



Original article

Efficacy and Safety of Emergency Resection in Treatment of Acutely Obstructing Colonic Cancer

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Abstract

Background: Surgical intervention is usually required for patients presenting with bowel obstruction secondary to colon cancer. However, urgent surgical intervention for such cases has higher morbidity and mortality rates. This study was done to evaluate the efficacy and safety of emergency resection in patients with colonic cancer presenting with acute bowel obstruction. **Patients and methods:** This prospective investigation included 20 patients diagnosed with obstructing colon cancer. For right-sided cases, right or extended right hemicolectomy was performed, followed by a primary anastomosis. In left-sided lesions, resection was done, followed by exteriorization of the two ends. Mortality, morbidity, and length of hospitalization were considered to be indicators of safety, whereas surgical cut margin status and nodal harvesting were the indicators of efficacy. **Results:** Sigmoid colon was the commonest affected site (50%), followed by descending colon (25%), hepatic flexure (20%), and caecum (5%). Operative time ranged between 90 and 131 minutes, with no intraoperative

complications. The included patients were allowed to start oral fluid on the second to the fifth post-operative day. The duration of hospitalization had a mean value of 5.2 days. The number of resected and infiltrated lymph nodes had mean values of 14.65 and 5.7, respectively, with a lymph node ratio ranging between 0.21 and 0.64. No mortality or serious post-operative complications was encountered in the current study.

Conclusion: Surgical resection in patients with obstructed cancer colon is associated with safe perioperative and good oncological outcomes.

1. Introduction:

Bowel obstruction is established on interruption of the normal flow of the intraluminal contents of the human bowel. Small intestinal obstruction is more common in surgical practice. However, large intestinal obstruction accounts for about 25% of these cases [1, 2].

In Egypt, colorectal cancer ranks the 7th among malignant neoplasms, as it represents 3.47% and 3% of male and female malignant neoplasms, respectively [3]. Previously in 2015, more than three thousand Egyptians were diagnosed with colon cancer after excluding rectal cancer patients [4].

It is worth mentioning that some patients newly diagnosed with colorectal cancer present with cancer-related emergencies like obstruction, bleeding, or perforation (about 33%) [5]. Obstruction is

the most common surgical emergency related to colon cancer. In such cases, neoplasm causes a mechanical obstruction, which could be partial or complete. The patient may present with an acute presentation like abdominal pain and obstipation, and the subject could also report a long old history of changing bowel habits [6].

The management of these cases still represents a challenging problem for most general and digestive surgeons [7]. Providing sufficient time for proper evaluation and preparation of the patient is crucial before the surgical intervention. Nonetheless, most of these patients have old age and multiple comorbidities, and their symptoms might have been present for several days [8, 9]. That is why surgical intervention for these cases is associated with prohibitive perioperative morbidity and mortality [10]

Herein, we conducted the current investigation to evaluate the efficacy and safety of emergency resection in patients with colonic cancer presenting with acute bowel obstruction.

2. Patients and Methods:

This prospective interventional investigation was carried out at the General Surgery Department of Beni-Suef University Hospitals during the period between July 15th, 2021, till November 15th, 2021. This was done after gaining ethical approval from the local scientific committee of our medical school.

The sample size was estimated via G Power software. Based on a confidence level of 95%, power 80%, and effect size of difference 0.50 (based on the data gathered from a previous study handling surgery for malignant colonic obstruction [11]), a sample of 20 was required for the current investigation.

We included adult patients from both genders diagnosed with colonic cancer at any site from the cecum till the end of the sigmoid colon presenting with acute bowel obstruction. Contrarily, patients with recurrent cancer, locally irresectable lesions, distant metastasis were excluded from our investigation. In addition, patients presenting with shock or multiorgan failure requiring damage control surgery were also excluded.

All of the included participants had signed informed consent following a simple explanation of the benefits and possible complications of the surgical intervention. All patients received the standard evaluation, including history taking (focusing on the symptoms and duration of obstruction), thorough clinical examination (including general and local abdominal examination), in addition to routine preoperative laboratory investigations. The radiological assessment included erect abdominal X-ray (to identify multiple air-fluid levels), pelviabdominal ultrasonography, and triphasic pelviabdominal computed tomography (to establish the cause and level of obstruction along with tumor extension).

Patients with low hemoglobin, albumin, or disturbed electrolytes were corrected before the surgery. All surgeries were performed under general anesthesia, and the exploration was done via a lower midline incision. Abdominal exploration was initially done to exclude metastasis. After that, tumor resection was done.

We performed resection via the lateral to medial approach. We ensured negative surgical cut margins, lymphovascular clearance, and not beaching the colonic wall. The related anatomical structures like ureters and duodenum were also preserved. After resection, the intestinal

content was evacuated into a sterile container to decrease distension and facilitate abdominal closure.

The resection extent was performed according to the location of the obstructing lesion. For right-sided cases, right or extended right hemicolectomy was performed. This was followed by a primary anastomosis (by interrupted vicryl 3/0 sutures). If the descending colon was affected, left or extended left hemicolectomy was done. Sigmoidectomy was done for sigmoid lesions. For all left-sided lesions, the two ends of the colonic cut ends were exteriorized as a double-barrel colostomy. No anastomosis was performed for such cases.

After the operation, patients were transferred to the intensive care unit (ICU) or internal ward, where frequent monitoring was done. Patients were kept NPO, and feeding was maintained via the IV route. Oral fluids were allowed when the patient passed flatus (or passed stool through the stoma), had good intestinal sounds, with unremarkable abdominal examination. Post-operative complications, mainly leakage, ileus, and infection, were noticed and recorded. Patients were discharged from the hospital if they achieved adequate oral intake, were free from complications and had controlled pain by oral medications.

Regular follow-up visits were scheduled for all patients after discharge. During these visits, a clinical assessment was done. Skin stitches were removed after 2 or 3 weeks. After that, patients were referred to the oncology department for adjuvant chemotherapy.

Our outcomes were the efficacy and safety of emergency resection in such cases. Mortality, morbidity, rate of unplanned reoperations, and length of hospital stay were considered to be indicators of the degree of safety, whereas surgical cut margin status and nodal harvesting were the indicators of efficacy.

Data were fed to the computer and analyzed using IBM SPSS software package version 26. Qualitative data were described using numbers and percentages. Quantitative data were described using median (minimum and maximum) for non-parametric data and mean with standard deviation for parametric data. This was done after testing data for normality using the Kolmogorov-Smirnov test.

3. Results:

The mean age of the included cases was 58.25 years (range, 49 – 69). Their BMI ranged between 24.3 and 35.3 kg/m² (mean = 28.5 kg/m²). Regarding gender distribution, males represented 60% of the included patients, whereas the remaining patients were

females. Smokers represented 20% of the study population (four cases). Diabetes mellitus and hypertension were detected in 25% and 15% of the study participants, respectively. Ischemic heart disease was present in only one patient (5%). Previous abdominal surgeries were reported by three patients (15%). In addition, a family history of colorectal cancer was reported by only one patient (5%).

The duration of obstructing symptoms ranged between two and five days (mean = 3.35). Abdominal pain, constipation, and abdominal distension were present in all of the included cases (100%). Weight loss and vomiting were reported only by four patients (20%). Table 1 shows the previous data.

Table (1): Demographic and clinical data in the study cases.

Variable	Data (n = 20)	
	Mean ± SD	Median (Range)
Age (years)	58.25 ± 6.57	59 (49-69)
BMI (Kg/m²)	28.5 ± 3.14	27.9 (24.3-35.3)
Duration of symptoms (days)	3.35 ± 0.88	3 (2-5)
Gender		
-Male	12 (60%)	
-Female	8 (40%)	
Comorbidities		
-Smoking	4 (20%)	
-Diabetes mellitus	5 (25%)	
-Hypertension	3 (15%)	
-Ischemic heart disease	1 (5%)	
Previous abdominal surgeries	3 (15%)	
Family history of colon cancer	1 (5%)	
Symptoms		
-Abdominal pain	20 (100%)	
-Distension	20 (100%)	
-Constipation	20 (100%)	
-Vomiting	4 (20%)	
-Weight loss	4 (20%)	

Preoperative radiological investigations revealed normal liver in the majority of patients (95%). Only one patient had cirrhotic liver on preoperative imaging. Regarding tumor location, the sigmoid colon was the commonest affected site (50%), followed by descending colon (25%), hepatic flexure (20%), and caecum (5%) (Table 2).

Table (2): Radiological data of the study participants.

Variable	Data (n = 20)
Liver status	
-Normal	19 (95%)
-Cirrhotic	1 (5%)
Mass location	
-Cecum	1 (5%)
-Hepatic flexure	4 (20%)
-Descending colon	5 (25%)
-Sigmoid colon	10 (50%)

On surgical exploration, the size of the obstructing mass ranged between five and 12 cm (mean = 9.2 cm). Sigmoidectomy was the commonest performed resection (50%), followed by left hemicolectomy (25%), extended right hemicolectomy (20%), and right hemicolectomy (5%). For right-sided lesions, primary anastomosis was performed (five cases – 25%), while patients with left-sided lesions had a double-barrel colostomy.

Intraoperative blood loss ranged between 175 and 380 ml (mean = 271.25 ml). Intraoperative blood transfusion was required in two patients (10%). No intraoperative organ injury was encountered in the current study. Operative time ranged between 90 and 131 minutes (113.7 minutes). Table 3 summarizes the previous data.

Table (3): Operative data of the study participants.

Variable	Data (n = 20)	
	Mean \pm SD	Median (Range)
Mass size (cm)	9.2 \pm 2.57	9.5 (5-12)
Type of resection		
-Right hemicolectomy	1 (5%)	
-Extended right hemicolectomy	4 (20%)	
-Left hemicolectomy	5 (25%)	
-Sigmoidectomy	10 (50%)	
Reconstruction method		
-Primary anastomosis	5 (25%)	
-Double barrel colostomy	15 (75%)	
Blood loss	271.25 \pm 66.45	270 (175-380)
Intraoperative blood transfusion	2 (10%)	
Adjacent organ injury	0 (0%)	
Operative time (minutes)	113.7 \pm 11.46	114 (90-131)

Regarding the pathological analysis of the resected specimen (Table 4), classic adenocarcinoma was the commonest encountered pathology (85%), followed by mucoid adenocarcinoma (10%), while signet ring adenocarcinoma was detected only in one patient (5%). Most tumors were highly differentiated (70%), while moderate and low differentiated ones were detected in 15% of cases for each type.

The number of resected lymph nodes ranged between 11 and 20 nodes (mean = 14.65), while the number of infiltrated nodes had a mean value of 5.7. Lymph node ratio ranged between 0.21 and 0.64 (mean = 0.4). Lymphovascular invasion was detected in 20% of patients. All surgical cut margins were free from malignancy in the current study.

Table (4): Pathological data of the study participants.

Variable	Data (n = 20)	
Neoplasm type		
-Adenocarcinoma	17 (85%)	
-Mucinous adenocarcinoma	2 (10%)	
-Signet ring	1 (5%)	
Differentiation		
-High	14 (70%)	
-Moderate	3 (15%)	
-Low	3 (15%)	
	Mean ± SD	Median (Range)
No of resected lymph nodes	14.65 ± 2.96	14 (11-20)
No of metastatic lymph nodes	5.7± 1.26	6 (4-8)
LNR	0.4 ± 0.11	0.41 (0.21-0.64)
Lymphovascular invasion	4 (20%)	
Safety margin status		
-Free	20 (100%)	
-Infiltrated	0 (0%)	

The amount of fluid drained through the NGT ranged between 450 and 1180 ml (mean = 799.8 ml). The day of NGT removal had a mean value of 2.1. The included patients were allowed to start oral fluid on the second to the fifth post-operative day (mean = 3.2 days). The duration of hospitalization had a mean value of 5.2 days (range, 4 – 7).

Post-operative ileus was encountered in four patients (20%), while surgical site infection was detected in six patients (30%). Moreover, post-operative fever was encountered in 35% of patients, while chest infection was detected in 10% of the study population. We did not encounter any cases with anastomotic leakage in patients with primary anastomosis, and no stomal complications were detected in the remaining diverted cases. No mortality was encountered in the current study.

Table (5): Post-operative data and complications in the study participants.

Variable	Data (n = 20)	
	Mean \pm SD	Median (Range)
NGT amount (ml)	799.8 \pm 204.23	800 (450-1180)
Day of NGT removal	2.10 \pm 0.72	2 (1-3)
Day of start oral intake	3.2 \pm 1.01	3 (2-5)
Duration of hospitalization	5.2 \pm 1.05	5 (4-7)
Post-operative complications		
-Ileus	4 (20%)	
-Surgical site infection	6 (30%)	
-Chest infection	2 (10%)	
-Fever	7 (35%)	
-Stomal complications	1/15 (6.67%)	
-Anastomotic leakage	0/5 (0%)	
-Mortality	0 (0%)	

4. Discussion:

The current study was conducted aiming to evaluate the efficacy and safety of emergency resection in patients with colonic cancer presenting with acute bowel obstruction. The mean age of the included cases was 58.25 years (range, 49 – 69). A previous Egyptian study included 40 patients with obstructed cancer colon whose ages ranged between 18 and 80 years (mean = 52.25 and 56.50 years in the two study groups) [12]. Turner and his associates reported that the mean age of 61.32 years in patients presenting with obstructed cancer colon [13]. The previous two studies reported an age range near ours.

In the current study, males represented 60% of the included patients, whereas the remaining patients were females. In the same context, Álvarez and his associates reported a higher prevalence of males, as they represented 66.3% of the included cases, whereas the remaining participants were females [14]. Contrarily, a previous Egyptian study showed a slight female preponderance approximately 1.2:1 [4].

Our findings showed that weight loss was reported only by four cases (20%). Another study reported that the prevalence of weight loss at diagnosis of colorectal cancer was about 27.3% [15].

In our study, left-sided or distal lesions were more common compared to the right or proximal lesions. Phillips and his coworkers reported that acute angulation of the splenic flexure along with the solid fecal state in the left colon could explain the previous findings [16]. Other factors preferring left-sided obstruction include inflammation, degree of fibrosis, and changes in bacteria flora [17]. Biondo et al. confirmed the previous findings as distal lesions were present in 56.6% of patients, while the remaining patients had proximal lesions [18].

In the current study, resection and ileocolic anastomosis for the right-sided obstructed tumor were considered safe and sound (five patients – 25%). On the other hand, it was not surprising to note that patients who had surgery for left-sided obstruction were more likely to have a stoma created (15 cases – 75%). Our tendency to make a diversion in left-sided lesions is based on the fact that anastomotic complications (mainly leakage) are more encountered after left colonic resections compared to right-sided ones [19, 20].

There is still some controversy about the initial surgical management for patients presenting with obstructed colon cancer. It is recommended to perform emergency resection followed by primary ileocolic anastomosis for obstructing right colon

neoplasms[21, 22]. This principle was applied in our study. Regarding left-sided neoplasms presenting with obstruction, multiple surgical options exist. These include primary diversion, Hartmann procedure, resection with primary anastomosis, subtotal or total colectomy[23-25].

In the current study, operative time ranged between 90 and 131 minutes (113.7 minutes). Manceau and his associates reported that the duration of operation ranged between 18 and 533 minutes (median = 150 minutes)[26]. It is accepted to find some differences between different studies regarding the previous parameter, and that could depend on the type of operation, resection performed or not, surgical expertise, and available facilities.

Our findings showed that intraoperative blood loss ranged between 175 and 380 ml (mean = 271.25 ml). Other authors reported that the mean amount of blood loss was 301 ml (SD 63.9) in patients who underwent curative resection for obstructed left colon cancer[27].

In our study, intraoperative blood transfusion was required in two patients (10%). In another study, blood transfusion was needed for 41.9% of patients who presented with obstructed colon cancer[18]. One could expect some differences between different studies, depending on preoperative

hemoglobin level, site of cancer (cecal lesion is often associated with anemia), amount of intraoperative blood loss, and anesthetic preferences.

In the current study, the size of the obstructing mass ranged between five and 12 cm (mean = 9.2 cm). Turner and his associates reported that tumor size had a mean value of 5.5 cm with an SD of 2.95 cm in patients with obstructed cancer colon [13].

Regarding the pathological analysis of the resected specimen in the current study, classic adenocarcinoma was the commonest encountered pathology (85%), followed by mucoid adenocarcinoma (10%), while signet ring adenocarcinoma was detected only in one patient (5%). This agrees with another review which stated that adenocarcinoma is the most common form of colorectal cancer[28].

In our study, the number of resected lymph nodes ranged between 11 and 20 nodes (mean = 14.65), while the number of infiltrated nodes had a mean value of 5.7. Lymph node ratio ranged between 0.21 and 0.64 (mean = 0.4). American Joint Committee on Cancer recommends the assessment of twelve or more nodes for accurate staging[29], and this was noticed in most of our cases. Nevertheless, Prandi et al. reported that that number could be fewer than

12 in about 50% of colon cancer patients, even in highly experienced centers[30].

LNR is an important prognostic factor in patients with colon cancer, and it describes the ratio of infiltrated to totally dissected lymph nodes[31]. LNR is more accurate than the exact number of infiltrated lymph nodes when estimating patient survival[29, 32]. A previous study reported that the mean number of resected lymph nodes in obstructed cancer colon was 16.1 nodes, which is near to our findings. Additionally, the same study reported a lymph node ratio of 0.134 [13]. The total number of resected lymph nodes was 12.32, while metastatic lymph nodes had a mean value of 5.2, according to Mirzaei and colleagues. LNR was 0.45[33]. It is expected to find some differences between studies regarding lymph node ratio according to tumor behavior and the number of dissected and infiltrated lymph nodes.

In the current study, lymphovascular invasion was detected in 20% of patients (4 cases). In another study, Biondo and his colleagues reported that lymphatic invasion was present in 40% of patients, whereas vascular invasion was present in 30.6% of patients who presented with obstruction due to colon cancer[18].

In our study, the duration of hospitalization had a mean value of 5.2 days (range, 4 – 7 days). El-Din and his associates

reported that the duration of hospitalization ranged between 6 and 23 days after surgical intervention for obstructed cancer colon[12]. Other authors reported a longer hospitalization period, as it had a median value of 10 days (range, 3 – 109 days)[34]. Differences regarding that parameter could be explained by different factors, including the type of operation, creation of a stoma, post-operative complications, and policy of the healthcare facility.

There was one case regarding stomal complications (stomal congestion which resolved spontaneously). In another study, stomal complications, including ischemia and breakdown, were encountered in five out of the included 83 participants (6.02%)[14].

In our study, post-operative ileus was encountered in four patients (20%), and this lies within the range reported in the literature (5.3 – 24%)[35-37].

We did not encounter any cases with anastomotic leakage in the five patients who underwent primary anastomosis in the current study. This may be due to the small sample size tested in the current study. In another study, the same complication was encountered in only one patient out of the included 83 cases (1.2%)[14]. Tan and Sim reported a 3% incidence rate for the same complication[34].

In the current study, surgical site infection was detected in six patients (30%). Another study reported that the same complication was detected in 24.1% of cases presented with bowel obstruction due to colon cancer[18]. Chest infection was encountered in 10% of our cases. Another study reported that pneumonia was encountered in eight out of the included 83 patients, with an incidence rate of 9.64% [14]. This is in line with our findings.

We did not encounter any cases with within hospital mortality in our study. Mortality rates related to colonic obstruction reported in the literature show a wide variation (from 5.4 percent to 31 percent)[38]. Manceau et al. reported that 138 patients died during the first 30 days after surgery (7.0%)[26]. In another study, Biondo et al. reported that mortality was encountered in 47 out of 320 patients with obstructed cancer colon (incidence of mortality = 14.7%)[18]. Such a large difference is difficult to explain without considering factors related to the physiologic status of patients, nature, location of the obstruction, and surgical findings.

Our study has some limitations; first of all, it is a single-center study that included a relatively small sample size. Additionally, it lacks intermediate- and long-term follow-

up. These drawbacks need to be further investigated in the upcoming studies.

5. Conclusion:

Surgical resection in patients with obstructed cancer colon is associated with good oncological outcomes, as proved by histopathological analysis. Post-operative complication rate, including morbidity and mortality, lies within the normal range following colorectal resections. It is safe to perform resection anastomosis in patients with right-sided lesions, while it is safer to perform diversion in left-sided obstructions.

Conflict of interest: Nil.

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