Cecal volvulus

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INTRODUCTION

A cecal volvulus is the rotation or torsion of a mobile cecum and ascending colon, which causes approximately 1 to 3 percent of all large bowel obstructions [1-3]. If untreated, cecal volvulus can progress to bowel ischemia, necrosis, or perforation [4-8].

The clinical manifestations, diagnosis, and management of cecal volvulus are discussed here. Other causes of large bowel obstruction are discussed elsewhere. (See "Large bowel obstruction" and "Sigmoid volvulus".)

EPIDEMIOLOGY

Although volvulus can occur at other sites of the alimentary tract, including the stomach, gallbladder, and small bowel, it most commonly occurs in the colon [9]. The cecum (10 to 52 percent) and sigmoid colon (43 to 71 percent) are the two most common sites of colonic volvulus [7,10-14]. Types of gastrointestinal volvuli other than cecal volvulus, such as sigmoid volvulus or gastric volvulus, are discussed in detail elsewhere. (See "Sigmoid volvulus" and "Gastric volvulus in adults".)

In an epidemiologic study, 63,749 cases of colonic obstruction were admitted in the United States from 2002 to 2010 [14]. The incidence of cecal volvulus increased by 5.53 percent per year, whereas the incidence of sigmoid volvulus remained stable. Sigmoid volvulus was more

common in older adult males >70 years old, African Americans, and patients with diabetes and neuropsychiatric disorders; cecal volvulus was more prevalent in younger females [14].

In other studies, the incidence of cecal volvulus ranged from 2.8 to 7.1 per million people per year [4,6].

PATHOPHYSIOLOGY

There are three types of cecal volvulus (figure 1) [4-8]:

- Type 1 – An axial cecal volvulus develops from clockwise axial torsion or twisting of the cecum along its long axis; the volvulized cecum remains in the right lower quadrant.
- Type II – A loop cecal volvulus develops from a torsion or twisting of the cecum and a portion of the terminal ileum, resulting in the cecum being relocated to an ectopic location (typically left upper quadrant) in an inverted orientation. Most, but not all, type II cecal volvuli have a counterclockwise twist [7].
- Type III – Cecal bascule involves the upward folding of the cecum rather than an axial twisting.

Torsion-type cecal volvuli (type I and II) are more common, accounting for approximately 80 percent of all cecal volvuli [7]. Cecal bascules (type III) account for the remaining 20 percent.

All three types of cecal volvuli require a mobile cecum and ascending colon, which could be congenital or acquired.

- Congenital mobile cecum is hypothesized to result from failed fusion of the ascending colon mesentery to the posterior parietal peritoneum [15]. Based upon autopsy studies, approximately 10 to 25 percent of the population have a cecum and ascending colon with sufficient mobility to develop a volvulus [16]. A congenital mobile cecum can also cause mobile cecum syndrome [17]. (See 'Differential diagnosis' below.)
- Acquired anatomic abnormalities, such as adhesions from abdominal surgery, can also contribute to the development of a cecal volvulus. Other clinical settings that have been associated with cecal volvulus include pregnancy [18], colonic atony, colonoscopy [19], and Hirschsprung's disease [20].

CLINICAL MANIFESTATIONS

Patient presentation — The clinical presentation is highly variable, ranging from insidious, intermittent episodes of abdominal pain to an acute abdominal catastrophe [2,4,11,21-23]. Most patients present with a gradual onset of steady abdominal pain accompanied by episodic cramping pain due to peristalsis. Besides abdominal pain, patients also present with nausea, vomiting, and obstipation [11]. The duration of symptoms can vary from hours to days [24].

The elements of a comprehensive history in a patient with acute abdominal pain are discussed separately. (See "Evaluation of the adult with abdominal pain" and "Evaluation of the adult with nontraumatic abdominal or flank pain in the emergency department", section on 'History'.)

Physical examination — The findings on physical examination are also variable. Patients who have bowel ischemia or perforation could have fever or hypotension, while others may have normal vital signs. (See "Overview of gastrointestinal tract perforation".)

The abdomen is generally diffusely distended and tympanitic. However, in some patients, the abdomen can be asymmetrically distended with tympany only in the midabdomen or in the right or left upper quadrant. Rebound tenderness can be elicited in patients who have peritonitis or ischemic bowel.

The approach to performing a physical examination in patients with acute abdominal pain is discussed separately. (See "Evaluation of the adult with nontraumatic abdominal or flank pain in the emergency department", section on 'Physical examination'.)

Laboratory studies — Laboratory studies are not diagnostic of cecal volvulus. However, a significant leukocytosis or metabolic acidosis may indicate the presence of bowel compromise (ischemia, necrosis, or perforation). Hypokalemia and other electrolyte abnormalities may develop after protracted vomiting associated with a bowel obstruction. (See "Evaluation of the adult with nontraumatic abdominal or flank pain in the emergency department", section on 'Ancillary studies'.)

DIAGNOSIS

Cecal volvulus should be suspected in patients who present with obstructive symptoms such as abdominal pain, nausea, and vomiting and a physical examination that reveals a distended and tympanitic abdomen. Abdominopelvic computed tomography (CT) is diagnostic of cecal volvulus in 90 percent of patients. The remaining 10 percent of cecal volvuli are diagnosed at the time of surgical exploration [7,22,23,25].

Diagnostic evaluation — The diagnostic evaluation starts with an upright abdominal plain film to identify an obstruction or pneumoperitoneum. In patients who have a pneumoperitoneum on plain film, which is indicative of bowel perforation, no further imaging is necessary. Such patients should be prepared for immediate surgery. (See 'Upright abdominal plain films' below.)

In patients who are diagnosed with a large bowel obstruction on plain film, an abdominopelvic CT scan should be performed to locate the level of obstruction and assess for bowel compromise. The "whirl sign" on a CT scan confirms the diagnosis of cecal volvulus in most patients [7,9,10,25,26]. (See 'CT scan' below.)

A contrast enema study can be performed if the CT scan is nondiagnostic [9,10]. Contrast (barium or water soluble [eg, Gastrografin]) should be instilled gently (eg, by gravity) to avoid colonic perforation and is contraindicated in the presence of necrotic bowel or pneumoperitoneum [9,10,27]. (See 'Contrast studies' below.)

Surgical exploration via laparoscopy or laparotomy should be performed when imaging studies fail to establish a diagnosis in a patient with worsening obstructive symptoms or an abdominal catastrophe (eg, perforation).

The diagnostic approach to a patient with acute abdominal pain is discussed separately. (See "Evaluation of the adult with abdominal pain" and "Evaluation of the adult with nontraumatic abdominal or flank pain in the emergency department".)

DIFFERENTIAL DIAGNOSIS

- Sigmoid volvulus – Sigmoid volvulus is the axial torsion of the sigmoid colon, which often leads to bowel obstruction and ischemia. Cecal and sigmoid volvuli can be distinguished by imaging studies; they also occur in different patient groups. Patients with a cecal volvulus are typically young, with a mean age of 33 years in India and 53 years in Western countries [27,28]. In contrast, patients with sigmoid volvulus are older, with a mean age of 70 years [14]. Patients with sigmoid volvulus often have chronic constipation or distal colon obstruction and are more likely to be institutionalized for neurologic or psychiatric conditions such as Parkinson's disease and schizophrenia. (See "Sigmoid volvulus".)

- Mobile cecum syndrome – Mobile cecum syndrome occurs when the cecum and ascending colon lack a posterior peritoneal attachment [17]. Patients typically present with intermittent right lower-quadrant abdominal pain and abdominal distention that is relieved with passage of flatus or stool.

- Transverse colon volvulus and splenic flexure volvulus – Transverse colon or splenic flexure volvulus can occur in patients who have a mobile transverse colon or splenic flexure as a result of a congenital or acquired loss of colonic attachments. However, transverse colon or splenic flexures rarely become volvulized and together account for fewer than 5 percent of all colonic volvuli [11].

- Ileosigmoid knotting – Ileosigmoid knotting is a rare condition in which the distal ileum wraps itself around the base of the sigmoid colon, resulting in a closed-loop colonic obstruction. It is more frequently diagnosed in patients residing in Asia, Africa, and the Middle East than in the United States.

- Gastric volvulus – Gastric volvulus is rare and caused by rotation of the stomach along its long or short axis, leading to variable degrees of gastric outlet obstruction. Patients with gastric volvulus may present acutely or chronically, typically with symptoms such as abdominal or chest pain, nausea, and vomiting. (See "Gastric volvulus in adults".)

- Distal small bowel obstruction – A patient with a distal small bowel obstruction can present with abdominal pain, nausea, vomiting, and abdominal distention. Plain abdominal films reveal distended loops of small bowel with a paucity of air in the colon. (See "Etiologies, clinical manifestations, and diagnosis of mechanical small bowel obstruction in adults".)

- Ischemic bowel – Mesenteric ischemia, either acute or chronic, is caused by a reduction in intestinal blood flow and can result in bowel infarction and sepsis. (See "Overview of intestinal ischemia in adults" and "Chronic mesenteric ischemia" and "Nonocclusive mesenteric ischemia".)

- Cecal diverticulitis – Cecal diverticulitis usually occurs in young adults and presents with signs and symptoms of a right lower quadrant inflammatory process with right-sided abdominal pain, nausea, and vomiting, as well as fever and leukocytosis. (See "Clinical manifestations and diagnosis of acute colonic diverticulitis in adults" and "Acute colonic diverticulitis: Medical management", section on 'Right-sided (cecal) diverticulitis'.)

- Appendicitis – Acute appendicitis typically begins with midabdominal pain that later shifts to the right lower quadrant and can be associated with nausea and vomiting. The symptoms of appendicitis vary depending upon the location of the tip of the appendix. Fever and leukocytosis can be observed as the severity of the appendicitis progresses. (See "Acute appendicitis in adults: Clinical manifestations and differential diagnosis".)

IMAGING STUDIES

Upright abdominal plain films — A plain upright abdominal film reveals the classic "comma"- or "coffee bean"-shaped cecum with an air-fluid level in approximately 25 percent of patients with cecal volvulus (image 1) [25]. The dilated cecum is typically displaced medially and superiorly, although it can be displaced anywhere in the abdomen (image 2) [9]. In addition, the small bowel is distended with air-fluid levels while the colon distal to the cecum is decompressed [2,10]. Findings in patients with cecal bascule are similar except for a more central position for the dilated cecum (image 3).

However, findings by abdominal plain film are not specific for cecal volvulus. Patients with suggestive findings on abdominal plain films should undergo abdominopelvic computed tomography (CT) to establish the diagnosis. In a retrospective review of 568 patients with cecal volvulus, abdominal plain film was suggestive in 46 percent but was only diagnostic in 17 percent of patients [27]. (See 'Diagnostic evaluation' above and 'CT scan' below.)

Free air identified under the diaphragm on upright abdominal plain films is indicative of a bowel perforation and mandates immediate surgery without further imaging.

CT scan — In patients with axial torsion of the cecum (type I or II), a CT finding of the "whirl sign" (twisting of the mesentery around the ileocolic vessels) is pathognomonic for cecal volvulus (image 4) [7,9,10,25,26]. In addition, CT scan may also demonstrate signs of bowel obstruction (a massively dilated cecum with associated small bowel dilation) (image 5) or signs of colonic or small bowel ischemia (mural thickening or mesenteric edema) [9]. In patients with a cecal bascule (type III), CT scan shows the cecum folding upward, resulting in obstruction without the axial twist of the mesentery (image 6).

Contrast studies — A single-contrast (barium or water-soluble) enema demonstrates a tapered or "bird's-beak" narrowing in the right colon, confirming a cecal volvulus (image 7). In cecal bascule, the termination of contrast is rounded as a result of the transversely folded cecum [9,10,29]. In the same retrospective review mentioned above, barium enema was diagnostic in 88 percent of patients with cecal volvulus [27].

MANAGEMENT

The management for patients with a cecal volvulus is primarily surgical [30]. Nonoperative reduction of cecal volvulus (eg, by colonoscopy or barium enema) is rarely successful (<5 percent) and could cause perforation; it therefore should **not** be attempted [31]. In addition, colonic necrosis may be missed in 20 to 25 percent of patients who undergo nonoperative reduction, and such patients may develop colonic perforation [2,14,32-34]. Surgical approaches

to cecal volvulus vary depending upon intraoperative findings and patient stability (algorithm 1).

Patients without bowel compromise — At the time of surgery, patients without bowel compromise should first have the volvulus detorsed. In hemodynamically stable patients, detorsion is typically followed by an ileocecal resection or a right colectomy. In unstable patients, a cecopexy (suturing the cecum to the abdominal side wall) with or without a cecostomy tube placement can be performed in lieu of a resectional procedure.

Stable patients without bowel compromise — In hemodynamically stable patients, either a right colectomy or an ileocolic resection should be performed as detorsion alone is associated with a failure rate ranging from 13 to 75 percent [35]. A right colectomy, which removes the cecum and entire ascending colon, is indicated when the entire ascending colon is mobile. The recurrence rate of cecal volvulus after right colectomy is essentially zero; however, the mortality rate after resection ranges from <5 to 18 percent [12,22,23,27].

An ileocolic resection, which removes the cecum but leaves a remnant of ascending colon, can be performed when only the cecum is unattached to the posterior parietal peritoneum. In patients who have an ileocolic resection, a colopexy (suturing) of the right colon remnant to the posterior peritoneum can be added and may reduce the risk of recurrent volvulus. In a small study of 10 consecutive patients, there was no recurrence after ileocolic resection with colopexy [36].

Unstable patients without bowel compromise — In hemodynamically unstable or debilitated patients, cecopexy can be performed alone or in conjunction with a cecostomy tube placement and/or appendectomy after detorsion [2,3,10,27,32,36,37].

Cecopexy fosters adhesion formation, which reduces the mobility of the cecum [37,38]. The recurrence rates following cecopexy vary from 0 to 28 percent, and the mortality rates range from 0 to 14 percent [38].

A cecostomy tube can be inserted into the cecum and brought out through the abdominal side wall to decompress the right colon. However, it can cause complications such as intraperitoneal fecal contamination, surgical site infections, and colocutaneous fistula. Thus, cecostomy is no longer performed as the primary procedure, except in clinically unstable patients who cannot tolerate a resectional procedure but require decompression of the right colon [27]. The recurrence rates after cecostomy vary from 2 to 14 percent, and the mortality rates range from 0 to 33 percent [12,24,27,32].

Sometimes a tube cecostomy may be performed after appendectomy, using the appendiceal orifice as the site of tube insertion.

Patients with bowel compromise — At the time of surgery, patients who are found to have bowel compromise (ischemia, necrosis, or perforation) should **not** have their volvulus detorsed, to avoid reperfusion injury. Instead, they should undergo resection of the compromised bowel in its volvulized position followed by an ileocolonic anastomosis if the patient is hemodynamically stable or an end ileostomy if the patient is not stable.

Stable patients with bowel compromise — Surgical detorsion is not performed in patients with gangrenous or necrotic bowel, as reperfusion of the compromised bowel segment may promote bacteremia and sepsis. Instead, an ileocolic resection or a right colectomy is performed without prior detorsion [10,36]. The extent of resection depends upon the extent of bowel ischemia as well as the mobility of the ascending colon. A mobile ascending colon requires a right colectomy, while a mobile cecum only requires an ileocecal resection.

In hemodynamically stable patients, a primary ileocolonic anastomosis completes the operation. However, in patients who have extensive bowel necrosis or excessive inflammation and spillage of enteric contents, the ileocolonic anastomosis may be protected by a loop ileostomy to be reversed at a later time.

Unstable patients with bowel compromise — If the patient is hemodynamically unstable, an ileostomy rather than a primary ileocolic anastomosis should be performed after bowel resection. The ileostomy may be reversed at a later date once the patient is stabilized. The reported mortality rates for patients with gangrenous cecal volvulus range from 17 to 40 percent.

Open versus laparoscopic surgery — Any of the procedures mentioned above may be performed using an open or laparoscopic approach. The choice is determined by surgeon preference; the open approach is preferred by most surgeons in the setting of greatly distended bowel. In addition, the mobile right colon generally makes it easy to deliver the bowel through a small laparotomy incision.

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Bowel obstruction".)

SUMMARY AND RECOMMENDATIONS

- A cecal volvulus is the rotation or torsion of a mobile cecum and ascending colon, which can cause bowel obstruction. If untreated, cecal volvulus can progress to bowel ischemia, necrosis, or perforation. (See 'Introduction' above.)

- The majority of patients with cecal volvulus (80 percent) have axial rotation of the cecum and a portion of the terminal ileum, which causes twisting of the mesentery and blood vessels. In the remaining 20 percent of patients, the cecum and ascending colon fold in an anterior cephalad direction, which is known as a cecal bascule. (See 'Pathophysiology' above.)

- The clinical presentation of cecal volvulus is highly variable, ranging from insidious, intermittent episodes of abdominal pain to an acute abdominal catastrophe. The physical examination typically reveals a distended and tympanitic abdomen. (See 'Clinical manifestations' above.)

- Cecal volvulus should be suspected in patients who present with obstructive symptoms such as abdominal pain, nausea, and vomiting and a physical examination that reveals a distended and tympanitic abdomen. Cecal volvulus is diagnosed in 90 percent of patients by abdominopelvic computed tomography (CT) and in 10 percent of patients at the time of surgery. (See 'Diagnosis' above.)

- The diagnostic evaluation for cecal volvulus starts with an upright abdominal plain film. Patients who have a pneumoperitoneum on plain film require immediate surgery; others with evidence of bowel obstruction but no pneumoperitoneum should undergo an abdominopelvic CT scan. A contrast enema study is performed if CT is not diagnostic. Surgical exploration via laparoscopy or laparotomy is required when imaging studies fail to establish a diagnosis in patients with worsening obstructive symptoms or an abdominal catastrophe (eg, perforation). (See 'Diagnostic evaluation' above and 'Imaging studies' above.)

- For patients with cecal volvuli, we recommend surgery rather than nonoperative reduction (**Grade 1B**). Surgical approaches vary depending upon intraoperative findings and patient stability (algorithm 1):

  - Patients without bowel compromise should first have the volvulus detorsed. In hemodynamically stable patients, detorsion is typically followed by an ileocecal resection or a right colectomy. In hemodynamically unstable patients, a cecopexy with

or without a cecostomy tube placement and/or appendectomy can be performed in lieu of a resectional procedure. (See 'Patients without bowel compromise' above.)

- Patients who have evidence of bowel compromise (ischemia, necrosis, or perforation) should **not** have the volvulus detorsed. Instead, they should undergo resection of the compromised bowel (ileocecal resection or right colectomy) in its volvulized position, followed by a primary ileocolonic anastomosis if the patient is hemodynamically stable, or an end ileostomy if the patient is hemodynamically unstable. (See 'Patients with bowel compromise' above.)

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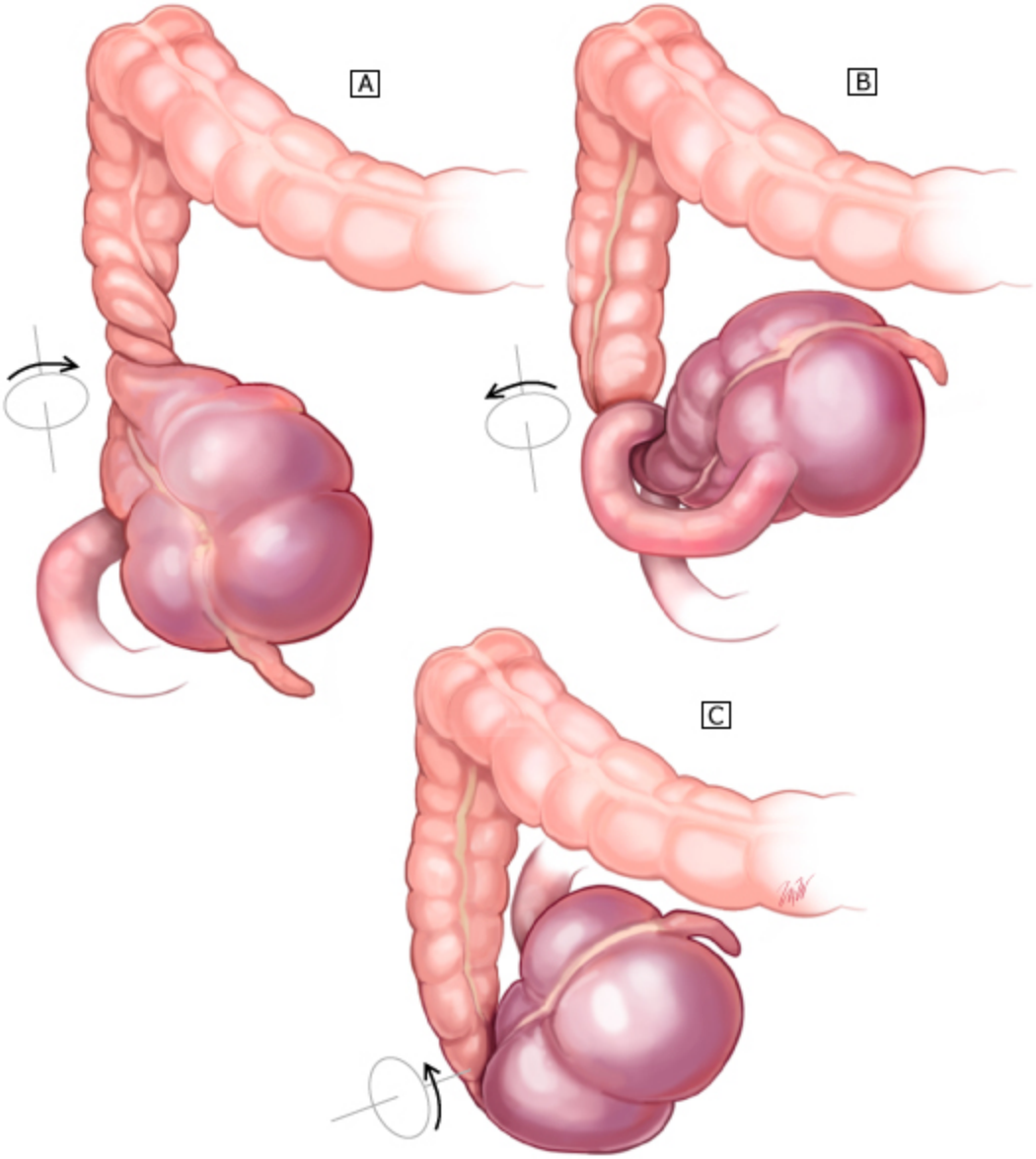
GRAPHICS

Types of cecal volvulus



A) Type I: Axial cecal volvulus

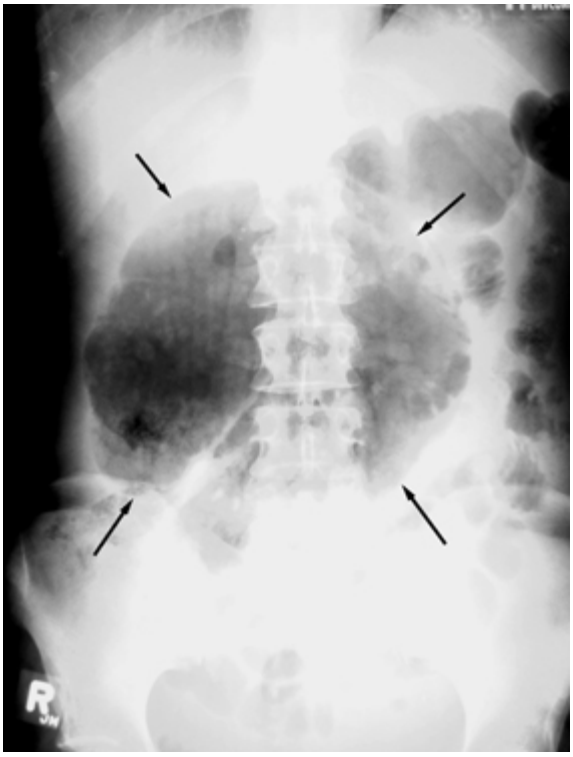
B) Type II: Loop cecal volvulus

C) Type III: Cecal bascule

Black arrow denotes direction of rotation.

Graphic 106353 Version 3.0

Cecal volvulus

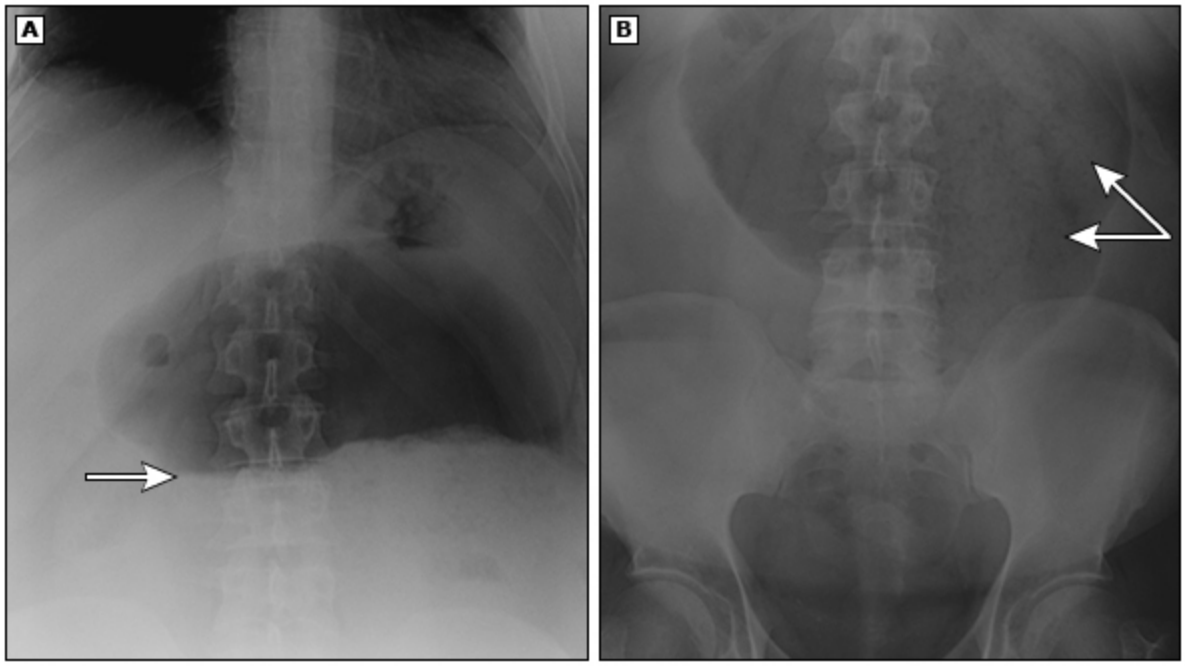


Plain abdominal radiograph of a 74-year-old man with severe abdominal pain and distension demonstrates a large air-filled cecum oriented transversely across the midabdomen (arrows) extending into the left upper quadrant. These features are consistent with a cecal volvulus. The subtle mural nodularity seen in the wall of the cecum suggests vascular compromise.

Courtesy of Jonathan Kruskal, MD, PhD.

Graphic 71577 Version 3.0

Cecal bascule - Abdominal films

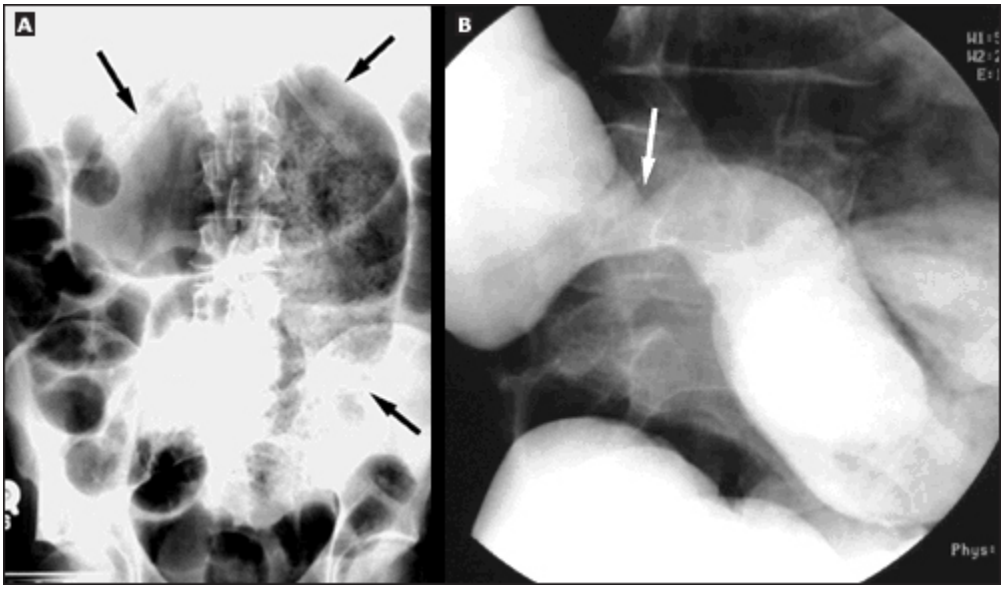


Plain radiograph in a 51-year-old male with generalized abdominal pain showing a distended cecum cranially displaced to the epigastrium. An air-fluid level is demonstrated in the cecum in the upright examination (A, arrow) while a moderate amount of stool is seen within the dilated cecum in the supine view (B, arrows).

Courtesy of Joseph Farnum, MD.

Graphic 87136 Version 2.0

Cecal bascule

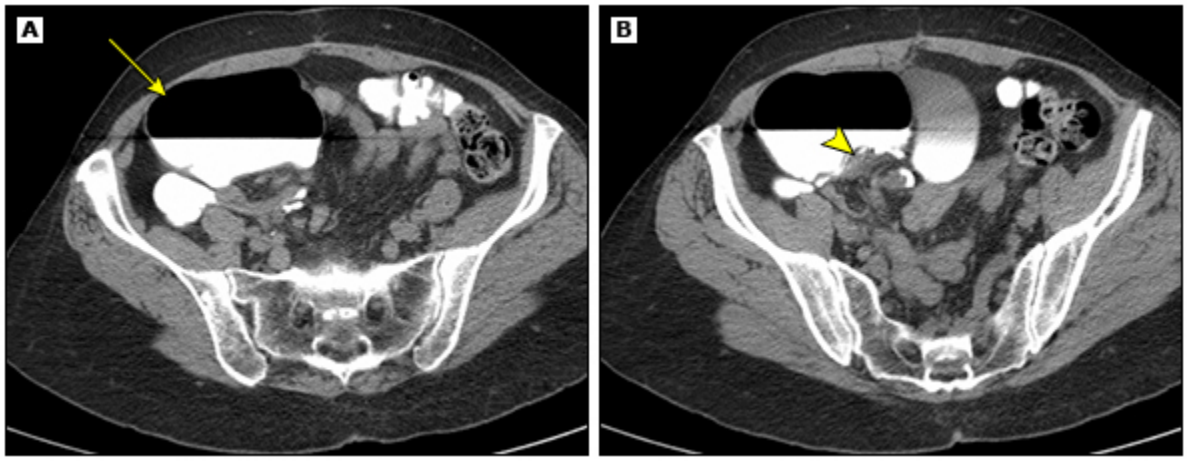


A plain film of the abdomen (left panel) demonstrates marked dilatation of a stool-filled cecal bascule (arrows). Following the administration of barium (right panel), the site of torsion is evident as marked narrowing of the lumen in the midascending colon (arrow). These features are consistent with a cecal bascule.

Courtesy of Jonathan B Kruskal, MD, PhD.

Graphic 80286 Version 3.0

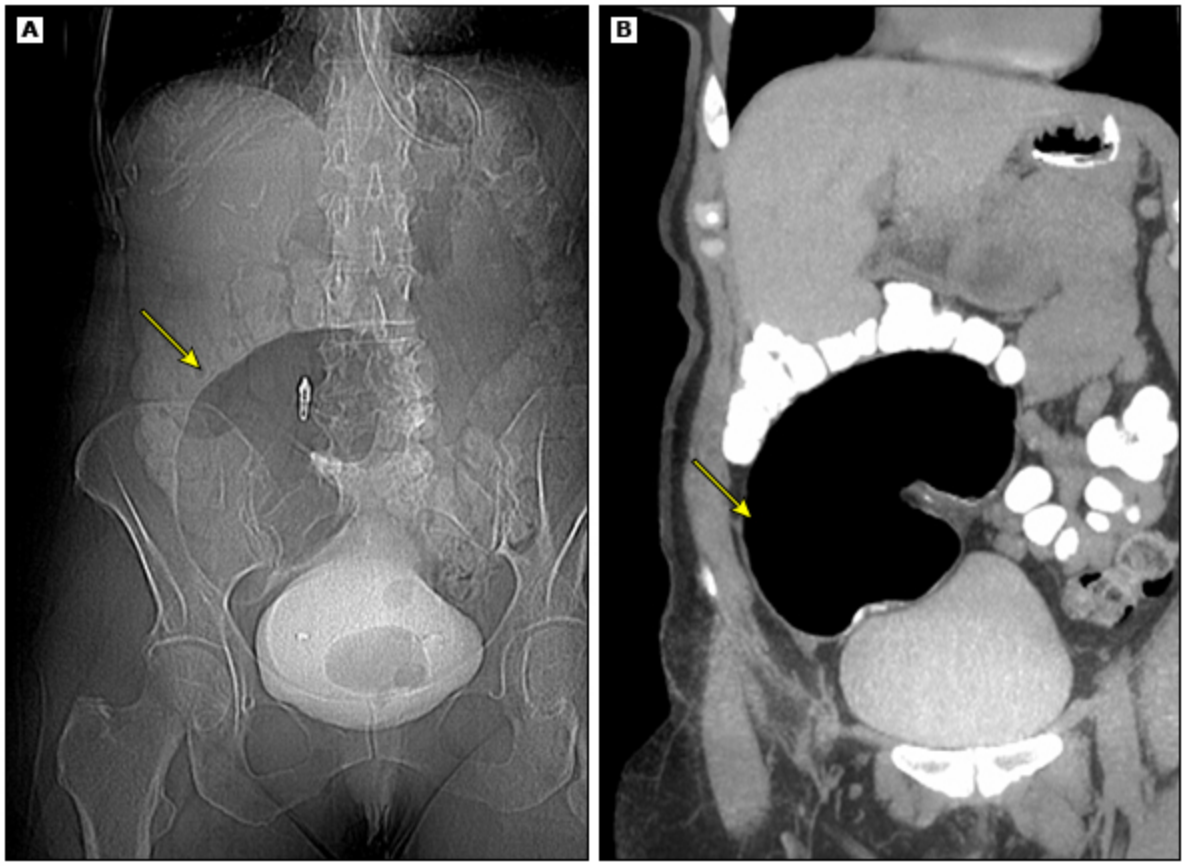
Computed tomography (CT) cecal volvulus



The axial CT scan (A) shows an air contrast level trapped in the dilated cecum (arrow). In image B, the counterclockwise "whirl sign" is evident (arrowhead).

Graphic 87766 Version 2.0

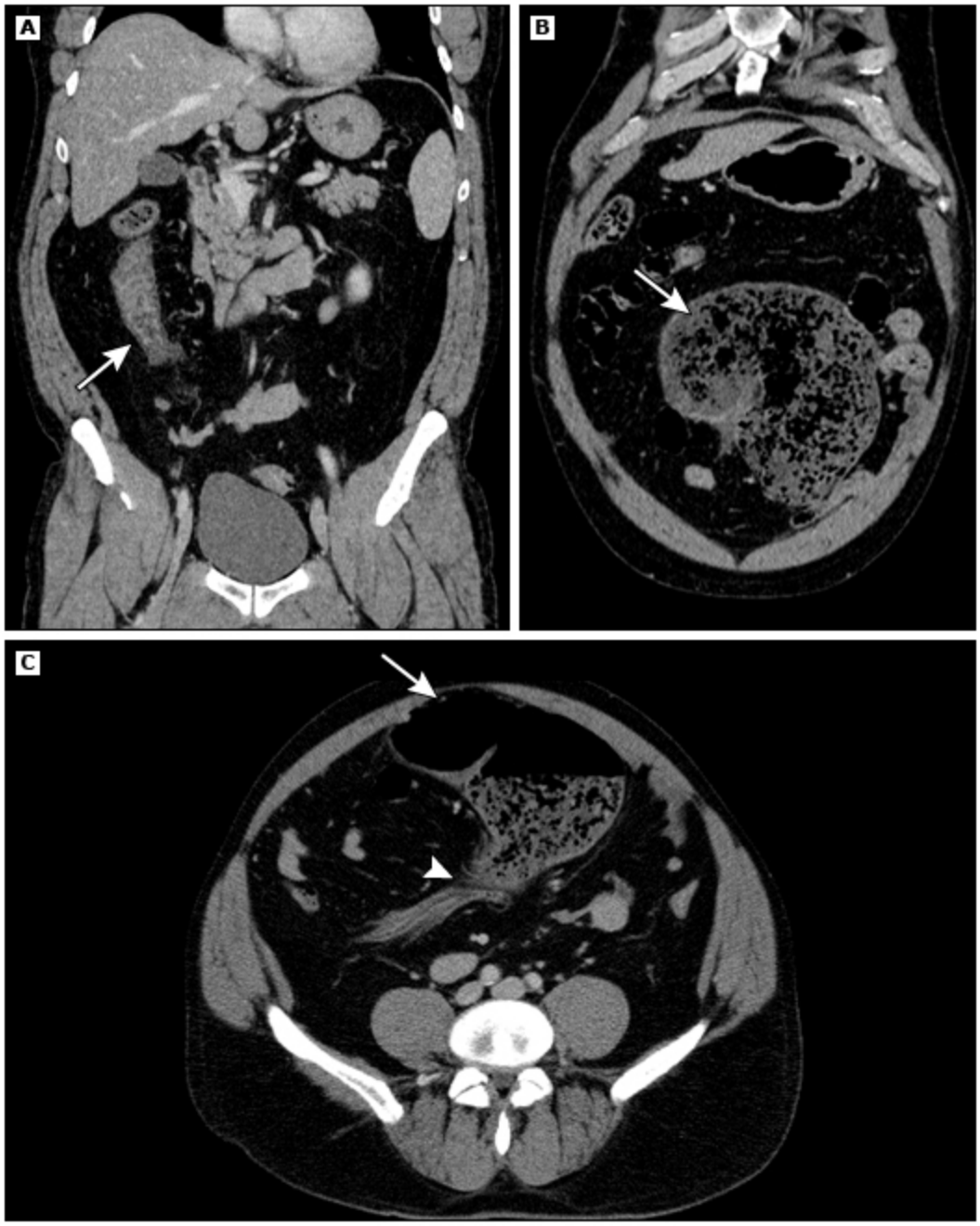
Scout and coronal computed tomography (CT) cecal volvulus



The scout film (A) shows a dilated cecum (arrow). The CT scan reformatted in the coronal plane (B) shows a large air pocket trapped in the cecal volvulus (arrow).

Graphic 87765 Version 2.0

Cecal bascule – CT scan



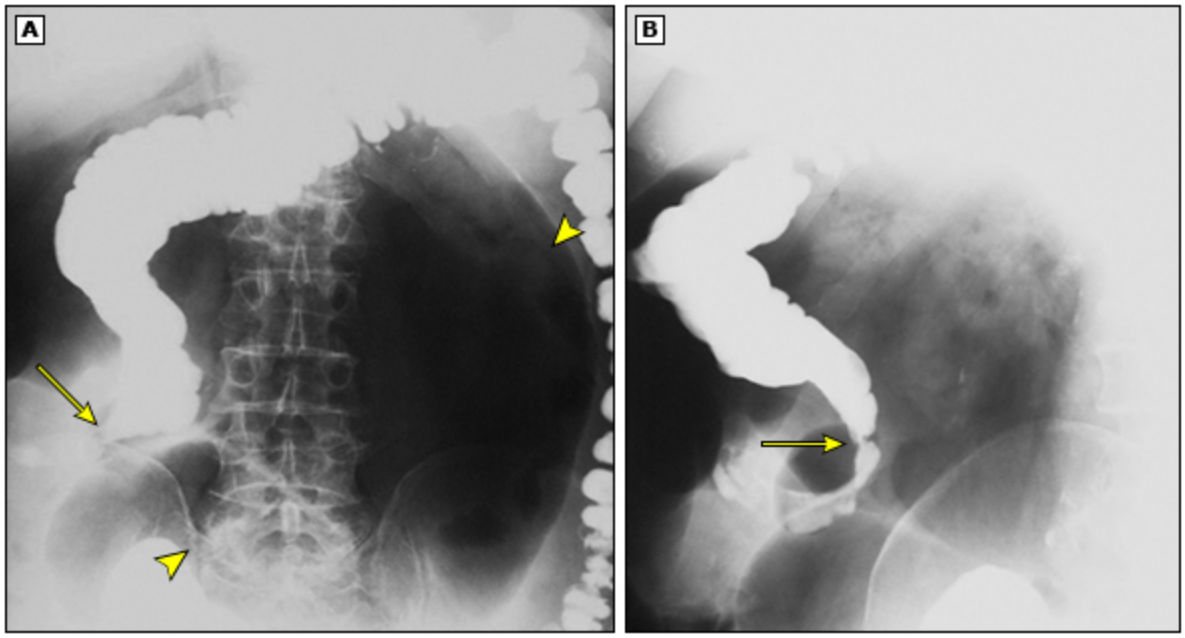
A multiplanar CT examination demonstrates a cecal bascule (B and C, arrow). Note the normal location of the ascending colon (A, arrow) and the region of fold with subsequent migration of the cecum in an anterior and cephalad direction (C, arrowhead). There is no evidence of vascular engorgement nor pericecal inflammatory change.

CT: computed tomography.

Courtesy of Joseph Farnum, MD.

Graphic 87137 Version 5.0

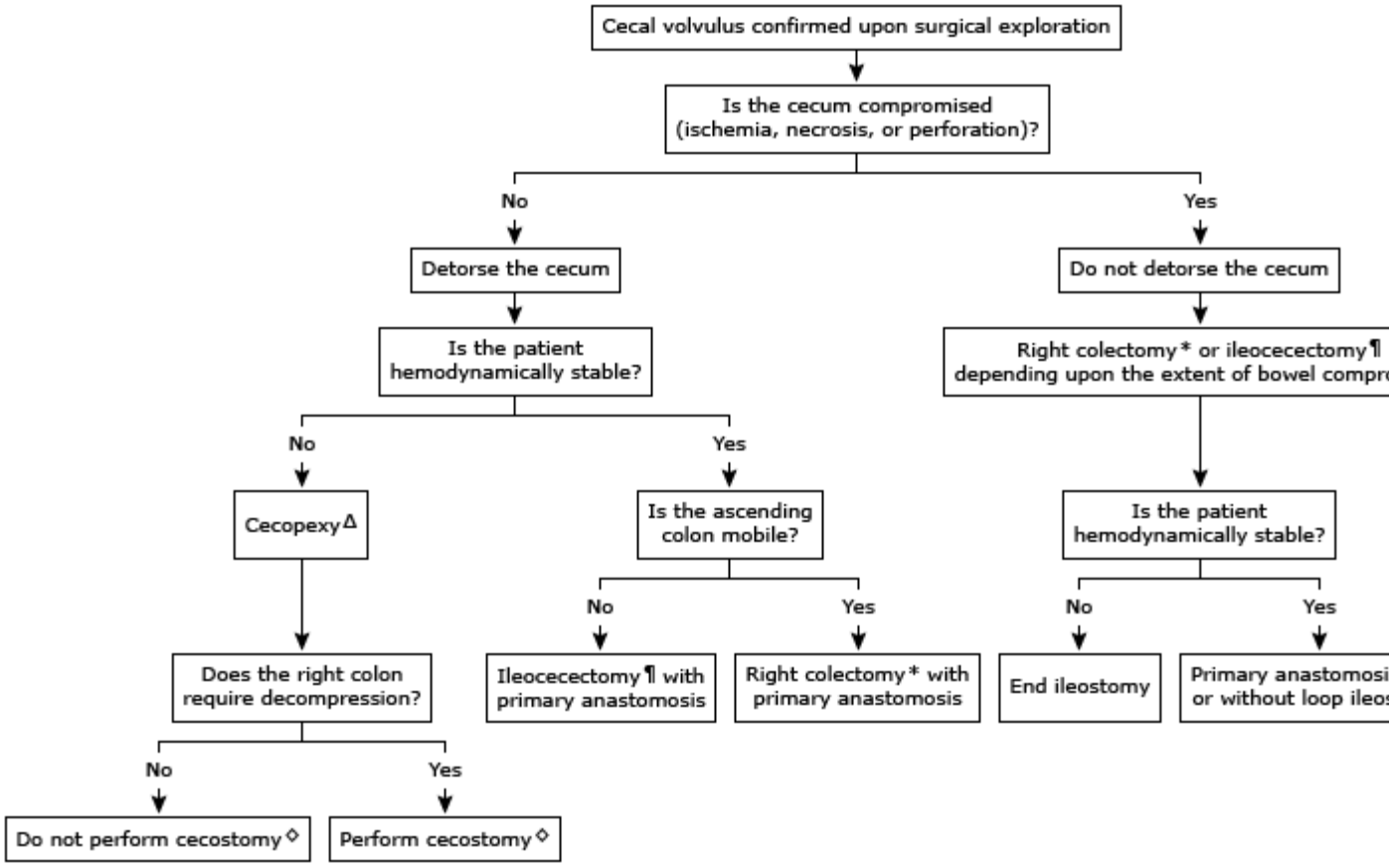
Barium enema cecal volvulus



The single-contrast barium enema (A) shows a contrast column reaching the region of the cecum via the decompressed descending colon, transverse colon, and ascending colon. As it reaches the region of the cecum, it is obstructed, manifesting with beak-shaped morphology (arrow) with no contrast entering the air-filled and distended cecum (between arrowheads). In B, the site of the volvulus is again noted (arrow). These findings confirm the diagnosis of a cecal volvulus.

Graphic 87764 Version 2.0

Surgery for cecal volvulus



* Right colectomy: removal of the terminal ileum, cecum, and ascending colon.

¶ Ileocecectomy: removal of the terminal ileum and cecum.

Δ Cecopexy: suturing of the cecum to the abdominal side wall.

◇ Cecostomy: inserting a tube through the abdominal wall and securing it into the cecum.

Graphic 107088 Version 1.0

Contributor Disclosures

Richard A Hodin, MD No relevant financial relationship(s) with ineligible companies to disclose. **Martin Weiser, MD** Consultant/Advisory Boards: PrecisCa [Gastrointestinal surgical oncology]. All of the relevant financial relationships listed have been mitigated. **Wenliang Chen, MD, PhD** No relevant financial relationship(s) with ineligible companies to disclose.

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