

## Emergency and Elective Surgery for Colorectal Cancer: A Single-Center Experience

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### ABSTRACT

**Objective:** Emergency surgical interventions due to colorectal cancer (CRC) obstruction are risk factors for poor prognosis. This study aims to compare emergency and elective surgeries for colorectal tumours performed in a single center.

**Material and Methods:** CRC patients operated on between November 2014 and November 2019 were included in the study. Patients were divided into two groups; Patients operated under elective conditions, and patients operated under the emergency diagnosis of ileus or acute abdomen.

**Results:** A total of 103 CRC patients were included in the study. Forty-five (43.7%) were operated in emergency situations, and 58 (56.3%) electively. 45.6% of the emergency cases were found to be Stage 3B and 4 (p=0.009). Bleeding and constipation were more common in elective cases, whereas in emergency cases, applications related to ileus and perforation were quite frequent (p<0.001). It was found that 62.3% of the tumors in emergency cases were seen in sigmoid and rectosigmoid regions (p=0.015). There was no anastomosis in 60.0% of emergency cases (p<0.001).

**Conclusion:** In the hospital area where the study was applied, compared to other countries, more patients with CRC underwent emergency surgery for intestinal obstruction. Therefore, necessary measures must be taken to prevent further increases in these rates.

**Keywords:** Intestinal obstruction, Colorectal cancer, ileus, ostomy

### INTRODUCTION

Intestinal obstruction (IO) occurs when the intestinal passage does not allow regular passage of food and intestinal contents due to mechanical obstruction or adynamic ileus. IO accounts for about 15% of those who apply to the emergency room because of acute abdominal pain (1). It has been reported that approximately 80% of IO cases originate from the small intestine, and the remaining 20% manifest due to colonic causes (2-3). The most common causes of large bowel obstruction (LBO) are colon carcinoma and volvulus (4).

According to the World Health Organization (WHO) 2018 data, the incidence of colorectal cancer (CRC) is 19.7% and ranked fourth (5). In terms of mortality rates, it is in third place after lung and breast cancer with an 8.9% mortality rate. In various series, 37% to 96% of colonic IO cases have been reported to be caused by colorectal tumor-related obstructions (2-3)

It has been shown that 8% to 29% of CRC patients are presented with IO diagnosis (6). Emergency surgical interventions due to acute colonic cancer obstruction are risk factors for poor prognosis. While postoperative mortality due to CRC for emergency surgery varies between 15% and 30%, it ranges between 1% and 5% for elective surgery. In parallel, morbidity rates are two times higher than elective surgery (7).

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In the light of advances in medical technologies, new updates are being developed in cancer screening programs. With the help of these screening programs, cancer is diagnosed earlier. Thus, cancer-related mortality and morbidity rates are tried to be reduced. Being late to diagnose colorectal cancer will increase the risk of emergencies, especially colonic obstruction. This retrospective study aimed to compare emergency and elective colorectal resections from an oncological perspective.

## MATERIAL and METHODS

After the study approval was obtained with the decision dated 25.12.2019 from the Clinical Research Ethics Committee of the training and research hospital, we designed a retrospective, cross-sectional study. We collected data by examining patient files and computer records. Patients who were operated on in the general surgery clinic of a training and research hospital between November 2014 and November 2019 and whose pathological diagnosis was reported as colorectal cancer were included in the study. We first divided the patients into two groups; patients who were operated on under elective conditions with a preliminary diagnosis of colon cancer, patients who were operated on with a primary diagnosis of ileus or acute abdomen. We planned the study by the Declaration of Helsinki.

Evaluated parameters: Patients' age, gender, the reason for admission, type of surgery (elective or emergency), intraoperative diagnosis, name of the surgery performed, duration of surgery, colon resection part, type of anastomosis, type of ostomy, intraoperative metastasis findings, pathological diagnosis, tumor-node-metastasis (TNM) stage, pathological examination metastasis findings (serosal lymph node count/metastatic lymph node count; distant organ metastasis findings), and length of follow-up. We compared these values between the two groups. In addition, we searched for a history of colorectal cancer screening program or admission to the family doctor or hospital with any complaints that may be related to colon tumors.

**Statistical analysis:** Continuous variables mean  $\pm$  standard deviation and categorical data were expressed as numbers and percentages. During the intergroup analysis of continuous variables, normality analysis was performed using the Kolmogorov-Smirnov Goodness of Fit Test. The T-Test was used to analyze variables that were suitable for normal distribution, and the Mann-Whitney U test was used for those who were not suitable. Categorical data analysis was performed using the Chi-square Test. Analyses were made using the IBM SPSS Package Program version 24.0 (IBM Corporation, Armonk, NY, USA). Cases where the type 1 error level was below 5% were considered statistically significant.

## RESULTS

A total of 103 CRC patients were included in the study. It was observed that 45 (43.7%) of these patients were operated in emergency situations, and 58 (56.3%) were operated under elective conditions. There was no statistically significant difference in emergency and elective cases in terms of age, gender, and follow-up times ( $p>0.05$ ). When these two groups were analyzed in terms of tumor stages, while the number of early-stage patients was high in elective cases, 45.6% of the

emergency cases were found to be Stage 3B and 4 ( $p=0.009$ ) (**Table I**).

The reasons for admission were ileus, perforation, and acute abdomen in patients who underwent emergency surgery, whereas constipation, bleeding, anemia, weight loss, abdominal pain, and palpable swelling were present in patients who underwent elective surgery. Statistically, ileus and perforation were more common in those who had emergency surgery, and bleeding and constipation were more common in those who had elective surgery ( $p<0.001$ ).

When tumor localizations were examined, it was found that tumors in emergency cases were mostly seen in sigmoid and rectosigmoid regions (62.3%). Whereas, in elective cases, it was found that tumors were seen in relatively close ratios in all regions of the colon. In the post-hoc analysis, it was found that the tumor was mostly in the sigmoid and rectosigmoid regions in patients undergoing emergency surgery, as the reason for the statistical difference between the two groups. ( $p=0.015$ ).

As for the type of resection, it was found that anterior, low anterior resection, segmental colon resection, and left hemicolectomy were frequently performed in emergency cases. However, in elective cases, the frequency of application of right hemicolectomy and very low anterior resection operations increased ( $p=0.007$ ). In the post-hoc analysis, the reason for the statistical difference between the two groups was that segmental colectomy was higher in patients who underwent emergency surgery, and right hemicolectomy and very low anterior resection in elective surgeries (**Table II**).

When comparisons were made in terms of anastomosis and ostomy findings, it was found that while there was no anastomosis in 60.0% of emergency cases, in 55.2% of elective cases, end-to-end anastomosis was performed (Table III). The reason for the statistical difference between the two groups in the post-hoc analysis was that anastomosis was less performed in patients who underwent emergency surgery, and end-to-end anastomosis was higher in elective surgeries. ( $p<0.001$ ). Ostomy (Hartmann's procedure in 40.0%) was performed in 80% of emergency cases, while no ostomy was applied in 74.9% of elective cases. The reason for the statistical difference between the two groups in the post-hoc analysis was that the Hartmann procedure was common in patients undergoing emergency surgery, and ostomy was less preferred in elective surgeries. ( $p<0.001$ ) (**Table III**).

When the number of resected lymph nodes and metastatic lymph nodes was compared, the number of the lymph nodes resected in emergency cases ( $15.44 \pm 6.55$ ) was similar in elective cases ( $16.41 \pm 10.69$ ) ( $p>0.05$ ). While metastatic lymph node averages in emergency cases ( $3.02 \pm 6.58$ ) were higher than in elective cases ( $1.80 \pm 3.88$ ). However, the differences were found to be statistically insignificant ( $p>0.05$ ) (**Figure I**).

Twenty-three of 45 patients operated on under emergency conditions went to their family physician once or twice a year. Still, none recommended the fecal immunochemical test (FIT) or colonoscopy. Twenty-two of the patients who underwent elective surgery were referred by their family physicians because the FIT test was positive. Thirteen of these patients had no symptoms.

**Table 1:** Comparison of the descriptive characteristics of colorectal cancer cases by emergency and elective surgery types.

	Emergency	Elective	Total	<i>p</i>
Age (years) (Avg.±SD)	64.6±9.6	63.1±12	63.8±11	0.512*
Gender (n,%)				
Female	17 (37.8%)	23 (39.7%)	40 (38.8%)	0.846‡
Male	28 (62.2%)	35 (60.3%)	63 (61.2%)	
Stage (n,%)				
Stage 0	0 (0%)	2 (3.4%)	2 (1.9%)	
Stage 1	<b>2 (4.4%)</b>	<b>10 (17.2%)</b>	12 (11.7%)	
Stage 2A	<b>10 (22.2%)</b>	<b>20 (34.5%)</b>	30 (29.1%)	<b>0.009‡</b>
Stage 2B	7 (15.6%)	1 (1.7%)	8 (7.8%)	
Stage 3A	1 (2.2%)	2 (3.4%)	3 (2.9%)	
Stage 3B	<b>18 (40.0%)</b>	<b>21 (36.2%)</b>	39 (37.9%)	
Stage 4	<b>7 (15.6%)</b>	<b>2 (3.4%)</b>	9 (8.7%)	
Follow-up period (month) [Median(min-max)]	7 (0-51)	6 (1-66)	6 (0-66)	0.970†
Total	45 (100%)	58 (100%)	103 (100%)	

\* Student T-Test, † Mann Whitney U Test, ‡ Chi-square Test

**Table 2:** Comparisons of emergency and elective surgery types for CRC cases, in terms of reason for attendance, varying locations and type of tumor resection.

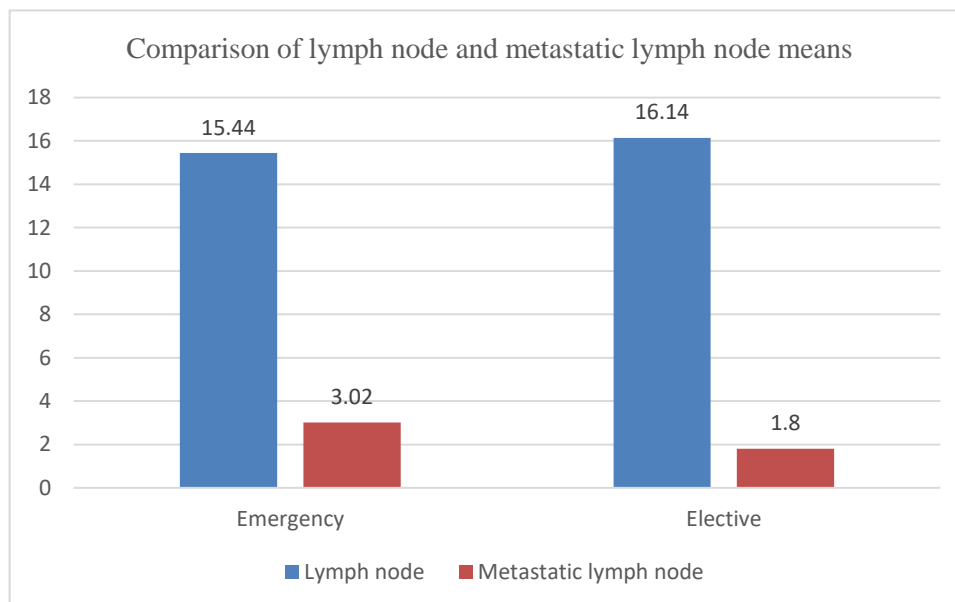
	Emergency	Elective	Total	<i>p</i>
Reason for application (n,%)				
Anemia	0 (0%)	9 (15.5%)	9 (8.7%)	
Bleeding	0 (0%)	<b>12 (20.7%)</b>	12 (11.7%)	
Constipation	0 (0%)	<b>25 (43.1%)</b>	25 (24.3%)	
Weight loss	0 (0%)	6 (10.3%)	6 (5.8%)	
Abdominal pain	0 (0%)	3 (5.2%)	3 (2.9%)	<b>&lt;0.001*</b>
Palpable swelling	0 (0%)	1 (1.7%)	1 (1.0%)	
Tenesmus	0 (0%)	2 (3.4%)	2 (1.9%)	
İleus	<b>36 (80%)</b>	0 (0%)	36 (35.0%)	
Perforation	<b>7 (15.6%)</b>	0 (0%)	7 (6.8%)	
Acute Abdomen	2 (4.4%)	0 (0%)	2 (1.9%)	
Tumor location (n,%)				
Caecum	4 (8.9%)	1 (1.7%)	5 (4.9%)	
Ascending colon	2 (4.4%)	<b>11 (19%)</b>	13 (12.6%)	
Hepatic flexure	0 (0%)	1 (1.7)	1 (1%)	
Transverse colon	<b>4 (8.9%)</b>	0 (0%)	4 (3.9%)	
Splenic flexure	1 (2.2%)	0 (0%)	1 (1%)	<b>0.015*</b>
Descending colon	<b>6 (13.3%)</b>	<b>11 (19%)</b>	17 (16.5%)	
Sigmoid	<b>16 (35.6%)</b>	<b>14 (24.1%)</b>	30 (29.1%)	
Rectosigmoid	<b>12 (26.7%)</b>	<b>14 (24.1%)</b>	26 (25.2%)	
Rectum	0 (0%)	<b>5 (8.6%)</b>	5 (4.9%)	
Multiple foci	0 (0%)	1 (1.7%)	1 (1.0%)	
Resection type (n,%)				
Anterior	<b>11 (24.4%)</b>	<b>11 (19%)</b>	22 (21.4%)	
Low anterior	<b>10 (22.2%)</b>	<b>15 (25.9%)</b>	25 (24.3%)	
Right hemicolectomy	2 (4.4%)	<b>13 (22.4%)</b>	15 (14.6%)	
Segmental colon	<b>9 (20.0%)</b>	2 (2.4%)	11 (10.7%)	
Left hemicolectomy	<b>5 (11.1%)</b>	<b>9 (15.5%)</b>	14 (13.6%)	<b>0.007*</b>
Subtotal colectomy	4 (8.9%)	2 (3.4%)	6 (5.8%)	
Total colectomy	1 (2.2%)	0 (0%)	1 (1.0%)	
Very low anterior	0 (0%)	<b>5 (8.6%)</b>	5 (4.9%)	
No resection	3 (6.7%)	1 (1.7%)	4 (3.9%)	
Total	45 (100%)	58 (100%)	103 (100%)	

\* Chi-square Test

**Table 3:** Comparison of CRC cases, according to emergency and elective surgery types, in terms of anastomosis and ostomy.

	Emergency	Elective	Total	<i>p</i>
<b>Anastomosis method (n,%)</b>				
End-to-end anastomosis	9 (20%)	<b>32 (55.2%)</b>	41 (39.8%)	<b>&lt;0.001*</b>
End-to-side anastomosis	6 (13.3%)	13 (22.4%)	19 (18.4%)	
Side-to-side anastomosis	3 (6.7%)	10 (17.2%)	13 (12.6%)	
No anastomosis	<b>27 (60%)</b>	3 (5.2%)	30 (29.1%)	
<b>Ostomy method (n,%)</b>				
No ostomy	9 (20%)	<b>44 (74.9%)</b>	53 (51.5%)	<b>&lt;0.001*</b>
Terminal ileostomy	3 (6.7%)	0 (0%)	3 (2.9%)	
Loop ileostomy	6 (13.3%)	11 (19%)	17 (16.5%)	
Loop colostomy	4 (8.9%)	1 (1.7%)	5 (4.9%)	
Hartmann	<b>18 (40.0%)</b>	2 (3.4%)	20 (19.4%)	
Double barrel	5 (11.1%)	0 (0%)	5 (4.9%)	
<b>Total</b>	45 (100%)	58 (100%)	103 (100%)	

\* Chi-square Test

**Figure 1:** Comparison of lymph node and metastatic lymph node means, in cases where emergency or elective surgery was performed due to CRC.

## DISCUSSION

Cancer is detected mainly in the colorectal region in the gastrointestinal tract. In the last few years, it has been observed that the frequency of CRC has increased, and the age of occurrence has decreased. When the expected 5-year prevalence rates, according to the World Health Organization, are analyzed, it is seen that CRC is the second (4,789,635 patients) behind breast cancer. In Turkey, the expected 5-year prevalence rate was reported as 49,614.

The risk increases with age in patients with colorectal cancer. The majority of patients with colorectal cancer are diagnosed after the age of 50 (90%)(8). As a result of larger series of clinical studies, it has been shown that the peak of the case is in the 7th decade (8,9). In our study, the mean age of the patients was found to be 63.8.

There was no difference in age in patients who underwent emergency and elective surgery.

Conversely, some studies have found that patients undergoing emergency surgery are older than patients undergoing elective surgery (10,11). As a result of our research, most patients with colorectal tumors are over the age of 45. We believe it is essential to know the peak age for early diagnosis and planning screening programs in this patient group.

No difference was found between the two groups in terms of gender in our study. The incidence of colorectal cancer was 1.5 times higher in males. There are different results in the literature according to the distribution of colorectal cancers by gender (12, 13).

Although it has been reported that it is seen at similar rates in both sexes, it has also been reported that it is 1.1 times more common in males than in females (14, 15). In our study, it was found to be higher than the rates in the literature. However, it is similar to studies based in Turkey (16).

In our study, early-stage tumors were less common in patients who underwent emergency surgery. More than half of the patients (26 out of 45) were stage III and IV (57.8%). In elective surgeries, this rate was 26 in 58 patients (43%). Bayar et al. (16) found this rate 82.2% and 36.6%, respectively. The fact that the results of these two studies conducted in the same country are so different may be an indication that screening and early diagnosis methods are not applied appropriately. When the patients who were operated under emergency and elective conditions were compared in a large series of studies, the patients who were operated under emergency conditions were at a more advanced stage. The rates of distant metastases increased (17, 18). Accordingly, studies were showing that occlusive tumors caused an increase in local spread and distant metastasis rates (19). In the light of these data, similar to these studies, the rate of stage IV patient group in the emergency operated group was higher than the elective surgery group (15%, 3.4%, respectively).

In our study, the most common reasons for admission to patients operated on under elective conditions were anemia, bleeding, and constipation, while IO and perforation in patients who underwent emergency surgery. Weight loss can be seen in patients with colorectal cancer. There is still confusion about the definition of clinically significant weight loss. However, 5% of body weight in 6-12 months is considered significant. In the 194 disease series of Majumdar et al. (20), the rate of weight loss was found to be 46%. In the study of Selvachandran et al. (21), this rate was 9.4%. This rate was 10.3% in our study, and all patients were in the elective surgery group. The reason for this difference may be that patients do not follow their weight effectively in our patient population.

Rectal bleeding may be the only manifestation of colorectal cancers (22). Studies have shown that rectal bleeding has high specificity but low sensitivity (23). In our study, 20.7% of the patients who underwent elective surgery had rectal bleeding. In studies, the positive reductive value of constipation was 15.7 (22, 23). It is usually considered together with diarrhea as part of the change in bowel habits. In our study, this symptom was observed in almost half of the patients who underwent elective surgery.

In our study, the most common symptoms of patients who underwent emergency surgery were ileus (intestinal obstruction) and perforation (95.6%). Symptoms in colorectal emergencies may be due to stenosis, complete obstruction, and perforation. Ollson et al. (24) found that patients presenting as an emergency tended to have more advanced tumors with worse stage distribution. Abdominal pain, abdominal distension, and vomiting (signs of ileus) are seen in large bowel obstruction. In addition, while 10% of emergency patients had tenesmus in one study, this rate was 3.2% in our research, and it was seen in those who had elective surgery (25).

According to the tumor location, CRC is most common in the rectosigmoid region, followed by the left and right colon, respectively. However, it is observed that the incidence of tumors located in the proximal colon has increased in recent years (26). In our study, the tumor localization was in the sigmoid and rectosigmoid regions (48.2% in the elective group and 62.3% in the emergency group). When the groups are compared, sigmoid colon tumors (69.7%) are the most common localization.

The consensus for the treatment of right colon obstruction includes the avoidance of a stoma, in preference for a single-stage resection, and anastomosis for all patients, except for the very skinny (27-30). However, an emergency treatment for left colon obstruction is debatable. Step-by-step surgery is generally recommended for left colon tumors (31). Because resection and primary anastomosis in a highly dilated and dirty colon under emergency conditions is considered risky. The most significant risk is anastomotic leakage. There are several options: basic colostomy, primary resection with end colostomy (Hartmann's operation), single-stage resection, and anastomosis (which may include subtotal colectomy or segmental colectomy), segmental colectomy + anastomosis and protective loop ileostomy, and colonic stenting. The purpose of placing an endoscopic stent (self-expanded metal stent (SEMS)) is to decompress the blocked bowel. This procedure can then be followed by one-step surgery (primary resection and anastomosis) to free the patient from a standard two-step procedure. In patients who cannot be operated on due to significant comorbidities or locally advanced or metastatic disease, SEMS placement may be final palliation (32). However, to carry out this procedure, the equipment of the hospital and the financial aspect of the procedure may present a problem.

Unfortunately, it is not possible for us to perform SEMS in our hospital. Therefore, urgent surgical intervention is performed in our clinic, and as a result, we are faced with an increased risk of morbidity and mortality. In this study, it was found that more than half of elective cases were at an early stage in terms of tumour stages, and as expected, almost half of emergency cases were stage 3B and stage 4. Upon inspection of the number of lymph nodes removed, it was observed that the number of lymph nodes removed in emergency and elective cases was very close. As for metastatic lymph node numbers, they were observed to be higher in emergency cases, but the difference was statistically insignificant. However, with advanced-stage tumours, morbidity rates were affected negatively.

Acute obstruction symptoms occur in 13-20% of patients with colon cancer (32). This study observed that 43.7% of CRC patients were operated on with symptoms of acute obstruction, far above these rates. Emergency surgery for acute colon obstruction carries a significant risk of mortality and morbidity and may require temporary or permanent colostomy in many patients (32,33). In this study, ostomy was opened in 80% of emergency cases, and the ostomy method was not applied in 74.9% of elective subjects. This undoubtedly increases morbidity rates.

The most important limitation of this study is that it is retrospective and single-Center.



We did not calculate the survival of the patients; the survivals could help us to obtain meaningful data. In addition, our evaluations in terms of postoperative complications were limited. However, we think that the hospital where the study was conducted reflects the Central Anatolian Turkish society very well. It is also preferred because it is a training and research hospital with many opportunities. This preference situation continues in the follow-up of the patients.

## CONCLUSION

Due to the increasing incidence of CRC, screening methods should be used in the most appropriate way for early diagnosis. In the hospital area where the study was applied, compared to other countries, it was found that a more significant number of patients with CRC underwent emergency surgery for intestinal obstruction. These findings indicate that Turkey's struggle against CRC is not successful. The screening methods in the country are insufficient, or there is a deficiency in the management of the application. Therefore, necessary measures must be taken to prevent further increases in these rates. Thus, CRC-related morbidity and mortality rates will decrease.

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**Ethical approval:** The study was conducted according to the guidelines of the Declaration of Helsinki and approved by Local Ethical Committee.

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