Colon Volvulus

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Colonic volvulus occurs when a portion of the large intestine becomes twisted around its mesentery, occluding the intestinal lumen and causing a bowel obstruction. If the colon twists 360° or more around the axis, the vascular supply may become obstructed leading to ischemia and perforation. Congenital conditions in children, such as malrotation or Hirschsprung's disease, can lead to colonic volvulus. More often, though, it is an acquired condition that occurs in adults and increases in frequency with older age.

Volvulus accounts for approximately 10–15% of large bowel obstructions in the United States, making it the third most common cause of large bowel obstructions in Americans [1]. Rates of volvulus are higher worldwide, particularly in a region termed the "volvulus belt" which includes South America, the Middle East, India, Africa, and Russia [2–4]. In these regions, volvulus accounts for as much as 50% of large bowel obstructions. The sigmoid colon is the site of torsion in approximately two thirds of patients. The remaining cases involve the cecum (15–30%), transverse colon (2–5%), or splenic flexure (1%) [5, 6].

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Etiology and Pathophysiology

Volvulus usually occurs in an elongated segment of colon connected to a long mesentery and a narrow mesenteric base. The long segment of colon is prone to twisting around its mesenteric pedicle, particularly if the base of the mesentery is narrow. This results in bowel obstruction, dilation, and ischemia and perforation if not promptly treated.

Conditions associated with elongation of the colon predispose a patient to sigmoid volvulus. The rate of sigmoid volvulus in the United States increases with advanced age, with the average patient being between 60 and 80 years old [6]. Chronic constipation, frequent laxative or enema use, and spinal cord injury are common risk factors. Men are more prone to sigmoid volvulus than women. This has been attributed through anatomic studies to the finding that the male sigmoid mesentery is longer than it is wide, while the reverse is true in women [7]. Psychiatric disease, and particularly disease treated with psychotropic medications, is also associated with higher rates of sigmoid volvulus [8]. This is likely due to the constipating effects of many psychotropic medications. Patients living in the "volvulus belt" who develop the condition, in contrast, are typically younger (40–50 years of age) and healthier than volvulus patients in the United States.

The term "cecal volvulus" may actually refer to one of several clinical entities. Despite the

name, cecal volvulus more frequently involves torsion of a mobile ascending colon distal to the ileocecal valve. However, there are occasional true cases of cecal volvulus where a mobile cecum and ascending colon twist around the colonic mesentery. Patients who develop cecal volvulus are younger; the typical cecal volvulus patient in the United States is 40–60 years old and is more often female. Cecal *bascule* is a similar but distinct clinical entity where the cecum folds anteriorly on itself, causing an obstruction. Cecal bascule occurs in patients with adhesive bands anterior to the cecum or ascending colon. These bands form a fixed point over which the cecum folding occurs. Cecal bascule may occur intermittently and then resolve, causing symptoms of intermittent obstruction.

Transverse colon and splenic flexure volvulus are rare clinical entities described largely in case reports. The transverse colon mesentery tends to be broad, short, and well fixated to the retroperitoneum, making the transverse colon an unlikely site for torsion. When transverse colon volvulus does occur, it is usually in the setting of underlying pathophysiology that causes lengthening of the mesentery (e.g., chronic constipation or neuropsychiatric disorders), lack of colonic fixation at the splenic or hepatic flexures, or congenital malrotation [9, 10]. Splenic flexure volvulus is even less common. It occurs in patients who lack retroperitoneal fixation of the splenic flexure or who have undergone surgery with transection of these points of fixation [11, 12].

Sigmoid Volvulus

Presentation

Symptoms of volvulus occur along a spectrum ranging from intermittent or chronic dysmotility to frank perforation. Patients with sigmoid volvulus often describe a long history of constipation and symptoms of acute or subacute bowel obstruction. A careful history and physical exam can help suggest a colonic obstruction, but imaging studies are typically necessary to precisely localize the site and etiology of the patient's
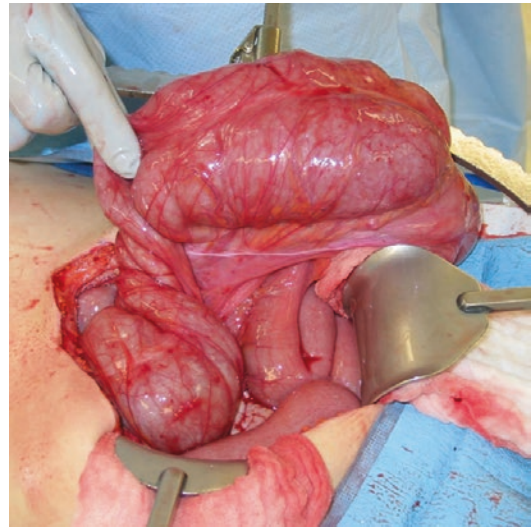

Fig. 28.1 Dilated sigmoid colon with visible twisting secondary to sigmoid volvulus

symptoms. As the colon torses, its lumen occludes and the colon distends (Fig. 28.1). Venous drainage is obstructed much earlier than the arterial inflow, and as a result, patients may not present with the sudden onset of acute abdominal pain that is seen with mesenteric ischemia. Instead, they often report slow-onset cramping abdominal pain that worsens, becomes constant, and is accompanied by progressive distention. Obstipation is common. Because the sigmoid colon can spontaneously detorse, patients may report symptoms that were relieved by an explosive episode of large volume diarrhea, only to later recur. Vomiting is often absent or is a late finding due to the distal location of the obstruction. When present, it typically occurs after several days of symptoms and is feculent.

On physical exam, patients who have been symptomatic for several days are distended, tympanic, and have diffuse, mild tenderness throughout the abdomen. With late presentations, arterial occlusion and transmural pressure on the colon wall secondary to intraluminal distention produce tissue ischemia. Symptoms in this setting range from focal to diffuse peritonitis. Hemodynamic abnormalities, severe pain, or rebound tenderness should alert the clinician to the possibility of intestinal ischemia. If untreated, these patients can progress to frank tissue necrosis, perforation, and sepsis.

Diagnosis

Radiographic studies are invaluable in diagnosing sigmoid volvulus. An upright or left lateral decubitus X-ray is obtained to look for free air beneath the diaphragm, which suggests perforation and mandates the need for urgent exploration. The classic finding on abdominal X-ray in sigmoid volvulus is the "bent inner tube sign." The twisted sigmoid colon becomes dilated, with its apex pointing toward the right upper quadrant and the twisted segment of colon in the left lower quadrant. Gas is typically absent from the rectum, and an air-fluid level may be present in the colon. Plain abdominal radiograph is sufficient to diagnose sigmoid volvulus in nearly 2/3 of patients [13].

In the past, contrast enema was performed when the plain X-ray was nondiagnostic. It shows the pathognomonic "bird's beak" narrowing of the colon at the distal obstruction site, with contrast enema present distal to the obstruction and absent in the proximal colon. Contrast enema should only be performed in patients without signs of perforation. Today, a CT scan is most often obtained if the plain abdominal X-ray fails to elucidate a diagnosis. CT has nearly 100% accuracy for diagnosis of sigmoid volvulus and is therefore of great utility [14]. Classic CT scan findings include a closed-loop colonic obstruction and a mesenteric "whirl" where the colonic vasculature becomes twisted around the mesenteric axis (Fig. 28.2).
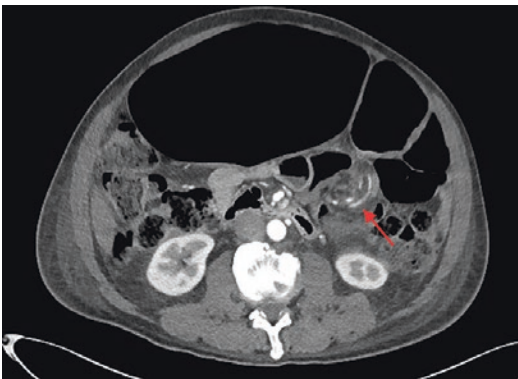

Fig. 28.2 62-year-old man with sigmoid volvulus. CT scan demonstrates dilated sigmoid colon and mesenteric "whirl sign" (arrow)

Management

Management of sigmoid volvulus has two aims: to relieve the obstruction and to prevent recurrence. Endoscopic detorsion was first described in 1947 by Bruusgaard [15] and continues to be the initial treatment for sigmoid volvulus today. In the stable patient, endoscopic decompression relieves the obstruction and allows definitive surgery to be performed electively once the patient has been resuscitated and medically optimized. Endoscopy is only appropriate in patients without signs of perforation or colonic ischemia; patients with these signs should undergo urgent operative exploration. Endoscopic detorsion can be performed with a rigid or flexible sigmoidoscope or colonoscope. Detorsion with a rigid sigmoidoscope was classically performed with the patient positioned on their hands and knees. However, this can be difficult for patients, particularly the elderly or those with significant abdominal pain. Instead, flexible sigmoidoscopy is performed with the patient in the left lateral decubitus position. The mucosa is examined for signs of bowel ischemia such as ulceration or necrosis. If these are encountered, the procedure is aborted and the patient prepared for surgery. If the colon mucosa appears healthy, the endoscope is gently advanced until a rush of air and feces (often quite dramatic) occurs as the colon detorses. A rectal tube is advanced past the site of torsion to prevent recurrent volvulus and to facilitate decompression of the proximal bowel. An abdominal radiograph is obtained to confirm successful detorsion. If the procedure is unsuccessful, the patient is taken to the operating room.

Endoscopic decompression is successful in 80% of patients, but without surgical treatment, approximately 70% will have a recurrence. Aggressive resuscitation and optimization are crucial to operative success. In the elderly patient population with multiple medical comorbidities, careful attention is paid to cardiopulmonary status, renal function, and fluid balance. The patient should undergo formal bowel preparation and complete colonoscopy in order to identify any neoplasms at the site of torsion or in the proximal colon. There is ongoing debate about whether

bowel preparation is necessary in patients who have had a recent colonoscopy (and thus do not require bowel preparation for this purpose). Bowel preparation has been the standard for elective colon resection, but recent data suggests that it may be unnecessary and may adversely impact outcomes. In addition, studies have demonstrated that patients with penetrating colon trauma can undergo resection and primary anastomosis without increased infection rates. Thus, it is likely safe to omit bowel preparation in patients who do not require it for preoperative colonoscopy.

In the past, patients with sigmoid volvulus were sometimes treated with pexy of the sigmoid colon to the pelvic sidewall, which was thought to decrease the risk of recurrent volvulus. This operation takes less time than colon resection and was thus attractive in fragile patients with medical comorbidities. Unfortunately, the recurrence rate with sigmoidopexy is unacceptably high (up to 50%), and thus we do not recommend this procedure.

If endoscopic detorsion is unsuccessful or there is concern for colon necrosis, the involved colon should be resected without detorsion to avoid releasing inflammatory mediators from the necrotic bowel into the circulation. To minimize spillage in patients who did not undergo bowel preparation, an intestinal clamp is placed on the proximal colon. The proximal and distal resection sites are identified. The mesentery in the specimen is divided prior to colon resection using either the clamp-and-tie technique or the LigaSure. The colon is then divided and passed off the field. If there is no concern for colonic ischemia on preoperative endoscopy, the colon can be detorsed prior to resection.

Colostomy Versus Primary Anastomosis

If the volvulus is successfully detorsed and an elective operation performed, primary colon anastomosis is appropriate provided the patient is hemodynamically stable, is well nourished, and does not have signs of colon necrosis. A temporary protective ileostomy can decrease the complications associated with anastomotic leak. Primary anastomosis is sometimes performed in patients who require surgery in the acute setting,

but we feel that these patients should all have a protective diverting ostomy. Sigmoid resection with end colostomy (Hartmann's procedure) is used in patients who are hemodynamically unstable or show systemic signs of sepsis. Hartmann's procedure is generally also indicated in patients who have necrotic colon at the time of surgery and are nutritionally depleted or immunosuppressed or those who have fecal incontinence at baseline.

Laparoscopic management of sigmoid volvulus has been successfully performed in recent years, and research demonstrates that the laparoscopic approach is safe [16]. However because there is limited intraperitoneal working space in patients with a hugely dilated colon, we recommend open surgery when the colon cannot be detorsed preoperatively. In patients who undergo endoscopic decompression and bowel preparation, the same resection options exist by the laparoscopic approach as for the open. Advantages to laparoscopic surgery are that it is better tolerated in patients with severe pulmonary disease and may convey a lower risk of wound complications in those at high risk of infection or dehiscence. The experience and skill of the surgeon is of paramount importance when deciding whether to attempt laparoscopic management.

Cecal Volvulus

Presentation

As discussed above, patients with cecal volvulus are typically younger and more often female than patients with sigmoid volvulus. In cecal volvulus, the ascending colon and cecum are mobile and have minimal attachments to the retroperitoneum. This mobility allows the ascending colon and cecum to rotate around the mesenteric axis, causing a true volvulus, or allows the cecum to fold up anteriorly on itself, causing a cecal bascule.

Cecal volvulus and bascule are difficult to diagnose because the symptoms are often nonspecific. Patients with a true cecal volvulus may describe sudden right-sided abdominal pain, dis-

tention, and tenderness to palpation. The symptoms of a cecal volvulus are more acute than those of a sigmoid volvulus, so these patients may seek medical attention earlier. Patients with cecal bascule often present with intermittent obstructive symptoms as the bascule folds and unfolds upon itself. This can make the clinical diagnosis of cecal bascule challenging. Ischemia or perforation should be suspected in patients who present with localized or general peritonitis.

Diagnosis

Radiographic studies are helpful in the diagnosis of cecal volvulus and bascule. However, up to 15% of cecal volvulus are only diagnosed at laparotomy [17]. An upright or left lateral decubitus X-ray is obtained to evaluate for free air below the diaphragm. In cecal volvulus the classic finding on abdominal X-ray is an air-filled, ahaustral cecum that extends from the right lower quadrant to the mid-abdomen or left upper quadrant. CT scan is useful when the diagnosis is unclear from plain X-rays. CT scan shows a dilated ileum and cecum with abrupt cutoff in the right lower quadrant. A "whirl sign" may be visible as the cecum, ascending colon, and mesentery swirl around the vascular pedicle [18].

In cecal bascule, the mobile distal portion of the cecum folds cephalad and anteriorly, causing an intermittent obstruction of the colon lumen. It can be difficult to appreciate a cecal bascule on X-ray, and abdominal CT scan will only reveal the process if performed while the cecum is obstructed.

Management

Colonoscopic decompression is rarely successful in cecal volvulus. As a result, surgery is the treatment of choice. Right hemicolectomy with primary ileocolic anastomosis is effective and has low morbidity and mortality, making it ideal in all patients who are able to tolerate the operation. Hemicolectomy is preferred to ileocectomy

because in many cases the volvulized segment involves the ascending colon. The recurrence rate after right hemicolectomy with primary anastomosis is less than 10% [19]. In a true cecal bascule, ileocectomy and primary anastomosis are appropriate if the ascending colon is appropriately fixed to the retroperitoneum. Detorsion and cecopexy or cecostomy were used in the past for frail patients who could not tolerate a long operation. Approximately 1/3 of these patients will have a recurrence, though, so these procedures are not recommended.

Colon resection with primary anastomosis is appropriate in many cases of emergent cecal volvulus. Even in patients with cecal perforation or gangrene, primary anastomosis is preferred because it has lower rates of anastomotic leak (0–9%) and mortality (0–23%) than resection with diversion [19, 20]. Hemodynamically unstable patients, however, should undergo resection and end ileostomy in order to decrease operative time. As with sigmoid volvulus, a necrotic cecum should not be detorsed prior to resection in order to avoid reperfusion injury and worsening acidosis. Instead, the proximal and distal points of resection are identified, bowel clamps are applied, and the mesentery is transected. The colon and ileum are transected last, and the specimen is passed directly off the field to avoid spillage. Creation of an end ileostomy should also be considered in patients at high risk of anastomotic leak, including those who use steroids or suffer from severe malnutrition.

Transverse Colon and Splenic Flexure Volvulus

Volvulus of the transverse colon or splenic flexure is rare, representing less than 5% of volvulus cases. When these conditions do occur, the presentation depends on the acuity with which the volvulus develops. Acute, complete volvulus leads to sudden onset of severe abdominal pain, nausea, vomiting, and abdominal distention. More chronic or incomplete volvulus presents with intermittent obstructive symptoms and abdominal pain. CT scan is diagnostic, demon-

strating a volvulized loop of colon with a mesenteric "whirl." The treatment for volvulus of the transverse colon or splenic flexure is resection of the involved segment. Primary anastomosis is performed in the clinically stable patient without signs of sepsis; unstable patients should undergo colostomy placement and mucous fistula or creation of a long Hartmann's pouch.

Summary

Colonic volvulus accounts for one in every ten cases of colonic obstruction in the United States. Chronic constipation and conditions that worsen constipation are the most common risk factor. Sigmoid volvulus is treated with colonic decompression followed by resection, while cecal volvulus and transverse colon volvulus are treated with resection. Management decisions, including whether or not to perform a primary anastomosis or colostomy, are based on the anatomic location of the volvulus, hemodynamic stability of the patient, and viability of the involved colon.

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