Volvulus: Small Bowel and Colon

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ABSTRACT

Volvulus of the intestine is a surgical emergency. Volvulus of the small bowel is more common in children and is most often secondary to malrotation. Small bowel volvulus is an uncommon cause for small bowel obstruction in adults, and is more likely to be secondary to postoperative adhesive bands. Colonic volvulus is a rare cause of large bowel obstruction, but more common than small bowel volvulus. The sigmoid is most frequently involved, with redundant colon as the primary cause. Cecal volvulus most commonly is due to lack of fixation. Colonic volvulus has a specific radiographic appearance; however, small bowel volvulus is difficult to distinguish from other causes of small bowel obstruction by radiographic means. New surgical techniques with minimally invasive surgery are increasingly being applied to this old problem with good results in selected cases.

KEYWORDS: Volvulus, bowel obstruction, minimally invasive surgery

Objectives: Upon completion of this article, the reader should be able to summarize the causes, age distribution, and treatment modalities of the different kinds of volvulus.

Volvulus of the small bowel and colon remains a significant cause for surgical emergencies in both children and adults. The age distribution and underlying causes for each part of the intestine is quite different and can present the surgeon with a diagnostic dilemma leading to an abdominal catastrophe if the volvulus is not diagnosed and treated promptly.

SMALL BOWEL

Children

Volvulus of the small bowel is much less common than volvulus of the large bowel in adults, but it can cause a critical surgical emergency in the newborn. Small bowel or midgut volvulus in the infant or child is most commonly secondary to malrotation. In the fifth week

of embryologic development, there is rapid elongation of the intestinal segment and the primary gut loop extends ventrally into the umbilical cord. By the 10th week, the abdomen has enlarged sufficiently to accommodate the growing intestinal tract and as it returns to the abdomen, there is a 270-degree counterclockwise rotation of the tube around the axis of the superior mesenteric artery, followed by fixation. Malrotation refers to interruption, reversal or arrest of this complex process and ranges from nonrotation to incomplete rotation or lack of fixation. This may result in axial rotation of the midgut causing midgut volvulus, although even complete malrotation may be asymptomatic.¹ Midgut volvulus presents as acute onset of bilious vomiting in the newborn, whereas older infants and toddlers tend to have more variable symptoms, including abdominal pain and constipation.² In the stable patient without peritonitis, the diagnosis is

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made with an upper gastrointestinal (GI) contrast study showing a high-grade or complete obstruction in the second or third portion of the duodenum with a characteristic "bird's beak." The treatment is laparotomy as described by William Ladd, with counterclockwise detorsion, division of Ladd's bands, resection of nonviable bowel and appendectomy. There is no need for pexis to the posterior abdominal wall.³

Other less common causes of pediatric volvulus are Meckel's diverticulum,⁴ meconium ileus,⁵ mesenteric and duplication cysts,^{6,7} and jejunal atresia or stenosis.⁸

Colon volvulus is uncommon in children, but can be secondary to malrotation as well as associated with medical problems such as Hirschsprung's disease, intestinal motility, chronic constipation, or imperforate anus.⁹

Adults

The incidence of small bowel volvulus in adults varies widely with geographic location. In the Western world, it is rare, and accounts for 1.7 to 6.2% of all small bowel obstructions.¹⁰ Obstructions can be viewed as either primary (in a normal abdominal cavity) or more commonly, secondary (due to anatomic malformations, malrotation, adhesions, tumors, or diverticula¹¹). Presentation is that of an acute small bowel obstruction, with abdominal pain, nausea, and vomiting. Peritoneal signs, palpable mass, fever, and leucocytosis are indicators of gangrenous bowel. Plain abdominal radiographs usually show a nonspecific pattern of small bowel obstruction.¹⁰ Treatment is laparotomy with either detorsion or resection if the bowel involved is compromised, with correction of the underlying cause as appropriate.

COLON

Volvulus of the colon accounts for 10 to 13% of all large bowel obstruction in the United States. It can involve any segment, but most frequently occurs in the sigmoid or cecum.¹²

Sigmoid Colon

Volvulus of the sigmoid colon is the most common large bowel volvulus; it occurs in ~70 to 80% of cases.¹³ It is usually secondary to a redundant colon, which may be associated with several illnesses.¹⁴ It is more common in the elderly, institutionalized patient.¹² Typical radiographic findings are the "bent inner tube" with the point usually directed to the right upper quadrant.¹⁵ In the stable patient without peritoneal signs, nonoperative reduction by enema or instrumentation is successful in 85% of cases with a low mortality rate.¹² However, recurrence rates are high, so definitive surgical treatment is recommended for patients without prohibitive comorbidities. The preferred approach in the stable patient

who can undergo a bowel preparation would be elective sigmoid resection. Other options range from cecostomy, transverse colostomy, sigmoid colostomy, operative detorsion, emergent resection (Hartmann procedure, obstructive resection (Paul-Mikulicz), primary anastomosis) to elective resection with primary anastomosis. Other, less frequently used options would include tube sigmoidostomy, mesocoloplasty, sigmoidopexy to the transverse colon, sigmoidopexy to the parietes, and fixations of the sigmoid mesentery.¹⁶ In patients with peritoneal signs where compromised bowel is suspected, definitive treatment with laparotomy and bowel resection is indicated.

Cecum

Ten to twenty percent of colonic volvulus is cecal volvulus.¹⁰ It is associated with lack of fixation of the right colon to the peritoneum and is more prevalent in a younger patient population. It manifests in two main forms: axial rotation of the cecum and the ileum around the mesentery (true volvulus) and the less common cecal bascule, where the bowel folds up on it self.¹⁵ Radiographic findings are those of large bowel obstruction with a "coffee bean" deformity directed toward the left upper quadrant. Patients with cecal volvulus are more likely to need initial surgical treatment, with cecopexy, cecostomy or resection. Detorsion alone is not recommended due to the high recurrence rate.

Other Locations and Special Considerations

Volvulus of the transverse colon is rare (2 to 4%) and splenic flexure volvulus is the least common site. Diagnosis is usually intraoperative and resection is the preferred treatment.¹⁵

Volvulus is more common during pregnancy, when the gravid uterus pushes the cecum or sigmoid out of the pelvis, and accounts for 25% of large bowel obstruction in the pregnant patient. Symptoms may be nonspecific and the use of radiologic imaging can be limited by the pregnancy. Therefore, a high level of suspicion is important to avoid morbidity and mortality of mother and child.¹⁷

Role of Laparoscopy

As experience with minimally invasive surgery increases, the indications diversify. Laparoscopic treatment for volvulus has been described for all age groups. The first case reports for laparoscopic procedures appeared in the early 1990s for adults^{18,19} and laparoscopic treatments of malrotation in children were described in 1996.^{20,21} To date, 19 articles have been published on a laparoscopic approach in acute small bowel obstruction, with acceptable morbidity and mortality. Of note, very few enterotomies upon

entry to the abdominal cavity were noted and half of these could be repaired without conversion.²² In the setting of intestinal dilatation and obstruction, access to the abdominal cavity needs to be undertaken very carefully to not cause a perforation. Open methods, like the Hasson canula or the Optiview would be the preferred options. Preferably, decompression of the bowel and stabilization of the patient prior to surgery is optimal for the minimally invasive approach to succeed. Severe distention and peritoneal signs should be regarded as contraindications.²³ A minimally invasive approach is feasible both in the acute and especially the elective setting, but depends on the surgeon's experience.

SUMMARY

Volvulus of small bowel and colon remains a significant cause of surgical emergencies. Underlying pathology varies with age. Prompt recognition with operative or nonoperative intervention is key to successful outcome. Minimally invasive surgery can be applied in selected cases in experienced hands.

DISCLAIMER

The authors of this article and their spouses have no financial interest in the topics discussed in this article.

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