

# Emergency Presentations of Colorectal Cancer



Canaan Baer, MD<sup>a,\*</sup>, Raman Menon, MD<sup>a</sup>, Sarah Bastawrous, DO<sup>b</sup>, Amir Bastawrous, MD, MBA<sup>a</sup>

## KEYWORDS

- Emergency • Colorectal • Carcinoma • Obstruction • Perforation • Bleeding
- Endoluminal stent

## KEY POINTS

- Proximal large bowel obstructions are typically treated with resection and anastomosis, whereas distal obstructions have more treatment options and require more catering to the individual situation.
- Obstructing rectal cancer is treated with proximal diversion, allowing for appropriate neoadjuvant therapy before oncologic resection.
- The approach to perforated cancers depends on the degree of peritoneal contamination and associated sepsis.
- Massive hemorrhage is uncommon in colorectal cancer and is treated similar to benign sources of colonic hemorrhage.

## INTRODUCTION

Despite increased screening efforts, up to 33% of patients with colorectal cancer will present with symptoms requiring acute or emergent surgical intervention.<sup>1,2</sup> Common emergency presentations include large bowel obstruction, perforation, and hemorrhage. Rates of morbidity, mortality, and stoma formation are higher for patients requiring emergent intervention compared with those managed electively.<sup>3,4</sup> Worse outcomes are felt to be not only related to the emergency itself but also to baseline differences in the 2 patient populations, with emergency patients having more physiologic derangements, dehydration and electrolytes abnormalities, poor nutrition, and neglected comorbidities.

Tumor biology may also play a role in their presentation and outcome. Cancers resected emergently are typically of a more advanced T stage, higher histologic grade,

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<sup>a</sup> Colon and Rectal Clinic, Swedish Medical Center, 1101 Madison, Suite 500, Seattle, WA 98104, USA; <sup>b</sup> Department of Radiology, Puget Sound Veteran's Affairs Administration Hospital, University of Washington, 1660 South Columbian Way, Seattle, WA 98108, USA

\* Corresponding author.

E-mail address: [canaan.baer@swedish.org](mailto:canaan.baer@swedish.org)

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and more likely to exhibit lymphovascular invasion.<sup>5-7</sup> Concomitant liver metastases are common as well.<sup>7-9</sup> If forced to operate at the patient's index presentation, the diagnosis and accurate staging information may be unavailable or incomplete. When initial findings suggest widely metastatic disease, the necessity for emergent interventions may have lasting implications on the eligibility for systemic chemotherapy.

The complexities of patients presenting with limited information and suboptimal physiology require individualization of surgical management. The tenets of oncologic resection for colorectal cancer surgery include wide radial, proximal, and distal margins and high ligation of the lymphovascular pedicle for extended lymphadenectomy (>12 nodes). These oncologic principles should be upheld even in cases of emergency surgery for symptomatic colorectal cancers.

The Clinical Practice Guidelines Committee of the American Society of Colon and Rectal Surgeons defines goals of treatment of colon cancer-related emergencies to include the following: (1) avert the immediate negative impact of the complication; (2) achieve the best possible tumor control; (3) ensure timely recovery to permit initiation of appropriate adjuvant or systemic treatment.<sup>10</sup> In this article, the authors look at specific emergency scenarios and the surgical options to achieve those goals.

## LARGE BOWEL OBSTRUCTION

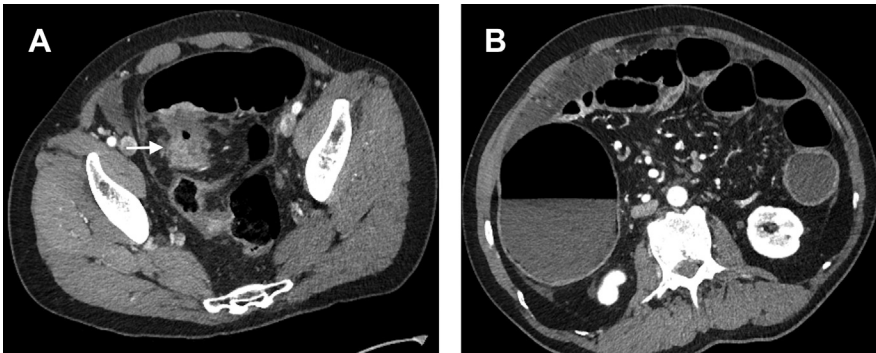
Obstruction is a common symptom of colorectal cancer, with an incidence range of 15% to 29%.<sup>11</sup> Obstruction is also the most common indication for emergency surgery for colorectal cancer, making up 77% of emergencies in a recent series.<sup>3</sup> Similarly, colonic malignancy is the most common cause of large bowel obstruction in adults.<sup>1,12,13</sup> As such, surgery for large bowel obstruction presenting acutely should be performed in an oncologic fashion, even if a formal diagnosis of malignancy has not yet been made. Patients presenting with obstruction and no evidence of metastatic disease should be operated on with curative intent.<sup>1</sup>

The presentation of complete bowel obstruction from a colon cancer is typically delayed by a gradual onset of symptoms. Patients may report increasing difficulty with bowel movements or self-medicating with over-the-counter laxatives. They may have developed significant abdominal distension before complete obstipation results in a need for emergency medical attention. Such an insidious onset can result in fairly stable physiology in patients presenting with malignant obstructions. Severe dehydration and electrolyte abnormalities are typically late signs. In some cases, symptoms can be sudden in onset, with severe persistent colicky abdominal pain.<sup>14</sup>

Computed tomography (CT) has become the imaging modality of choice for patients presenting with symptoms concerning for colonic obstruction. It is readily available in emergency departments and can localize an obstructing lesion with a sensitivity of 96% and specificity of 93%.<sup>15,16</sup> Particularly with the use of a triple-contrast protocol (oral, rectal, and intravenous [IV]), CT can make an accurate diagnosis in nearly 89% of cases. CT also offers accurate staging information of both locoregional and distant disease spread<sup>15-17</sup> (**Fig. 1**).

Although less commonly used in current practice, hydrosoluble contrast enema is also a valuable imaging technique. Sensitivity and specificity in colonic obstructions are 80% and 100%, respectively.<sup>15-17</sup> In a stool-filled colon, CT may not be able to identify a small intraluminal lesion that is readily apparent on contrast enema<sup>16</sup> (**Fig. 2**).

Colonoscopy is often not available or appropriate in the emergency setting, and patients presenting in extremis may require surgical intervention before an endoscopic evaluation can be arranged. When feasible, colonoscopy offers the ability to identify



**Fig. 1.** (A) Axial CT images with IV contrast in a patient with an obstructing sigmoid adenocarcinoma (*arrow*). (B) There is marked dilatation of the cecum with an air fluid level. Note omental caking due to metastases.

and localize an obstructing lesion as well as to confirm a diagnosis with tissue sampling. Colonoscopy also offers the potential for relief of obstructions with placement of endoluminal stents, to be discussed in more detail later. When encountered outside of the emergency setting, lacking corollary symptoms, a lesion that cannot be traversed with a standard colonoscope (diameter 11.8–13.0 mm) is much more likely to require an emergency operation, with a hazard ratio of 6.9 (1.6–29.7).<sup>4</sup> This finding warrants an expedited referral to a surgical specialist.

Obstructing colon cancers can be defined as occurring either proximal or distal to the splenic flexure, with site of disease having a significant impact on treatment options. The left colon is more prone to obstruction, most commonly in the sigmoid.<sup>18</sup> Reasons for this include a tendency toward morphologically more annular lesions, a relatively narrow colonic luminal diameter, and a thicker stool consistency.<sup>19</sup> The



**Fig. 2.** Hydro-soluble contrast enema reveals a 4-cm annular carcinoma at the rectosigmoid junction.

larger diameter of the right colon means that obstructions are less common, typically involving very bulky tumors.

### ***Proximal Obstructions***

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Because of the larger diameter of the cecum and ascending colon, right-sided obstructions are less common and historically thought to represent bulky tumors of more advanced stage. Early studies found lower disease-free survival in proximal obstructing cancers compared with distal cancers, independent of perioperative complications or the presence of lymph node metastases.<sup>19</sup> A more recent analysis, however, looked at 377 patients undergoing colectomy for obstructing cancers, evenly split between proximal and distal sites, and found no difference in rates of recurrence or 3-year survival.<sup>20</sup>

In general, proximal colonic obstructions have a simpler decision tree than distal obstructions. Resection is often viewed as less technically demanding and most patients can undergo an ileocolonic anastomosis, which is lower risk for complications when compared to colocolonic or colorectal anastomoses. Reasons for this anastomosis being more favorable include a more reliable blood supply and a lower incidence of significant proximal bowel dilation and size mismatch.

Oncologic resection with primary anastomosis for right colon cancers has long been advocated as safe and definitive surgical management in all but the frailest of patients, with fewer anastomotic complications compared with distal resections.<sup>8</sup> The leak rate after right hemicolectomy or extended right colectomy, even in emergency settings, is estimated at 2.8% to 4.6%, leading many to pursue this approach even in high-risk patients.<sup>17</sup> This rate is somewhat higher than the reported leak rate for an elective right colectomy in the range of 1% to 2%.

Other studies, however, have documented higher rates of complications. A recent review of 87 emergency colectomies included 43 proximal cancers. Anastomotic dehiscence after right hemicolectomy occurred in 12% (4 of 33). Two additional patients had resection of the transverse colon only with primary colocolonic anastomosis; 1 leaked.<sup>3</sup> In another large study, the leak rate after right colectomy was as high as 16.4% (28 of 173).<sup>20</sup> The finding of a higher-than-expected leak rate after right colectomies has led some investigators to advocate the benefits of a protective or terminal stoma in a subset of high-risk patients.<sup>21</sup> Specific criteria have yet to be defined. In these cases, attempt should still be made for definitive oncologic resection.

The operative approach to an obstructing ascending colon tumor is typically a right hemicolectomy with high ligation of the ileocolic artery and the right branch of the middle colic artery, and an ileo-transverse anastomosis. When tumors are present in the mid to distal transverse colon, a proper oncologic resection includes high ligation of the middle colic artery. When this is required, there is vascular compromise of the “watershed” splenic flexure, and the best approach is an “extended right colectomy,” including resection of the splenic flexure and an ileo-descending anastomosis. Of note, whenever the patient’s baseline condition or the intraoperative variables lead to a high risk of anastomotic leak, the safest approach is resection with an end ileostomy. For patients with more equivocal presentations, ileocolonic anastomosis with a proximal loop ileostomy may be appropriate.

### ***Distal Obstructions***

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Because of narrow bowel diameter and thicker stool consistency, the descending and sigmoid colon are common sites for obstructing colon carcinomas. Compared with proximal lesions, there are considerably more options available to the surgeon

addressing such a patient. Although it is widely acknowledged that the specific approach must be tailored to each individual patient, surgeon expertise, and available resources, there remains significant controversy on the optimal emergency management of obstructing distal colon cancers. These options are outlined and compared in a 2010 guideline statement from the World Society for Emergency Surgery (WSES) and Peritoneum and Surgery Society.<sup>22</sup>

### **Loop colostomy**

Loop colostomy is an established component of the surgical treatment options for obstructing distal carcinomas, with the intent of providing definitive oncologic resection in a staged approach. The obstruction is thus managed in the first stage with creation of a proximal loop colostomy. In the second stage, the tumor is resected and the stoma reversed. Alternatively, colostomy reversal can be performed as a third stage. Depending on patient- and tumors-specific factors, the transverse or descending colon can be used. In general, a loop ileostomy is discouraged, because the presence of a competent ileocecal valve may prevent adequate alleviation of the distal obstruction.

The appeal of this staged approach is that it minimizes operative time and surgical trauma during the acute presentation when physiologic derangements and tissue integrity are suboptimal. The initial colostomy may even be performed with only local analgesia in some cases.<sup>15</sup> It also reduces the risk of contamination from unprepared bowel and allows for complete staging and multidisciplinary review before definitive treatment.<sup>22</sup> However, loop colostomies are often associated with high complication rates, including stomal prolapse, hernia, and dehydration, and the approach does not allow for an oncologic resection.

Loop colostomy is a safe option best suited to patients who are too frail to endure a resectional procedure. Loop colostomy may also be appropriate when the cancer is locally advanced and invading adjacent organs, limiting the feasibility of a proper oncologic resection in an emergency situation.

### **Hartmann resection**

The classic Hartmann procedure involves resection of the primary lesion with creation of an end colostomy and closing the distal colon/rectum. Large reviews have established the feasibility of emergency resection following standard oncologic principles of high ligation of the vascular pedicle, retrieval of at least 12 regional lymph nodes, and en bloc resection of adjacent tissues for negative margins.<sup>3,23</sup> Like a loop colostomy, this approach mitigates the risk of anastomotic leak. Hartmann resection is currently the most common operation performed for distal colon carcinomas presenting emergently, especially by general surgeons.<sup>15,24,25</sup>

Despite the longer operative time for a formal resection, literature has not shown any worse short- or long-term outcomes in patients undergoing formal Hartmann resection compared with the staged approach. A randomized study by Kronborg<sup>26</sup> showed no difference in mortality, recurrence rate, and cancer-specific survival between colostomy or Hartmann procedure in emergency presentations. The only difference found in this study was a longer hospital stay in the staged approach due to the need for multiple subsequent operations. Of note, this study has been criticized for its long accrual period, incomplete follow-up, and heterogenous underlying pathology. A Cochrane systematic review in 2004, which did not include the Kronborg study due to methodological flaws, nevertheless made the same conclusions.<sup>27</sup> WSES guidelines conclude that colostomy (staged approach) should be reserved for “damage control” situations, unresectable tumors, and cases where multimodal treatment is anticipated before formal resection.<sup>22</sup>

A contradictory conclusion was made by another recent randomized controlled trial (RCT), which found no difference in outcomes, including transfusion rates or duration of hospitalization between a staged approach and Hartmann resection.<sup>28</sup> The investigators of this study argue rather that colostomy for staged approach is ideal for younger, healthier patients who will tolerate definitive surgery in as little as 2 to 3 weeks when less bowel distention and inflammation may allow for a technically easier and more oncologically sound resection.<sup>28</sup> Nevertheless, most investigators agree that Hartmann resection is the procedure of choice for older patients with high American Society of Anesthesiologists (ASA) scores, advanced obstructions, and proximal bowel distension, and whose underlying medical comorbidities might preclude definitive surgery in a staged fashion.<sup>15,22,26–28</sup>

The main disadvantage of a Hartmann resection is the residual stoma. Among patients with colon cancer, the rate of Hartmann reversal is only 20% for reasons including advanced disease, complications from treatment, and poor performance status.<sup>29,30</sup> Operations to restore intestinal continuity are also associated with significant morbidity and mortality.<sup>15</sup> Stomas are not without their own complications, and rates increase the longer they are in place, adversely affecting quality of life.<sup>31,32</sup>

### ***Single-stage primary resection and anastomosis***

For many years, a single-stage oncologic resection with primary anastomosis was considered too high of a risk in the emergency setting. Concerns included further physiologic derangement to a critically ill patient, increased extent of surgery and operating room time, difficulty manipulating and mobilizing a distended colon, and potential for contamination of the peritoneal cavity. Patients may be severely malnourished due to reduced oral intake before presenting with obstruction, and proceeding with an operation before nutritional optimization may increase their risk for postoperative complications, especially if the condition of proximal bowel is dilated, ischemic, or otherwise suboptimal for an anastomosis. Of utmost importance are the complications from an anastomotic leak, which can be catastrophic and forestall adjuvant systemic chemotherapy when indicated.

Large studies, however, have established the feasibility of primary resection and anastomosis (PRA) in appropriately selected patients. Resection with primary anastomosis can reduce length of stay and reduce number of operations with similar rates of morbidity and mortality. Nonrandomized reviews and retrospective data have shown the rate of anastomotic leak in emergency settings to be 2.2% to 12%, which is similar to rates in elective colon resection of 1.9% to 8%.<sup>22</sup> Thus, even in acutely symptomatic distal colon carcinomas, PRA is recommended in the position statement from the Association of Coloproctologists of Great Britain and Ireland.<sup>31,33</sup>

Appropriate patient selection is critical to success in this inherently high-risk environment. Specific factors that have been associated with poor outcomes in obstructing colon cancer operations include age greater than 70, ASA grades III–IV, preoperative renal failure, surgery within 24 hours of presentation, and advanced cancer stage.<sup>21,29,33</sup> Any of these factors may argue for either a Hartmann resection with end colostomy or potentially a primary anastomosis with a protecting loop ileostomy.

### ***Total abdominal colectomy***

Total abdominal colectomy with ileorectal anastomosis (TAC/IRA) is another option for select patients. It also removes the distended and potentially ischemic proximal colon, resecting back to healthy terminal ileum for a primary anastomosis. This approach is particularly appropriate in cases with suspected synchronous tumors or hereditary

colorectal cancer syndromes. Another very important indication for TAC/IRA is cecal perforation or impending perforation, which is common in advanced distal obstructions. In general, a double resection to remove the cecum and the distal tumor separately, leaving the transverse colon intact, is not recommended.

A small randomized trial compared outcomes from subtotal colectomy to segmental resection (PRA) and found no difference in hospital mortality or complication rates. Segmental colectomies in this study included intraoperative colonic irrigation. At 4 months, however, the subtotal colectomy patients reported more frequent bowel movements and more presentations with bowel problems than in the PRA group. The investigators concluded that subtotal colectomy should be reserved for cases of synchronous lesions or when the integrity and viability of proximal colon is questioned.<sup>34</sup>

### ***Self-expanding metal stents***

Self-expandable metal stents (SEMS) represent a nonoperative modality to address distal colonic malignant obstructions. These stents were first developed in the 1990s for palliation of obstructions from unresectable tumors or in patients deemed poor candidates for resectional surgery.<sup>24,35,36</sup> Stents are also used as a temporizing “bridge to surgery” with the goal of enabling elective, possibly laparoscopic, resection.

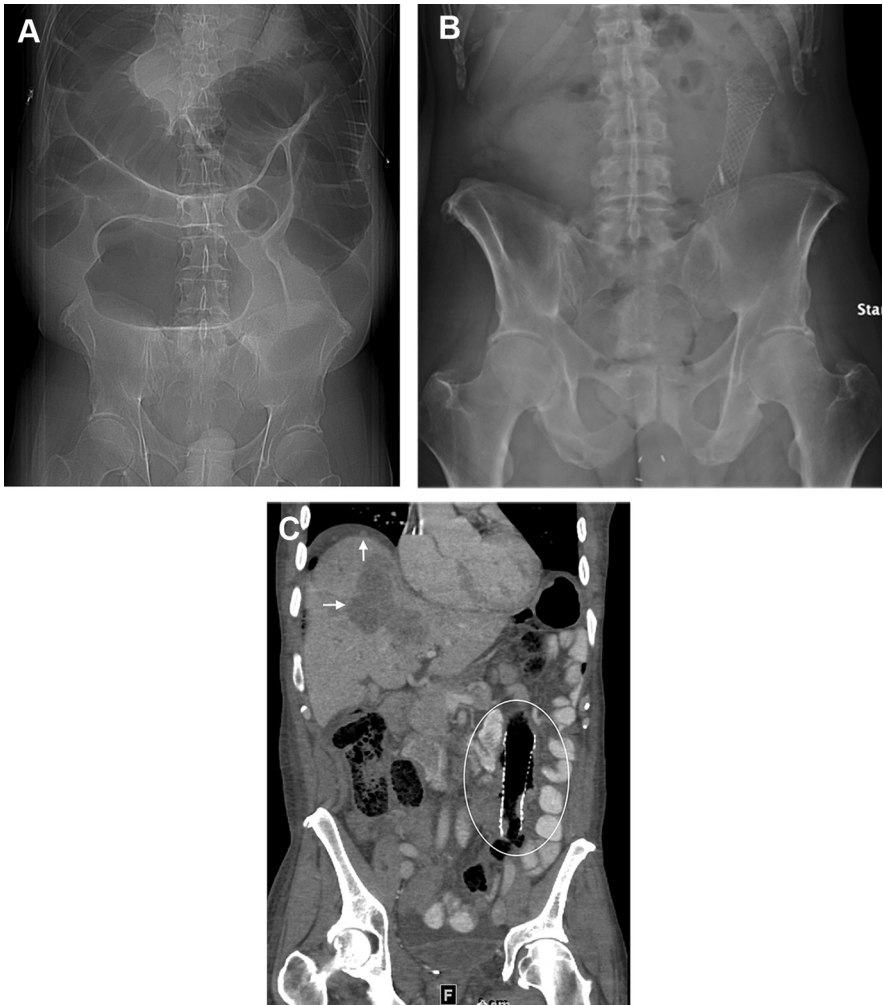
SEMS involve the endoscopic placement of a guide wire across the obstructing lesion, often with the assistance of fluoroscopy, followed by an uncovered, self-expanding metal stent. Balloon dilation is not typically necessary. Once the stent has been deployed, success is confirmed by a rush of air and fluid past the obstruction (**Fig. 3**). If desired, the endoscope can typically be advanced through the stent to visualize the proximal colon. Although stenting is technically feasible for all areas of the colon, it has been more successful and better studied for left-sided lesions.

Stenting is an attractive alternative to emergency surgery. Proponents argue that stenting can allow for the managing team to stabilize the patient, correct dehydration and other electrolyte imbalances, optimize medical comorbidities and nutritional status, complete oncologic staging, and involve a multidisciplinary team. Early studies supporting the use of SEMS in this context argued that as a bridge to surgery, stents could reduce morbidity and mortality and lower stoma rates compared with surgery alone.<sup>35,37–41</sup>

Not all reported data, however, have supported these initial claims. For example, a recent observational study compared surgery to SEMS as a bridge to surgery. Despite high rates of technical success with stent placement (91%) and relatively low rates of complications (microperforation rate 13%), there was no difference in perioperative mortality and no difference in rates of primary anastomosis or stoma creation.<sup>31</sup>

In a large systematic review and meta-analysis, the rate of clinical success relieving obstruction with SEMS was only 52.5% overall, compared with 99% with surgery. Morbidity and mortality were again similar between groups; however, the rates of primary anastomosis were surprisingly low in the bridge-to-surgery group, only 64.9% compared with 55% in the surgery-first group, not statistically different. Anastomotic leak rates were slightly better in the stented patients, but also not significant.<sup>42</sup>

Stent deployment is not without risk. In fact, of the 6 RCTs comparing SEMS to upfront surgery in distal obstructing cancers, half closed enrollment early due to high rates of stent-related complications, most notably perforation during deployment.<sup>15,35</sup> Other complications include failure to relieve the obstruction, migration, and subsequent stent occlusion. Tumor perforation during stent deployment likely



**Fig. 3.** Anterior posterior upright radiograph (A) before and (B) after placement of descending colon metal stent for decompression of obstructing colon cancer (C). Coronal CT image shows stent in descending colon. Note liver and peritoneal metastatic lesions (arrow).

mandates emergency surgery. Peritoneal spillage adds additional physiologic stress to the patient and may limit the surgical options in the setting of feculent peritonitis.

Some authors argue that even following uncomplicated deployment, the local trauma from a stent may encourage tumor cell dissemination and worsen oncologic outcomes.<sup>43</sup> A retrospective comparative study using SEMS as a bridge to surgery found a significantly lower overall 5-year survival in the SEMS group compared with surgery alone (25% vs 62%, respectively). Cancer-specific mortality was also higher in the SEMS group (48% vs 21% for surgery only). There were also nonsignificant benefits for the surgery-only group in disease-free survival, recurrence rates, and mean time to recurrence. In fact, in the study's multivariate analysis, stent insertion was the only modifiable factor affecting the poor outcomes in that arm.<sup>44</sup>



In general, success rates are higher and complication rates lower in SEMS case series involving experienced endoscopists. However, further studies are needed before SEMS is considered the standard for malignant bowel obstructions. In the presence of metastatic disease or short life expectancy, stents may prevent a morbid operation and allow quicker initiation or continuation of systemic chemotherapy. SEMS should only be performed by endoscopists with adequate expertise to limit complication rates.

### ***Obstructing Rectal Cancer***

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Rectal bleeding and a change in stool appearance are the most common symptoms of rectal cancer.<sup>45</sup> Many early asymptomatic rectal cancers will be found on screening endoscopy, but a rectal cancer presenting with acute obstructive symptoms is typically of a locally advanced stage.

The additional challenges and morbidity associated with pelvic surgery weigh in the decision making for acutely symptomatic rectal cancers. Optimal oncologic resection should include total mesorectal excision. In the elective setting, neoadjuvant chemoradiation has become the standard of care for T3 or node-positive rectal cancers in the United States. Compared with the previous discussion of colon cancers, there is more enthusiasm for measures that safely temporize acute symptoms of rectal cancer to allow for complete staging and initiation of neoadjuvant treatment.

#### ***Loop ileostomy or colostomy***

In patients with obstructing mid and low rectal cancers without findings of metastatic spread, simple diversion provides the opportunity to complete staging and give neoadjuvant chemoradiation with a staged oncologic resection for curative intent. Loop colostomy allows for decompression as well as access to the proximal colon for assessment of proximal synchronous lesions. However, it may limit opportunities for reconstructing bowel continuity with an eventual low anterior resection by sacrificing bowel length or blood supply to the future anastomosis. A loop ileostomy often works better for these patients, although it is associated with a small risk of a closed loop obstruction when a competent ileocecal valve exists. In the setting where sphincter preservation is clearly not an option, a loop colostomy is more fitting.

#### ***Hartmann resection***

In the case of obstructing carcinomas of the upper rectum, a Hartmann procedure may be chosen, providing definitive resection without the added risks of an anastomosis. Indeed, this option may be appropriate for older patients with more comorbidities, even in the absence of acute obstruction. Patients should be aware that colostomy reversal in this setting is extremely uncommon.

#### ***Self-expandable metal stents***

As described above for distal colon cancers, the use of SEMS for obstructing rectal cancers is most appropriate in patients with widely metastatic disease who will benefit most from systemic chemotherapy, or who are too physiologically stressed to tolerate a low anterior resection or abdominal perineal resection. The risk of tumor perforation during placement limits their use in treatment plans with curative intent.<sup>1</sup> Importantly, placement of rectal stents carries significant risk of distal migration and severe tenesmus from pressure on the upper anal sphincter mechanism. Therefore, SEMS is limited to lesions in the upper rectum.

## PERFORATION

Perforation is the second most common reason for urgent or emergent surgery associated with colorectal carcinoma, with an incidence of 2.6% to 12%.<sup>46,47</sup> Perforations most commonly occur at the site of the primary tumor, due to necrosis and friable tissue. Depending on the location, these may progress to either free or contained perforations. Perforation can also occur proximal to an obstructing carcinoma. Increasing pressure and distension from a complete distal obstruction follow the Law of Laplace, which can ultimately result in ischemia of the proximal bowel and perforations at remote proximal sites. The cecum is the most common site of this type of diastatic perforation.<sup>6</sup> This clinical presentation has been recognized as an independent prognostic factor for morbidity and mortality.<sup>7</sup>

An obstructing cancer increases the risk of perforation, with rates of 12% to 19%.<sup>48</sup> Perforation is reported to be the most lethal complication of colorectal carcinoma. In some studies, mortality associated with secondary peritonitis from perforation is as high as 30% to 50%.<sup>1,49</sup>

### *Free Perforation*

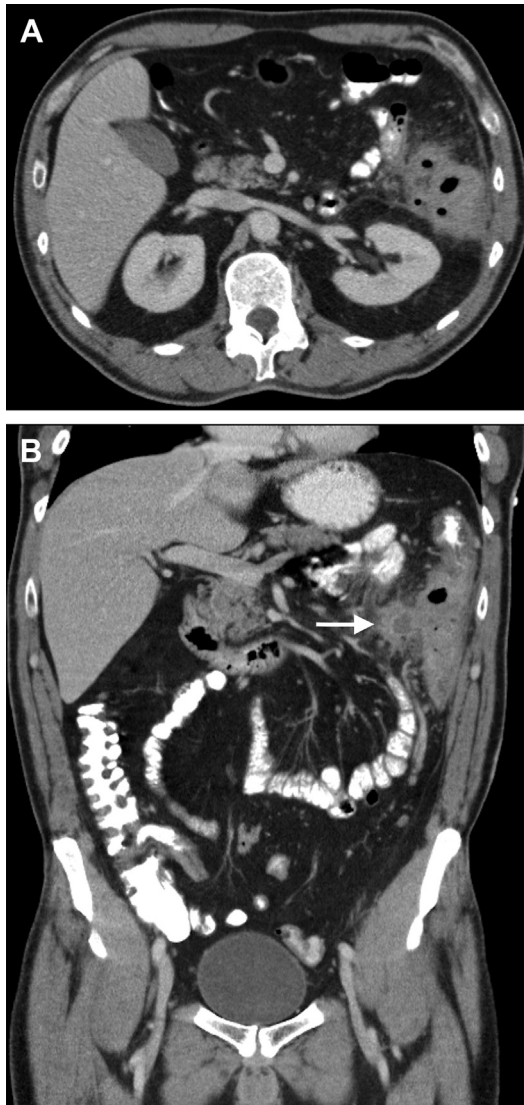
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Free perforation with spillage into the peritoneum is suggested by the classic findings of generalized peritonitis, including involuntary guarding and rebound tenderness. CT imaging may show free air, free fluid, air at the site of perforation, pneumatosis intestinalis, or portal venous air. In the diagnosis of a perforation from colorectal carcinoma, CT has a sensitivity of 95% to 98%, specificity of 95% to 97%, and accuracy of 95%<sup>1</sup> (Fig. 4).

Colorectal perforation seeding the peritoneal cavity is a surgical emergency with poor outcomes. These patients can rapidly progress into septic shock, disseminated intravascular coagulation, multisystem organ failure, and death. Although emergent surgical intervention is often required, outcomes have been generally poor, with mortalities ranging in older studies from 6% to 33%.<sup>50–52</sup> Even the most recent series highlighting advanced critical care management, by Yamamoto and colleagues,<sup>50</sup> still report a mortality of 12%. Risk factors included older age and low preoperative blood pressure. Before any operation in the setting of a perforated colorectal cancer, patients and families should be thoroughly counseled regarding the poor prognosis.

The surgical approach is typically open exploration and thorough washout with identification of the diseased and perforated site. Even without the established diagnosis of malignancy, resection of the perforated site should adhere to the principles of oncologic resection with extended lymphadenectomy for accurate pathologic staging. Despite the poor perioperative mortalities, patients presenting with perforation from a colorectal cancer, without findings of widely metastatic lesions, should still be managed with a curative intent. Tumor perforation upstages the lesion's T stage to T4, but does not directly impact the M stage. Oncologic resection typically concludes with creation of an end stoma. Primary anastomosis may be considered in the carefully selected patient, provided that the anastomosis is protected with a diverting ileostomy.<sup>29</sup>

When they cause perforation, lesions proximal to the splenic flexure are twice as likely to result in peritonitis than to form a localized abscess.<sup>53</sup> Poorly contained leaks should also be expected with this is also true of the diastatic perforations mentioned above, wherein a distal obstructing carcinoma results in ischemia and perforation of the proximal bowel, most commonly the cecum. Subtotal colectomy is the operation of choice in these settings. An ileocolic or ileorectal anastomosis may be considered in low-risk patients.<sup>46</sup>



**Fig. 4.** (A) Axial and (B) coronal CT images show a left colon soft tissue mass with marked narrowing of the lumen with circumferential wall thickening and infiltration of the surrounding pericolic fat compatible with localized perforation. Note adjacent pericolic abscess (*arrow*).

### **Abscess**

Contained perforations may present with localized tenderness. Imaging may reveal a phlegmon or abscess, which is more common than free perforation in descending and sigmoid colon lesions.<sup>53</sup> Many cases of perforated colorectal cancer presenting as abscess are not diagnosed preoperatively and can mimic diverticulitis or appendicitis on CT imaging.<sup>46,53</sup>

The role for percutaneous drainage of contained perforations from a carcinoma differs from that of benign diseases. In the presence of widely metastatic disease, treatment with antibiotics and percutaneous drainage avoids the morbidity of an operation. In some cases, however, drawn out infectious complications can forestall systemic chemotherapy. In the absence of widely disseminated disease, percutaneous drainage of a contained perforation may result in seeding tumor cells along the drainage tract rendering the disease metastatic.<sup>53</sup> When a malignancy is suspected, drains should be placed in a manner where the skin and drain tract can be later resected en bloc with the cancer. Definitive surgical management involves en bloc resection of the mass and any invaded adjacent organs and/or percutaneous drains whenever technically feasible.<sup>1</sup>

## BLEEDING

Gastrointestinal bleeding is reported in up to 50% of patients with colorectal cancer.<sup>1,54</sup> Most of this bleeding, however, is low volume, is self-limited, and does not require emergent surgical intervention. Bleeding is often an early symptom of a colorectal cancer associated with lower risk of advanced stage at diagnosis, and a shorter delay in presentation. Unlike the insidious onset of an obstructing cancer, patients often remember to the day when bleeding began.<sup>45</sup> Bleeding is complicated by the fact that most acute tumor bleeding is likely in the setting of chronic anemia of cancer and blood loss from the tumor.

Acute massive gastrointestinal bleeding from a colorectal carcinoma is rare. The initial management is aimed at resuscitation, establishing large-bore IV access, and stabilization with crystalloid and correction of underlying coagulopathy or other metabolic abnormalities.

In the clinically stable patient, efforts to localize the source of bleeding should be sought before surgical treatment whenever possible.<sup>1</sup> Endoscopy will identify the source in 74% to 89% of cases, although this technique may be limited in the unprepared colon.<sup>55,56</sup> Tagged red blood cell scan is less sensitive, localizing the source in 26% to 72%, but it does detect bleeding at rates as low as 0.1 mL/min, making it a potential screening test before angioembolization. Embolization has documented success rates of 42% to 86%; however, it carries the risk of worsening intestinal ischemia.<sup>1,55</sup> This option may be more attractive in the setting of metastatic disease to avoid laparotomy and associated delays in systemic chemotherapy.

Surgery is the most effective and definitive approach for a hemorrhaging colorectal cancer. Some general indications for surgical intervention include hemodynamic instability despite transfusion of more than 6 units of blood products, slow bleeding requiring more than 3 units of blood products per day, inability to stop hemorrhage with endoscopic or endovascular techniques, or recurrent episodes of hemorrhagic shock.<sup>57</sup>

When the site has been localized, resection should adhere to oncologic principles with curative intent. The decision to form a stoma or perform a PRA with or without proximal diversion should be carefully considered in light of any anemia, coagulopathy, and unstable hemodynamics that often accompany the bleeding patient.

## MINIMALLY INVASIVE PLATFORMS

Emergency laparoscopic colectomy for symptomatic colorectal cancer has been described in several case series and case-control studies. Laparoscopy typically requires longer operative times, but is associated with lower blood loss, shorter hospital stay, and similar morbidities and mortalities when compared with open surgery. Rates of conversion to open surgery range from 0% to 17% in emergency colectomies.<sup>58</sup>

Appropriate patient selection is central to the safety and feasibility of minimally invasive techniques in the emergency setting. Surgeon experience with elective laparoscopic colectomy techniques is prerequisite.

The first case report of emergency robotic colectomy was recently published for a hemorrhagic right-sided colon cancer, with good postoperative and oncologic outcomes.<sup>58</sup>

## OUTCOMES

The feasibility of oncologic resections in the emergency setting has been well demonstrated. Teixeira and colleagues<sup>3</sup> documented R0 resection possible in up to 92% of emergency colectomies. Patients for whom R0 resection was not achieved had bulky T4 lesions or were unable to tolerate more radical en bloc resections. Adequate lymphadenectomy (>12 nodes) was documented in 71%.

The long-term and oncologic outcomes for colorectal cancers presenting with emergency complications are worse than their elective counterparts. A recent retrospective review from Ireland included 34% of colon resections performed emergently and collected long-term follow-up to assess oncologic outcomes. Emergency resections were more often T4 lesions (38% vs 13%) and more often lymph node positive (58% vs 38%). Perforation was the indication in 8%. Positive margins were found in 10% of emergency colectomies compared with only 1% of elective cases. With up to 5 years follow-up, the median survival for emergency presentations was only 59 months compared with 82 months for elective cases during the same time.<sup>6</sup> Other studies have shown similar results,<sup>23,59</sup> although exactly what is responsible for these worse outcomes is still debated.<sup>60</sup>

High rates of complications have been associated with urgent or emergent colectomy. One institution's retrospective review of 209 consecutive colectomies found higher rates of wound infections, wound dehiscence, and intra-abdominal abscess in emergency colectomies.<sup>61</sup> The rates of perioperative mortality for emergency colorectal cancer resections range from 5% to 34%.<sup>62-64</sup> The immediate threats to life will dictate how resources are allocated to the resuscitation and preoperative workup. The liberal use of stomas is advocated and demonstrated in most series.

## SUMMARY

The management of emergency complications of colorectal carcinomas has changed over the past few decades. For proximal lesions, general consensus is that hemicolectomy with primary anastomosis is safe with an acceptably low leak rate. For distal obstructions, there is active investigation and controversy challenging practices both new and old. Single-stage resections and the use of endoluminal stents to temporize emergency presentations have allowed some surgical specialists to reduce the morbidities of stomas and multiple operations. Ultimately, the best management must be tailored to each specific scenario. In the treatment of emergency presentations of colorectal carcinoma, care must be individualized to the patient, the experience of the surgeon, and the resources available at the facility.

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