

Gastrointestinal motility should be emphasized after laparotomy treatment for complete small intestinal volvulus in older adults

A case report

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Abstract

Rationale: Complete small intestinal volvulus is a rare entity in adults, unlike partial intestinal volvulus. Although prompt surgical intervention is the mainstay of treatment, attention should also be paid to recovery of intestinal function postoperatively. Ignoring this issue during the postoperative recovery process can have serious consequences. We report the case of an 82-year-old woman with complete small intestinal volvulus at the root of the superior mesenteric vessel.

Patients concerns: The patient was admitted for acute onset (22 hours) of abdominal pain and distention. Nausea and vomiting also developed during this period.

Diagnoses: Abdominal physical examination was suspicious for peritoneal irritation. Computed tomography scan showed anticlockwise swirl of the mesenteric vessels at the lower margin of the pancreas with distension of the entire small intestine. A complete small intestinal volvulus was diagnosed.

Interventions: Laparotomy and detorsion of the volvulus were performed after early diagnosis.

Outcomes: The patient developed intestinal wall edema because of ischemic-reperfusion damage. She exhibited severe abdominal distention and absent intestinal motility. Two days later, she went into septic shock; she died 19 days after surgical intervention.

Lessons: Because complete small intestinal volvulus involves the entire intestine, ischemic-reperfusion intestinal damage after detorsion may be severe and can predict prognosis.

Abbreviations: SMV= superior mesenteric vein, SMA= superior mesenteric artery, CT= computed tomography, WBC = white blood cell.

Keywords: complete small intestinal volvulus, gastrointestinal function, laparotomy, septic shock, vessel thrombosis

1. Introduction

Complete small intestinal volvulus, also referred to as midgut volvulus, means torsion of the whole small intestine at the root of the superior mesenteric vessel. It occurs most frequently in

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children and rarely occurs in adults. Adult complete small intestinal volvulus is primarily seen in the Middle East and Central Africa; this distribution relates to dietary habits.^[1] Longlasting volvulus may result in massive bowel necrosis. Prompt laparotomy can prevent the development of intestinal ischemia, which is associated with high morbidity and mortality.^[2] Herein, we report a case of adult complete small intestinal volvulus. The patient received prompt laparotomy without intestinal resection; however, she died 19 days postoperatively. Patient's relative has provided written informed consent for publication of the case.

2. Case presentation

An 82-year-old female was admitted to the emergency department with abdominal pain and distention accompanied by nausea and vomiting for 22 hours. Because distention and vomiting had gradually developed, she consulted a local hospital after the initial abdominal discomfort. She was diagnosed with a bowel obstruction and received decompression through a nasogastric tube. Twenty-two hours later she was transferred to our hospital for further treatment. She had undergone a cholecystectomy 18 years prior and a right upper femoral fracture had been repaired with internal fixation one year prior to presentation. She had no other comorbidities.

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Figure 1. Contrast-enhanced CT scan showing small intestinal volvulus at the root of the superior mesenteric vessel. A whirl sign was identified (arrow). The asterisk indicates the pancreatic uncinate process. The abdominal wall defect is marked at the right side. Distended small intestine and exudation around the bowel were also identified.

On examination, a surgical scar approximately 10 centimeters in length was seen at the right side of the abdominal wall. There was a palpable, reducible mass approximately 4 to 5 cm in diameter along the surgical scar. Her abdomen generally exhibited suspicious rigidity and bowel sounds were not present. Complete blood count showed a white blood cell (WBC) count of 15×10^9 /L with 97% neutrophils but was otherwise within normal limits. A contrast-enhanced computed tomography (CT) scan showed anticlockwise swirl of the mesenteric vessels at the lower margin of the pancreas (Fig. 1). The entire small intestine was distended, and an incisional hernia was also present.

These findings were compatible with small intestine volvulus and acute peritonitis, implying that bowel infarction might be present. On emergency laparotomy, the whole small intestine was distended and congested. The color of the bowel was dark red, implying ischemia (Fig. 2A). When the distended small intestine was delivered from the abdominal cavity, an anticlockwise 360degree twist was identified at the root of the superior mesenteric vessel below the transverse colon mesentery. A slight arterial pulse was palpable at the tight twist. An immediate detorsion of the volvulus was performed. The bowel color improved to normal approximately 20 minutes later (Fig. 2B). Two diverticula were found at the small intestine, distant from the volvulus site (Fig. 2, C and D). Because the bowel distention was not too severe, small intestine decompression was not performed. After reconfirming the superior mesenteric blood supply, we closed the abdominal wall. During the operation, a total of 2500 mL of liquid (1500 mL crystal and 1000 mL colloid) was infused and 600 mL of urine was discharged.

The second day postoperatively, the patient's temperature rose to 38°C, accompanied by low blood pressure (80/55 mmHg) and tachycardia (140 beats per minute); physical examination showed abdominal distention. Septic shock was diagnosed, and fluid resuscitation and antibiotics (imipenem and vancomycin through intravenous) were administered. A vasoactive drug was used because of the low blood pressure. We suspected that the entire small intestine had experienced ischemic–reperfusion damage after untwisting of the volvulus. Consequently, the bowel permeability likely increased, and bacteria from the bowel lumen were transferred to the blood, resulting in septic shock.



Figure 2. Intraoperative view of the dark red small intestine, indicating bowel ischemia (A), with adjacent viable jejunum. The ischemic small intestine is indicated with the arrow. The bowel color improved to normal 20 minutes after detorsion of the volvulus (B), indicating that the bowel was still viable. Two diverticula are marked with asterisks in B. One of the diverticula is enlarged in C.



Figure 3. Contrast-enhanced CT scan 2 days postoperatively. The whirl sign that indicated the volvulus had disappeared, but dilated bowel filled with fluid and edema of the intestinal wall was apparent, which indicated intestinal paralysis and congestion. A filling defect, which resulted from thrombosis, was identified in the superior mesenteric vein (SMV; B). The red arrow indicates the SMV, the white arrow indicates the superior mesenteric artery (SMA), and the asterisk indicates the pancreatic uncinate process.

Contrast-enhanced CT confirmed the occurrence of ischemicreperfusion damage; it revealed a dilated bowel lumen filled with fluid and showed a thickened intestinal wall (Fig. 3). A filling defect was also identified in the superior mesenteric vein (SMV); SMV thrombosis was suspected. The patient developed gastric bleeding due to a stress ulcer, so a proton pump inhibitor was administered. On the fifth day postoperatively, the patient suffered from hypoxemia; physical examination showed pulmonary rales and edema of the abdominal wall and extremities. This type II respiration dysfunction may result from the large volume of intravenous fluids used for fluid resuscitation. Endotracheal intubation and mechanical ventilation were used to treat the hypoxia. The patient's condition improved. Vital signs were stable, and abdominal distention improved after a bowel movement on postoperative day six. Enteral nutrition was administered through a nasogastric tube. However, on the thirteenth day postoperatively, the patient's temperature rose again; blood cultures revealed a catheter-related bloodstream infection. At the nineteenth day postoperatively, the patient died from extensive hemorrhage caused by a stress ulcer.

3. Discussion

Complete small intestinal volvulus is defined as torsion of the entire small intestine at the root of the superior mesenteric vessel. It compromises the blood supply to the entire small intestine as well as the ascending colon and part of the transverse colon. This condition, which is also known as midgut volvulus, more commonly occurs in children, where it may be caused by anatomical abnormalities of fixation and rotation of the intestines.^[3] Complete small intestine volvulus is a rare entity in adults. In contrast to segmental volvulus, in which predisposing factors such as adhesive bands and diverticula are present, complete intestinal volvulus occurs in the absence of underlying abnormalities in adults.^[4]

Initially, small intestine volvulus presents with manifestations of bowel obstruction. As the situation progresses, peritonitis symptoms such as abdominal rigidity and rebound tenderness will be present. Shock is an important clinical feature of extensive intestinal volvulus.^[5] Contrast-enhanced CT is the preferred modality to diagnose volvulus with high specificity and sensitivity.^[6] A whirl sign at the root of the mesenteric vessels is typically observed^[7]. When a diagnosis of complete small intestine volvulus is suspected, surgical intervention without delay is highly recommended. Small intestinal infarction, which happens in the late stages of complete small intestine volvulus, is disastrous.^[8] Massive resection is inevitable when bowel necrosis occurs, which results in short bowel syndrome postoperatively and necessitates life-long parenteral nutrition.

Herein, we reported a case of complete small intestinal volvulus. Although managed with timely surgical intervention, which avoided massive bowel resection, the patient still died nineteen days postoperatively. This case highlights the importance of considering additional issues beyond prompt surgical detorsion, when managing complete small intestine volvulus patients.

Shock is a prominent feature in patients with extensive intestinal volvulus. It can present as hypovolemic shock in the early stages. When venous return is occluded in complete small intestine volvulus, large amounts of blood are lost into the splanchnic bed. Animal models show that pure venous occlusion can cause congestion of up to 60% of an animal's blood volume into the lumen, bowel wall and coelomic cavity.^[5] Timely detorsion of the twisted bowel can release the congested blood and effectively ameliorate shock symptoms. During the later stages of an extensive intestinal volvulus, septic shock occurs because of the ischemic damage to the bowel. Absorption of bacterial toxins through the damaged bowel wall is the cause of septic shock in this situation.^[9] Our patient did not show signs of shock at admission but did develop septic shock after detorsion of the volvulus. This differs from our experience that most complete small intestine volvulus patients are admitted with symptoms of shock and improve after detorsion. This patient suffered abdominal distention one day postoperatively. The contrastenhanced CT scan at 2 days postoperatively revealed a distended bowel lumen and edema of the bowel wall. Although the twisted bowel did not necrose during the 22 hours prior to presentation at our hospital, it experienced ischemic-reperfusion damage after untwisting. Consequently, large amounts of inflammatory factors and bacterial toxins were likely absorbed into the bloodstream, resulting in septic shock following surgical intervention.

Intestinal decompression during detorsion surgery has not been well-addressed in the literature. There are 2 early reports regarding intra-operative decompression, but both are performed on animal models. They confirmed that vigorous handling of bacteria-laden small bowel during operation result in bacteremia in rats.^[10] The bowel motility recovery was of longer duration in the operatively decompression group than those who were not decompressed of dog models.^[11] In our patient, decompression of the bowel contents was not performed intraoperatively. The residual intraluminal fluid aggravated bowel distention and may have contributed to the septic shock. We infer that intraoperative decompression is beneficial to recovery of intestinal function and extenuation of bacterial toxin absorption. Postoperative septic shock may be avoided or relieved by decompression. We conclude that intraoperative decompression is necessary in patients with complete small intestine volvulus, especially those with a delay in surgical treatment and those with severe bowel distention.

Superior mesenteric vein thrombosis after detorsion is another important issue that should be kept in mind.^[12] Vessel endothelial damage during torsion is a predisposing factor for thrombosis. Midgut volvulus with simultaneous vessel thrombosis has been previously reported.^[13] In our patient, SMV thrombosis was confirmed postoperatively by contrast-enhanced CT. The occlusion of the SMV led to bowel wall edema and insufficient venous return, which directly aggravated shock. Because of the patient's gastrointestinal hemorrhage, anticoagulation was not administered. Prophylactic anticoagulation is strongly recommended after detorsion of complete small intestine volvulus in the absence of contraindications such as hemorrhage.

In conclusion, in cases of small intestine volvulus involving the entire small intestine, prompt surgical intervention can avoid massive bowel resection. If small intestine resection is not needed, decompression of the distended bowel is recommended. Postoperatively, septic shock and vessel thrombosis are 2 important issues that should be considered. Prophylactic treatment for these potential sequelae should be administered in a timely manner in order to avoid adverse outcomes.

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