Emergencies Related to Primary Colon Cancer: Multidisciplinary Management of Colon Obstruction, Perforation and Bleeding Due to Colon Cancer in the Absence of Metastatic Disease

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Abbreviations

CRC	Colorectal cancer
CT scan	Computed tomography
DC	Damage control
HP	Hartmann procedure
LBO	Large bowel obstruction
LCO	Left colon obstruction
OLCC	Obstructed left colon cancer
ORCC	Obstructed right colon cancer
RC	Right colectomy
RPA	Resection and primary anastomosis
SEMS	Self-expanding metallic stents
TD	Tube decompression

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8.1 Introduction

Interest in colorectal cancer (CRC) is still high because of the relevance of the disease. In the last 50 years, there have been large improvements about survival, due to screening programs, accurate and preoperative staging, and a multidisciplinary treatments [1, 2].

However, when the first appearance occurs in emergency clinical scenario like occlusion, perforation, or bleeding, diagnosis, life-saving strategies, obstruction release, and oncological issues are a challenging matter. Physician and surgeon must be skilled in identifying the right balance between saving-life procedures and oncological issues.

Emergency settings related to colorectal cancer are not so rare:

- Large bowel complications are the 47% of gastrointestinal emergencies [3]; large bowel obstruction (LBO) represents almost the 80%, while perforation ranges the 20% of the emergency [4–7].
- Bleeding has been thought to occur about 6–10% of patients with advanced cancer [8].
- CRC presents as urgencies or emergencies in a wide range from 7% to 40% [3].
- In the 75% of cases, CRC obstruction is located distal to the splenic flexure, and the most common location is the sigmoid colon [9].
- In almost 70% of cases, perforation occurs at the tumor site; in almost 30% of cases proximal to the tumor site [3, 10, 11].

8.2 Clinical Presentation

8.2.1 Occlusion

When LBO presents acutely, the most common symptoms are crampy abdominal pain, abdominal bloating, and absence of bowel movement and flatus; vomiting is less frequent. When LBO presents subacutely, there are a gradual development of symptoms, changes in bowel movement, and recurrent left lower quadrant abdominal pain.

Abdominal examination shows abdominal distension, tenderness, and hyperactive or absence of bowel sounds. A rectal cancer may be directly palpable at the rectal exploration [12–14].

Laboratory test evaluates electrolyte imbalances, elevated urea nitrogen, and metabolic alkalosis as consequences of vomiting and dehydration.

8.2.2 Perforation

When perforation occurs at the tumor site, the peritoneal contamination is usually localized. When perforation is located proximal of the tumor site, the fecal spread results in diffuse peritonitis, sometimes in septic shock.

In this case, physical examination reveals fever, tachypnea, tachycardia, and confusion; the abdomen may present a diffuse or a localized direct tenderness, guarding, or rebound tenderness. Bowel sounds are usually absent. Leukocytosis and neutrophilia, elevated amylase levels, and lactic acidosis are nonspecific indicators of perforation or necrosis [15].

8.2.3 Bleeding

Gastrointestinal (GI) bleeding from colonic tumors is manifested as hematochezia or melena or symptomatic anemia. Bleeding as a direct result of GI malignancy can vary in presentation from occult bleeding to massive hemorrhage, being the direct cause of death; anyhow, in spite of upper GI bleeding tumor, lower GI bleeding is generally less severe, with spontaneous cessation of bleeding in 80% of cases [16].

8.3 Imaging

Clinical evaluation and laboratory test are always the first step for evaluation in these patients, but they are not specific and variable. Nevertheless, clinical suspicion suggests which diagnostic tests are indicated to obtain a definitive diagnosis.

8.3.1 Occlusion

Abdominal plain X-ray is always the first radiologic diagnostic test, even if US bedside should be able to replace it, with the limit of operator expertise [17]. CT scan (with i.v. contrast) is the imaging test of referral for colorectal occlusion, because it offers absolute advantages in terms of neoplastic staging, cancer-related complications, and synchronous different diseases [18, 19].

When CT scan is not available, colonic enema is a valid alternative in identifying the site and the nature of obstruction.

In stable patients, colonoscopy should be considered for direct visualization of site of obstruction and to obtain biopsies, if an emergent surgical resection has not been planned or endoscopic stent placement can be performed [9, 20, 21].

8.3.2 Perforation

When the clinical scenario is suspected for bowel perforation, abdominal plain X-ray or abdominal US (even bedside) should be used as first screening tests; one of the limitations is the detection of small amount of free air as happens in case of perforation at the tumor site [22].

In stable patient, CT scan should be considered, in order to define the cause and the site of perforation (at the tumor or proximal to the tumor), despite free air in the peritoneal cavity leads to surgical exploration, because there are some cases of

pneumoperitoneum not related to intestinal perforation [23, 24]. On the other hand, performing a CT scan never should expose the patient to unsafe delay with adjunctive risk for safety.

8.3.3 Bleeding

Colonscopy is the best option: in contrast to upper GI bleeding and in acute setting, it can be feasible although it requires rapid bowel preparation and may be poorly tolerated by the patient. Overall early colonoscopy appears to be safe [25].

CT angiography can give many information. Angiography is occasionally required to diagnose the site of bleeding (to obtain a positive test bleeding must be active at a rate of 0.5–1 mL/min) [26].

8.4   Treatment

Management of the complications of the primary colorectal cancer has the dual aim to come out from a critical clinical setting and to offer a good prognosis in terms of oncological outcome. The first is often time dependent.

8.4.1 Occlusion

8.4.1.1 Left Colon

To manage obstructive left colon cancer (OLCC), not only surgical solutions are available; most of the time, surgical and nonsurgical solutions are used together in two or three steps.

– Loop colostomy (as bridge to resection or palliation)
– Loop colostomy is reserved for severely ill patients who are too unfit for major surgical procedures and/or in case of unresectable tumors if self-expanding metallic stents (SEMS) are not feasible [27, 28].
– Primary resection with end colostomy (Hartmann's procedure—HP) or resection and primary anastomosis (RPA)
   In the absence of other risk factors, RPA is the best option for uncomplicated malignant left-sided large bowel obstruction [29]. There is no evidence that a covering stoma can reduce the risk of anastomotic leak and its severity [30]. Patients with high surgical risk, instead, are better managed with HP [31–33]. Only in case of cecal tears/perforation or evidence of bowel ischemia or synchronous right colonic cancers, a total colectomy is considered [20].
   Laparoscopy in emergency treatment of OLCC is not contraindicated but is reserved to selected favorable cases and in specialized centers [34].

– Tube decompression (TD)
  TD can be a valid alternative option in order to achieve a highly successful rate of elective surgery with RPA [35].
– Endoscopic colonic stenting by self-expanding metallic stents (SEMS)
  Endoscopic colonic stenting gives the same benefit in terms of resolution of occlusion for palliation since it is associated with similar mortality/morbidity rates but a shorter hospital stay [36]. SEMS as bridge to elective surgery offers a better short-term outcome than direct emergency surgery, the complications are comparable, but rate of stomas is significantly lower [36, 37].

Alternative treatments are preferred to SEMS in patients eligible for further bevacizumab-based therapy due to the high risk of perforation: that's why, early involvement of the oncologist in the decision is very important [38, 39].

8.4.1.2 Right Colon

– Resection and anastomosis with or without proximal stoma creation
  In right-sided colon cancer causing acute obstruction, right colectomy (RC) with primary anastomosis can be performed most of the time. Favorable anatomical and technical features and limitation of alternative to surgery make RC with primary anastomosis the option of choice. A terminal ileostomy associated with colonic fistula is an alternative when a primary anastomosis is considered unsafe [40].
– Intestinal internal bypass
  In case of unresectable right-sided colon cancer, a loop ileostomy or a side-to-side anastomosis between the terminal ileum and the transverse colon (the internal bypass).
– Decompressive cecostomy is abandoned for the high rate of malfunction and complication; only the percutaneous technique is reserved to very sick patients [41].
– Endoscopic stent placement for right colon obstruction is not recommended because of the high risk of migration and the technical difficulty to perform it; it's reserved for palliative management of inoperable proximal malignant occlusions [42].

8.4.2   Perforation

In case of cancer-related colon perforation, the priority is the control of sepsis source, combined with prompt medical treatment.

When free peritonitis occurs, usually related to perforation proximal to tumor site, patients are at higher risk for septic shock development compared to patients with contained collection usually related to perforation at the tumor site for necrosis; in the first case, mortality reaches rates of 19–65% and decreases to 0–24% in cases of localized peritonitis [3, 11].

Although the treatment of intra-abdominal infection is time dependent (the medical treatment and the source control must be started as soon as possible) [43, 44], whenever possible, oncological resection should be performed in order to obtain better oncological outcome. The patient clinical condition is the priority, and the performance of a standard oncological resection can lead to similar results of elective cases [3, 10].

In case of diastatic perforation (proximal to tumor site, generally the neoplasm is in the left and the perforation is in the cecum), simultaneous tumor resection and management of proximal perforation are indicated: depending on the colonic wall thickening, a subtotal colectomy may be required.

In case of perforation at the tumor site, it is indicated to perform a formal resection with or without anastomosis with or without stoma.

When the perforation site is the same of the tumor localization for a right side, a right colectomy can be performed. In case of poor general or "bad" local conditions, a resection without anastomosis and terminal ileostomy is performed.

When the perforation involves transverse and left side, usually a resection with anastomosis with or without ileostomy is attempted. Hartmann's procedure is performed, especially when clinical conditions require an immediate surgical control just keeping in mind that 50% of patients will have no reversal.

While a diastatic perforation is often a consequence of a distal occlusion, a perforation on at the tumor site is clearly an advanced-stage disease, and it represents an important issue for following therapy. The risk of peritoneal carcinomatosis in perforated colorectal cancer ranges between 14% and 54%, but further literature data is needed [45].

8.4.3 Bleeding

According to the hemodynamic status, the management of bleeding includes different and sequential steps. Blood transfusions and coagulation disorder treatment are often required [46].

8.4.3.1 Endoscopic Treatment

Once the patient is hemodynamically stable, colonoscopy can be performed after adequate colon cleansing. In patients with high-risk clinical features and signs or symptoms of ongoing bleeding, a rapid bowel purge should be initiated following hemodynamic resuscitation and a colonoscopy performed within 24 h of patient presentation after adequate colon preparation to potentially improve diagnostic and therapeutic yield.

Radiographic interventions can be considered in patients with high-risk clinical features and ongoing bleeding who have a negative upper endoscopy and do not respond adequately to hemodynamic resuscitation efforts and are therefore unlikely to tolerate bowel preparation and urgent colonoscopy.

Surgical treatment is required when ongoing bleeding is unresponsive to other measures. Early surgery provides no benefit when performed for minor indications.

Is reasonable to reserve surgery for those with evidence of continuous and severe bleeding. Accurate prior localization with colonoscopy or TC angiography of the site of bleeding is important for surgical management of lower GI bleeding.

8.5   Unstable Patients

Occlusion, perforation, or bleeding for CRC could bring to patient instability: in this case, patients are amenable for damage control treatment, if (at least one):

- pH <7.2
- Core temperature <35 °C
- BE <−8
- Laboratory/clinical evidence of coagulopathy
- Any sign of sepsis/septic shock which include the necessity of vasopressor

Acute bleeding causes hemodynamic instability, and this condition worsens in the condition of coronary artery disease, particularly in patients with heart failure, where antithrombotic and antiplatelet therapy need to medical and blood products support.

When facing clinical instability due to occlusion or perforation, the emergency physician, the surgeon, and the anesthesiologist should apply the damage control philosophy. Damage control (DC) should be started as soon as possible after resuscitation began.

Except in case of hemorrhagic shock, surgical emergency requires an initial period of resuscitation, before surgical intervention, in order to prevent hemodynamic collapse on induction of anesthesia. Few hours are necessary to re-establish adequate organ perfusion and to begin broad-spectrum antibiotic therapy.

In an operating theater of a septic shock due to a fecal peritonitis, the aim of DC is the prompt source control. Definitive treatment as anatomical reconstruction and abdominal closure is a secondary goal, and it's deferred eventually to secondary procedure after physiological normalization. If an open abdomen (OA) has to be considered, stoma creation is avoided, and bowel is left stapled inside the cavity.

The loop ileostomy is reserved for occlusion when the tumor is not easily resectable or in case of time-dependent surgical procedure, especially for left-sided lesions, where in an unstable patient, a single-stage procedure represents a time-consuming intervention, at high risk of anastomotic leak.

In those cases when planned re-laparotomy represents a necessity, a take back to operating theater is usually performed 24–48 h after the initial operation. The goal to be achieved after OA is the early and definitive closure of the abdominal wall as soon as possible in order to reduce complications associated with OA [47–49].

While in case of bleeding or occlusion, prophylaxis is enough to avoid bacterial translocation, in patients with colon carcinoma perforation, antibiotic therapy mainly targeting Gram-negative bacilli and anaerobic bacteria is always suggested. Furthermore, in critically ill patients with sepsis, early it's suggested using broader-spectrum antimicrobials.

8.6 Conclusions

Emergency related to a colorectal cancer gives two main problems: the first is related to the control of septic or hemorrhagic source, clinical instability, and metabolic disorders, and they are time dependent. The second issue is related to the oncological outcome.

Medical treatment and the source control should be started as soon as possible because the intra-abdominal infection can occur with septic shock or can early develop in it. While perforation may induce generalized peritonitis, colon obstruction causes volume depletion and electrolyte disorders; moreover, these factors coexist and together may faster lead to patient instability, represented by metabolic impairment, coagulopathy, and signs of shock. Even if less common, acute bleeding can occur directly as a cause of cardiovascular collapse, and also when it's associated with malignancy, it still represents a factor of an increased mortality rate [50].

The oncological outcome, instead, is strongly influenced by the advanced disease and by an incomplete preoperative treatment. That's why the surgeon, keeping in mind the septic status, should be aware to perform the best oncological resection giving to the patient the shorter postoperative recovery time and complication rate allowing to complete staging and chemotherapy programs.

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