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ORIGINAL ARTICLE

Results of surgery for colorectal carcinoma with obstruction

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Abstract
Background/aims Emergency surgery for obstructing colorectal carcinoma is thought to be associated with poor survival. The aim of the study is to assess the results of surgery for obstructing colorectal cancer.
Materials and methods From 1987 to 2004, 80 patients underwent emergency surgery for completely obstructing colorectal carcinoma (COC), and 171 patients underwent elective surgery for non-obstructing cancer (NOC). Morbidity, mortality, and the late outcome were assessed.
Results The groups were comparable for age, gender, tumor distribution, histopathologic characteristics, stage, morbidity, concomitant operations, recurrence, and sites of recurrence. High ASA class, poor performance status, and high mortality rate were recorded in COC group ($p<0.05$). Mortality was related to ASA class ($p<0.001$), performance status ($p<0.001$), and obstruction ($p=0.014$). ASA class was the single independent factor of morbidity ($p<0.001$). The groups were comparable for survival ($p>0.05$).
Conclusions Obstructing colorectal carcinoma seems to be associated with high mortality rate, but long-term survival seems to be the same with non-obstructing carcinoma.

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Keywords Obstruction · Colorectal carcinoma · Survival · Morbidity · Hospital mortality

Introduction

The incidence of colorectal carcinoma with obstruction has not changed in the last decades and varies between 7% and 29% [1–4]. Urgent surgical treatment of obstructing colorectal carcinoma is thought to be associated with high morbidity and hospital mortality rate [3–5]. Advanced age and severe concomitant diseases, deteriorated general condition, and water-electrolyte imbalance have been reported to be related to high morbidity and hospital mortality [6]. Obstructing colorectal carcinomas are thought to be frequently of advanced stage and have decreased long-term survival compared to non-obstructing carcinomas [7].

The purpose of the study is to assess retrospectively the perioperative and the long-term results of patients undergoing emergency surgery for obstructing colorectal carcinoma and compare them with the results of patients undergoing elective surgery for non-obstructing carcinomas.

Materials and methods

From 1987 to 2004, 387 patients underwent surgical treatment for primary colorectal carcinoma in a single general surgical department. Of them, 80 patients (20.7%) were admitted to the hospital because of acute large bowel obstruction (COC group) and underwent urgent surgery within 24 h from admission. Patients with colorectal carcinoma that underwent urgent surgery for any other

reason except complete obstruction (perforation or abscess) were excluded from the analysis. In addition, patients with middle or low rectal carcinomas were excluded because none of them presented with large bowel obstruction at the time of diagnosis. During the same period, 171 patients underwent elective surgery for colorectal carcinoma (NOC group).

The colon was divided into left and right segment, the junction being defined as the distal third of the transverse colon.

Complete obstruction was assessed by medical history, physical examination, abdominal X-ray, surgical findings, and urgent surgical operation within 24 h of admission.

The age, gender, and the presence of concomitant diseases were recorded at admission. The performance status was assessed according to Karnofsky performance scale. Data for tumor distribution, main and concomitant operations, TNM stage, ASA class, and histopathology were also recorded.

Perioperative management

The same surgical team followed the same standard surgical policy. The patients with large bowel obstruction were preoperatively resuscitated with aggressive fluid and electrolyte replacement by monitoring the central venous pressure and urine output, correction of electrolyte imbalance, and nasogastric decompression. Right-sided colon tumors were always resected, and the continuity of the gastrointestinal tract was restored with ileocolic anastomosis. The patients with left-sided colon tumors underwent Hartmann's resection. In these cases, the continuity of the gastrointestinal tract was restored 6 to 7 months following initial operation and after the completion of adjuvant treatment if it was necessary. The patients with TNM stage III were treated with adjuvant chemotherapy. The patients in whom an R_2 resection was performed received palliative chemotherapy.

Histopathology

Complete histopathologic report was possible according to TNM system for all the specimens. R_0 resections were considered the operations with no macroscopically visible tumor (either primary or metastatic) left behind. R_1 resections were considered the operations with microscopically tumor left behind. R_2 resections were defined as those with macroscopically visible tumors left behind.

All the patients surviving surgery were followed-up with physical examination, hematological–biochemical examinations, tumor markers, and CT scan at 6-month intervals for the first 5 years after initial surgery and once a year later. Recurrences and the failure sites were recorded.

Statistical analysis was made using SPSS (Statistical Package for Social Sciences). The study of relationships between variables was made using x^2 test (Pearson's correlation). Survival analysis was performed using the Kaplan–Meier method and comparison of curves with the log-rank-test. Cox regression analysis made possible multiple analysis of survival and logistic regression analysis was used to calculate the clinical factors related to morbidity and recurrences. p values <0.05 were considered significant. The postoperative deaths were not excluded from the survival analysis.

Results

The mean age of COC and NOC group was 72.9±9.8 (45–91) and 69.8±9.8 (35–92) years respectively ($p>0.05$). The groups were also comparable for gender, TNM stage, residual tumor, concomitant surgery, concomitant diseases, treatment with adjuvant chemotherapy, recurrences, and the failure sites ($p>0.05$). The majority of patients in COC group were assessed as ASA class II and III in contrast to the majority of patients in NOC group that were assessed as ASA class I and II ($p=0.001$). Most patients in NOC group were assessed as 90–100% Karnofsky performance status. However, a significant number of patients in COC group were assessed as 70–80% Karnofsky performance status, therefore, the groups were not comparable for performance status ($p=0.001$). The tumor distribution was significantly different between the two groups because left-sided colon tumors were more common in COC group ($p=0.006$). In 21 cases, the tumor obstructing the colon was located at the descending colon, in 29 cases at the sigmoid colon, and only in two cases at the splenic flexure. Severe concomitant diseases were found in 47 patients in COC group and in 103 patients in NOC group ($p>0.05$; Table 1). Hypertension, cardiovascular disorders, chronic pulmonary diseases, and insulin-dependent diabetes were the most common concomitant diseases. A detailed analysis of tumor distribution is demonstrated in Table 2.

Details about main and concomitant surgery and adjuvant therapy are given in Table 3. Concomitant surgery included two liver segmental resections, 19 hysterectomies, four splenectomies, four segmental resections of the small intestine, 11 cholecystectomies, and 11 unilateral oophorectomies in COC group. In COC group, five liver segmental resections, 21 hysterectomies, two partial gastrectomies, one resection of the tail of the pancreas, seven splenectomies, five segmental resections of the small bowel, 28 cholecystectomies, and 28 unilateral oophorectomies consisted concomitant surgery (Table 4).

In both groups, all the primary tumors were resected during initial operation and were found to be primary

Table 1 General characteristics

Indicator	COC group	NOC group	*p* value
Age			>0.05
≤60	11 (13.8%)	26 (15.2%)	
>60	69 (86.2%)	145 (84.8%)	
Gender			>0.05
Male	33 (41.3%)	85 (49.7%)	
Female	47 (58.8%)	86 (50.3%)	
ASA stage			0.001
I	21 (26.3%)	95 (55.6%)	
II	41 (51.3%)	66 (38.6%)	
III	18 (22.4%)	9 (5.3%)	
IV	0 (0%)	1 (0.5%)	
Performance status			0.001
90–100%	56 (70%)	161 (94.2%)	
70–80%	23 (28.8%)	10 (5.8%)	
50–60%	1 (1.2%)	0 (0%)	
Tumor distribution			0.015
Right colon	17 (21.2%)	52 (30.4%)	
Left colon	52 (65%)	78 (45.6%)	
Upper rectum	11 (13.8%)	41 (24%)	
Comorbidity	47 (58.8%)	103 (60.2%)	>0.05

adenocarcinomas. No specimen in COC group was identified as T_1 (Table 5). Although 17 patients of COC group and 33 patients of NOC group were identified as stage IV, in ten patients of COC group and in 22 patients of NOC, a potentially curative operation was impossible, and macroscopically visible tumor was left behind at distant sites (Table 3).

The hospital mortality in NOC group was 6.4% (11 patients) and in COC group 16.3% (13 patients; $p=0.014$). Mortality was related to ASA class ($p<0.001$), performance status ($p<0.001$), complete obstruction ($p=0.014$), and to concomitant diseases ($p=0.001$). Twenty-three patients (28.8%) in COC group and 31 patients (18.1%) in NOC group had complications in the immediate postoperative period, but the difference was not statistically significant ($p=0.056$). By multivariate analysis, it was demonstrated that ASA class was the single independent indicator of morbidity ($p<0.001$).

Table 2 Tumor distribution

Location	NOC group	COC group
Cecum	24	7
Ascending colon	17	5
Right colic flexure	11	5
Transverse colon	17	3
Splenic flexure	4	2
Descending colon	10	7
Sigmoid colon	47	40
Upper rectum	41	11

Table 3 Surgical characteristics

	COC group	NOC group	*p* value
Main surgical operation			0.001
Right colectomy	19 (23.8%)	56 (33.8%)	
Transverse colectomy	1 (1.2%)	14 (7.2%)	
Left colectomy	50 (62.5%)	59 (34.5%)	
Low anterior resection	10 (12.5%)	42 (24.5%)	
Residual tumor			>0.05
R_0	67 (83.8%)	148 (86.5%)	
R_1	3 (3.8%)	1 (0.6%)	
R_2	10 (12.4%)	22 (12.9%)	
Concomitant surgery	51 (63.8%)	97 (56.7%)	>0.05
Adjuvant chemotherapy	29 (36.3%)	82 (48%)	>0.05

Survival

Mean survival rate for NOC and COC group was 120±7 (95% CI=107–134) and 80±8 (95% CI=64–96) months respectively. Five-year survival rate for NOC and COC group was 68% and 61% respectively ($p=0.20$; Fig. 1). By univariate analysis, it was demonstrated that survival was related to age, ASA class, performance status, T, N, M, stage, degree of differentiation, residual tumor, and treat-

Table 4 Histopathologic characteristics

	COC group	NOC group	*p* value
T			>0.05
T_1	0 (0%)	5 (2.9%)	
T_2	7 (8.8%)	31 (18.2%)	
T_3	62 (77.4%)	121 (70.7%)	
T_4	11 (13.8%)	14 (8.2%)	
N			>0.05
N_0	41 (51.2%)	86 (50.3%)	
N_1	20 (25%)	53 (30.9%)	
N_2	19 (23.8%)	32 (18.8%)	
M			>0.05
M_0	63 (78.8%)	138 (80.7%)	
M_1	17 (21.2%)	33 (19.3%)	
TNM stage			>0.05
I	4 (5%)	23 (13.6%)	
II	34 (42.5%)	52 (30.8%)	
III	25 (31.3%)	61 (36.1%)	
IV	17 (21.2%)	33 (19.5%)	
G			>0.05
G_1	30 (37.5%)	57 (33.3%)	
G_2	36 (45%)	87 (50.8%)	
G_3	14 (17.5%)	27 (15.9%)	

Table 5 Univariate analysis of survival

Indicator	*p* value
Age	0.023
ASA class	0.004
Performance status	0.035
T	<0.001
N	<0.001
M	<0.001
Degree of differentiation	0.007
Residual tumor	<0.001
Adjuvant chemotherapy	0.022
Stage	<0.001

ment with adjuvant chemotherapy (Table 5). However, by multivariate analysis, it was demonstrated that nodal invasion and residual tumor were identified as independent prognostic indicators of survival (Table 6).

No patient was lost during follow-up. Recurrence was recorded in 36 patients of the NOC group and in 15 patients of the COC group ($p>0.05$). In COC group, 11 distant and four locoregional recurrences were recorded, and in NOC group, 29 distant and six locoregional recurrences were recorded ($p>0.05$). By multivariate analysis, it was demonstrated that only nodal invasion was the independent indicator for recurrence ($p<0.001$).

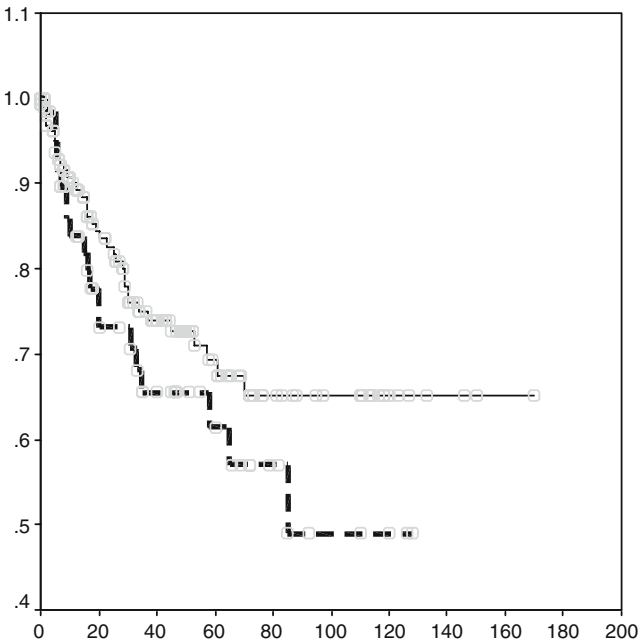

Fig. 1 Ten-year survival in obstructing (*dotted line*) and non-obstructing colorectal carcinomas (*continuous line*; $p=0.20$)

Table 6 Multivariate analysis of survival

Indicator	*p* value	HR	95% CI
Nodal invasion	0.001	2.42	1.725–3.394
Residual tumor	0.001	3.766	1.16–7.03

Discussion

The incidence of obstructing carcinoma of the colon requiring urgent surgery (20.7%) was similar to the incidence reported in other studies [1–4]. It is believed in a few studies that the incidence of tumor distribution obstructing the colon is not significantly different between left and right sides [7, 8]. However, in most studies, it is documented that the left colon is the most frequent site of obstruction, and this has been confirmed in the present study [4, 6, 9, 10]. Although the splenic flexure has been reported to be the most vulnerable site for obstruction because of its acute angle [6], only two out of six patients with left colic flexure tumors have had obstruction at this site. The reasons of colonic obstruction have not been completely elucidated. It seems that there are other factors precipitating obstruction, as are the change in colonic flora in the proximal segment, the inflammatory edema, the impaction of solid feces, and the fatigue of intestinal muscle proximally to stenosis, etc. [6].

Many studies state that obstructing colorectal carcinomas are either locally advanced or they are associated with distant metastases [6, 10, 11]. Others have documented that this is not true and even T_1 carcinomas may be the cause of obstruction [12]. Although no T_1 tumor was identified in COC group, the distribution of TNM stage, as well as the rate of residual tumor after the completion of surgery, was similar in both groups.

Resection and ileocolic anastomosis at initial surgery is the generally accepted management of the right-sided obstructing tumors [6, 13]. In contrast, the surgical management of obstructing carcinoma of the left colon is controversial. Primary resection of the tumor has been suggested as the best oncologic approach [1, 14]. Others recommend that resection must be avoided at initial surgery [15] either because the anastomosis may be disrupted in more than 50% of the cases in case of primary anastomosis or because the patients' general condition may be deteriorated and simple decompression of the large bowel may be the only alternative. It is generally known that staged resection in left-sided obstructing carcinomas carries a low mortality rate [5]. Hartmann's procedure has been recommended as an intermediate and safe surgical option, by which on the one hand the oncologic approach and the

decompression of the large bowel are achieved at initial surgery and on other hand the lethal surgical complications may be largely avoided [16]. One-stage surgery with primary anastomosis has been advocated in properly selected patients with complete obstruction with a small risk of anastomotic leak [6, 17], but this has not been attempted in patients of the present study.

A high hospital mortality rate was recorded because high ASA class and poor performance status were found in COC group. These factors were strongly related to hospital mortality [18]. Recent studies have shown that APACHE II score and blood transfusion are independent factors of hospital mortality [9, 19].

No difference in morbidity rate was recorded between the groups, although a higher morbidity rate would be expected in COC group [9, 20]. High ASA class has been reported as one of the most important independent risk factors for morbidity that has been reconfirmed in the present study [9, 18].

Patients without obstruction of the large bowel are thought to have better long-term survival [7, 21] because the obstructing tumors are believed to be more locally advanced or more frequently are associated with distant metastases [3, 20]. Others have found that nodal involvement is more common in obstructing tumors of the large bowel [4, 5, 13, 22]. Obstruction and stage have been identified as independent prognostic variables [13].

The analysis of the data demonstrated that the groups were not different for TNM stage and tumor resectability (R). In addition, all the patients in COC group underwent primary tumor resection. It has long been stated that primary tumor resection is a favorable prognostic indicator [1]. Improvement in survival has been documented in recent reports [8, 23]. The independent prognostic variables were nodal invasion and the residual tumor, although by univariate analysis, it was found that the age, ASA class, performance status, TNM stage, the degree of differentiation, treatment with adjuvant chemotherapy, and the residual tumor were related to survival.

The recurrence rate and the failure sites were the same in both groups, although it was stated that obstruction carries a higher risk of recurrence [21].

Conclusions

The mortality of patients with obstructing carcinomas of the large bowel is high because these patients are assessed as high ASA class and poor performance status. The morbidity is the same as in patients with non-obstructing carcinomas. The long-term survival of patients with obstructing carcinomas of the large bowel is the same as the survival of patients with non-obstructing carcinomas.

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