



# Management of Perforated Colon Cancers

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## ABSTRACT

It is known that emergency surgery for colon cancer is associated with high morbidity and mortality. We retrospectively evaluated colon cancer patients admitted with perforation. The total 223 patients who had colon cancer, 74 (33%) underwent emergent colon surgery and 34 (15%) of them had perforation. Median age was  $60.65 \pm 10.06$  years (range:39-79 years) and 12 patients were female (35%). The most common tumor localization was in sigmoid colon (41%). Perforation site was proximal to the tumor in 26 cases (76.5%) and at the tumor site in 8 (23.5%). Peritonitis was present in 28 patients (82%). One of the major complications was anastomotic dehiscence (6 patients, 17.6%). The mortality rate was 29.4% (10 patients) and the morbidity rate was 47.1% (16 patients). The mortality of perforated colon cancer cases is high. Factors associated with mortality are left sided colon tumors ( $p=0.006$ ), ASA score  $> 2$  ( $p=0.01$ ), the presence of liver metastasis ( $p=0.005$ ) and the presence of  $>25$  index according to Mannheim peritonitis index ( $p=0.002$ )

**Key words:** Colon cancer, perforation, management

## Perfore Kolon Kanserinin Tedavisi

### ÖZET

Kolon kanseri için acil cerrahi yüksek morbidite ve mortalite ile ilişkili olduğu bilinmektedir. Biz geriye dönük olarak perforasyon ile başvuran kolon kanseri hastalar değerlendirilmiştir. Kolon kanserli toplam 223 hasta çalışmaya alındı, bunların 74'üne (%33) acil kolon cerrahisi uygulandı ve bunların 34 (%15)'ünde perforasyon mevcut idi. Ortalama yaş  $60.65 \pm 10.06$  yıl (39-79 yaş) idi ve 12 hasta kadın (%35) idi. En sık tümör lokalizasyonu sigmoid kolonda (%41) idi. Perforasyon yeri 26 hastada (%76.5) tümörün yakınında ve 8 (%23.5)'inde tümör sahasında idi. Peritonit 28 hastada (%82) mevcuttu. Önemli komplikasyonlarından biri anastomoz yarılmaması (6 hasta, %17.6) idi. Mortalite oranı %29.4 (10 hasta) ve morbidite oranı %47.1 (16 hasta) idi. Perfore kolon kanseri vakalarının mortalitesi yüksek idi. Mortalite ile ilişkili faktörler sol taraflı kolon tümörleri ( $p=0.006$ ), ASA skoru  $> 2$  ( $p=0.01$ ), karaciğer metastazı varlığı ( $p = 0.005$ ) ve Mannheim peritonit indeksine göre  $>25$  ( $p = 0.002$ ) idi.

**Anahtar kelimeler:** Kolon kanseri, perforasyon, tedavi

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## INTRODUCTION

Colon and rectal cancers are the most common gastrointestinal cancers. They are 3rd most common and 2nd most common causes of cancer deaths among men and women, respectively (1-3). About 11-43% of all colon cancers admit in emergent clinical situation and 2-22% of them have perforation (4-6). It is also reported that perforations consist of 8.8% of all colon emergencies (7). Perforation of the colonic wall at the tumor site causes both spillage of colonic content and thereby peritonitis and sepsis. Also tumor are spilled into the peritoneum and this worsens the prognosis (1,8-10).

We retrospectively evaluated in this study our colon cancer patients admitted with perforation.

## MATERIALS AND METHODS

Records of 223 colon cancer patients admitted to our clinic, Ataturk University School of Medicine Department of General Surgery, between January 2006 and December 2010 were investigated, retrospectively. From the 223 patients 74 underwent emergent colon surgery and 34 of them had perforation. Demographic data of the patients, preoperative laboratory data, tumor localization, perforation site, distant metastasis, presence of peritonitis, surgical intervention, blood transfusion requirements, hospitalization time, morbidity and mortalities were recorded. The American Society of Anesthesiologists (ASA) score was employed to define the risk of surgery and Mannheim peritonitis index was used to describe the severity of peritonitis.

## RESULTS

A total of 34 patients were operated for perforated colon cancer. Median age was  $60.65 \pm 10.06$  (39-79 years), 12 patients were females (12/22). Laboratory data of the patients are illustrated at table 1. Most common tumor localization was sigmoid colon (41%). Tumor localizations were listed at table 2. In 32 patients (94.1%) tumors could be resected. Perforation site was proxi-

**Table 1.** Laboratory data of the patients are illustrated

Hemoglobuline	$12.84 \pm 2.85$ g/dl ( 6.7-17.6 )
leucocyte	$11600 \pm 2800$ /mm <sup>3</sup> (3000-22000)
albumin	$3.07 \pm 0.49$ g/dl ( 2.1-3.8 )

mal to the tumor 26 cases (76.5%) and at the tumor in 8 (23.5%). Twenty-four patients suffered from obstruction at the same time. Blood transfusions were made in 12 patients. Looking at the Mannheim peritonitis index; 4 patients (11.7%) had scores under 15, 12 patients (35.3%) had scores between 16-25 and 18 patients (53%) had scores over 25. ASA scores was  $\leq 2$  for ten patients (29.4%) and  $>2$  for 24 patients (70.6%)

## Surgical procedures

Peritonitis was present in all patients and was mostly generalized (28 patients). All tumors at the right colon (12 cases) were resected and in all cases primary anastomosis was performed. In 4 cases an additional diverting ileostomy was also performed. In patients with left colon tumors (22 cases) tumor resection could be performed in 20 cases except in two that had un-resectable rectum tumor. From these cases Hartman Procedure was performed in 16 cases. Detailed data of surgical procedures are illustrated at table 3. Liver metastases were detected in 4 patients during the operation but were not surgically treated at the same operation.

## Complications

One of the major complications was anastomotic dehiscence. This complication occurred in 6 patients with right colon tumor who underwent resection and primary anastomosis. Anastomoses performed in these cases were ileo-transvers or ileo-ascending anastomoses. All patients with anastomosis problems had generalized peritonitis at the first operation and all underwent a second operation. At the second operation a resection including the anastomosis site was performed and an end ileostomy created. Other complications including wound infection, pulmonary infection, wound dehiscence, intra-abdominal abscess and thromboembolism.

**Table 2.** Grading of conjunctival impression cytology and corneal and conjunctival calcification

	n	%
right colon	12	35.3
ascending colon	8	23
hepatic flexura	2	6
transverse colon	2	6
left colon	22	64.7
splenic flexura	2	6
sigmoid colon	14	41
rectosigmoid	6	18

**Table 3.** Factors associated with morbidity

		Morbidity				p value
		Yes Count	%	No Count	%	
Gender	female	8	66.7	4	33.3	0.091
	male	8	36.4	14	63.6	
Age	<60	6	42.9	8	57.1	0.681
	>=60	10	50.0	10	50.0	
Hemoglobuline	<10	8	100.0	0	.0	0.001
	>=10	8	30.8	18	69.2	
Albumin	<3	2	16.7	10	83.3	0.009
	>=3	14	63.6	8	36.4	
Tumor localizations	right colon	8	66.7	4	33.3	0.091
	left colon	8	36.4	14	63.6	
Peritonitis	diffuse	10	35.7	18	64.3	0.006
	localized	6	100.0	0	.0	
Perforation site	At the tumor	4	50.0	4	50.0	1.0
	proximal	12	46.2	14	53.8	
ASA	≤2	0	.0	10	100.0	0.000
	>2	16	66.7	8	33.3	
Resection	yes	16	50.0	16	50.0	0.487
	no	0	.0	2	100.0	
Anastomosis	Yes	10	71.4	4	28.6	0.017
	no	6	30.0	14	70.0	
Stoma	Yes	8	30.8	18	69.2	0.001
	no	8	100.0	0	.0	
Blood transfusions	yes	8	66.7	4	33.3	0.091
	no	8	36.4	14	63.6	
Liver metastasis	yes	2	50.0	2	50.0	1.0
	no	14	46.7	16	53.3	
Mannheim peritonitis index	<15	4	25.0	0	.0	0.205
	16-25	4	25.0	8	44.4	
	>25	8	50.0	10	55.6	

Statistically complications were associated with anemia (Hemoglobuline <10gr/dl,  $p=0.001$ ), hypoalbuminemia (Albumin <3g/dl,  $p=0.009$ ), presence of diffuse peritonitis ( $p=0.006$ ), ASA score >2 ( $p=0.000$ ), primary anastomosis ( $p=0.01$ ) and stoma ( $p=0.001$ ) (Table 3).

### Mortality

Ten patients died postoperatively (29.4%). Mortalities were attributed to sepsis in 5, to pulmonary embolism in 3 and cardiac problems in 2. Factors associated with mortality were left sided colon tumors ( $p=0.006$ ), ASA score > 2 ( $p=0.01$ ), the presence of liver metastasis ( $p=0.005$ ) and the presence of >25 index according to Mannheim peritonitis index ( $p=0.002$ ) (Table 4). Median hospitalization time was 17 3.2 day (1- 64 days).

### DISCUSSION

Colon cancers are the most common cancers of the gas-

trointestinal system. Up to 11-43% of all cancers admit in emergent circumstances and perforation is present in 2-22% of all cancers (1,4-6). Some authors reported the perforation rate to be 8.8% among all colon emergencies (7). In our series the rate of emergency admittance was 33.1% and perforation rate among all emergency admittances was 45.9%. The rate of patients operated under emergent circumstances was consistent with the literature but perforation seems to be relatively high. This in fact can be attributed delayed admittance and delayed diagnosis.

In patients with right colon cancer emergency surgery consists of right hemicolectomy and ileo-colic anastomosis. Management of complicated or perforated left colon cancer however remains still a debate (5). In general it is advised to perform resection and anastomosis for perforated right and resection and colostomy (Hartmann procedure) for perforated left colon tumors (11). However we experienced problems with this ap-

Table 4. Factors associated with mortality

		Mortality				p value
		Yes Count	%	No Count	%	
Gender	female	2	16.7	10	83.3	0.432
	male	8	36.4	14	63.6	
Age	<60	2	14.3	12	85.7	0.141
	>=60	8	40.0	12	60.0	
Hemoglobuline	<10	2	25.0	6	75.0	1.0
	>=10	8	30.8	18	69.2	
Albumin	<3	6	50.0	6	50.0	0.112
	>=3	4	18.2	18	81.8	
Tumor localizations	right colon	0	.0	12	100.0	0.006
	left colon	10	45.5	12	54.5	
Peritonitis	diffuse	10	35.7	18	64.3	0.148
	localized	0	.0	6	100.0	
Perforation site	At the tumor	0	.0	8	100.0	0.072
	proximal	10	38.5	16	61.5	
ASA	<2	0	.0	10	100.0	0.017
	>2	10	41.7	14	58.3	
Resection	yes	8	25.0	24	75.0	0.08
	no	2	100.0	0	.0	
Anastomosis	Yes	2	14.3	12	85.7	0.141
	no	8	40.0	12	60.0	
Stoma	Yes	10	38.5	16	61.5	0.072
	no	0	.0	8	100.0	
Blood transfusions	yes	6	50.0	6	50.0	0.112
	no	4	18.2	18	81.8	
Liver metastasis	yes	4	100.0	0	.0	0.005
	no	6	20.0	24	80.0	
Mannheim peritonitis index	<15	0	.0	4	16.7	0.002
	16-25	0	.0	12	50.0	
	>25	10	100.0	8	33.3	

proach. The anastomosis dehiscence was high in resection and primary anastomosis for perforated right colon cancers in our series. Resection and primary anastomosis for left sided perforated colon cancer is currently advised in patients with good clinical performance (12). One stage operation has the advantage of avoiding colostomy thereby providing comfort and avoiding colostomy related complications and a second operation (5). Our approach is more classical and we prefer to perform resection and end colostomy in our patients with left colon tumor perforations.

The perforation site in colon cancer perforations can be located either near at the tumor site or distant (mostly cecum). Tan and associates reported that short and long term outcomes are not associated with the perforation site (13). In our series perforation was located mostly distant from the tumor. However we couldn't show any association between perforation site and complications or in-hospital mortality.

Perforation causes peritonitis and this can be generalized or local (14). Mandava and associates (9) reported the rates of generalized and localized peritonitis 20% and 31%, respectively. In our series the rate of generalized peritonitis was higher than localized peritonitis (28 patients vs 6 patients). We think that this high rate of generalized peritonitis could be attributed to the delay admission of the patients that we frequently observe in our region. The presence of generalized peritonitis was associated with complications in our series, including anastomotic dehiscence. Primary anastomosis in patients with generalized peritonitis remains still a debate. Classically primary anastomosis is avoided in these circumstances, however current studies had shown that primary anastomosis in patients with generalized peritonitis can be made safely with low complication and mortality rates (5). As stated above our experience showed that generalized peritonitis is associated with high rates of anastomotic dehiscence in patients with right colon

cancer that managed with resection and primary anastomosis. All patients with leakage from the anastomosis underwent a second surgical intervention and an end ileostomy was performed. Despite the high leakage rate in these patients we observed that this complication hadn't any impact on mortality. We suggest that in patients with perforated right colon cancer and generalized peritonitis an ileostomy should not be avoided.

One other factor associated with mortality was liver metastasis in our study. Tan and associates reported that surgical intervention for liver metastases provided long-term disease-free survival (13). However our patients with liver metastasis had not only advanced disease but also presented with a bad clinical condition and all these patients died between postoperative 1st and 7th days. We don't advocate liver resection at the same operation, but it can be scheduled during the long-term management in surviving patients.

In general, mortality in perforated colon cancer cases is high. Mandava et al (5) reported this rate to be 12% while Bielecki (15) reported a rate of 16.9%. Factors affecting mortality are advanced age, ASA score > 3, stoma creation, blood transfusions, technique of anastomosis, presence of colonic ischemia, advanced tumor stage and metastatic disease (16-18). In our series mortality rate was 29.4 % (n=10). This rate was higher in patients who underwent stoma creation with resection of the tumor. Stoma creation without resection, however had a lower mortality rate in our series. However Bielecki had different findings. They stated that in patients who underwent resection and anastomosis the mortality rate was lower than resection and stoma creation (15).

In conclusion, we think that the high mortality rate seen with resection and stoma creation in our series can be attributed to late admission and advanced disease. In addition to these factors, tumor location at the left colon was a factor affecting mortality.

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