Colonic volvulus is a rarely encountered surgical entity whose etymology derives from the Latin volvere, meaning “to roll” or “to twist.” The diagnosis dates to the Papyrus Ebers, circa 1550 BC in ancient Egypt, whereby if a patient “… [did] not evacuate it for a twist in the bowel and if the phlegm does not find a way out then it shall rot in the belly.” In ancient Greece, Hippocrates described the use of injecting air or a long suppository to manage volvulus.1 Current data reveal sigmoid volvulus as the most common colonic volvulus, followed by volvulus of the cecum, transverse colon, and splenic flexure.1 Overall, colonic volvulus accounts for 3 to 5% of bowel obstructions in the United States. This percentage increases to nearly 50% of bowel obstructions in countries with endemic rates of colonic volvulus.2 Despite a low incidence in the United States, diagnosis, management, and patient outcome depend on an appropriate index of suspicion and adherence to the proposed algorithm [see algorithm].

Definition, Pathogenesis, and Epidemiology

CECAL VOLVULUS

Remarkably, cecal volvulus was first described in 1646 by Hildanus3 and observed by von Rokitansky 200 years later in 1837.4 Although originally reported as a rotation of the cecum, more specific definitions and classifications have evolved. In 1905, Corner and Sargent described three forms of cecal volvulus,5 which were later adapted by Graham6 and clarified by Weinstein.7 Cecal volvulus may be defined as (1) rotation along an oblique axis with the cecum occupying the periumbilical or left upper quadrant, (2) rotation along the cecum’s long access, or (3) cecal bascule, whereby the posterior surface folds forward, creating a transverse axis of rotation.5–7 Rotation along an oblique axis is considered most common due to rotation around two fixed points as opposed to one in rotation along the long axis. In a 20-year Mayo Clinic experience, only 10% of cecal volvulus cases involved a cecal bascule, which is sometimes attributed to a transverse cecal band from previous surgical intervention.2 Although some authors suggest that “right colon volvulus” is a more appropriate description because the cecum cannot technically volvulize, we subscribe to and use the more common nomenclature of “cecal volvulus” in this topic review.8,9

The pathogenesis of cecal volvulus likely involves myriad factors, including embryologic development, colonic dysmotility, adhesion formation, and dietary intake. During embryologic development, failure of complete intestinal rotation creates an elongated mesentery and a lack of right colon fixation to the lateral sidewall. Based on cadaver studies, abnormality in cecal fixation allowing for volvulus or folding is present in upwards of 37% of the population.9–11 However, the incidence of cecal volvulus is drastically lower, suggesting that other factors may be essential in the development of pathologic disease. Published observations implicate adhesions from previous abdominal surgery as the lead point to initiate the twisting of the colon in cecal volvulus.5,9,12,13 Ballantyne and colleagues demonstrated that 27% of volvulus patients were within 2 weeks of a previous operation.2 In addition to abdominal adhesions, the study also suggested decreased colonic motility, adynamic ileus, and distal obstruction as contributing factors to cecal volvulus formation by creating a heavy dilated cecum more susceptible to twisting.2 This may in part explain why 12 to 28% of acute volvulus patients are diagnosed during admission for another medical reason.12,14 For example, delayed colonic transit may contribute to cecal volvulus formation in pregnant females; however, upward displacement of a mobile right colon is believed to be a more likely culprit.15,16 Perhaps the strongest contributor is consumption of a high-fiber diet. Worldwide data consistently demonstrate a significantly higher rate of volvulus within the “volvulus belt” countries, where “rough” diets are common.17 Currently, the patient is likely predisposed due to an anatomic variant producing a mobile colon, with volvulus occurring due to tension from obstruction, adhesion, pregnancy, or other processes elongating and dilating the colon.

An entity exists known as “mobile cecum syndrome,” which was originally described by Inglefinger in 194218 and expounded on by Rogers and Harford in 1984.19 It is marked by chronic, subacute, intermittent torsion due to the lack of right colon mesenteric fusion at the lateral peritoneum. Signs and symptoms are vague, including abdominal distention and chronic periumbilical or right lower quadrant pain. Patients often require multiple evaluations without a definitive diagnosis that distinguishes it from a “true” cecal volvulus.20,21 Up to 50% of acute volvulus patients report recurrent symptoms associated with “mobile cecum syndrome.”19 However, roughly one in 40 patients with “mobile cecum syndrome” are subsequently treated for acute volvulus.21 Although typically difficult to diagnose due to nonspecific symptoms, awareness of the condition may allow for elective correction prior to presentation of an acute volvulus.

The demographics and epidemiology of cecal volvulus are difficult to ascertain, even in “high-risk” parts of the world [see Table 1]. Much of the data comes from single-center series and case reports, making generalization across a heterogeneous population tenuous at best. In the United States and other Western countries, the rate of cecal volvulus is about 1 to 3% of all acute intestinal obstructions,16,22,23 equivalent to 2.8 to 7.1 per million population per year.22 Interestingly, the incidence of cecal volvulus over the past 3 to 5 years in the United States is increasing.24 Cecal volvulus accounts for 10 to 60% of all colonic volvulus cases per year.2,14,22,25 The worldwide incidence of cecal volvulus, in particular areas located in eastern Europe, Russia, and Africa, is considered much higher than in the Westernized world. At the turn of the 20th century, Scandinavian countries cited cecal volvulus as the source of obstruction in...
Approach to the Patient with Colonic Volvulus

**Gastrocolonic Volvulus — 2**

**Approach to the Patient with Colonic Volvulus**

- **Peritonitis, Shock, Suspected Gangrene**
  - Emergent Surgery
  - Gangrenous Bowel
    - Low-Risk Patient
      - Resection + 1˚ Anastomosis (All volvulus types)
      - Resection + Stoma Creation (All volvulus types)
    - High-Risk Patient
      - Resection + Stoma Creation (All volvulus types)

- **Viable Bowel**
  - Low-Risk Patient
    - Resection + 1˚ Anastomosis (All volvulus types)
    - A. Resection + Stoma Creation (All volvulus types)
    - B. Detorsion with colopexy or mesocoloplasty
  - High-Risk Patient
    - Resection + 1˚ Anastomosis (All volvulus types)

**Clinical Evaluation**

- Volvulus Suspected

**Stable**

- Imaging (CT, WSE)
  - Sigmoid Volvulus
    - Endoscopic Decompression + Rectal Tube
      - Failure or Complication
        - High-Risk Patient
          - Elective Surgery
        - Low-Risk Patient
          - Resection + 1˚ Anastomosis
    - Success
      - Low-Risk Patient
      - Elective Surgery

- Gangrenous Bowel

- Cecal, Transverse, & Splenic Volvulus; Ileosigmoid Knot

- Viable Bowel

- A. Observation + Bowel Regimen
  - B. Endoscopic Colonic Fixation (PEC)
  - C. T-Fastener Colonic Fixation
  - D. Resection + Stoma Creation

- Failure or Complication
  - A. Observation + Bowel Regimen
  - B. Endoscopic Colonic Fixation (PEC)
  - C. T-Fastener Colonic Fixation
  - D. Resection + Stoma Creation

**Elective Surgery**

**Low-Risk Patient**

**High-Risk Patient**

**Emergent Surgery**

**Imaging (CT, WSE)**

**Success**

**Failure or Complication**

**Resection + 1˚ Anastomosis**

**Resection + Stoma Creation**

**A. Observation + Bowel Regimen**

**B. Endoscopic Colonic Fixation (PEC)**

**C. T-Fastener Colonic Fixation**

**D. Resection + Stoma Creation**
almost 12% of cases. The higher incidence of cecal volvulus in these countries is theoretically attributed to higher fiber intake in non-Western countries. However, more recent data suggest that the incidence in endemic countries is closer to 1%, similar to that of the United States and Canada. Historically, the mortality of cecal volvulus was above 50% in operative and 100% in nonoperative cases. Modern advancements in diagnosis and management have reduced operative mortality to 12 and 33% for viable and nonviable cecum, respectively. The contribution of gender to the risk of volvulus is difficult to determine. Some groups have demonstrated a male or female predominance, whereas others cite equal distribution. The age at presentation is usually in the fifth and sixth decades of life, which is younger than sigmoid volvulus but older than previously reported during the first part of the 20th century. Groups suggest that age at presentation is related to exterior influences, such as diet, culture, and geographic region. Due to the heterogeneous nature of the disease, identification of independently associated risk factors, aside from anatomic predisposition, may prove difficult to define.

**TRANSVERSE COLON VOLVULUS**

Volvulus of the transverse colon is an exceedingly rare cause of abdominal pain and intestinal obstruction. Review of the literature demonstrates fewer than 100 cases, although the absolute number of patients with this diagnosis is likely much higher. In a 20-year review of 137 colon volvulus patients at a tertiary referral center, authors at the Mayo Clinic identified four cases of transverse colon volvulus, consistent with an incidence of 3 to 4% of colon volvulus cases. Mortality in patients with ischemic bowel at presentation is estimated at 33%, versus approximately 6% in nongangrenous cases. From 2002 to 2010 in the National Inpatient Database, Halabi and colleagues showed 16.7% mortality for all transverse volvulus patients undergoing resection.

Volvulus of the transverse colon is rare; hence, elucidation of predisposing factors is difficult, supporting the broadly accepted observation that a short, broad-based transverse colon mesentery protects against volvulus. Scattered reports suggest that chronic constipation causing colonic elongation, a history of adhesive bands from previous abdominal surgery, distal bowel obstruction from stricture or carcinoma, and congenital anatomic abnormalities creating a floppy mesentery are potential risk factors for the development of a transverse colon volvulus. Some data suggest a higher incidence in women, which is ascribed to female predominance of mesenteric elongation. A peak incidence in the second, third, and seventh decades of life was suggested in one review; however, patients of any age have been reported. Gerwig published four anatomic variations felt to predispose patients to a transverse colon volvulus, including (1) elongation of the mesentery, (2) absence of mesentery with mobile bowel, (3) closely approximated points of fixation at the hepatic and splenic flexures, and (4) congenital or acquired adhesions.

**SPLENIC FLEXURE VOLVULUS**

Volvulus of the splenic flexure is the rarest form of colonic volvulus, accounting for 1 to 2% of all cases. Review of the literature demonstrates fewer than 75 cases, with Ballantyne and colleagues reporting only three cases over 20 years at the Mayo Clinic. Some authors suggest that it may be a more common disease entity that is underreported due to spontaneous detorsion or reduction induced by imaging studies. The first case report was published by Glazer and Adlersberg in 1953, shortly followed by Buenger in 1954. Most reports are of patients in the fifth, sixth, and seventh decades of life, although any age may be affected. Minimal racial data exist to demonstrate any clear etiologic differences. According to limited data, a predisposition for splenic flexure volvulus is strongest in patients with absence of gastrocolic, phrenocolic, and splenocolic ligaments, occurring congenitally or operatively. Adhesive bands from previous surgery, chronic constipation, and pseudo-obstruction have all been implicated. As with other forms of colonic volvulus, a distal obstruction, either from mass or colonic dysmotility, predisposes to splenic flexure twisting. Splenic flexure volvulus is suggested as more likely to reduce spontaneously, explaining its lower incidence, lower mortality, and higher relative success rates with nonoperative intervention in the acute setting.

**SIGMOID VOLVULUS**

von Rokitansky is credited with the first report of sigmoid volvulus in the West. Sigmoid volvulus is defined by the axis of bowel rotation, either mesenteroaxial or organoaxial. Interestingly, the existence of an organoaxial form is disputed based on data stating that torsion during sigmoid volvulus relates only to mesenteroaxial rotation. In a small anatomic study, Bhattacharjee and colleagues illustrated seven patterns of sigmoid colon shape, the most common being a mesocolon that is vertically longer than wide (doliachomesocolic). The opposite, brachymesocolic, is a mesocolon wider than vertical length. Although men were more likely than women to have a doliachomesocolic sigmoid, no differences based on age were shown. Some authors argue that this anatomic predisposition is genetic, illustrated by endemic rates of sigmoid volvulus among certain ethnicities, such as Indians, Africans, and Turks. Others suggest the lack of pediatric cases and high

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**Table 1. Demographics of Colonic Volvulus in the United States**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cecal</th>
<th>Transverse</th>
<th>Splenic Flexure</th>
<th>Sigmoid</th>
<th>Ileosigmoid Knot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>M:F</td>
<td>F&gt;M</td>
<td>M:F</td>
<td>M&gt;F</td>
<td>M&gt;&gt;F</td>
</tr>
<tr>
<td>Age</td>
<td>5th–6th decade</td>
<td>2nd–3rd, 7th decades</td>
<td>5th–7th decades</td>
<td>7th–8th decades</td>
<td>4th–5th decades</td>
</tr>
<tr>
<td>Race</td>
<td>Black, Middle Eastern &gt; white</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Black, Middle Eastern &gt; white</td>
<td>Black, Middle Eastern &gt; white</td>
</tr>
</tbody>
</table>

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incidence within elderly and psychiatric patients as support for an acquired etiology of sigmoid volvulus. Ultimately, the question of genetic versus sporadic sigmoid volvulus remains unanswered.

As with cecal volvulus, pathogenesis of sigmoid volvulus begins with a freely mobile, frequently redundant colon and an elongated, narrow mesentery. The directionality of torsion can be counterclockwise or clockwise, with the majority of patients experiencing counterclockwise rotation. Increasing degrees of colonic rotation produce physiologic (<180°), obstructive (>180°), and strangulating (>360°) volvulus. As rotation increases, venous outflow decreases, leading to bowel edema and eventual vascular insufficiency as arterial inflow becomes limited. Factors for the development of sigmoid volvulus include anatomic predisposition combined with sources of colonic distention, creating a torsion effect. Excessive distention may result from several factors, including rapid fecal loading after fasting (the Islamic holiday of Ramadan, postwar, postharvest), adhesions from previous surgery, pregnancy, and chronic constipation. Several sources of chronic constipation include customs of holding stooling for long periods of time, medication or narcotic use, decreased activity level, and increased age. Recent work implicates colonic distention as the inciting event leading to torsion, especially at the antimesenteric border, where this portion of colon gains more length than the mesenteric side during distention. Subsequent peristalsis forces a predisposed colon to further twist, leading to varying degrees of volvulus. Despite a proposed understanding of how sigmoid volvulus may occur, a definite precipitating event or series is currently unknown.

Sigmoid volvulus is the most common form of colonic volvulus. In endemic parts of the world, upwards of 50% of intestinal obstructions are related to sigmoid volvulus. However, sigmoid volvulus is responsible for less than 5% of all intestinal obstructions in the United States. Nonetheless, these figures do not necessarily represent a significant difference in the incidence of sigmoid volvulus between these parts of the world. In fact, recent evaluation of sigmoid volvulus in the United States reported an incidence of 1.67 per 100,000 person-years, almost identical to an endemic African cohort. Not surprisingly, sigmoid volvulus is associated with the elderly population (mean age 68, peak incidence in the eighth decade) in the United States versus a predominance in young males in more endemic parts of the world. Several studies demonstrate a strong male predominance due to higher rates of dolicomesocolia and factors such as stooling patterns. "Theories for lower female incidence include more accommodating abdominal musculature and a wider pelvis, allowing for a distended sigmoid to spontaneously reduce." The pathogenesis of ileosigmoid knot is multifactorial, with dietary intake reported to be the most important. As with all forms of volvulus, congenital or surgical manipulation of mesentery produces a hypermobile small bowel and a largely redundant sigmoid colon with a narrow mesentery. When anatomic factors are present in a patient population known for prolonged fasting followed by rapid intake of high fiber and liquid, ileosigmoid knotting is more likely to occur. In Uganda and Afghanistan, the Bagan-dans and Mohammedans eat an entire day’s worth of food and liquid at a single sitting. During Ramadan, the incidence of ileosigmoid knot increases 10-fold in Mohammedans, further supporting the role of diet and dietary habits in the development of this disease process. The prevailing theory states that rapid movement of a high-bulk meal forces previously empty small bowel loops (from fasting) into a clockwise rotation around a redundant sigmoid mesentery. Peristalsis of the small bowel then forces the bowel to progressively wrap, creating a knot. The end result is formation of double closed-loop obstructions that require emergent surgical intervention.

Ileosigmoid knot causing bowel obstruction is so exceedingly rare in the United States that one report described only two known cases. As such, our understanding comes from countries at highest risk, including Finland, Uganda, and Turkey. Males account for more than 80% of patients. In a review of 280 cases, patients ranged in age from 4 to 90 years, with a mean age of 40 [see Table 1]. The reported mortality for ileosigmoid knot spans 0 to 48%, with a mean of 35.5%. Higher mortality is attributed to the fact that 80% of patients have gangrenous bowel at laparotomy. Aside from dietary practice, predisposing factors may include embryologic herniation at the ligament of Treves, whereby the incidence of volvulus approaches 17% as bowel herniates upwards. Adhesive disease from previous surgical intervention, fibrous omphalomesenteric duct, or Meckel diverticulum may create a fulcrum by which volvulus occurs. Patients with an ileosigmoid knot must be monitored for future development of sigmoid volvulus if the colon is not resected during the initial operative intervention. These patients often harbor a narrow-based sigmoid colon mesentery, which predisposes them to both ileosigmoid knot and sigmoid volvulus. Knowledge of predisposing anatomic and dietary factors aids the surgeon in quickly diagnosing this rapidly fatal condition.
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Figure 1  Types of ileosigmoid knot. (a) The most common is type I, whereby the ileum actively wraps itself around the sigmoid mesentery in either a clockwise or counterclockwise direction; it occurs in 48.5% of patients. (b) Type II, whereby the sigmoid colon wraps around the ileum in a clockwise or counterclockwise direction, occurs in 13.2% of patients. Less commonly, the surgeon is unable to define how the knot occurred (type IV or undetermined) (not pictured); rarely, the ileocecum actively wraps around the sigmoid mesentery (type III) (c).

Clinical Evaluation

HISTORY

Accounting for 10 to 15% of all colonic obstructions, colonic volvulus follows malignancy and diverticulitis as the third most common cause of colonic obstruction in the United States. This represents 9,000 to 15,000 surgical admissions annually at a cost of $69 to 115 million. In several parts of the "volvulus belt," indirect and direct costs are considered much higher due to the impact on lost production and use of limited overall health care resources. As such, it is incumbent on the clinician to reduce morbidity through prompt decision making and diagnosis. The pathophysiology of colonic volvulus results in colonic obstruction, varying degrees of ischemia from obstruction of venous outflow and arterial inflow, and a clinical history consistent with the diagnosis. Admittedly, these symptoms create a
The diagnosis of colonic volvulus results from a detailed history supplemented by appropriate diagnostic imaging. Lindner and Marcus showed an appropriate history combined with specific radiographic findings allowed for preoperative diagnosis.34 Most volvulus patients will present with acute onset of crampy, colicky abdominal pain.1,2,3,45 The duration of pain preceding the presentation of cecal volvulus is often shorter (24 to 48 hours) than in patients with sigmoid volvulus (3 to 4 days).12,86 In a study of sigmoid volvulus, only 17% of patients sought medical care in less than 24 hours because of worsening abdominal pain and distention.75 Early emesis in the presentation of sigmoid volvulus may occur as a vagal response to a fulminating volvulus and portends a worsened prognosis. In contrast, delayed emesis indicates a recurrent or subacute form and relates to distal bowel obstruction. Patients with an ileosigmoid knot complain of nausea and emesis 87 to 100% of the time.75 This history helps distinguish forms of colonic obstruction from that of small bowel. If emesis is present, feculent or foul-smelling vomitus may indicate protracted disease. Careful description of a patient’s diet may give clues to the underlying etiology. Patients with a history of prolonged fasting followed by ingestion of a coarse, high-fiber diet may be presenting with either a sigmoid volvulus or ileosigmoid knot. The onset and amount of abdominal distention reported by the patients are also helpful. Less distention suggests a more acute form versus patients reporting worsening of long-standing abdominal distention in the face of repeated bouts of abdominal pain. Less commonly, the patient reports a questionable “mass” along with a previous history of distention and pain.

A thorough bowel history should be elicited, including recent passage of flatus or stools, although their absence does not exclude the diagnosis of volvulus. A history of diarrhea or constipation, and its relation to onset of symptoms, is important in light of chronic constipation as a potential risk factor [see Table 3]. Patients may comment on chronic use of laxatives or enemas, which further suggests chronic constipation as an etiology. Reports of melena or hematochezia with abdominal pain may suggest ischemia from fulminant volvulus.

The past medical history should focus on bowel dysmotility from chronic constipation, psychiatric disorders (parkinsonism, organic brain syndrome, dementia, multiple sclerosis, and paralysis), or narcotic use. The remote or recent surgical history suggests a possible adhesive source or narcotic-associated bowel dysfunction. Late pregnancy is a known risk factor and will likely be readily apparent on patient presentation. Chilaiditi syndrome involves the transposition of transverse colon between the diaphragm and liver and has been suggested as a possible risk factor for the development of transverse colon volvulus.89–91 The pertinent surgical history includes all previous abdominal operations, especially those involving surgical correction of previous malrotation or surgery requiring previous colonic mobilization [see Table 3].

### PHYSICAL EXAMINATION

The physical examination involves quick assessment of acuity with immediate evaluation of vital signs and determination of instability. Eisenstat and colleagues described acute fulminating and subacute progressive forms of transverse colon volvulus, with acute fulminating volvulus demonstrating a higher mortality due to rapid clinical deterioration.34,36,46 Volvulus of the sigmoid may produce fulminant, indolent, or recurrent subtypes, with acuity highest for fulminant disease presentation.34 Similarly, upwards of 60% of ileosigmoid knot patients present in acute shock.75

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**Table 2** Differential Diagnosis of Colonic Volvulus

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal rectal mass</td>
</tr>
<tr>
<td>Diverticular or ischemic stricture</td>
</tr>
<tr>
<td>Infectious colitis with associated megacolon</td>
</tr>
<tr>
<td>Colonic pseudo-obstruction (Ogilvie syndrome)</td>
</tr>
<tr>
<td>Mesenteric ischemia</td>
</tr>
<tr>
<td>Diverticulitis</td>
</tr>
<tr>
<td>Acute or chronic pancreatitis</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
</tr>
<tr>
<td>Distal bowel obstruction from hernia</td>
</tr>
<tr>
<td>Distal bowel obstruction from adhesive disease</td>
</tr>
<tr>
<td>Adynamic ileus</td>
</tr>
<tr>
<td>Hirschsprung disease</td>
</tr>
<tr>
<td>Giant colonic diverticulum</td>
</tr>
<tr>
<td>Colonic duplication with obstruction</td>
</tr>
<tr>
<td>Congenital malrotation with obstruction</td>
</tr>
</tbody>
</table>

**Table 3** Risk Factors for Colonic Volvulus

<table>
<thead>
<tr>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital risk factors</td>
</tr>
<tr>
<td>Thin, narrow mesentery</td>
</tr>
<tr>
<td>Lack of congenital colonic attachments to peritoneal surface</td>
</tr>
<tr>
<td>Colonic dysmotility</td>
</tr>
<tr>
<td>Hirschsprung disease</td>
</tr>
<tr>
<td>Diseases associated with chronic constipation (i.e., parkinsonism, cerebral palsy)</td>
</tr>
<tr>
<td>Congenital malrotation</td>
</tr>
<tr>
<td>Acquired risk factors</td>
</tr>
<tr>
<td>Intra-abdominal adhesions from previous surgery</td>
</tr>
<tr>
<td>Adynamic ileus or colonic dysmotility induced by surgery or medications</td>
</tr>
<tr>
<td>High-fiber and -liquid diet</td>
</tr>
<tr>
<td>Previous colonic mobilization</td>
</tr>
<tr>
<td>Distal bowel obstruction</td>
</tr>
<tr>
<td>Pregnancy</td>
</tr>
</tbody>
</table>

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After an initial evaluation for hemodynamic instability, focus shifts to the abdominal examination, whereby the patient is usually diffusely tender but without rebound. Rebound tenderness suggests peritonitis from free perforation due to ischemia and bowel gangrene. Abdominal distention may be worse on the physical examination compared with other obstructive etiologies as a larger, more distensible colon fills the abdominal cavity. Additionally, the chronicity of volvulus symptoms may contribute to a significantly distended abdomen. Rarely will the surgeon see improvement in distention with placement of a nasogastric tube. A midabdominal mass may suggest a sigmoid volvulus, whereas a right upper quadrant mass and a left upper quadrant mass suggest a transverse or cecal volvulus, respectively. An empty left iliac fossa is considered pathognomonic for sigmoid volvulus in the setting of abdominal pain and distention; however, it occurs in fewer than 35% of patients. The surgeon should expect a tympanitic abdomen to percussion. Auscultation may reveal high-pitched sounds early in the course, later replaced by quiet bowel due to ischemia. A rectal examination at the time of evaluation should rule out a distal mass or other cause of distal large bowel obstruction. The remainder of the physical examination, including the heart and lung examination, should be completed in a timely fashion based on patient status.

**Investigative Studies**

**Blood Tests**

Blood work for suspected bowel obstruction, large or small, does not aid in the differentiation of underlying pathology. Instead, laboratory values aid the clinician in determining acuity. An elevated or severely depressed white blood cell count suggests an inflammatory process and possible sepsis. Elevated hemoglobin or hematocrit suggests hemoconcentration and volume depletion in the setting of vomiting. Electrolyte abnormalities such as hypokalemic hypochloremic metabolic alkalisosis may occur from repeated emesis. Metabolic acidosis may be determined using an electrolyte panel, lactate level, or arterial/venous blood gas. Some studies suggest coagulopathy as an independent risk factor for poor outcomes, so determination of the international normalized ratio (INR) and partial thromboplastin time (PTT) is appropriate. Please search the publication for further discussion of acid-base disorders and water-sodium balance.

**Imaging Studies**

**Plain film radiograph**

Currently available imaging techniques are vastly superior to those from even a decade ago, let alone the early 1900s [see Table 4]. However, abdominal radiographs and water-soluble studies remain valuable in the early diagnosis of colonic volvulus. Plain radiographs of the abdomen are expedient and low cost and produce minimal radiation exposure to the patient (i.e., pregnancy). However, in a large review of 568 cecal volvulus cases spanning 30 years, 46% of plain films suggested cecal volvulus, but only 17% were read as “definitive.” Additionally, 30% were misread as small bowel obstruction. In 1948, McGaw and colleagues suggested that the following findings are necessary for diagnostic certainty in a single plain film of the abdomen: (1) dilated cecum in an abnormal position (90% in the left upper quadrant), (2) loops of distended small bowel with gas proximal to the cecum, (3) ileocecal valve on the right of the distended viscus, (4) spiral distortion of mucous membrane folds at the site of twisting, and (5) a single fluid level in the upright colon [see Figure 2]. Other reports suggest dilation of the large bowel with a twist pointing to the left upper quadrant, absence of gas and intestinal contents within the distal colon, cecal shadow out of position, and serial studies over a few hours demonstrating enlargement of a distended large bowel loop as diagnostic. Findings on plain film for transverse colon and splenic flexure volvulus are generally unhelpful but may show proximal colonic dilatation, distal decompression, a “bent inner tube,” and two high-fluid levels on upright abdominal film [see Figure 3]. Sigmoid volvulus is visualized as the classic “coffee bean sign” in fewer than 60% of patients, but plain films are historically diagnostic in 57 to 90% of patients. Other findings, such as absence of rectal gas, sigmoidal wall

<table>
<thead>
<tr>
<th>Type</th>
<th>Plain Film</th>
<th>Water-Soluble Enema</th>
<th>CT Scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cecal</td>
<td>Distended bowel with long axis from RLQ to LUQ</td>
<td>Nondilated bowel distal to twist; bird’s beak appearance</td>
<td>“Whirl sign” of cecum and ileocolic mesentry</td>
</tr>
<tr>
<td>Transverse</td>
<td>Distended proximal bowel, decompressed distal bowel, “bent inner tube”; double-obstruction sign</td>
<td>Nondilated bowel distal to twist; bird’s beak appearance at region of transverse colon</td>
<td>“Whirl sign” of transverse and associated mesentery, double obstruction</td>
</tr>
<tr>
<td>Splenic flexure</td>
<td>Distended proximal bowel, decompressed distal bowel, “bent inner tube”; double-obstruction sign</td>
<td>Nondilated bowel distal to twist; bird’s beak appearance at region of spleen</td>
<td>“Whirl sign” of transverse and associated mesentery, double obstruction, mobilized spleen</td>
</tr>
<tr>
<td>Sigmoid</td>
<td>“Coffee bean sign”; dilated pelvic colon loop toward RUQ with ends pointed to pelvis</td>
<td>Nondilated bowel distal to twist; bird’s beak appearance at pelvic brim</td>
<td>“Whirl sign” of sigmoid and mesentry</td>
</tr>
<tr>
<td>Ileosigmoid knot</td>
<td>Dilated pelvic colon loop, stool in nondistended right colon, signs of small bowel obstruction</td>
<td>Nondilated bowel distal to twist; bird’s beak appearance at pelvic brim</td>
<td>“Whirl sign” of ileocolic and sigmoid mesentry, medial deviation of ascending and descending colon</td>
</tr>
</tbody>
</table>

CT = computed tomography; LUQ = left upper quadrant; RLQ = right lower quadrant; RUQ = right upper quadrant.
radiographs demonstrate colonic distention, usually consistent with sigmoid volvulus, which confuses the clinician who is expecting a small bowel obstruction based on the clinical presentation.75,77,81 Abdominal radiographs will demonstrate colonic distention, the “omega” sign of sigmoid volvulus with apex pointing toward the right upper quadrant, stool in the proximal colon, and air-fluid levels within the small bowel suggesting obstruction.77,79,81,100–102 Medial thickening, pneumatosis, proximal colonic distention, and apex of sigmoid loop under the left hemidiaphragm, may suggest sigmoid volvulus [see Figure 2].39 When properly interpreted, a plain abdominal radiograph can be a high-yield diagnostic study in the patient with bowel obstruction.

Preoperative diagnosis of an ileosigmoid knot occurs in less than 30% of cases, although recent diagnostic improvements are attributed to cross-sectional imaging. Abdominal radiographs demonstrate colonic distention, usually consistent with sigmoid volvulus, which confuses the clinician who is expecting a small bowel obstruction based on the clinical presentation.75,77,81 Abdominal radiographs will demonstrate colonic distention, the “omega” sign of sigmoid volvulus with apex pointing toward the right upper quadrant, stool in the proximal colon, and air-fluid levels within the small bowel suggesting obstruction.77,79,81,100–102 Medial thickening, pneumatosis, proximal colonic distention, and apex of sigmoid loop under the left hemidiaphragm, may suggest sigmoid volvulus [see Figure 2].39 When properly interpreted, a plain abdominal radiograph can be a high-yield diagnostic study in the patient with bowel obstruction.

**Figure 2** Plain film radiographs of cecal and sigmoid volvulus. *(a)* Cecal volvulus with *arrows* indicating colonic wall pointing toward the right lower quadrant. *(b)* Sigmoid volvulus with *arrows* indicating colonic wall pointing toward the pelvis.

**Figure 3** Plain film radiographs of transverse and splenic flexure volvulus. *(a)* Transverse colon volvulus with proximally dilated and distally decompressed bowel as indicated. Staples and clips are present from recent intra-abdominal surgery. *(b)* Severely dilated colon at the splenic flexure with a paucity of distal colon gas and a normal proximal transverse colon bowel gas pattern. *Arrows* indicate colonic wall. *Circle* indicates point of volvulus.
deviation of the distal descending colon is considered highly specific for the diagnosis.\textsuperscript{102}

**Contrast enema studies** Although computed tomography (CT) is surely becoming the test of choice when encountered with a query of intra-abdominal pathology, a contrast enema should remain in the consulting surgeon’s diagnostic repertoire. Diagnosis is confirmed in upwards of 90\% of patients, despite being ordered in fewer than 50\% of patients who ultimately come to surgical intervention for cecal volvulus.\textsuperscript{33} Cone-shaped obstruction with spiral mucosal folds seen on study suggests and confirms the diagnosis, along with demonstration of a “bird’s beak” at the site of volvulus [see Figure 4].\textsuperscript{34,42,45,50,92,95,97} For patients with incomplete or spontaneously reducing volvulus, the contrast study may demonstrate spiral bands of linear density and increased radiance.\textsuperscript{45} In recurrent sigmoid volvulus, a “twisted tape” sign representing twisting of mucosal folds visualized after evacuation of rectal contrast may aid the diagnosis [see Figure 5].\textsuperscript{103} Water-soluble and barium enemas are unhelpful in an ileosigmoid knot as the clinician is lulled into treating a sigmoid volvulus, with a subsequent delay in definitive

![Figure 4](https://example.com/figure4.png)

**Figure 4** Contrast enema of cecal, transverse, and splenic flexure volvulus. Classic finding of “bird’s beak” with abrupt cutoff at the point of volvulus. The distance of the contrast column indicates the location of volvulus, including (a) cecum, (b) transverse colon, and (c) splenic flexure.
invagination from surrounding pericolic fat and is present in half of all cecal volvulus scans. Other descriptions in the literature, including dilation of small bowel and prominence of cecal haustra, are considered poor discriminators of cecal volvulus. However, a finding of decompressed distal colon in the face of dilated cecum and ascending colon is both sensitive and specific for the diagnosis of volvulus. If cross-sectional imaging reveals an abnormal splenic flexure in the appropriate clinical setting, splenic flexure volvulus should be considered. With sigmoid volvulus, the most sensitive findings include a single sigmoid colon transition point (95%) and disproportionate enlargement of the sigmoid colon (86%). When combined with scout film findings, cross-sectional imaging is superior for the diagnosis of colonic volvulus.

Along with volvulus location, a CT scan may delineate secondary findings, including distal mass or bowel ischemia. Unfortunately, findings such as bowel wall thickening, fat stranding, and even pneumatosis correlate very poorly with pathologic ischemia. Other concerns attributed to CT scans are misdiagnosis. Cross-sectional imaging of an ileosigmoid knot will demonstrate a whirl sign of both terminal ileal and sigmoid mesenteries, along with medialization of the right colon [see Figure 9]. Unfortunately, this diagnosis is overlooked as evaluation focuses on the sigmoid mesenteric “whirl” and misses the small bowel twisting around the mesentery. Additional findings suggestive of ileosigmoid knot include the convergence of superior and inferior mesenteric vasculature toward the sigmoid colon, a finding surgeons must seek.

**Computed tomography** The use of CT for evaluation of abdominal pain in the United States has skyrocketed. In a review of national imaging trends, Kocher and colleagues demonstrated a 330% increase in cross-sectional imaging performed from 1996 to 2007. Additionally, many patients are undergoing imaging prior to surgical evaluation. The University of Minnesota evaluated the ability of cross-sectional imaging to aid in the diagnosis of cecal volvulus versus other imaging modalities and found it to be far superior. Cross-sectional imaging confirms the diagnosis in almost 90% of cases, without the need for a radiologist or technician to complete the fluoroscopic procedure [see Figure 6]. For sigmoid volvulus, CT or MRI accuracy approaches 100% [see Figure 7]. With imaging studies likely available at the time of consultation, surgeon knowledge of salient findings is important and allows for timely diagnosis and management. The “whirl sign,” with a sensitivity of 100%, a positive predictive value of 100%, and a negative predictive value of 80%, demonstrates a directional swirling of the mesentery, indicative of cecal versus sigmoid volvulus [see Figure 8]. Another sign, demonstrating two transition points and a characteristic crossing, represents an “X marks-the-spot” finding. Unfortunately, this sign is not present in all cases of volvulus. The “split-wall sign” resembles plain radiograph findings of bowel wall

**Figure 5** Contrast enema of sigmoid volvulus. Sigmoid volvulus indicated by (a) “bird’s beak” sign and (b) “tape sign” after evacuation of contrast. Arrows point to “tape sign.”
**Treatment**

**Nonoperative Therapy**

Most reports demonstrate observational mortality of nearly 100% in acutely ill or septic volvulus patients, with spontaneous reduction occurring in fewer than 2% of patients. Radiographic reduction with water-soluble or barium enema is not advocated as a management strategy for most forms of colonic volvulus. Although effective almost 90% of the time in diagnosis, enema for therapeutic reduction is successful in less than 5% of adult patients. Additionally, watchful waiting of colonic volvulus is strongly discouraged [see Table 5].

Since initial attempts in the 1970s, the endoscopic reduction of cecal volvulus remains successful in less than 30% of cases, with a procedural perforation risk of 1 to 3%. Success is equally bleak in the management of transverse...
Gastro colonic volvulus — 12

Colon endoscopic decompression because it often proves technically difficult compared with reduction of splenic flexure or sigmoid volvulus. Following decompression, the patient remains at high risk for recurrence. Rectal tube placement, due to distance from the anal canal in cecal and proximal colon volvulus, does little to prevent recurrence or provide patient relief. When attempting endoscopic reduction of proximal colon volvulus, it is recommended to set a time limit less than 30 minutes. The authors also suggested the use of CO\textsubscript{2} colonoscopy rather than the more traditional air insufflation endoscopy during attempted decompression because carbon dioxide is readily absorbed from the colon, allowing the colon to desufflate more rapidly than when filled with air.

In contrast, urgent endoscopic decompression of sigmoid volvulus is considered first-line therapy in patients without signs of peritonitis or shock. Successful decompression occurs 90\% of the time, with rigid and flexible modalities being equally effective. Care is required to limit air insufflation, which may worsen the patient’s condition. Overt ischemic signs mandate surgical intervention. Despite newer technologies, recurrence rates for sigmoid volvulus reduction preclude this as definitive management.

For high-risk patients managed with endoscopic decompression, initiation of a bowel regimen, including fiber supplementation, stool softeners, and suppositories, is suggested. In cases of successful sigmoid volvulus reduction, surgical management is currently recommended within 2 to 5 days after decompression.

Successful percutaneous placement of tube sigmoidostomy was first described in the 1990s. More recently, larger cohort studies demonstrated successful decompression in more than 75\% of sigmoid volvulus patients. Regrettably, mortality was near 4\%, the abdominal sepsis rate was 9\%, and the minor complication rate approached 30\%. The benefits of this minimally invasive procedure included evaluation of colonic mucosa to determine vascular insufficiency, direct visualization of tube entry to prevent inadvertent injury, and minimal sedative use in high-risk patients. The keys to success include successful decompression and clearance of stool, followed by placement of two to three percutaneous tubes such that a fulcrum for volvulus is not created. Additionally, T-fasteners are described for fixation instead of percutaneous tubes.

Operative therapy

Colonic volvulus, whether acute or chronic, is a surgical disease requiring prompt management. Strong predictors of perioperative mortality include age over 60 years or coagulopathy at presentation. Worsening outcomes are expected in patients with peritonitis, ischemic bowel, creation of ostomy, cancer, chronic kidney disease, congestive heart failure, associated weight loss, chronic

**Figure 7** Cross-sectional abdominal imaging of sigmoid volvulus. The “whirl sign” is present in most studies of (a, b) sigmoid volvulus. Circles indicate “whirl sign.”
obstructive pulmonary disease, or an acute electrolyte imbalance. A myriad of options are available to the surgeon for definitive management, each with benefits and risks that must be tailored to the individual patient.

**Simple Detorsion**

Operative management of colonic volvulus has evolved over the last 100 years. Historically, surgery involved exploratory laparotomy and simple detorsion of involved bowel. Mortality for simple detorsion of colonic volvulus ranges from 0 to 25%, with a reported recurrence of 0 to 70%. Although it is technically simple to perform, Wilson recommended against this procedure in 1965, stating that "... [it is] inappropriate to simply detorse and leave alone as [the] patient [is] at high risk for recurrence." Others agreed and suggested the addition of colopexy following detorsion to prevent recurrence.

**Colopexy**

Early attempts at cecopexy involved suturing the cecum to the anterior abdominal wall. Unfortunately, this created a fulcrum around which small bowel could herniate or an overly floppy right colon could torse. Later modification involved pexy of the colon to psoas fascia for a significant length instead of the anterior or posterior parietal peritoneum. Dixon and Meyer described raising a flap of peritoneum and sewing it to mesentery, which was reported to significantly decrease recurrence. Another enhancement by Rogers and Harford involved raising a peritoneal flap, roughing up the mesentery, and suturing the flap to the antimesenteric taenia. Most recently, two studies reported laparoscopy to be an effective approach for cecopexy in mobile cecal syndrome, despite less than 10% of all cases being managed in this fashion. Unfortunately, all methods of cecopexy suffer from inadequate long-term follow-up.

*Figure 8* Cross-sectional abdominal imaging of transverse colon volvulus. Volvulus of the transverse colon is rare. Computed tomographic findings of volvulus can be subtle, requiring evaluation of the colon itself to indicate a tapered point in conjunction with a mesenteric swirl. Circles indicate volvulus of transverse mesocolon mesentery.
Published rates of recurrence are between 0 and 40%, with an operative mortality of 0 to 30%. Mortensen and Hoffman described a parallel colopexy for transverse colon volvulus. Following detorsion and needle desufflation, the proximal and distal transverse colon were sutured to a fixed ascending and a descending colon, respectively. More recently, fixation of the transverse colon was described using omentum at both splenic and hepatic flexures. Long-term recurrence data are unavailable; however, neither maneuver is recommended in patients with a mobile cecum. Open and laparoscopic sigmoidopexy are described, along with minimally invasive forms of sigmoidopexy using T-fasteners. High rates of recurrence nearing 70% outweigh the benefits of low procedural mortality. Exteriorization, plication, and mesosigmoidoplasty are described but suffer from small sample sizes and selection bias regarding comparison against the gold standard of sigmoidal resection. As such, these methods are secondary options in high-risk patients unable to undergo definitive resection with or without stoma creation. Please search the publication to review preoperative evaluation of the elderly surgical patient and evaluations of surgical risk, including cardiac and pulmonary risk assessment.

**Tube Colostomy**

For patients considered too sick to undergo detorsion and colopexy, cecostomy or appendicostomy tube placement was once considered appropriate first-line treatment. Despite published recurrence rates similar to those of simple detorsion and cecopexy, these procedures suffer from significantly higher rates of mortality, wound infection, persistent fistula, and intra-abdominal sepsis due to persistent necrosis of remaining bowel. In patients in whom cecostomy is performed, it is important to maximize tube management to prevent failure. This involves flushing with increasingly higher amounts of fluid and clamping and unclamping the tube at regular 2- to 4-hour intervals. Similar to colopexy, tube colostomy is indicated only in high-risk patients with sigmoid volvulus unable to undergo definitive resection with or without colostomy creation.

**Resection with or without Primary Anastomosis**

Surgical resection with primary anastomosis is now considered standard of care for colonic volvulus. Through the 1990s, surgical mentors advocated detorsion and cecopexy in the presence of unprepared bowel as safest for patients. However, Melchior, one of the initial proponents of surgical resection, reported complications in six patients treated with colonic resection as similar to those undergoing colopexy alone. As many patients previously treated with detorsion later underwent colonic resection for recurrence, surgeons opted for definitive treatment at the initial presentation. If gangrene or ischemic changes were present at the initial observation, resection was mandated as the mortality for this patient population ranged from 33 to 41.4% versus 14.5 to 19% in patients without gangrenous bowel [see Figure 12]. Recent data support this approach, with lower rates of complications such as wound infection,

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**Table 5: Nonoperative Management of Sigmoid Volvulus**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Success Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid proctoscopy with or without rectal tube</td>
<td>70–90</td>
</tr>
<tr>
<td>Flexible sigmoidoscopy with or without rectal tube</td>
<td>70–90</td>
</tr>
<tr>
<td>Percutaneous decompression of volvulus followed by endoscopic evaluation</td>
<td>70–75</td>
</tr>
<tr>
<td>Blind insertion of rectal tube</td>
<td>5–15</td>
</tr>
<tr>
<td>Water-soluble or barium enema</td>
<td>5</td>
</tr>
<tr>
<td>Direct observation</td>
<td>2</td>
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</tbody>
</table>

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Figure 9: Cross-sectional abdominal imaging of ileosigmoid knot. Although exceedingly rare in the United States, ileosigmoid knot presents with dual swirling patterns involving both sigmoid mesentery volvulus (A circle) and ileocolic mesentery volvulus (B circle).
readmission rates, and rates of stoma formation compared with detorsion and colopexy (Ricciardi R, personal communication, 2014). Mortality historically ranges from 0 to 40%; however, since 1990, this has decreased to less than 10% (Ricciardi R, personal communication, 2014).22,24

For transverse colon volvulus, resection may include segmental colectomy, extended right hemicolectomy, or extended left hemicolectomy without significantly increased morbidity or mortality [see Figure 13].34,35,41 Laparoscopy for resection is used in less than 2% of cases, providing little opportunity for comparison of outcomes.24 Alternatives to primary anastomosis include resection with double-barrel colostomy or anastomosis with proximally diverting loop ileostomy. Proximal diversion alone as a treatment of transverse colon volvulus is ill advised due to the potential for a closed-loop obstruction in patients with a competent ileocecal valve.132

Definitive management of splenic flexure volvulus involves segmental resection with primary anastomosis similar to cecal and transverse colon volvulus.1,2,139,148 As most patients present with subacute disease, definitive resection and anastomosis in a controlled, unsoiled operative field are often possible. In patients with redundant transverse colon, extended resection with ileosigmoid colostomy is performed.

Figure 10  Endoscopic evaluation in sigmoid volvulus. Careful insertion of the endoscope with minimal insufflation is required to the (a) point of sigmoid volvulus. Once through, the proximal colon (b) will demonstrate significant distention. Here the endoscopist must fully evaluate the mucosa for signs of ischemia.

Figure 11  Use of an esophageal overtube for placement of a rectal tube. A semirigid, clear tube is inserted under endoscopic guidance to (a) and through (b) a sigmoid volvulus. This technique allows for easier passage of a semirigid rectal tube past the point of volvulus, reducing the concern for recurrent twisting of the bowel during tube placement.
In patients with sigmoid volvulus, options for resection are based on the clinical picture [see Figure 14]. Patients requiring emergent management due to sepsis or peritonitis are safely treated with Hartmann resection, although the surgeon should consider the extensive mortality and morbidity associated with colostomy formation and subsequent attempts at closure. Compared with primary resection and anastomosis (8 to 13%), mortality associated with colostomy creation is significantly higher (25 to 50%). These results may not be applicable to all populations due to differences in hospital resources, surgeon training, and postoperative care facilities. In addition, patients undergoing end-colostomy formation may be inherently sicker than those undergoing resection with anastomosis.

For patients initially reduced endoscopically or with enema, resection of the sigmoid colon is recommended within the first 2 to 5 days postreduction. This allows for reduction of associated edema without subjecting the patient to prolonged insertion of a rectal tube and a higher risk of recurrence. Although laparoscopy provides benefits in elective surgery, the emergent and semiurgent management of sigmoid volvulus limit its use. Often massive distention prevents sufficient visualization and ability to mobilize the colon unless the colon is successfully decompressed at the initiation of the procedure by colonoscopy. We again recommend the use of CO₂ colonoscopy rather than air insufflation because carbon dioxide is readily absorbed from the colon. Alternatively, mini-laparotomy through a lower midline or Pfannenstiel incision may be feasible, with reported outcomes comparable to that of laparoscopic resection.

In patients with a history of megacolon associated with sigmoid volvulus, over 22% will develop a late recurrence following sigmoid resection. This is in comparison with a recurrence rate of less than 1% in patients without megacolon or other colonic dysmotility undergoing similar resections. In patients with dysmotility or megacolon associated with sigmoid volvulus, one should consider total colectomy with ileorectal anastomosis as the recommended procedure.

To date, surgical resection with anastomosis remains the gold standard for the management of colonic volvulus in patients without significant contraindications to surgical intervention. The surgeon must ensure that adequate margins are obtained, especially when gangrenous bowel is present. If concerns exist regarding bowel compromise, the safest course of action is creation of either an ileostomy or a

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**Figure 12** Necrotic cecum in the operating suite. Necrotic or ischemic bowel mandates surgical resection, regardless of patient risk. Options include primary anastomosis, anastomosis with proximal diversion, or end ileostomy.

**Figure 13** Transverse colon volvulus in the operating suite. Although the bowel is viable (a), definitive management should include primary resection (b) with anastomosis. Depending on the site of volvulus, the surgeon may complete a right, extended right, or subtotal colectomy in these patients.
colostomy. To review the technique for segmental colectomy and ostomy creation, please search the publication for segmental colon resection.

Operative management of an ileosigmoid knot can be a challenge and is often determined by the degree of ischemia and difficulty in reducing the volvulus of both the ileum and the sigmoid colon. As discussed previously, nonoperative management is not recommended. On presentation and diagnosis, patients must be resuscitated with appropriate fluids and monitoring. Flexible sigmoidoscopy is often performed on patients presumed to have simple volvulus; however, imminent failure of reduction must suggest an ileosigmoid knot. Operative intervention involves initial determination of bowel viability as both small and large bowel are at risk for infarction. Some authors advocate immediate stapling of the small bowel at the point of ingress and egress, which may facilitate untying of the bowel. Increased speed, reduced risk of inadvertent enterotomy, and reduced risk of worsened sigmoid ischemia make this our procedure of choice. After excision of affected small bowel, sigmoidectomy is suggested to prevent recurrence and future sigmoid volvulus. Sound surgical principles will guide the creation of primary anastomosis of both the small and large bowel, with most patients able to safely avoid stoma creation. Although untying and detorsion with subsequent mesosigmoidostomy of viable sigmoid are described, we recommend resection as definitive management for this potentially fatal disease.

**Conclusion**

The diagnosis and management of colonic volvulus have evolved significantly since Hippocrates recommended the use of long suppositories. A thorough and expeditious history and physical examination will aid in the selection of further diagnostic imaging and potential operative intervention. The proposed algorithm can serve as a guide to efficient diagnosis and management of this challenging patient population.

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*Figure 14* Sigmoid volvulus in an elderly gentleman. Often chronic in nature, the abdominal examination may reveal (a) a significantly dilated abdominal wall. At the time of exploration (b), the margin of bowel ischemia dictates the extent of resection (c).
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Acknowledgments

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Figure 1 Christine Kenney