomography demonstrating dilated small-bowel loops, with **a** thickening of the involved mesentery (*black arrow*) and **b** “clockwise” rotation of branches of the superior mesenteric vein (*white arrow*) around the superior mesenteric artery (“whirl sign”)

quently to bowel ischemia and necrosis. The annual incidence of midgut volvulus is smaller in Western countries (1.7–5.7 per 100,000 population) and larger in Africa and Asia (24–60 per 100,000 population).<sup>2</sup> Similarly, midgut volvulus is presented as small bowel obstruction in 3–6% of patients in the first group and in 20–50% of patients in the second group.<sup>5,6</sup>

Small bowel volvulus is categorized as primary and secondary. Primary small bowel volvulus occurs usually in children and young males, in which there is no predisposing abnormality found during laparotomy. Anatomically, the small bowel in high-risk populations and the corresponding mesentery are longer with a narrower insertion and a lack of mesenteric fat.<sup>7</sup> On the other hand, secondary midgut volvulus occurs usually in older patients (sixth to eighth decade of life), affecting equally both sexes, in which the intestine is twisted around an underlying point of fixation.<sup>8</sup> The most frequently encountered cause is postoperative adhesions. However, many other causes have been reported in case reports or series, including internal hernias, tumors, mesenteric lymph nodes, Meckel's diverticulum, mesenteric lipoma, mesenteric lymphangioma, pregnancy, endometriosis, abscess, mycobacterial disease, aneurysms, and hematomas.<sup>9–16</sup>

Clinical presentation of primary midgut volvulus is usually nonspecific. An abrupt onset of signs and symptoms of small-bowel obstruction in a patient without previous abdominal surgery or other obvious causes (hernias), preceded by colicky epigastric or periumbilical pain several days before, should raise suspicion for this entity.<sup>1</sup> More importantly, “pain out of proportion” of the degree of obstruction as seen in acute mesenteric ischemia and signs of systemic inflammatory response (tachycardia, fever, tachypnea, and leukocytosis) or peritonitis should prompt the surgeon to urgently operate the patient, due to ensuing intestinal vascular compromise.

Preoperative diagnostic workup includes plain abdominal films, ultrasonography (US), abdominopelvic CT scan, and, more recently, multidetector CT (MDCT) angiography. Abdominal radiographs can demonstrate nonspecific signs of intestinal obstruction, such as air-fluid levels and dilated bowel loops and signs of intestinal ischemia or necrosis, such as thumbprinting and pneumatosis intestinalis or in extreme cases portal vein gas. However, plain films have low accuracy in diagnosing midgut volvulus.<sup>8</sup> Doppler US has been reported to be helpful in the diagnosis of midgut volvulus, identifying the encircling of the intestinal loops and the superior mesenteric vein (SMV) around the superior mesenteric artery (SMA), which is termed the “whirlpool sign,” with 92% sensitivity and 100% specificity.<sup>17–19</sup> Disadvantages of US are the fact that it is operator dependent and that gas interposition can limit its sensitivity.

Abdominopelvic CT is currently considered as the imaging modality of choice because it can demonstrate signs of small bowel obstruction (dilatation of closed or air-filled bowel loops), pathognomonic signs of the volvulus (the rotated mesentery and SMV encircling clockwise the SMA termed “whirl sign” and mesenteric thickening) and signs of intestinal ischemia (thickening or presence of air in the bowel wall, portal vein gas, and free peritoneal fluid).<sup>2,17,20–23</sup> Angiographic appearance of the twisted mesenteric vessels, termed as the “barber pole sign,” is pathognomonic for midgut volvulus as well.<sup>24</sup> Additional signs of catheter angiography include tapering or abrupt termination of the mesenteric vessels, prolonged contrast transit time, absent venous opacification, or a dilated SMV.<sup>17</sup> However, it is time-consuming and invasive. Instead, MDCT angiography has been introduced and widely accepted, producing multiplanar three-dimensional images, providing information about the presence of the volvulus, the degree and location of intestinal obstruction, the presence of intestinal ischemia, and any associated anomalies of adjacent organs.<sup>17,25</sup>

Clinically assumed and radiologically demonstrated volvulus necessitates immediate operative intervention due to the associated risk of intestinal ischemia. Devolvulation (untwisting) of the involved bowel is frequently the only maneuver need to be done, although some authors recommend intestinal fixation or even resection in order to avoid a recurrence of the volvulus.<sup>2,8,26</sup> Almost half of the patients will undergo an intestinal resection for a gangrenous small intestine.<sup>12</sup> Currently, there are several reports describing the laparoscopic management of midgut volvulus, considering the benefits of shorter postoperative hospital stay, reduced postoperative complications, and possibly reduced subsequent adhesion formation compared to the open approach.<sup>27–29</sup>

The outcome of patients with small-bowel volvulus is worse when there is a delay in diagnosis (due to its rarity, especially in Western countries), involvement of older patients with associated comorbidities and development of intestinal ischemia and necrosis. Thus, although mortality in patients explored surgically for midgut volvulus is 10–35%, it increases dramatically to 20–60% in patients with gangrenous bowel.<sup>2</sup>

In conclusion, primary midgut volvulus should be suspected in every patient presenting with abrupt onset of abdominal pain and signs of intestinal obstruction, without previous abdominal surgery or other obvious causes. Plain X-rays are nonspecific, and US is operator dependent. The imaging modality of choice is the CT scan and the newest MDCT angiography, which can demonstrate the rotated small bowel and mesentery, providing simultaneously information for any associated intestinal ischemia. Early diagnosis and immediate operative intervention are key factors associated with a better prognosis for this group of patients.

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