Large bowel obstruction

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Literature review current through: **Feb 2024.**
This topic last updated: **Sep 28, 2023.**

INTRODUCTION

Bowel obstruction occurs when the normal flow of intraluminal contents is blocked. The clinical features, diagnosis, and management of large bowel (colorectal) obstruction are reviewed here. Small bowel obstruction is discussed in other topics. (See "Etiologies, clinical manifestations, and diagnosis of mechanical small bowel obstruction in adults" and "Management of small bowel obstruction in adults".)

Colonic perforation, which can develop as a sequela of large bowel obstruction, is discussed elsewhere. (See "Overview of gastrointestinal tract perforation", section on 'Colon and rectum'.)

EPIDEMIOLOGY

Although small bowel obstruction is more common, large bowel obstruction constitutes approximately 25 percent of all intestinal obstructions [1].

Despite widespread screening for colorectal cancer, large bowel obstruction is the initial presenting symptom of up to 30 percent of colon cancers [2]. The median age of patients presenting with obstructing colorectal cancer is 73 years.

Over 75 percent of large bowel obstructions occur at or distal to the transverse colon, where the size of the colonic lumen is smaller (figure 1) [2-4]. The most common location of obstructing colorectal cancer is at the sigmoid colon, and tumors at the splenic flexure are more likely to obstruct than tumors at the hepatic flexure.

ETIOLOGY

Bowel obstruction can be functional (due to abnormal intestinal physiology) or mechanical (due to extrinsic or intrinsic [mural or intraluminal] compression) and can be partial or complete. Mechanical large bowel obstruction can be caused by malignant or benign etiologies [5].

Malignant — Large bowel obstruction is caused by cancer in 60 percent of cases [3,4,6-8]. Obstruction complicates 8 to 29 percent of colorectal cancers and accounts for 80 percent of emergency presentations of colorectal cancer [9]. Extracolonic neoplasms such as pancreatic cancer, ovarian cancer, and lymphoma cause approximately 10 percent of large bowel obstructions [10-12].

Benign — The most common benign etiologies of large bowel obstruction include:

- **Volvulus** – Volvulus is the most common benign cause of large bowel obstruction (15 to 20 percent) [13], and sigmoid volvulus is the most common etiology of large bowel obstruction in resource-limited countries [14,15]. (See "Sigmoid volvulus", section on 'Colonic dysmotility' and "Cecal volvulus", section on 'Pathophysiology'.)

- **Hernia** – Although the small bowel is more commonly involved with abdominal wall hernias, colonic incarceration occurs in approximately 2.5 percent. Rare sliding hernias have also caused obstruction [16]. (See "Overview of abdominal wall hernias in adults" and "Classification, clinical features, and diagnosis of inguinal and femoral hernias in adults".)

- **Adhesion** – Prior abdominal surgery can lead to adhesive bowel disease, and although adhesive small bowel obstruction is more common, adhesive large bowel obstruction can occur. (See "Postoperative peritoneal adhesions in adults and their prevention".)

- **Stricture** – Repeated bouts of intestinal inflammation can cause strictures from diseases such as diverticulitis (1.7 to 10 percent), ischemic colitis, or inflammatory bowel disease. (See "Clinical manifestations and diagnosis of acute colonic diverticulitis in adults" and "Colonic ischemia" and "Clinical manifestations, diagnosis, and prognosis of ulcerative colitis in adults" and "Clinical manifestations, diagnosis, and prognosis of Crohn disease in adults".)

  Prior colorectal resection can also be complicated by stricture formation. The incidence of stricture after colorectal anastomosis has been reported to be between 3 and 30 percent of cases [17,18]. Anastomotic stricture may be discovered during routine surveillance colonoscopy and is usually mild and asymptomatic [19]. Symptomatic strictures require

treatment. (See "Management of anastomotic complications of colorectal surgery", section on 'Strictures'.)

Rarer benign etiologies of large bowel obstruction include bezoars, intussusception, and retroperitoneal fibrosis. Also, case reports have described symptoms of colonic obstruction caused by appendiceal mucocele, urinary retention, gallstone ileus, endometriosis, and mycobacterium tuberculosis [3,20-30]. Fecal impaction, commonly due to chronic constipation, can also obstruct the colon.

Additionally, a variety of benign conditions can lead to rectal stenosis, including inflammatory bowel disease, tuberculosis, suppository use, radiotherapy, fibrosis due to endometriosis, lymphogranuloma venereum, and postoperative stricture, among others [19].

CLINICAL PRESENTATIONS

Patients with large bowel obstruction can present acutely with abrupt onset of abdominal distension and abdominal pain from sudden luminal obstruction, or subacutely or chronically with a change in bowel habits over a period of time due to progressive luminal narrowing. Longer duration of symptoms and associated symptoms such as unintentional weight loss or rectal bleeding suggest a malignant cause rather than a benign etiology.

Acute obstruction

Symptoms — Patients with acute large bowel obstruction present after an average of five days of symptoms [2]. The most common symptoms of acute mechanical large bowel obstruction are bloating, abdominal pain, and obstipation. Bloating and distension often proceeds abdominal pain. Nausea and/or vomiting may or may not accompany these symptoms but is more likely with proximal colonic obstruction, which can mimic small bowel obstruction. Abdominal pain is described as infraumbilical and crampy with paroxysms of pain occurring every 20 to 30 minutes. Pain in the low pelvis may be due to rectal tenesmus as a sign of rectal obstruction.

In a review of patients with colonic volvulus, the most frequent symptoms of obstruction were abdominal pain (58 percent) and obstipation (55 percent) [15]. While most patients with sigmoid volvulus presented with distention (79 percent), most patients with cecal volvulus presented with abdominal pain, which occurred in 89 percent of patients [31]. The average symptom duration for patients with sigmoid volvulus was 38 hours [32].

Focal abdominal pain may indicate peritoneal irritation due to colonic ischemia, whereas a sudden relief of pain followed by a progressive worsening of pain may relate to intestinal

perforation. (See "Colonic ischemia", section on 'Acute colonic ischemia' and "Overview of gastrointestinal tract perforation".)

Physical examination — Abdominal inspection will usually show abdominal distention, which can be particularly dramatic for distal complete obstructions. Focal or diffuse abdominal tenderness and/or peritonitis may indicate colonic ischemia or infarction.

Although more commonly associated with small bowel obstruction, patients with large bowel obstruction, particularly those with a delayed presentation, may show signs of dehydration or shock, such as tachycardia or hypotension, or even abdominal compartment syndrome in extreme cases [33].

Subacute obstruction — Subacute or chronic colorectal obstruction typically presents as a progressive change in bowel habits, typically over weeks to months. A change in bowel habits associated with unintentional weight loss over the same period is suggestive of malignancy.

DIAGNOSIS

A diagnosis of large bowel obstruction may be suspected based upon typical symptoms, but a definitive diagnosis generally requires imaging studies to distinguish large from small bowel obstruction, judge whether the obstruction is partial or complete, identify the location of the obstruction, and determine a possible etiology. For those with malignancy, imaging also identifies associated regional and metastatic disease. For patients who present with perforation, the diagnosis may be made in the operating room.

Diagnostic evaluation — Imaging studies are required to diagnose and characterize large bowel obstructions. Laboratory tests can assess the severity and any complications of a large bowel obstruction. Lower endoscopy (sigmoidoscopy or colonoscopy) is usually not required to diagnose an acute large bowel obstruction but can help investigate patients with chronic symptoms, rule out functional obstruction, and identify the etiology of the large bowel obstruction.

Imaging — Plain radiography and computed tomography (CT) of the abdomen are the most practical and useful imaging studies. For most hemodynamically stable patients, we suggest abdominal CT, which is highly sensitive and specific for detecting large bowel obstruction (each >90 percent) [34,35]. Although plain radiography is more readily available and less expensive than abdominal CT, it is also less sensitive and specific.

CT accurately distinguishes between true colonic obstruction and pseudo-obstruction and can accurately diagnose intraluminal, intrinsic, and extrinsic causes [22,35-38]. Signs of large bowel obstruction on abdominal CT include a transition point with dilated proximal colon (>8 cm) and collapsed distal colon [39].

CT can detect intraluminal colon or rectal mass. The "apple core" lesion as a radiographic sign of colonic malignancy originally described for barium enema can also be seen with abdominal CT. For malignant obstruction, abdominal CT can identify multifocal disease, metastatic disease, ascites, or carcinomatosis, which may influence surgical decision making [40].

CT is also useful in diagnosing and distinguishing between sigmoid and cecal volvulus, for which the initial treatment differs [41]. Another CT finding that differentiates a true mechanical obstruction and colonic pseudo-obstruction is the relative cecal size. If the colon is distended and cecal diameter is clearly less than that of other colonic segments, a true mechanical obstruction is less likely [42]. Signs of sigmoid volvulus include the "X-marks-the-spot" sign, which is the observation of two crossing transition points arising from a single location, and the "split-wall" sign, which describes a separation of the wall of the sigmoid (by mesenteric fat) as a result of incomplete folding (image 1A-B) [22,43]. Cecal bascule, as a sign of cecal volvulus, can be seen on plain films or CT (image 2). (See "Sigmoid volvulus", section on 'Imaging' and "Cecal volvulus", section on 'CT scan'.)

Plain films may demonstrate characteristic findings of volvulus (image 3), including such signs as the "northern exposure" sign [44] and the "coffee bean" sign [45], or may demonstrate pneumoperitoneum. Although there is a common belief that the apex of the loop of sigmoid volvulus classically points to the right upper quadrant, one study found equal numbers of patients with sigmoid loops pointing to the midline and left side as well [43]. Each of these radiographic signs may be sufficient to initiate intervention [46]. However, plain abdominal radiographs are nonspecific [36]. Plain abdominal radiographs alone lack adequate sensitivity and may miss a diagnosis of volvulus in up to one-third of cases [38,39].

Lower gastrointestinal studies (eg, barium enema) are rarely needed to establish a diagnosis of mechanical large bowel obstruction, given the availability and accuracy of abdominal CT. However, they can be used in emergency situations to rule out colonic pseudo-obstruction.

Laboratory studies — Routine laboratory studies in patients who present with abdominal pain typically include a complete blood count with differential and a basic metabolic profile. These studies are not specific for a diagnosis of large bowel obstruction but can help to assess the presence and severity of hypovolemia or other metabolic abnormalities, and leukocytosis with a leftward shift or neutrophil predominance may indicate the presence of complications.

For patients found on imaging studies to have a lesion consistent with malignancy of the colon or rectum, we obtain a carcinoembryonic antigen (CEA) level. Although an elevated CEA level is strongly suggestive of a malignant etiology, in and of itself, it is not diagnostic of colorectal cancer.

Endoscopy — Lower endoscopy (sigmoidoscopy, colonoscopy) is not necessary or possible as an initial diagnostic modality for acute large bowel obstruction but can aid in the diagnosis of those with chronic symptoms for whom large bowel obstruction cannot be excluded on plain films or abdominal CT. Lower endoscopy may also be needed to evaluate findings on imaging suggestive of synchronous tumor, which occurs in up to 10 percent of malignant cases [47].

DIFFERENTIAL DIAGNOSIS

Besides small bowel obstruction, non-neoplastic colonic diseases such as toxic megacolon, paralytic ileus, and Ogilvie's syndrome can mimic large bowel obstruction [22]. Despite the similarities in patient presentation, abdominal CT accurately distinguishes small from large bowel obstruction and true colonic obstruction from pseudo-obstruction. (See 'Imaging' above.)

- **Small bowel obstruction** – Compared with small bowel obstruction, pain associated with large bowel obstruction occurs over a greater time interval and occurs lower in the abdomen between the umbilicus and pubic tubercle. Lower abdominal pain and abdominal distention are characteristic of mechanical large bowel obstruction. A history of prior abdominal surgery suggests small bowel obstruction, unless the patient underwent a prior colonic resection. Similarly, the presence of hernia or history of hernia repair suggests small bowel more than large bowel obstruction. (See "Etiologies, clinical manifestations, and diagnosis of mechanical small bowel obstruction in adults".)

- **Toxic megacolon** – In patients with toxic megacolon, the entire colon is usually distended. This entity is commonly associated with *Clostridioides difficile* or inflammatory bowel disease; thus, the patient usually has a history of antibiotic use or inflammatory bowel disease. In addition, these patients are often quite ill and can have systemic signs (ie, sepsis) in the absence of colonic perforation. Systemic signs of toxicity or sepsis are not usually seen with typical etiologies of mechanical large bowel obstruction unless the colon has already perforated. (See "Toxic megacolon".)

- **Ogilvie's syndrome** – This syndrome may also present with lower abdominal pain and distention, but imaging typically fails to identify a clear transition point or mechanical etiology. In mechanical large bowel obstruction, the cecum is typically the most distended

portion of the colon, which is often not the case in pseudo-obstruction of the colon [42]. (See "Acute colonic pseudo-obstruction (Ogilvie's syndrome)".)

- **Paralytic ileus** – Paralytic ileus will present with generalized bowel distention, which will also include the small bowel. Imaging will not demonstrate any clear transition point or mechanical etiology. Causes of ileus are given in the tables and are discussed in detail separately (table 1 and table 2). (See "Postoperative ileus" and "Measures to prevent prolonged postoperative ileus".)

MANAGEMENT OF ACUTE LARGE BOWEL OBSTRUCTION

Acute large bowel obstruction is a surgical emergency that accounts for up to 4 percent of surgical admissions for urgent abdominal indications. Patients diagnosed with acute mechanical large bowel obstruction should be managed in the hospital.

General principles — Initial supportive care of the patient with mechanical large bowel obstruction consists of bowel rest, intravenous fluid therapy with correction of electrolyte abnormalities, and gastric decompression for those with nausea or vomiting. Subsequent treatment depends upon the etiology and location of the obstruction, medical comorbidities of the patient, and local resources and expertise of the available clinicians.

Unlike small bowel obstructions, the majority of which can be managed nonoperatively, approximately 75 percent of large bowel obstructions ultimately require surgical intervention during the same hospital admission [1]. Specific procedures used to manage large bowel obstruction include ostomy alone for fecal diversion (initial or palliative), colorectal resection with or without proximal diverting ostomy, and Hartmann's procedure (colon resection with end colostomy). Types and techniques for specific colon resections and ostomy procedures are reviewed separately. (See "Overview of colon resection", section on 'Colon resection' and "Overview of surgical ostomy for fecal diversion".)

Laparoscopic surgery for large bowel obstruction has been reported to be feasible and safe [48]. The choice between open versus laparoscopic approach to colon resection is discussed separately. (See "Overview of colon resection", section on 'Minimally invasive colon resection'.)

Malignant obstruction — Colorectal cancer is the most common cause of large bowel obstruction, comprising 60 percent of all cases. (See 'Malignant' above.)

Patients requiring immediate surgery — Patients who present with an acute malignant colorectal obstruction may require immediate surgery if they have a perforation or pending

perforation (eg, detected by presence of pneumatosis), are clinically unstable (tachycardic, hypotensive, with lactic acidosis), or are highly symptomatic (algorithm 1).

- Those who are unstable or have high surgical risk should undergo diversion only with a loop ostomy if the lesion if bulky (eg, T4) or anatomically difficult to resect in an expeditious fashion (eg, rectal) [9,49].

  - The two traditional surgical methods of colonic decompression are transverse loop colostomy and "blowhole" colostomy (typically transverse colon) [50]. Both procedures can be performed open or laparoscopically, or even under local anesthesia for patients who are unstable [49].

  - The placement of a cecostomy tube is an alternative but is rarely used because the tube frequently obstructs and is difficult to care for [51]. Nevertheless, for patients with a short life expectancy who are high-risk surgical candidates, cecostomy may still be a reasonable option that can be performed using local anesthetic in an interventional suite or operating room using fluoroscopic guidance.

- Otherwise, even patients who have high surgical risk or are unstable may undergo a resection and proximal diversion if the lesion is technically straightforward to resect (eg, not bulky or rectal). The extent of the resection is discussed separately. (See 'Segmental resection versus subtotal colectomy' below.)

- Despite the high risk, patients who have a perforation require a resection and proximal diversion for source control. Perforation occurs more commonly at the point of obstruction, most likely due to local tumor invasion or inflammatory reaction, rather than in the proximal, dilated colon.

- Patients who are stable and have low-to-moderate surgical risk may undergo resection of the obstructing lesion and proximal dilated bowel with or without proximal diversion. A proximal diversion mandates a staged operation, in which the obstructing lesion is resected and the colon is either anastomosed with a proximal diverting loop ostomy or brought out as an end colostomy. At a second operation, the ostomy is reversed and gastrointestinal continuity restored.

  The decision to choose a staged versus one-stage procedure depends upon several factors, including the location of the obstructing lesion, condition of the proximal colon, and medical comorbidities of the patient as well as their life expectancy, goals of care, and the presence of proximal perforation [52]. Whenever possible, a one-stage resection is the preferred treatment for colon obstruction [26,53-55]. The absence of mechanical bowel

preparation is not a contraindication to primary anastomosis, though a bowel preparation, when performed, can decrease the risk of anastomotic leak [56]. The role of intraoperative colonic lavage and subtotal colectomy with ileocolic anastomosis for colonic obstruction is discussed below. (See 'Role of bowel preparation' below.)

In practice, a one-stage resection is usually chosen for patients with low-to-moderate operative risk, a single obstructing tumor, longer life expectancy (based on tumor characteristics, age, comorbidities), and a strong aversion to a stoma [54,55]. The anastomotic leak rate is 2.2 to 6.9 percent [57-59].

A staged resection is appropriate if the risk of anastomotic leak (and the attendant morbidity) is judged to be high. The disadvantage of a staged approach is that the stoma reversal procedure is associated with a high rate of complications, likely related to selection of high-risk patients. In addition, up to 40 percent of patients do not undergo the operation to reverse the stoma [26,58,60]. Patients with a permanent ostomy report having a poorer health-related quality of life compared with those without an ostomy [61,62].

Patients not requiring immediate surgery — For patients who have left-sided malignant obstruction but do not require immediate surgery, we suggest endoscopic stenting as the first-line therapy rather than immediate surgery, provided that the lesion is accessible endoscopically and appropriate expertise is available.

Endoscopic stenting is predominantly used for malignant large bowel obstruction in the left colon [63], although it can also be used for right-sided obstructing lesions at specialized centers [64-67]. Stenting obstructing lesions requires advanced endoscopic skills and is not feasible in the distal rectum or colonic flexures where there is acute angulation of the bowel [68]. (See "Enteral stents for the management of malignant colorectal obstruction".)

Compared with immediate surgery, endoscopic stenting reduces postoperative morbidity and stoma rate [69] but has been associated with a 4 to 5 percent risk of perforation [70,71] and peritoneal seeding [72]. Despite that, comparable survival has been shown in randomized trials with up to 36 months of follow-up [73-75].

In patients with malignant large bowel obstruction, colonic stenting can be used for preoperative decompression in candidates for curative resection or for palliation in those with advanced, unresectable disease (algorithm 1) [76,77].

- **Candidates for curative resection** – For patients with complete or near-complete obstruction, stenting can be used to open the lumen enough to decompress the colon.

This provides a window of time prior to surgery to correct volume depletion and electrolyte abnormalities and allow for mechanical bowel preparation prior to surgery, thereby permitting surgery to be performed under elective, rather than emergency, circumstances. In most series, the average time from stent deployment to resection was 7 to 14 days [70,78,79], although there are studies suggesting benefits with delaying surgical resection for two or four weeks [80,81].

The benefit of this approach is to potentially allow for resection and primary anastomosis (one-stage operation) rather than ostomy (two-stage operation). In a meta-analysis of eight randomized trials and 497 patients, preoperative stenting reduced temporary (34 versus 51 percent) and permanent stoma rate (22 versus 35 percent), increased primary anastomosis rate (70 versus 54 percent), and also reduced 60 day morbidity (34 versus 51 percent), but not mortality rate (9.6 versus 9.9 percent), compared with emergency surgery [69].

Additionally, decompression and resuscitation may allow for a less invasive (ie, laparoscopic) operative procedure [82]. The additional time before operation also allows for complete oncologic staging. As an example, colonoscopy may be able to be performed in the interim to rule out synchronous lesions.

- **Palliation** – Up to 50 percent of patients who present with malignant large bowel obstruction are not candidates for curative resection [83-86]. For patients who are unable or unwilling to undergo palliative resection, stenting is an alternative to surgical diversion and is successful in over 90 percent in the short term [60,87-93]. For stenting with palliative intent, the median postprocedure hospital stay is two days, and patients may immediately begin palliative chemotherapy and/or radiotherapy [94]. (See "Locoregional methods for management and palliation in patients who present with stage IV colorectal cancer", section on 'Nonsurgical palliative options'.)

Patients who do not require immediate surgery but are not candidates for endoscopic stenting should also be fully staged. Those who have resectable nonmetastatic diseases should undergo an oncologic resection with or without proximal diversion or a loop diverting ostomy upfront followed by neoadjuvant chemoradiation therapy, followed by definitive oncologic resection (algorithm 1). The choice is made by multidisciplinary input. Those who have unresectable and/or metastatic diseases should undergo palliative chemo(radio)therapy with or without a diverting loop ostomy.

Volvulus — Colonic volvulus is the second most common cause of large bowel obstruction, comprising 15 to 20 percent of all cases.

- For patients with sigmoid volvulus, flexible sigmoidoscopy is generally suggested to initially decompress the colon to allow for semi-elective surgery (rather than as emergency) or may be the only treatment in high-risk patients. However, for patients who are able to tolerate an operation, elective resection during the same hospital stay is indicated for sigmoid volvulus because of the high rate of recurrence (up to 50 percent) with endoscopic decompression alone [95]. (See "Sigmoid volvulus", section on 'Management'.)

- For patients with cecal volvulus, the treatment is typically surgical. Options include ileocecectomy or right colectomy with or without proximal diversion, depending on patient and clinical factors. (See "Cecal volvulus", section on 'Management'.)

Diverticular disease — Diverticular diseases are the third most common cause of large bowel obstruction, comprising 10 percent of all cases.

Acute diverticulitis and colon cancer can both cause colonic obstruction and are difficult to distinguish by imaging alone. Thus, in this setting, surgery is required to rule out cancer and also to relieve symptoms of obstruction. Patients who present with colonic obstruction attributable to diverticular diseases should undergo surgical resection of the involved colonic segment or proximal fecal diversion if a resection cannot be performed safely. However, colonic obstruction due to diverticular disease is rarely complete, which allows bowel preparation to be attempted. Endoscopic stenting is usually not helpful for colonic obstruction caused by diverticulitis. (See "Acute colonic diverticulitis: Surgical management".)

Colitis — Ischemic colitis or inflammatory bowel disease can occasionally cause large bowel obstruction by causing colonic or rectal strictures.

- Patients with episodes of chronic recurrent colonic ischemia can develop colonic strictures, typically within three to six months. Ischemic strictures that produce no symptoms should be observed; some will resolve in 12 to 24 months without specific therapy. If symptoms of partial obstruction develop, segmental resection is indicated. Endoscopic dilation or stenting has been attempted, but the efficacy of this approach has not been established in this population of patients. (See "Colonic ischemia", section on 'Chronic ischemic colitis'.)

- Surgical procedures commonly used to treat Crohn's or ulcerative colitis or proctitis include segmental colectomy, total colectomy with ileorectal anastomosis, total proctocolectomy with end ileostomy, and proctectomy. The choice of procedure depends upon the location of the disease and the indication for surgery. (See "Surgical management of Crohn disease", section on 'Colorectal resection' and "Surgical management of ulcerative colitis".)

Anastomotic stricture — A subset of patients identified with colon or rectal stricture who are largely asymptomatic can usually be managed expectantly once malignancy (primary or recurrent) has been ruled out. Mildly symptomatic anal strictures may be managed in an outpatient setting if they do not present with large bowel obstruction. Strictures severe enough to cause symptoms of large bowel obstruction are generally managed in the hospital setting. Treatment options for patients with anastomotic stricture involving the colon include transanal strictureplasty with electrocautery or laser, dilation, stenting, and surgical resection [17].

Special considerations — Two technical issues are worth mentioning when discussing surgical treatment of large bowel obstruction.

Role of bowel preparation — For patients with large bowel obstruction who cannot be stented, we suggest not using any type of bowel preparation (preoperative or intraoperative) for the emergency surgery. On the other hand, bowel preparation should be given prior to surgery to patients who have been stented and successfully decompressed as a bridge to surgery, especially when planning a colocolonic or colorectal (instead of an ileocolonic) anastomosis.

Intraoperative colonic lavage (combined antegrade/retrograde technique (figure 2)) has been used by some surgeons for hemodynamically stable patients but is usually not necessary [96]. Two small randomized studies comparing decompression alone with on-table lavage (OTL) did not show any benefit for OTL [97,98]. The disadvantages of performing OTL are that it significantly increases operative time (from 25 to 60 minutes in one study) and may increase soilage [99,100]. Accumulating evidence has determined that primary anastomosis without OTL is safe and associated with acceptable morbidity if the bowel wall is not too thin; thus, we do not suggest routine OTL [101]. (See "Overview of colon resection", section on 'Bowel preparation'.)

Numerous studies show that successful bowel preparation with combined oral and mechanical bowel preparation prior to elective colorectal resections decreases rates of deep and superficial surgical site infections, anastomotic leaks, and ileus [102,103]. Therefore, preoperative bowel preparation and oral antibiotics are standard for any patient who can tolerate them, including those who have been stented as a bridge to surgery. (See "Overview of colon resection", section on 'Bowel preparation'.)

Segmental resection versus subtotal colectomy — A subtotal colectomy, rather than a segmental resection, should generally be performed when a distal obstructing lesion presents in combination with a more proximal colonic perforation, serosal tearing or ischemic changes from severe colonic distention, or synchronous polyps (found in up to 11 percent) [47]. A

primary ileocolonic anastomosis is likely appropriate in this situation, but depending on the clinical circumstances, an end ileostomy might be chosen instead [104]. Ileorectal anastomosis is generally discouraged in patients with preexisting fecal incontinence or impaired pelvic floor function.

The advantages of subtotal colectomy include elimination of synchronous and potentially metachronous proximal tumors and removal of proximal dilated colon (traditionally a contraindication to an anastomosis). Disadvantages include a possibly permanent end ileostomy and the side effect of diarrhea (especially in older adult patients), at least in the short term; however, if sufficient terminal ileum and sigmoid colon remain, the incidence of diarrhea is markedly decreased [26,105]. (See "Overview of surgical ostomy for fecal diversion".)

Acceptable long-term outcomes for subtotal colectomy with primary anastomosis have been reported [99,106]. Early postoperative diarrhea can be controlled with medication, and most patients can be weaned off these medications after several weeks [107]. In one series of 72 patients undergoing subtotal colectomy, 51 (71 percent) had five or fewer daily bowel movements two months after operation [108]. The SCOTIA (Subtotal Colectomy versus On-Table Irrigation and Anastomosis) study randomized 91 patients and reported no difference in hospital mortality or complication rates (including anastomotic leak). However, patients undergoing subtotal colectomy reported significantly more daily bowel movements at four months postoperation compared with those undergoing segmental colectomy [109].

MORBIDITY AND MORTALITY

Perioperative (30-day) morbidity and mortality for obstructing colorectal lesions are similar for benign versus malignant pathology, though for oncologic reasons long-term mortality is worse for malignancy.

Patients undergoing emergency surgery for colorectal malignancies have a 30-day mortality rate of 10 to 15 percent [58,110-113]. This represents up to a 10-fold increase in mortality over the 1 to 2 percent mortality rate after elective colon resection [36,114-116]. The most frequent causes of death are septic complications and multiple organ failure. In addition to higher morbidity and mortality during the index operation, there is a higher rate of local recurrence and metastatic disease after curative resection following emergency surgery, and five-year cancer-specific survival is significantly lower (<30 percent) [117,118].

The strongest predictors for poor outcome for patients with large bowel obstruction are the physiologic status of the patient, comorbidities, and, for patients with malignancy, tumor

biology [3,110,114,119]. Important prognostic factors for poor outcome include age, American Society of Anesthesiologists (ASA) grade, Acute Physiology And Chronic Health Evaluation (APACHE) 2 score, and the presence of peritonitis [2,58,114].

Because patients with colorectal obstruction often undergo operation under less-than-ideal conditions, it is not surprising that one or more complications occur in half of all patients [52]. Surgical site infection occurs in over one-third [2]. Stoma-related complications such as pain, skin irritation, stricture, prolapse, retraction, hernia, and necrosis occur in up to 44 percent of patients [120-122]. (See "Management of anastomotic complications of colorectal surgery" and "Management of intra-abdominal, pelvic, and genitourinary complications of colorectal surgery" and "Overview of surgical ostomy for fecal diversion", section on 'Complications'.)

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

- **Large bowel obstruction** – Bowel obstruction occurs when the normal flow of intraluminal contents is blocked. Large bowel obstruction constitutes approximately 25 percent of all intestinal obstructions. Colorectal cancer (60 percent), volvulus (15 to 20 percent), and diverticular disease (10 percent) are the most common causes of large bowel obstruction. (See 'Epidemiology' above and 'Etiology' above.)

- **Clinical presentations** – Depending upon the time course of development of the obstruction, patients with large bowel obstruction can present acutely with abdominal pain and obstipation or more chronically as a progressive change in bowel habits. (See 'Clinical presentations' above.)

- **Diagnosis** – A diagnosis of large bowel obstruction may be suspected in a patient with typical symptoms of distension followed by abdominal pain, but a definitive diagnosis generally requires imaging studies to distinguish large from small bowel obstruction, judge whether the obstruction is partial or complete, identify the location of the obstruction, and determine a possible etiology. For those with malignancy, imaging also identifies associated regional and metastatic disease. For patients who present with perforation, the diagnosis will necessarily be made in the operating room. (See 'Diagnosis' above.)

- **Imaging** – For most hemodynamically stable patients, we prefer abdominal CT to another imaging modality (eg, plain abdominal films). CT is highly sensitive and specific for detecting large bowel obstruction and can accurately distinguish between small and large bowel obstruction, between true colonic obstruction and pseudo-obstruction, and between malignant and benign etiologies (eg, volvulus). (See 'Imaging' above.)

- **Management** – Patients identified with acute mechanical large bowel obstruction should be admitted to the hospital. Initial supportive care includes bowel rest, intravenous fluid therapy with correction of electrolyte abnormalities, and gastrointestinal decompression for those with nausea or vomiting. Subsequent treatment depends upon the etiology and location of the obstruction, the medical comorbidities of the patient, and the local resources and expertise of the available clinicians. (See 'General principles' above.)

  - Patients who present with an acute malignant colorectal obstruction may require immediate surgery if they have a perforation or pending perforation, are clinically unstable (tachycardic, hypotensive, or with evidence of lactic acidosis), or are highly symptomatic. Surgical options include loop diverting ostomy if the lesion is technically difficult to resect and resection with proximal diversion if the lesion is perforated or relatively easy to resect (algorithm 1). (See 'Patients requiring immediate surgery' above.)

  - For patients who have a left-sided malignant obstruction but do not require immediate surgery, we suggest endoscopic stenting rather than immediate surgery (**Grade 2C**). Colonic stenting can be used for preoperative decompression in candidates for curative resection or for palliation in those with advanced, unresectable disease. Patients who are not candidates for endoscopic stenting should be treated surgically or with palliative chemotherapy depending on their cancer stage (algorithm 1). (See 'Patients not requiring immediate surgery' above.)

  - For patients with a mechanical large bowel obstruction that cannot be stented first as a bridge to surgery, we suggest not using any type of bowel preparation (preoperative or intraoperative) for emergency surgery (**Grade 2C**). On the other hand, patients who have been stented and successfully decompressed should undergo preoperative bowel preparation prior to surgery, especially when planning a colocolonic or colorectal (instead of an ileocolonic) anastomosis. (See 'Role of bowel preparation' above.)

  - For patients with a distal obstructing lesion presenting in combination with a more proximal colonic perforation, serosal tearing or ischemic changes from severe colonic distention, or synchronous polyps, we suggest performing a subtotal colectomy rather

than a segmental resection (**Grade 2C**). (See 'Segmental resection versus subtotal colectomy' above.)

- **Outcomes** – Perioperative (30 day) morbidity and mortality for obstructing lesions are similar for benign versus malignant pathology, though for oncologic reasons long-term mortality is worse for malignant obstruction. Patients undergoing emergency surgery for colorectal malignancies have significantly worse outcomes than those undergoing elective resection. (See 'Morbidity and mortality' above.)

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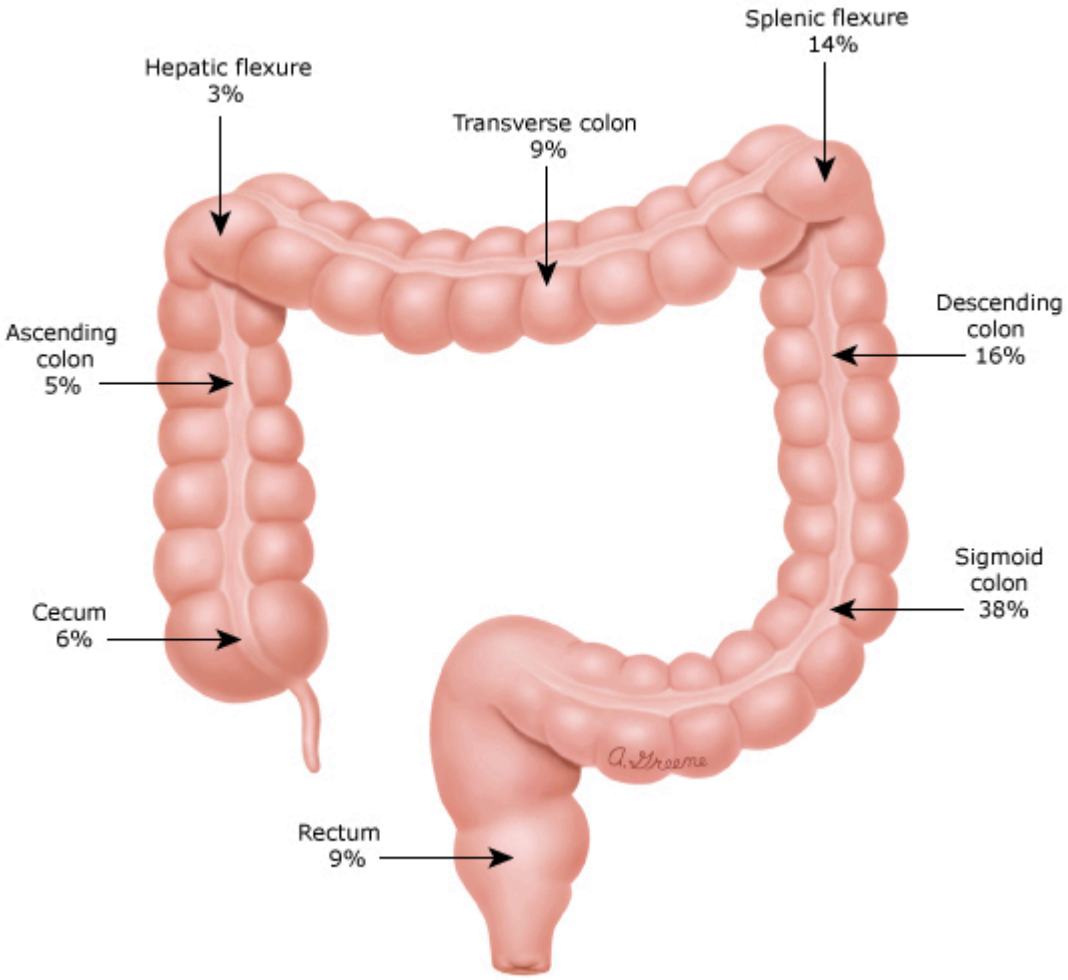
Topic 90291 Version 14.0

GRAPHICS

Sites of large bowel obstruction



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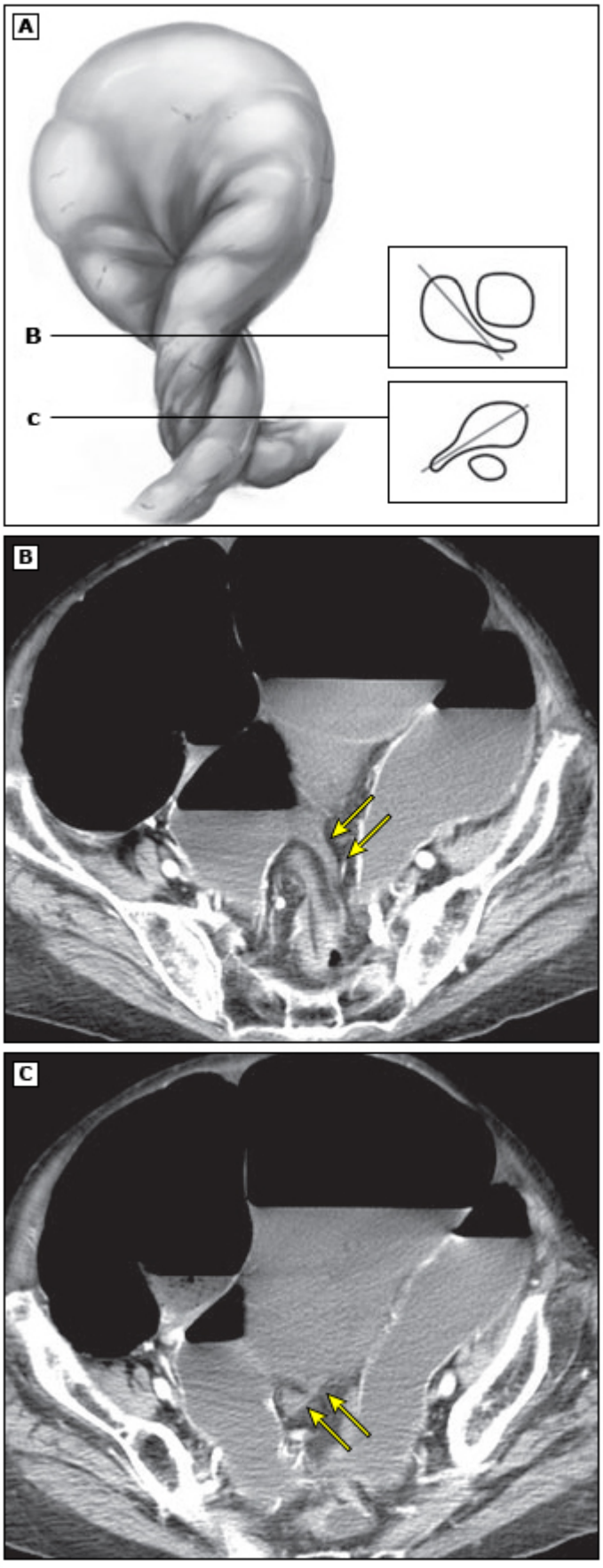
Graphic 100580 Version 1.0

Sigmoid volvulus



A 90-year-old woman with sigmoid volvulus.

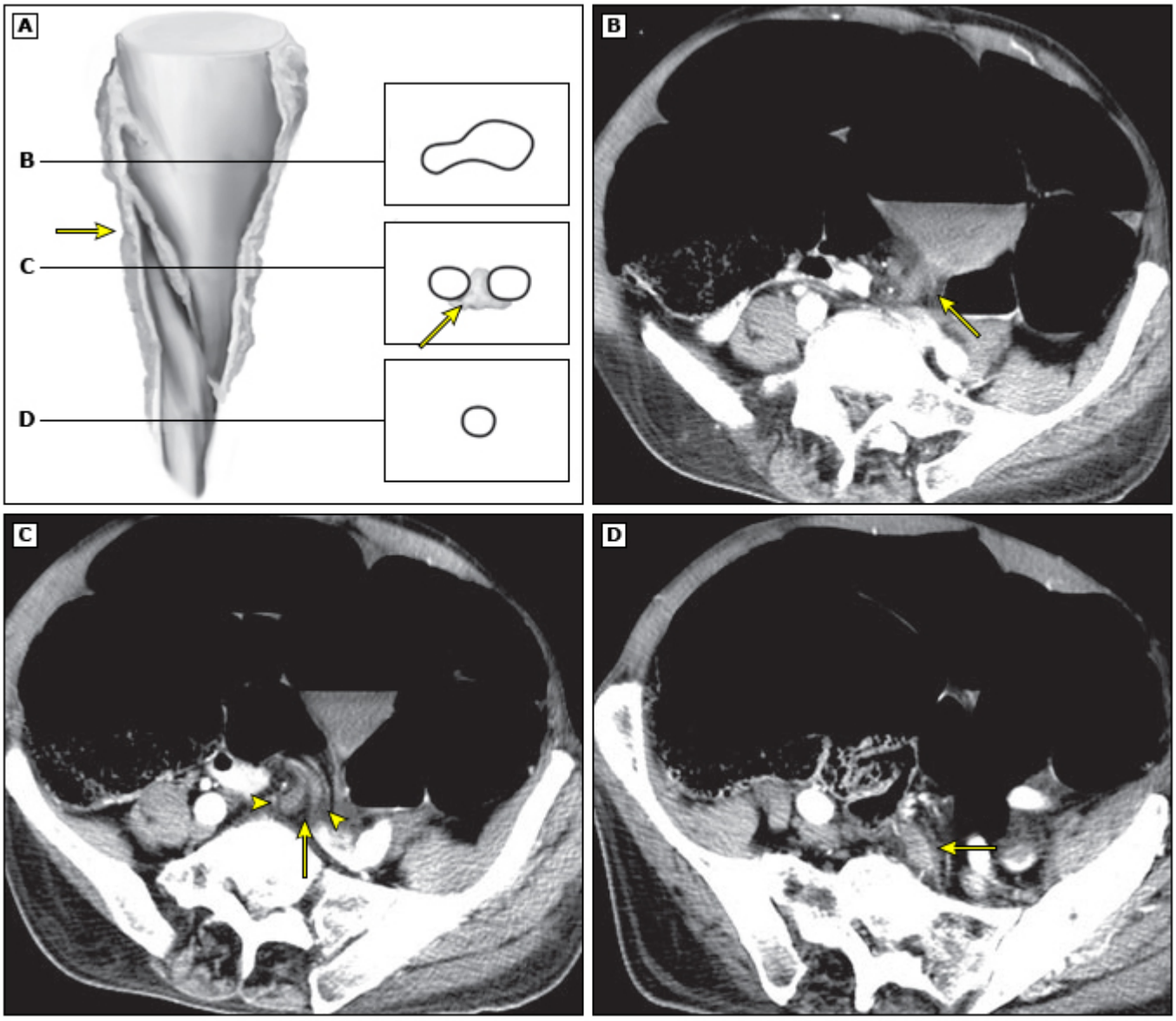
(A) Drawing shows X-marks-the-spot sign caused by crossing transition points. Horizontal lines and schematic axial insets indicate levels of B and C. Oblique lines in insets indicate two transition zones oriented in opposite directions, producing an X shape.

(B) Contrast-enhanced axial computed tomography (CT) image through proximal-superior transition (arrows).

(C) Axial CT image 15 mm caudal to B through distal-inferior sigmoid transition (arrows), which is oriented in the direction opposite to the proximal transition.

Graphic 93452 Version 1.0

Sigmoid volvulus



A 75-year-old man with sigmoid volvulus.

(A) Drawing shows split-wall sign caused by apparent separation of sigmoid walls by adjacent mesenteric fat (arrow) secondary to incomplete twisting. Horizontal lines and schematic axial insets indicate levels of B-D.

(B) Contrast-enhanced axial computed tomography (CT) image through the single beak-shaped transition point (arrow).

(C) Axial CT image 25 mm caudal to B shows mesenteric fat (arrow) separating the two sigmoid walls (arrowheads).

(D) Axial CT image 25 mm caudal to C shows the decompressed rectosigmoid (arrow).

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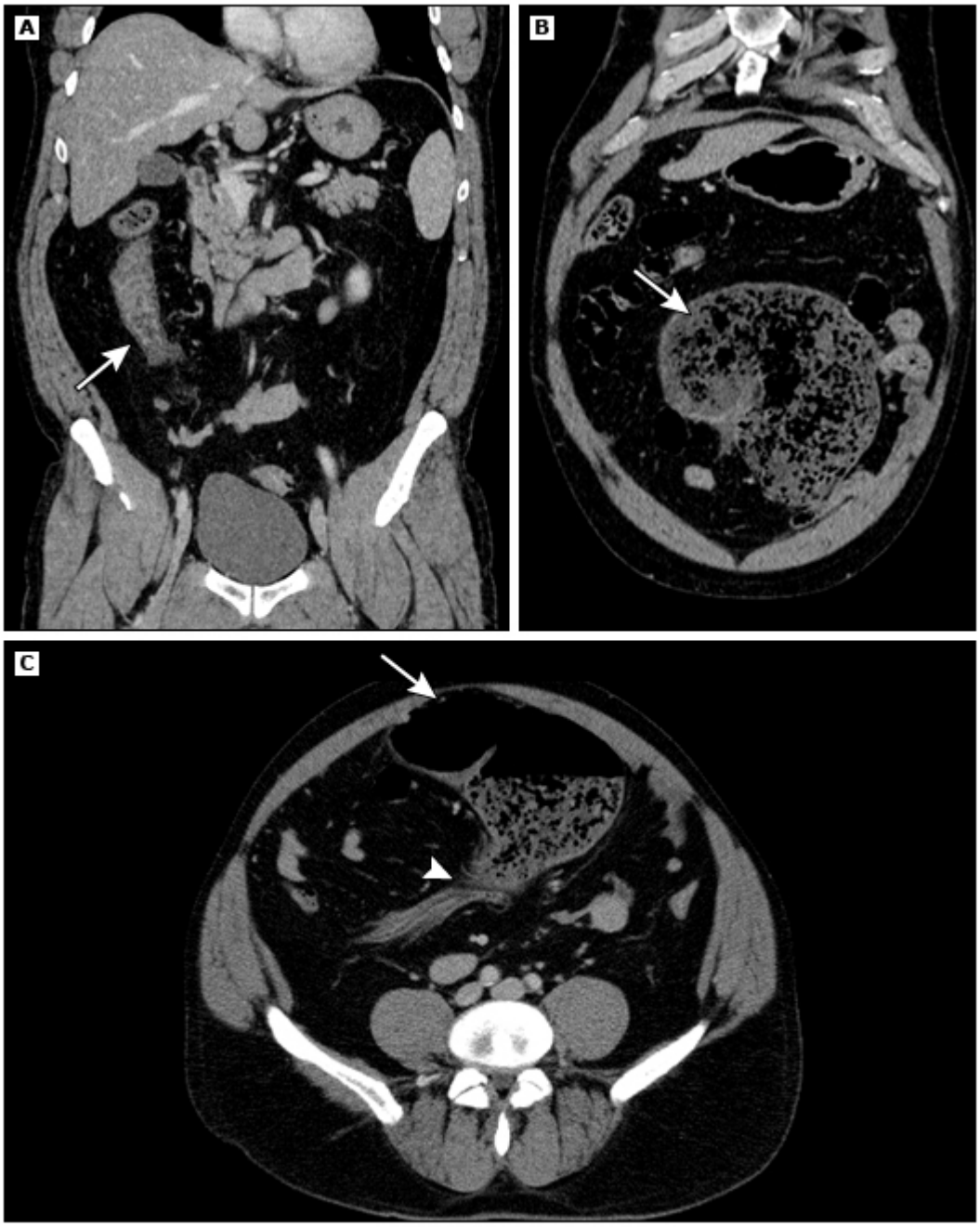
Graphic 93453 Version 1.0

Cecal bascule – CT scan



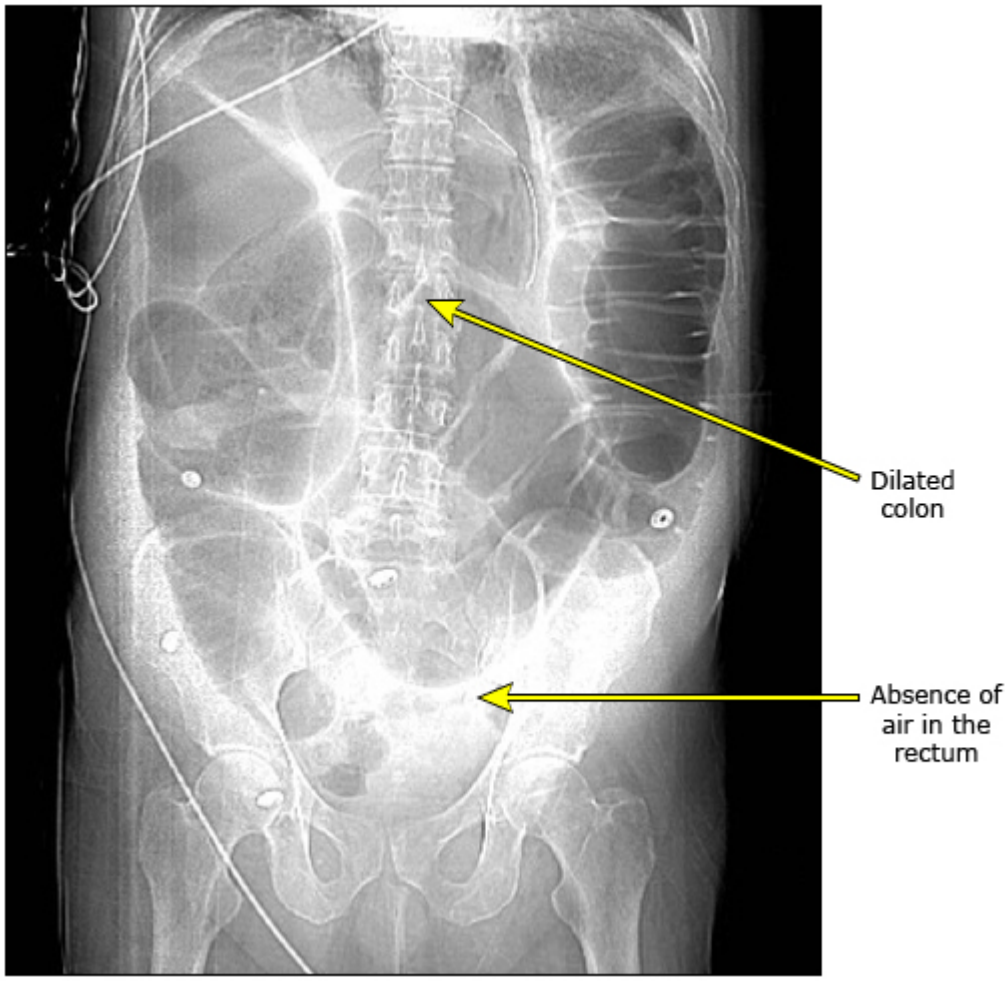
A multiplanar CT examination demonstrates a cecal bascule (B and C, arrow). Note the normal location of the ascending colon (A, arrow) and the region of fold with subsequent migration of the cecum in an anterior and cephalad direction (C, arrowhead). There is no evidence of vascular engorgement nor pericecal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

CT: computed tomography.

Courtesy of Joseph Farnum, MD.

Graphic 87137 Version 5.0

Sigmoid volvulus



Plain abdominal radiograph of a patient with a sigmoid volvulus demonstrates a large air-filled sigmoid colon (arrow) extending from the pelvis to the right upper quadrant and the absence of air in the rectum (arrow).

Courtesy of Mukesh Harisinghani, MD, Department of Radiology, Massachusetts General Hospital, Boston, MA.

Graphic 67675 Version 3.0

Nonsurgical causes of ileus

Pharmacologic agents
Opioids
Antihypertensive agents: Non-dihydropyridine calcium channel blockers (verapamil>diltiazem), clonidine
Antineoplastic agents: Bortezomib, busulfan, pegylated liposomal doxorubicin, methotrexate, paclitaxel, thalidomide, vinblastine, vincristine
Gastrointestinal agents:
▪ Antidiarrheal/antispasmodic: Alosetron, loperamide, diphenoxylate-atropine, hyoscyamine
▪ Phenothiazine antiemetics: Prochlorperazine, promethazine
Other: Oral iron preparations, zoledronic acid
Drugs with significant anticholinergic properties, including:
▪ Selective serotonin reuptake inhibitor antidepressants (paroxetine>fluoxetine)
▪ Tricyclic antidepressants (eg, amitriptyline, imipramine, desipramine, nortriptyline)
▪ Antipsychotics (eg, clozapine, haloperidol, olanzapine, quetiapine)
▪ Parkinson disease medications (eg, benztropine, carbidopa-levodopa, entacapone)
▪ H_1 antihistamines, first generation (eg, diphenhydramine, chlorpheniramine, cyproheptadine, meclizine)
▪ Muscle relaxants (eg, baclofen, cyclobenzaprine, tizanidine)
▪ Overactive bladder (OAB) medications (eg, oxybutynin, solifenacin, tolterodine)
▪ Atropine products
A method for estimating additive anticholinergic effects of various drugs is provided in a separate table. This is not a complete list of all medications that can contribute to nonsurgical ileus.
Medical conditions
Pancreatitis
Gastroenteritis
Spinal cord injury
Myocardial infarction
Stroke
Pneumonia
Hypokalemia

Diabetes (neuronal loss with progressive disease)
Diabetic ketoacidosis
Acute intermittent porphyria
Botulism
Severe burns
Parkinson disease
Epilepsy

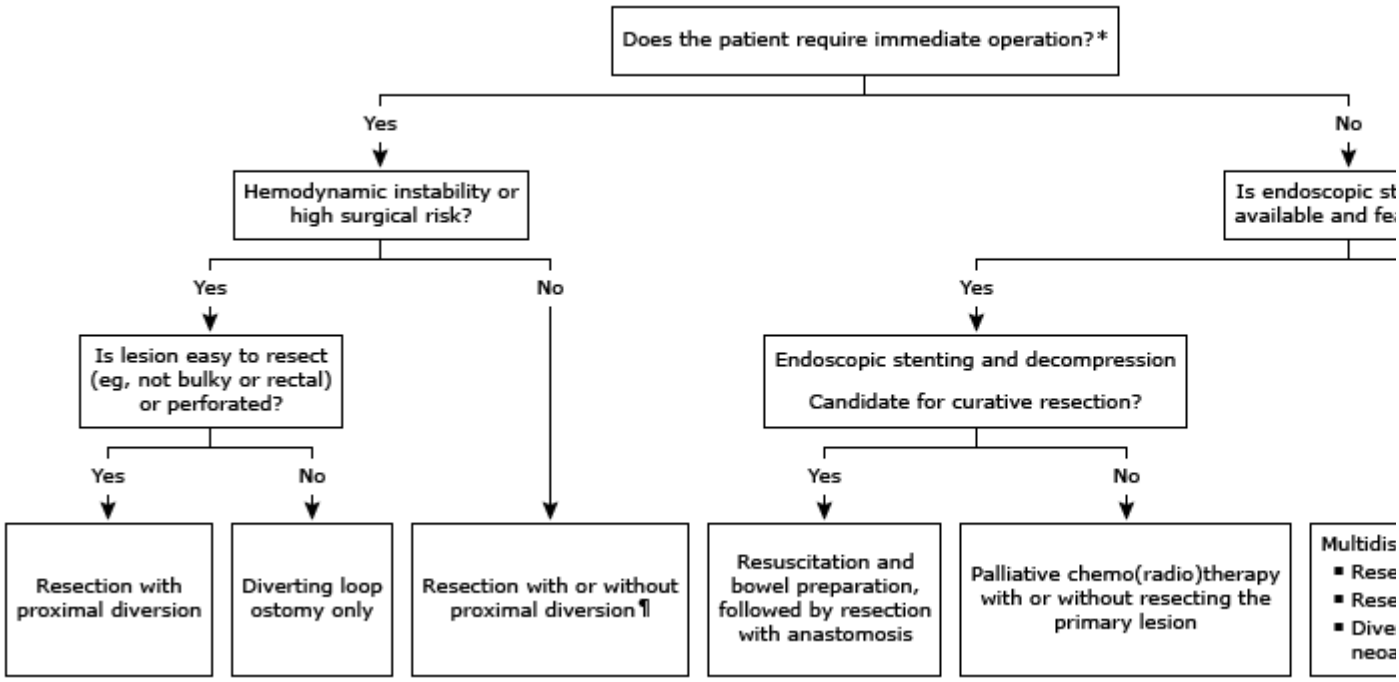
Graphic 96322 Version 2.0

Potentially treatable causes of ileus

Abdominopelvic abscess
Anastomotic leaks
Anticholinergic drugs
Antihistamines
Appendicitis
Cholecystitis
Hemoperitoneum or retroperitoneal hemorrhage
Hypokalemia
Hypomagnesemia
Opiates
Pancreatitis
Sepsis
Uremia

Graphic 70101 Version 1.0

Malignant large bowel obstruction

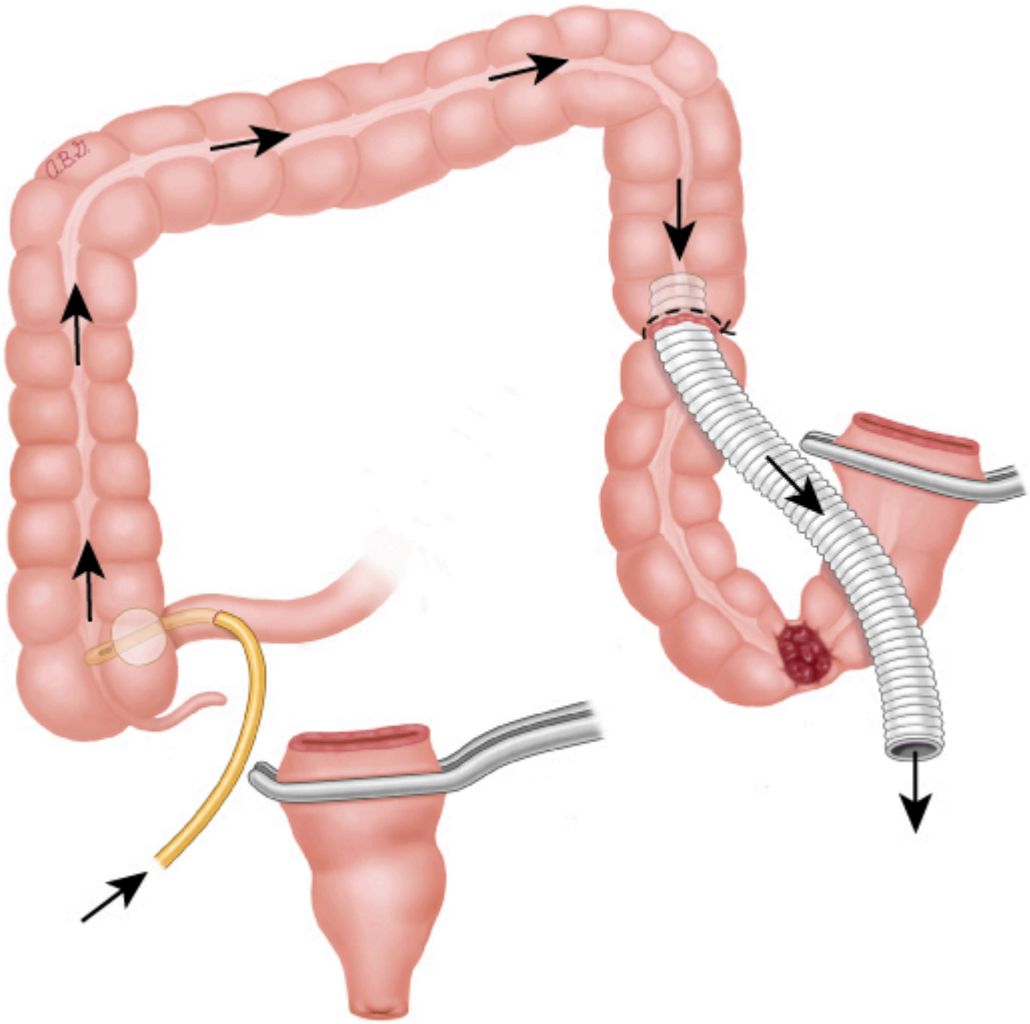


* Perforation or pending perforation (eg, pneumatosis coli), clinically unstable (tachycardic, hypotensive, or with lactic acidotic), severe symptoms.

¶ The need for proximal diversion depends upon the location of the obstructing lesion, condition of the proximal colon, and medical comorbidities of the patient.

Graphic 132576 Version 2.0

Technique of intraoperative colonic lavage



Modified from: Dudley HA, Racliffe AG, McGeehan D. Intraoperative irrigation of the colon to permit primary anastomosis. Br J Surg 1980; 67:80.

Graphic 100585 Version 2.0

Contributor Disclosures

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