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EVIDENCE-BASED CURRENT SURGICAL PRACTICE

Colorectal Emergencies: Review and Controversies in the Management of Large Bowel Obstruction

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Abstract
Introduction Traditionally, large bowel obstruction (LBO) has been managed as an operative emergency. Its causes and treatments are an important part of general surgical and colon and rectal surgery practices.
Discussion While management has traditionally been emergent laparotomy with resection or removal of underlying pathology, newer methodologies and treatments over the last decade have required treating physicians to consider a number of other options, including nonoperative options such as stenting, when treating these patients.
Conclusion Given these changes, treating a patient with LBO requires a thoughtful assessment and comprehensive understanding of underlying pathology, assessment of the patient's comorbidities and up-to-date knowledge of modern options for treatment.

Keywords Large bowel obstruction · Colonic obstruction · Obstructing colon cancer

Introduction

Traditionally, large bowel obstruction (LBO) has been managed as an operative emergency.[1] Its causes and treatments are an important part of general surgical and colon and rectal surgical practices. While management has classically been emergent laparotomy with resection or removal of underlying pathology, newer methodologies and treatments over the last decade have required treating physicians to consider a number of other options, including nonoperative options such as stenting when treating these patients. Given these changes, treating a patient with LBO requires a thoughtful assessment and comprehensive understanding of underlying pathology, assessment of the patient's comorbidities and up-to-date knowledge of modern options for treatment.

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We plan to discuss etiology, symptoms, diagnosis, and controversies in the management of LBO in the current era of endoscopy and minimally invasive surgery, with a focus on recent treatment developments, controversies, and recommendations.

Etiology

Large bowel obstruction most commonly occurs in the elderly. The majority of LBOs are due to neoplasms, most often colon cancer, which accounts for just over 50 % of LBOS.[2,3] In fact, around 10 % of colon cancers initially present with LBO.

The most common sites of malignant obstruction are the descending colon and rectosigmoid. Volvulus accounts for another 10–17 % of LBO and arises from an axial rotation around the mesentery.[3] Volvulus most often occurs in the sigmoid colon or in the cecum. Diverticular strictures are the cause of around 10 % of LBO. Acute diverticulitis can also cause colonic obstruction due to abscess compression, stricture, or inflammation. Cecal bascule is an uncommon cause of obstruction. Other rare causes of obstruction include intussusception, Crohn's, extrinsic tumors, fecal impaction, foreign body, or infection. Other diagnoses on the differential of colonic obstruction are functional such as acute (toxic) or chronic megacolon and "Ogilvie syndrome." Adhesion related obstruction is rare.

Symptoms

Patients with LBO usually present with abdominal pain, distention, and obstipation. Emesis is less common a symptom and presents late in the course of obstruction. Presentation depends on underlying etiology. Obstruction may be acute as in the case of volvulus but is more chronic in the case of cancers. Pain often occurs over a distended cecum because that is the area of the large bowel that is the most susceptible to distension according to La Place's law.

Patients with untreated LBO may have signs of dehydration, sepsis, distension, a palpable mass, ascites, or peritoneal signs. Detecting when an LBO is an acute surgical emergency, i.e., perforation, is largely based on clinical signs and symptoms. High fever, tachycardia, and peritonitis suggest strangulation, perforation, or ischemia and usually require an urgent laparotomy.

Diagnosis

As with any surgical disorder, a focused history and physical are important in narrowing the differential. It is important to determine whether the course is acute, as often with volvulus, or more chronic, as with obstruction from cancer. A review of symptoms should focus on recent bowel changes, changes in weight or factors that incite pain. Medical history should include whether the patient has had chronic constipation or diarrhea, a history of narcotic use, and any surgical history.

On physical exam, important findings include distension, tympany, mass, or peritonitis. A nodal exam should be completed to evaluate for metastatic disease as obstructive tumors often present late. A digital rectal exam should be performed assessing for rectal mass or blood. And, if possible, proctoscopy should be completed to evaluate for sigmoid volvulus or sigmoid mass.

Initial blood work should include a CBC to evaluate for anemia or an elevated WBC, a basic metabolic panel to figure out electrolyte or acid–base abnormalities and is necessary before a contrast CT scan would be ordered. A lactic acid may help to determine the degree of ischemia, if any is suggested. If a cancer is diagnosed, a complete staging workup should be done including CEA and a CT of the chest, abdomen, and pelvis, in addition to a completion once the obstruction has been dealt with.

Imaging

Plain abdominal films are usually the first diagnostic imaging performed because they are quick, inexpensive, and can help give a sense of the underlying pathology and rule out free intraperitoneal air. In some cases of volvulus or megacolon, plain will be the only necessary diagnostic test.[4] The risk of perforation increases when the diameter of the cecum exceeds 10 cm. Chapman et al. report that an abdominal three-way has 84 % sensitivity and 72 % specificity in identifying LBO.[5] While reasonable at identifying an LBO, plain film does not provide any information on the underlying cause.

Contrast enema has traditionally been the gold standard for diagnosis of LBO and remains an important clinical tool. Water-soluble contrast is given as an enema and then a plain film is obtained. This can help to delineate the level of obstruction with 96 % sensitivity and 98 % specificity, and in some cases may be therapeutic.[5] The drawbacks of contrast enema are patient discomfort and availability of the study.

In order to identify the location of occlusion, underlying etiology such as mass or any other signs of inflammation or perforation, a CT scan is indicated so long as the patient is hemodynamically stable and does not have signs of acute peritonitis that would indicate a need to go directly to the operating room. CT when associated with multiplanar reconstruction has a sensitivity of 83 %, specificity of 93 %, and an accuracy of 91 % in determining the presence of ischemic complications.[6–9] In addition, it helps to provide detailed information about the severity of obstruction from sources such as diverticular disease, obstructive masses, or internal hernias. CT is much more readily available and easier to order in most practices.[10]

Radiologic findings associated with LBO include air/fluid levels within dilated loops of colon and failure of contrast to pass distally. In addition, if there is a point of obstruction, a luminal caliber change is usually noted.

Differential

Differentiation between total mechanical obstruction versus partial obstruction or pseudo-obstruction is critical because the first is typically treated surgically, whereas the others may be treated with medication or simple bowel rest. Imaging will play a key role in this distinction. Even with imaging, it often can be difficult to distinguish large bowel obstruction from colonic pseudo-obstruction. In fact, one third of patients diagnosed with LBO on clinical exam and abdominal x-rays have colonic pseudo-obstruction, and one fifth of those initially diagnosed with colonic pseudo-obstruction actually have an underlying LBO.[2]

CT scan can be helpful to distinguish this as patients with pseudo-obstruction or megacolon will not have a transition point or definitive area of caliber change.

Under any modality, cecal dilation can be a sign of impending perforation and should be taken seriously. Typically the upper limit of a point that leads to ischemia and perforation is about 12 cm. There have been some reports of cecal perforation at smaller diameters, and the risk does

depend on acuity—as slower processes may be able to tolerate a more dilated cecum.[11]

Management

Initial Resuscitation

Patients with LBO are usually intravascularly depleted and sequester fluids. As a result of this third spacing, they often need volume resuscitation in conjunction with other measures. In addition, if patients have vomiting, they may have further electrolyte and fluid losses, and nasal-gastric tube placement should be considered. Supportive care and resuscitation should be undertaken immediately after assessment, even before a definitive diagnosis has been made.

Both as part of the diagnosis of LBO and its management, flexible sigmoidoscopy should be considered early in the management so long as a patient is stable. In patients with a rectal mass, sigmoidoscopy may be used for initial diagnosis. Perforations are rare, and the flexible sigmoidoscopy can be done without any sedation or anesthetic. For patients with volvulus, a "swirl sign" is often seen. Especially important for patients with obstruction is that CO_2 insufflation is used. Regular air insufflation may be associated with higher rates of perforation and may make an obstruction worse. The CO_2 insufflation is absorbed 250 times faster than air and less likely to cause inadvertent proximal colonic distension.[12]

Surgical

Even today patients with perforation, closed loop obstruction with ischemia, or peritonitis still require emergent laparotomy. A few preoperative considerations should be considered. As mentioned above, appropriate fluid and electrolyte repletion is important prior to surgery. Appropriate preoperative antibiotics should be given with both good aerobic and gram-negative coverage. Patients should have preoperative stomal marking while awake and sitting upright if possible. In addition, the risks of surgery should be discussed with the patient's family and the patient. If the patient is sick, the family should be made aware that the hospital course could be long and may include prolonged intubation or the possibility of an open abdomen. For the procedure, appropriate perioperative anticoagulation should be given so long as the patient is not septic. Patients should generally be placed in a modified lithotomy position so that if needed access to the rectum is possible. Anesthesia should be made aware of the surgeon's concerns prior to incision and be prepared for additional fluid resuscitation as needed. Traditional management of LBO has been an emergent exploratory laparotomy. If obstruction is a tumor in the right or transverse colon, primary resection and anastomosis should be considered as long as bowel looks viable and patient is hemodynamically stable and fit for resection.[13] If resection is more distal, treatment is more controversial, and proximal diversion is often the procedure of choice. Obviously, surgery depends on the site of obstruction, the viability of the obstructed bowel, and the overall patient condition. Traditional three-stage surgery is rarely performed. More often, a two-stage procedure is performed—with either resection of the obstructed segment or cancer and primary anastomosis with or without diversion or with resection and a Hartmann's procedure.

Hartmann's operation was initially introduced in 1923 by Henri Hartmann as a procedure for resection of lower sigmoid and upper rectal cancers. The majority are performed during emergency situations.[14,15] Morbidity is often high (up to 35 %), and they are often not reversed, with up to 45 % of patients remaining with a permanent colostomy.[16,17] If feasible to perform a primary anastomosis with a proximal diversion in lower rectal cancers, this is preferable but can often not be done in an emergency situation. If a patient is unstable, creation of an anastomosis is not advisable. However, in carefully selected patients with obstructing colon cancer who are hemodynamically stable, primary resection and anastomosis is associated with excellent survival and outcomes.[18]

As expected, in a study performed by the SCOTIA study group in 1995, they found that patients with left colon malignant obstruction had better bowel function if they had a segmental resection than if they had a subtotal colectomy, although overall morbidity and mortality was otherwise similar.[19,20] If a cancer is the cause of obstruction and the patient can tolerate it, the appropriate segmental resection with high vascular ligation should be performed.

Special Situations

Sigmoid Volvulus

Flexible sigmoidoscopy and decompression in patients with sigmoid volvulus is successful in detorsing 85–95 % of patients with sigmoid volvulus. But it is contraindicated in patients with peritonitis or an acute abdomen.[21] And if unsuccessful, urgent surgery is needed. In addition, because there is up to a 60 % rate of recurrence, it is recommended that these patients still undergo surgery at time of original admission for sigmoid resection.[22]

Cecal Volvulus/Bascule

Colonoscopic decompression is generally ineffective (<30 % of patients can be helped with colonoscopy), and these patients have a higher rate of ischemia, as a result surgery remains the

primary treatment modality. In 1990, Rabinovici et al. reviewed the 568 cases reported in the literature and found that up to 20 % of patients have a gangrenous cecum.[23] In addition, detorsing with cecopexy or performing a cecostomy had much higher rates of complication and recurrence. Primary resection is the primary method of management. The majority of these patients can be resected and reanastomosed, unless the patient is unstable, in which case a proximal diversion maybe needed or a second look operation.

Stenting in Malignant Obstruction Controversy and Recommendations

Up to one third of patients with colorectal cancer in western countries present with near or complete mechanical obstruction due to tumor burden and require urgent management. Both acute and subacute obstructions from malignancy have high morbidity and mortality. Because of this, especially for left-sided lesions where resection is more complicated, stenting has been suggested as a tool to let patients move past the phase of acute obstruction and either be treated with systemic palliative or neoadjuvant chemotherapy without a delay for surgery or so that they can avoid emergent surgery. Since the early 1990s, a number of reports have been described using stents for the management of colonic obstruction. These studies have looked both the use of stents for palliative reasons and as a potential bridge to surgery (see Table 1).

Palliation

As a treatment for patients with incurable disease, a stent may lend patients the opportunity to get systemic chemotherapy and provide palliation without the morbidity of an operation. A Cochrane review of colonic stenting for palliation evaluated five randomized trials looking at stenting compared to surgery and found that surgery had a higher clinical success (99 vs. 78 %) but that the time to relief was shorter for stents and that morbidity and mortality was similar for their patients.[24] In addition, a recent multicenter randomized trial of stenting versus surgery was closed early due to an unexpectedly high perforation rate in the nonsurgical arm.[25] Still many centers use stenting for palliation with excellent results.[26] The reality as that for many patients with advanced disease who are not good surgical candidates, stenting may allow palliation and earlier treatment. However, because of technical variability, it should be used at centers with experience in advanced endoscopic technique. In addition, when used for palliation, patients should be warned that they may need additional procedures and that there are high rates of long-term complications.[27] So for patients fit for surgery, surgery is typically the procedure of choice.

Bridge to Surgery

For patients with acute obstruction who are sick, a stent may be able to hold them over to nutritional improvement and then resection or even neoadjuvant chemotherapy. For patients with combined liver/colon disease, a stent may allow deferral of the colectomy and allow treatment of the liver. In addition, because of the high morbidity and mortality of obstructing colon cancers, stents may turn an emergent procedure into an elective one, and patients can be optimized, prepped, and decrease surgical mortality from around 20 % down to 5 %. Patients with resectable colon cancers can also decompress and have the rest of their colon evaluated to make sure that there are no synchronous lesions. In a paper by Vitale et al., up to 10 % of the patients in their review had a synchronous cancer, and as a result of being able to have preoperative stenting, they were able to have a full evaluation and make a more educated surgical resection plan.[28–33] In addition, a cost-effectiveness analysis concluded that colonic stent insertion followed by surgery was more effective and less costly than

Table 1 Key randomized controlled trials in colonic stenting for malignant obstruction

Author	Year	No. patients stented/ surgery	Stent Success (%)	Perforation rate	Findings	Reason for stent	Other
Fiori et al.[34]	2004	11/11	100 %	none	Improved return of function	Palliation	
Cheung et al.[35]	2009	24/24	83 %	none	SEMS reduced blood loss, pain, leak, stoma		Time from SEMS to surgery <2 weeks
Pirlet et al.[36]	2010	30/39	47 %	14 %		Trial closed prematurely due to high perforation rate in stent group	
Van Hooft et al. [31]	2011	47/51	70 %	12 %		Trial closed prematurely due to high rate of morbidity on interim analysis	
Alcantara et al.[37]	2011	15/13	100 %	nr	SEMS reduced morbidity and anastomotic leak	Trial closed due to high rate of anastomotic leak in emergency surgery group	Surgery group underwent lavage

emergency surgery, especially when looking at the patient's quality of life.[25] A multi center study showed that colonic stenting relieved the obstruction in 93 % of patients, and as a result, 92 % of patients were able to undergo a single-stage resection and anastomosis within 8.6 days of stent placement, with only one patient having a perforation.[38]

Tan et al. performed a meta-analysis of randomized controlled trials of self-expanding metallic stents (SEMS) as a bridge to surgery versus emergency surgery for malignant left-sided large bowel obstructions.[39] Their group that while as a bridge to surgery SEMS had a higher successful primary anastomosis and lower overall stoma rates, and 0 difference in complications or mortality, there was a high association with both clinical and silent perforation. In addition, technical and clinical successes were lower than expected overall. Cirocchi et al.[40] conducted a similar meta-analysis and also found that clinical success was higher in the emergency surgery group. These authors however caution, as is important that in all of the RCTs performed, the numbers are small, and the majority of the studies did not look at long-term quality of life, cost, or oncologic outcome.

Because of the mixed findings of these studies, careful patient selection regarding the use of stenting is very important. Stenting of rectal tumors is generally avoided because they tend to migrate and cause pain. In addition, stenting at the splenic flexure and rectosigmoid may be more likely to perforate due to the angulation of the stents. New methodologies are being utilized to help minimize the risk of perforation. And for patients who have stents as a bridge to surgery, erosion and perforation may be less likely than surgery is performed in the early post-stenting period.

Conclusions and Final Recommendations

While there have been some changes in the diagnosis and management of large bowel obstruction, it remains a surgical emergency that is important for clinicians to understand and manage correctly. CT scan has taken over as the imaging modality of choice in the majority of cases. The most controversial issue to date is that of colonic stenting. As a palliative procedure, stenting should be used with caution and by those with advanced endoscopic experience. It is associated with high rates of reintervention and complications and so should be used with caution. As a bridge to surgery, it has not proven to be as beneficial as expected. And patients who are clearly resectable and can tolerate surgery should undergo surgery as the treatment of choice given both the short-term and long-term benefits. For the more complicated patients, stenting has been used with good success. This continues to evolve as there are many more surgical and endoscopic options available and as neoadjuvant therapy continues to evolve. Most importantly is the physician's focus on the patient's comorbidities, disease process, and technological technical complexity in order to make individual treatment decisions.

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