

Large Bowel Obstruction: Etiologies, Diagnosis, and Management

Kevin A. Chen, MD¹ Muneera R. Kapadia, MD, MME¹

¹Division of Gastrointestinal Surgery, Department of Surgery, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

Address for correspondence Muneera R. Kapadia, MD, MME, Division of Gastrointestinal Surgery, Department of Surgery, University of North Carolina at Chapel Hill, 4038 Burnett Womack Building, Chapel Hill, NC 27599 (e-mail: muneera_kapadia@med.unc.edu).

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Abstract

Large bowel obstructions (LBOs) often require urgent surgical intervention. Diagnosis relies on astute history and physical examination, as well as imaging with computed tomography (CT) scan for stable patients. Because of the high mortality associated with colonic perforation in patients with LBOs, decisive surgical decision-making is needed for optimal outcomes. This review seeks to provide an overview of the etiologies of LBO, diagnosis, and general management principles, as well as specific management for the most common etiologies, including colorectal cancer and strictures.

Keywords

- ▶ large bowel obstruction
- ▶ colorectal cancer
- ▶ colonic stent

Workup and management of large bowel obstruction (LBO) is an important part of both general surgical and colorectal surgical practices. LBO can mandate urgent surgical intervention and carries a high risk of mortality at 9.8 to 20%.^{1,2} LBOs represent 20 to 25% of all bowel obstructions and are more common in elderly individuals.^{3,4} The etiology of LBO is varied and can include functional, benign, and malignant causes. The most common etiologies of LBO are adenocarcinoma of the colon or rectum, representing 50 to 60% of cases, diverticular strictures, and volvulus.^{5,6} Management should be focused on the specific etiology, but this article will review broad surgical principles for management of both benign and malignant causes of LBO.

Etiology

The etiologies of LBO are varied but can be categorized into functional, benign, and malignant causes (▶ **Table 1**). Functional causes of LBO include acute colonic pseudo-obstruction (Ogilvie's syndrome) and constipation. Benign causes most commonly include volvulus, accounting for 10 to 17% of LBOs, and diverticular strictures, accounting for around 10% of LBOs.⁷ Less common causes are Crohn's strictures, hernia, adhesions, intussusception, diverticular strictures, anastomotic strictures, endometriosis, retroperitoneal fibrosis, fecal impaction, and foreign bodies.

Malignancy is the most frequent etiology of LBO, accounting for over 50% of cases.^{4,7} About 10 to 30% of colorectal cancers initially present with LBO.^{2,4,8} Obstruction is more common in the descending colon due to its smaller lumen.^{2,9} Metastatic disease or external compression from other intra-abdominal tumors (pancreatic cancer, ovarian cancer, and lymphoma) are also possible.⁵

Diagnosis

Clinical Presentation, Physical Examination, and Laboratory Values

Patients with LBO often present with abdominal pain, distension, and obstipation. Compared with small bowel obstructions, patients with LBO are less likely to have nausea and vomiting unless they have delayed presentation or have an absent or incompetent ileocecal valve (e.g., prior ileocecal resection). The timing of symptom onset is helpful for distinguishing causes of LBO, as patients with rapid symptom onset are more likely to have volvulus, while gradual symptom onset may indicate a malignant or stricturing process. Prior episodes of left lower quadrant pain may indicate diverticular disease, while constitutional symptoms such as fatigue and weight loss may indicate malignancy.¹⁰

Digital rectal examination can help identify distal masses or fecal impaction. In addition, physical examination

Table 1 Etiologies of large bowel obstruction

Functional	Benign	Malignant
<ul style="list-style-type: none"> ● Acute colonic pseudo-obstruction (Ogilvie's) ● Constipation/impaction 	<ul style="list-style-type: none"> ● Volvulus ● Hernia ● Adhesions ● Intussusception ● Stricture (anastomotic, Crohn's, diverticular) ● Endometriosis ● Retroperitoneal fibrosis ● Foreign body 	<ul style="list-style-type: none"> ● Colorectal cancer ● Metastatic cancer ● Pelvic or peritoneal tumors

findings and vital sign changes, such as peritonitis, fevers, tachycardia, and hypotension, may indicate perforation and mandate immediate surgical intervention. Laboratory values assessing leukocytosis and lactic acidosis can indicate the presence of ischemia. Preoperative albumin can give insight into patients' nutritional status.^{11,12} Tumor markers, especially carcinoembryonic antigen (CEA), may also be obtained. Ultimately, imaging is required for definitive diagnosis.

Imaging

Plain abdominal radiographs are inexpensive, able to be obtained at the bedside, and can quickly identify pneumoperitoneum. Abdominal X-ray series have an 84% sensitivity and 72% specificity for identifying LBOs.¹³ Abdominal X-ray is most helpful for volvulus, but less discerning for other causes of LBO. Contrast enemas can also be used in the diagnosis of LBO and can identify the level of obstruction with 96% sensitivity and 98% specificity.¹³ However, obtaining a contrast enema in a timely fashion can be difficult in many hospitals and uncomfortable for patients.⁸

Unless the patient is hemodynamically unstable or has findings of diffuse peritonitis, further evaluation with computed tomography (CT) scan is indicated. An example of CT showing LBO is shown in **Fig. 1**. CT can provide information regarding the etiology and location of LBO. Classic findings on CT for LBO include air/fluid level within dilated colon and failure of oral contrast to pass distally with a change in the

caliber of the lumen at the point of the obstruction.⁶ CT findings such as wall thickening, mural hypoenhancement, pneumatosis, mesenteric stranding, and peritoneal fluid can indicate ischemia and impending perforation.^{14,15} Additional findings such as wall thickening and hyperenhancement indicating inflammatory bowel disease or diverticulitis, or intraluminal masses indicating malignancy, can be helpful in identifying the etiology of the LBO.⁶ The colon is considered dilated with diameter greater than 9 cm in the cecum and 6 cm in the left colon. At sizes greater than 12 cm of the cecum, there is an increased risk of perforation.^{16,17} For these patients, early surgical intervention should be considered.

Management

General Principles

The management of patients with LBO should be guided by the specific etiology, identified using diagnostic tools. However, some key principles of management are similar among different cases. First, patients with LBO often have intravascular volume depletion and electrolyte imbalances and require intravenous fluid resuscitation and repletion of electrolytes. For patients with signs of sepsis, ischemia, or perforation, antibiotics should be initiated. Patients with significant nausea and vomiting or evidence of gastric or small bowel distension on imaging should undergo gastric decompression. In contrast, patients without small bowel

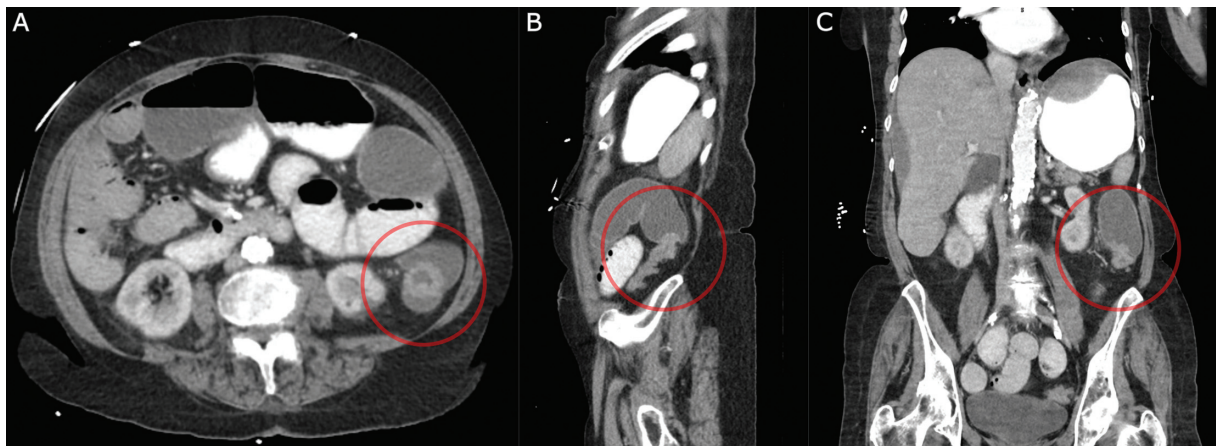


Fig. 1 Computed tomography (CT) scan showing large bowel obstruction with dilated transverse colon and transition point in descending colon. (A) Axial views with a *circle* around the obstructing mass. (B) Sagittal views with a *circle* around the transition point. (C) Coronal views with a *circle* around the transition point.

dilation, with a competent ileocecal valve, functionally have a closed loop obstruction, which can progress rapidly to cecal perforation.

For stable patients with malignant obstructions and no signs of ischemia or perforation, self-expanding metal stent (SEMS) placement may be considered. SEMS placement allows for decompression of the dilated colon. Obstruction secondary to colorectal cancer is the main indication for SEMS. In select cases, benign obstructions may be stented, although the complication rate is higher.^{18,19} SEMS may be used in the palliative setting or as a bridge to surgery. In the latter, following stent placement, definitive resection may be performed in the elective setting, with a minimally invasive approach, more often with a primary anastomosis, and less often with stoma placement.^{20–22} Because of these benefits, SEMS is the preferred approach in appropriate patients compared with immediate surgery.²³ SEMS placement has a success rate of approximately 70 to 80%, but is associated with several complications, including perforation (~5%), stent migration, hemorrhage, and re-obstruction.²⁴ SEMS should not be considered a long-term solution because of the risk of stent erosion and re-obstruction over time.²⁴ They should also not be placed in areas of acute angulation (such as the flexures) due to higher risk of stent erosion or migration or in the rectum because it may result in pain and tenesmus.²⁵ SEMS followed by resection has shown equivalent long-term outcomes (3-year overall and disease-free survival) compared with immediate surgery.^{24,26,27}

For LBO of any etiology, ischemia, peritonitis, and perforation are associated with significantly higher mortality (up to 50%).²⁸ For this reason, decisive surgical intervention is needed to prevent these complications. Prior to proceeding to surgery, attention should be paid to resuscitation and antibiotic administration as described earlier. In addition, preoperative stoma marking, noting creases on the abdomen when the patient is sitting up, can decrease stoma complications and improve self-care postoperatively.^{29,30} In the setting of LBO, preoperative mechanical bowel preparation is not possible and may precipitate perforation. Instead, on-table colonic lavage, performed by instilling 4 L of saline through the appendiceal orifice and collecting the effluent in anesthesia gas tubing secured to the cut end of the bowel, can reduce the colonic stool burden.^{25,31–33}

Surgical management of LBO involves the following key considerations: (1) resection versus proximal diversion only; (2) for patients who undergo resection, primary anastomosis versus ostomy creation; (3) for patients who undergo primary anastomosis, proximal diversion with a loop ostomy versus no diversion. Proximal diversion only is useful in the cases where immediate resection may carry a high risk of morbidity or mortality for malignant or benign etiologies not amenable to SEMS placement.³⁴ Similar to SEMS placement, proximal diversion followed by elective definitive resection is associated with higher likelihood of primary anastomosis and lower risk of permanent ostomy.^{34–36} Of note, in the cases in which only proximal diversion is used, if the ileocecal valve is competent, a loop ileostomy will not relieve

the obstruction and a loop colostomy or end colostomy with mucus fistula should be used instead.¹⁰

If resection of the obstructing segment of the colon is pursued, the decision to perform primary anastomosis or to divert proximally should be carefully considered.^{8,25,37} The decision to perform an anastomosis depends on the location of the obstruction, preoperative steroids or immunosuppression, the patient's nutrition and hemodynamic status, and the presence of perforation or fecal contamination. Right-sided anastomoses may have a lower risk of anastomotic leak (2.8–5.2%) and primary anastomosis is considered safer in the emergent setting.^{31,38,39} In contrast, left-sided resection, especially low rectal anastomoses, has a higher risk of anastomotic leak (up to 36%) and proximal diversion should be considered in most cases.⁴⁰ Preoperative steroid use, immunosuppression, and preoperative weight loss are also known risk factors for anastomotic leak.^{40–43} Intraoperative adjuncts, which have demonstrated utility in assessing risk of leak, include air leak test, evaluation with flexible endoscopy, and angiography with indocyanine green.^{44–46} In higher risk cases, anastomosis with proximal diversion should be considered. Finally, in the cases with gross fecal contamination, septic shock, and large volume (>300 mL) of blood loss, or in the cases with severe dilation of the proximal colon with size mismatch, resection with diversion and possible mucus fistula (Hartmann's procedure) should likely be performed.^{12,47} Depending on surgeon experience and the absence of small bowel dilation, a minimally invasive approach may be feasible and is associated with shorter length of stay.⁴⁸ In the cases in which the patient has profound hemodynamic instability and viability of the colon is marginal, a damage control approach is reasonable.⁴⁹

Colorectal Cancer

Resection of obstructing colorectal cancers should follow proper oncologic guidelines, including adequate margins and harvest of pericolic and mesenteric lymph nodes.¹⁰ If not completed preoperatively, staging, CEA value, and colonoscopy should be completed postoperatively.²³ In stable patients with partial obstructions, definitive diagnosis, and evaluation for synchronous lesions with colonoscopy before surgery is ideal. Use of SEMS as a "bridge to surgery," with improved postoperative outcomes has been discussed earlier. For patients with rectal cancer, proximal diversion for low cancers should be considered so that neoadjuvant therapy may be completed prior to definitive resection.^{10,50,51} Patients with obstructing cancers have worse long-term outcomes (16 vs. 37% for 5-year survival), although this appears to be related to age and stage, rather than obstruction or emergency surgery in itself.^{52–55} For elderly patients and those who have poor functional status preoperatively and/or have evidence of metastatic or peritoneal disease, goals of care discussions and consultation with palliative care services should be considered, as palliative surgery is associated with high rates of complications, readmission, and re-obstruction and limited life expectancy.⁵⁶ These patients may be better suited for palliative stent placement, unless

they are receiving the antiangiogenesis agent bevacizumab, which increases risk of perforation.^{51,57,58}

Stricture

Strictures resulting in LBO may be caused by diverticulitis, ischemic colitis, Crohn's disease, or previous anastomoses. Diverticular strictures cause approximately 10 to 20% of LBO.^{16,37} Surgical management of diverticular strictures includes considering the underlying etiology, with resection distally to the top of the rectum and proximally of gross diverticular disease to prevent recurrence of diverticulitis.⁵⁹ Stenting of diverticular strictures is associated with worse success rates and more frequent complications including perforations and fistulas.^{19,60} Balloon dilation may be attempted for strictures secondary to Crohn's disease, especially if they are in the ileocolic location. The presence of active inflammation, need for ongoing medical therapy, smoking, and elevated C-reactive protein (CRP) are associated with failure of endoscopic balloon dilation and need for surgery.^{61,62} Dilation of strictures with adjacent perforation or fistula is associated with increased risk of complications.^{61,63}

Conclusion

Patients with LBO need urgent intervention to prevent perforations and ensure optimal outcomes. CT scan is the most rapid and definitive diagnostic tool. Perforation and peritonitis are associated with worse outcomes, so decisive surgical intervention is needed for the highest risk patients. As alternatives to immediate surgery, SEMS for patients with colorectal cancer and balloon dilation for patients with Crohn's strictures may be considered. Careful consideration of patient and disease characteristics is needed for optimal surgical management.

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Conflict of Interest

None declared.

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