
Volvulus of the Small Intestine

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At the Mayo Clinic, six patients with primary volvulus and 51 with secondary volvulus were treated during a 10-year period. Volvulus of the small intestine must be considered when a patient presents with small-bowel obstruction, and early operative intervention should be undertaken to prevent vascular compromise.

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VOLVULUS IS A WELL-RECOGNIZED CAUSE of acute intestinal obstruction, occurring most often in the sigmoid and other areas of the colon. Volvulus of the small intestine is rarely encountered in the adult population of the United States, but occurrences in the populations of certain African, Asian, and Middle Eastern nations have been well-documented.¹⁻³ There are two categories of volvulus of the small intestine: 1) primary small-bowel volvulus, in which there are no predisposing anatomic abnormalities, and 2) secondary small-bowel volvulus, in which an acquired or a congenital abnormality causes a rotation of the bowel.

We reviewed the Mayo Clinic experience of small-bowel volvulus during a 10-year period with respect to incidence, symptoms, laboratory, and roentgenographic abnormalities, operative procedures, and clinical outcome.

Materials and Methods

The clinical records of patients with small-bowel volvulus seen at the Mayo Clinic from January 1975 to December 1984 were reviewed. The diagnosis was obtained from the operative report. Patients with neonatal small-bowel volvulus were excluded from the study. A retrospective analysis of presenting signs and symptoms and laboratory and roentgenographic abnormalities was undertaken. All patients were categorized as having either primary or secondary volvulus. The results were correlated with operative procedure and clinical outcome.

Results

The series involved 57 patients with small-bowel volvulus (six with primary volvulus and 51 with secondary volvulus). At our institution, of the total number of patients seen with small-bowel obstruction, 5.7% had volvulus (Fig. 1). The secondary causes included adhesive bands, volvulus around an ileostomy, partial malrotation, Meckel's diverticulum, and volvulus through a wide omental or mesenteric defect. The average age of the patients was 59 years (range of 11-92 years), and there was an equal distribution of men and women.

At presentation, all patients experienced abdominal pain, 52 (91%) experienced nausea and vomiting, 42 (74%) had abdominal distention, 33 (58%) had obstipation, 32 (56%) had tachycardia, and eight (14%) had fever. The mean duration of symptoms before presentation was 32 hours, and the mean duration from presentation to surgery was 36 hours.

The main laboratory abnormality was a high leukocyte count. Seventy-three per cent of the patients had leukocytosis, and 68% had a left shift. The mean amylase level was 152 U/L (normal being 35-115), and the mean alkaline phosphatase level was 163 U/L (normal being 45-250).

A flat and upright abdominal roentgenogram was obtained in all patients, and the findings were consistent with the small-bowel obstruction observed in 44 (77%). In seven of these patients (16%), the findings were compatible with closed-loop obstruction. Eight patients underwent contrast studies, and the level of obstruction was well-demonstrated in all eight.

All patients underwent laparotomy. The diagnosis of small-bowel volvulus was made or confirmed at surgery.

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Submitted for publication: February 8, 1988.

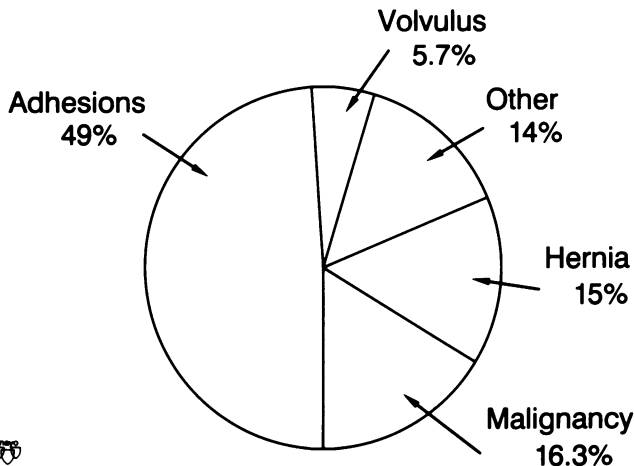


FIG. 1. Causes of small-bowel obstruction in patients seen during a 3-year period at the Mayo Clinic.

Twenty-eight patients (49%) had ischemic or frankly gangrenous bowel at operation. The operative procedure consisted of resection with primary anastomosis in 28 patients and detorsion with or without lysis of adhesions in 29. Area of involvement included the ileum in 30 patients, the jejunum in 17, and either both the jejunum and ileum or the junction of jejunum and ileum in five. In five patients, the area of involvement could not be determined from the operative report. Seven patients died during their hospitalization, accounting for an overall perioperative mortality of 12.3%. This rate increased to 21.4% when the bowel was ischemic. Causes of death included sepsis from peritonitis (three patients), myocardial infarction, hepatic failure, pneumonia, and cerebrovascular accident (one patient each). In addition, there was a 42% incidence of major postoperative morbidity. Average length of hospitalization was 13 days, including 3 days in the intensive care unit.

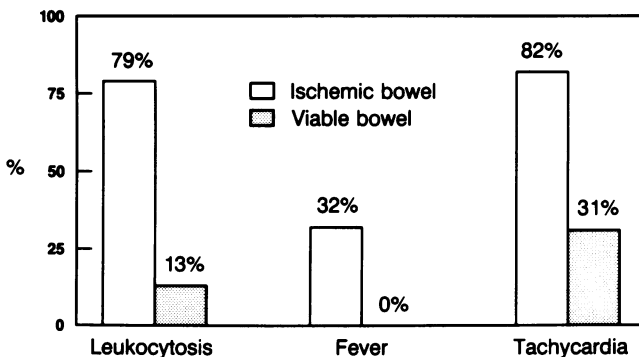


FIG. 2. Frequency of leukocytosis, fever, and tachycardia in patients with small-bowel volvulus, according to whether bowel was viable or ischemic.

A comparison of patients who had vascular compromise at surgery with those who had viable bowel at surgery showed that the mean duration between onset of symptoms and operation was 68 hours for the patients who did not undergo resection and 48 hours for those who did. Surgical exploration was performed 6 hours (median time) after admission in those patients with ischemic bowel, indicating a delay in presentation rather than a delay in diagnosis. Patients who had ischemic bowel also had a higher incidence of leukocytosis, fever, and tachycardia (Figs. 2 and 3).

Discussion

In the United States, volvulus of the small intestine is an unusual cause of acute intestinal obstruction. Duke and Yar³ have documented that primary small-bowel volvulus is one of the more common surgical problems encountered among certain African, Asian, and Middle Eastern nations. Tiwari et al.² reported a 14.2% incidence of this condition in Kanpur, India, among patients with acute intestinal obstruction.

Volvulus of the small intestine can be differentiated into two categories based on cause: primary volvulus and secondary volvulus. Primary small intestinal volvulus is a condition in which there is torsion of a segment of small-bowel mesentery in the absence of congenital bands or postoperative adhesions. Several factors have been proposed as contributing to the development of primary small-bowel volvulus. One theory is the presence of a long mobile mesentery. Vaez-Zadeh et al.¹ reported that patients with primary small-bowel volvulus have a longer mesenteric length and a shorter mesenteric base. Koernig⁴ observed that small-bowel volvulus was much more frequent among Russian peasants, whose small-bowel lengths averaged 6.9 m, than among the German population, whose small-bowel lengths averaged 5.79 m. In addition, dietary factors have been postulated to predispose primary small-bowel volvulus. The practice of consuming large high-fiber meals after prolonged intervals of fasting leads to forceful bowel peristalsis.⁵ With the abrupt transit of a large bulky meal into the proximal jejunum, this heavier segment of bowel migrates into the left lower quadrant because of an absence of resistance in the pelvis. The empty loops of ileum and jejunum are thereby forced in a clockwise rotation into the right upper quadrant, predisposing a torsion of the mesentery. Duke and Yar supported this mechanism by demonstrating a striking increase in the incidence of primary small-bowel volvulus in the population of Afghanistan that was associated with their religious period called Ramadan.³ During Ramadan, the Afghans fast during the daylight hours, then at sunset, consume large quantities of food and liquids. This sudden

intake of nutrients after fasting may be a predisposition to primary small-bowel volvulus.

Secondary small-bowel volvulus occurs when there is an underlying lesion upon which the mesentery can twist. The causes are varied, including adhesive bands, mesenteric or omental defects, volvulus around the stoma, and volvulus associated with pregnancy.⁶⁻⁹ Because of its presumed rarity, little has been written in the Western literature about secondary volvulus. However, Welch and Anderson⁶ reported a series of 53 patients from the Glasgow Royal Infirmary during the 15-year period of 1965-1980. In their series, 16 patients had no obvious predisposing factors, whereas in the remaining 37 patients, the volvulus was acquired as a consequence of a preformed anatomic abnormality. Twenty-five patients had gangrenous bowel at operation. Eleven patients died during the postoperative period, accounting for a perioperative mortality of 21%. The perioperative mortality for those patients with gangrenous bowel increased to 47%.

Radiographic examination of the patient with small-bowel volvulus usually shows findings similar to those of small-bowel obstruction, being seen in 44 patients (77%) in our series. However, 13 (23%) had unremarkable findings on plain films. Buranasiri et al.¹⁰ have reported the characteristic angiographic appearance of small-bowel volvulus known as a "barber pole sign," which is caused by spiraling of the branches of the twisted superior mesenteric artery. Cynn and Hodes¹¹ documented that gas in the mesenteric vein (without portal venous gas) is indicative of gangrene in the small intestine secondary to volvulus or an internal hernia. Contrast studies can be a useful adjunct for diagnosis and, in our series, demonstrated the area of obstruction in each of the patients in whom an upper gastrointestinal (G.I.) tract study was obtained.

Many attempts have been made to delineate factors that indicate strangulated obstruction. Stewardson et al.¹² emphasized a classic quartet of findings: leukocytosis, fever, tachycardia, and localized tenderness. In the current series, a comparison of the patients who had ischemic intestine with those who had viable intestine showed that all patients of both groups experienced pain. No patient in the nonresected group had fever (temperature > 38 C), whereas 32% of those undergoing resection had a temperature of greater than 38 C. The incidence of tachycardia, as defined by a rate of greater than 100 beats per minute, increased from 31% to 82% in the presence of compromised bowel. Leukocytosis (leukocyte count > 10,000/mm²) seemed to be of predictive value for the presence of ischemic bowel (Fig. 3). Only 13% of patients with a leukocyte count of less than 10,000/mm² required resection, whereas 79% of patients with a leukocyte count greater than 20,000/mm² had gangrenous bowel. Resection was required in approximately 50% of the patients

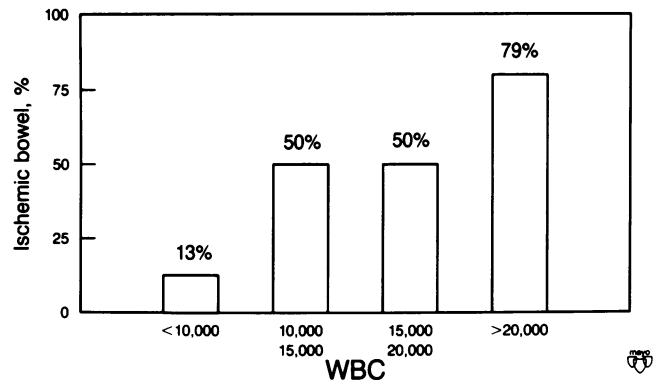


FIG. 3. Distribution of leukocyte count in patients with ischemic volvulus of the small intestine.

with a count between 10,000 and 20,000/mm². Ideally, such patients should undergo surgery before ischemic injury occurs, but leukocytosis, along with pertinent clinical signs, should increase the suspicion of bowel ischemia and lead to prompt surgical intervention.

It has been suggested that the duration of vascular compromise is a factor that leads to infarction of the bowel. The mean duration of symptoms before surgery was 68 hours for the nonresected group, and 48 hours for the resected group. This difference should not be misinterpreted as an incentive for prolonged observation. Further analysis revealed that this discrepancy reflected the more rapid clinical deterioration of patients with ischemic bowel, rather than a difference in the management of the patients who had a viable intestine. Only with earlier operative intervention, before the onset of vascular compromise, can one anticipate an improved overall outcome.

Conclusions

Volvulus of the small intestine is an unusual cause of acute small-bowel obstruction. There is a high incidence of strangulation associated with volvulus of the small bowel. In the present series, the overall mortality increased from 12.3% to 21.4% when the bowel was ischemic. This increase emphasizes the need for early operative intervention in order to prevent vascular compromise.

Summary

Volvulus of the small intestine is an infrequent cause of small-bowel obstruction. At the Mayo Clinic, six patients with primary volvulus and 51 with secondary volvulus were treated during a 10-year period. The presenting signs, symptoms, and laboratory abnormalities of these 57 patients were consistent with other forms of small-

bowel obstruction. Forty-nine per cent of the patients had vascular compromise at laparotomy and required resection. Overall perioperative mortality was 12.3%, and this rate increased to 21.4% in patients with ischemic bowel. Leukocytosis was a frequent finding in the patients with gangrenous bowel. Volvulus of the small intestine must be considered when a patient presents with small-bowel obstruction, and early operative intervention should be undertaken to prevent vascular compromise.

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