

Outcome of Palliative Operations for Malignant Bowel Obstruction in Patients With Peritoneal Carcinomatosis From Nongynecological Cancer

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Background: Malignant bowel obstruction (MBO) secondary to peritoneal carcinomatosis carries a grave prognosis. We evaluated clinicopathologic factors that predict outcomes after palliative operations for MBO.

Methods: Data on patients undergoing laparotomy for palliation of gastrointestinal MBO at City of Hope between 1995 and 2000 were retrospectively collected. Successful palliation was defined as the ability to tolerate solid food (TSF).

Results: Sixty-three patients underwent operative treatment. In 20 patients, MBO was the first presentation of disease; for others, the median disease-free interval was 15 months. The complication rate was 44%, and postoperative mortality was 15%. The median length of stay was 12 days. Twenty-nine patients (45%) were discharged from the hospital on a regular diet; 22 (76%) continued to eat until their last follow-up. Median survival was 90 days. Univariate factors for longer survival were TSF on discharge, colorectal primary, and nonmetastatic status at first diagnosis. Patients with ascites and whose cancer first presented with MBO had an inferior survival. Noncolorectal primary remained a multivariate predictor for decreased survival. TSF was predicted by the absence of ascites, an obstruction not involving the small bowel, and a preoperative albumin of >3.0 mg/dl. Multiple logistic regression analysis yielded presence of ascites and small-bowel obstruction as predictors of inability to TSF.

Conclusions: Only one third of patients with MBO from peritoneal carcinomatosis will have prolonged postoperative palliation with significant, but acceptable, treatment-related morbidity. TSF at discharge is a useful predictor of continued palliation for most patients. Patients with colorectal cancer may have superior survival outcome and better palliation; others are at risk for poor outcomes, especially in the presence of ascites and MBO of small bowel. In these patients, highly selective use of laparotomy is recommended.

Peritoneal carcinomatosis reflects the regional spread of cancer cells within the peritoneal cavity.¹ Although not always associated with widespread visceral or extraperitoneal disease, it nearly always reflects incurable disease when it results from gastrointestinal or other nongynecological malignancies.² In addition, it carries the potential for significant patient morbidity and symptom development. A particularly challenging scenario is the occurrence of ma-

lignant bowel obstruction (MBO),³ because operative treatment in this setting may lead to significant morbidity, with limited treatment success and poor survival.^{4,5} Information on outcomes after laparotomy for MBO and on predictors for successful palliation remains sparse. The purpose of this study was to examine postoperative results in patients operated on for bowel obstruction caused by peritoneal carcinomatosis from gastrointestinal and other nongynecological cancers and to assess the palliative benefit in this high-risk patient population.

PATIENTS AND METHODS

Patients undergoing laparotomy for MBO secondary to carcinomatosis from a nongynecological primary tumor at City of Hope National Medical Center between

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July 1995 and June 2000 were analyzed. Demographic information, clinical parameters, treatment-related variables, and outcomes were collected retrospectively. All operations had been performed with palliative intent, namely, to relieve the bowel obstruction, prevent vomiting, and recreate the opportunity for enteral nutrition. All patients had preoperative symptoms of abdominal pain and were unable to take solid food by mouth. Successful palliation was defined as the ability to postoperatively tolerate solid food (TSF) at the time of discharge from the hospital. Lethal events included postoperative deaths in the hospital or within 30 days from the operation. Morbidity or complications were defined as untoward events during the postoperative course that required unplanned diagnostic or therapeutic intervention. Statistical analysis included Fisher's exact test or χ^2 analysis as appropriate for contingency analysis of nominal variables and Mann-Whitney or Student's *t*-testing for nonparametric or parametric comparison of continuous variables. Length of hospital stay was computed by a parametric, actuarial method described previously.⁶ Survival was calculated with the Kaplan-Meier method.⁷ Groups were compared by log-rank testing.⁸ Multivariate survival analysis was based on the Cox regression.⁹ Logistic regression was used for categorical outcome analysis of the following preoperative factors: age, sex, primary diagnosis, initial stage, disease-free interval, prior chemotherapy, prior radiation, number of previous

laparotomies, obstruction level, presence of ascites, and various laboratory parameters, including serum albumin. For all multivariate tests, stepwise backward elimination models were chosen. Significance of differences was assumed at *P* values of .05 or less.

RESULTS

Patient Demographics

Demographic and clinical parameters are listed in Table 1. Sixty-three patients with symptomatic peritoneal carcinomatosis underwent operative treatment. Their ages ranged from 25 to 83 years. Peritoneal carcinomatosis was the first presentation of cancer in 20 patients (synchronous disease); in the remaining 43 individuals, the median disease-free interval was 15 months (range, 6–108 months). Primary diagnoses included cancer from colorectal (*n* = 31), gastric (*n* = 12), gastrointestinal stromal (*n* = 5), pancreatic (*n* = 4), bile duct (*n* = 1), small intestine (*n* = 1), and other nongynecological visceral (*n* = 9) origins. Twenty patients (32%) had undergone more than one previous laparotomy. The American Joint Committee on Cancer stage distribution at the time of the first diagnosis (before the onset of MBO in 43 patients) included stage II (*n* = 6), stage III (*n* = 36), and stage IV (*n* = 21). Visceral or extra-abdominal disease extent were not completely assess-

TABLE 1. Patient and treatment characteristics

Variable	Subcategory	Total patient cohort	Patients reaching TSF	Patients not reaching TSF	<i>P</i> value
Sex (n)	Male	38	15	23	NS
	Female	25	14	11	
Age, median (y)		58	61	55	NS
Presentation interval, median (mo)		12	15	12	NS
Primary cancer (%)	Colorectal	49	59	41	NS
	Noncolorectal	51	41	59	
Prior chemotherapy (%)		78	76	79	NS
Prior radiation (%)		27	21	32	NS
Prior laparotomies, median (n)		1	1	1	NS
Operative procedure (%)	Resection	41	31	50	NS
	No resection	59	69	50	
Ascites (%)		24	14	32	.08
Obstruction level (%)	Gastric outlet	29	18	34	NS
	Small bowel	71	55	85	.008
	Large bowel	41	52	32	NS
Postoperative mortality (%)		21			NA
Postoperative complications (%)	Infectious	24	17	29	NS
	Noninfectious	21	14	26	
Length of stay, median (d)		12	9	16	.0004
Survival, median (m)		3.0	6.0	2.0	.001

NS, not significant; NA, not applicable; the percentages of obstruction levels do not add up to 100 because some patients presented with multiple levels of obstruction.

able, because preoperative computed tomograms had not routinely been obtained for every patient.

Operative Treatment

In all individuals, diffuse peritoneal carcinomatosis was documented. This was accompanied by ascites in 15 (24%). Levels of intestinal obstruction are listed in Table 1. The percentages do not sum up to a total of 100 because multiple simultaneous sites of obstruction were identified in 22 patients (35%). Predominant operative procedures included a major resection ($n = 26$), internal bypass ($n = 19$), mere gastrostomy drainage tube placement ($n = 10$), and colostomy placement ($n = 8$). In addition, jejunostomy tubes ($n = 15$), additional tube gastrostomies ($n = 25$), or colostomies ($n = 5$) were placed in patients undergoing resection or bypass procedures.

Postoperative Outcome

Twenty-eight patients experienced a postoperative complication (44%), including 15 infections and 13 non-infectious events. Major resections led to a slightly higher rate of postoperative complications (50% vs. 41%; $P =$ not significant). There was no intraoperative death, but 10 patients died in the hospital after surgery (16% in-hospital mortality), and 3 others died within 30 days of discharge from the hospital, for an overall 30-day mortality rate of 21%. Twenty-nine patients (45%) were discharged tolerating a regular diet. Of these, 22 (or 76%) continued to eat until their last follow-up. Treatment and outcome characteristics, separated by the ability to TSF, are listed in Table 1. Preoperative or intraoperative predictors of inability to achieve TSF included small-bowel obstruction and the presence of ascites (Table 2). Three patients with small-bowel obstruction, ascites, and a serum albumin of <3 mg/dl were nevertheless able to eat at the time of discharge. The median length of hospital stay was 12 days (range, 3–39 days). There was a significantly shorter hospitalization in patients reaching TSF (Table 1, Fig. 1).

TABLE 2. Predictors of palliation failure

Variable	Univariate <i>P</i> value	Multivariate	
		Hazard ratio (CI)	<i>P</i> value
Small-bowel obstruction	.016	6.4 (1.7–31.9)	.009
Ascites	.04	5.2 (1.3–29.5)	.03
Albumin <3 mg/dL	.04	2.2 (0.9–5.5)	NS

CI, confidence interval; NS, not significant.

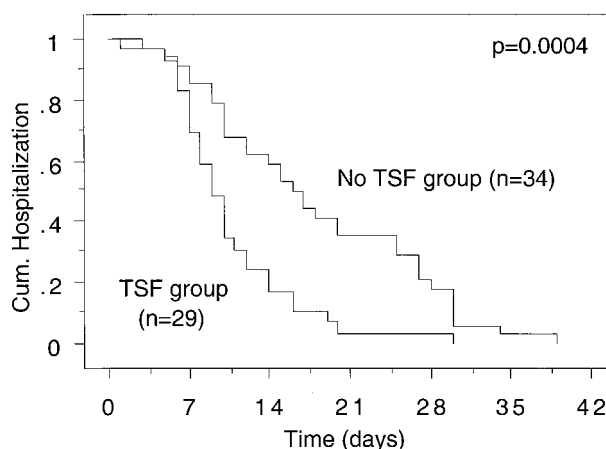


FIG. 1. Length of hospital stay \times ability to tolerate solid food (TSF).

Survival and Long-Term Palliation

At a median follow-up of 78 days (120 days for surviving patients), the median actuarial overall survival for the entire cohort was 90 days. Of preoperative clinical variables, noncolorectal cancer, ascites, or synchronous MBO at the time of cancer diagnosis led to an inferior survival (Table 3). In addition, TSF status at the time of discharge led to a significantly longer survival (Fig. 2). Resecting or nonresecting operations did not result in a survival difference. Multivariate testing revealed a colorectal primary as single predictor for increased survival (Fig. 3, Table 3).

Thirty-nine patients were readmitted to the hospital after the initial discharge. They spent a median of 22 days (range, 3–66 days) in the hospital during any subsequent admission, consistent with approximately 5.6% of the remaining patient days alive. Patients achieving TSF at discharge were more likely to experience a subsequent readmission (83% vs. 45%, $P = .009$) but spent a significantly smaller proportion of remaining lifetime within the hospital (2.1% vs. 9.8%, $P = .003$). The median length of continued TSF ability was 90 days (range, 20–660 days). Comparison of TSF duration and survival curves in patients discharged on regular diet did not reveal any significant differences (Fig. 4).

DISCUSSION

For most nongynecological malignancies, peritoneal carcinomatosis is an indicator of extremely poor long-term survival. Low-grade appendiceal or colorectal cancers may represent rare exceptions to this notion if treated with aggressive cytoreduction, peritonectomy, and intraperitoneal chemotherapy.^{10,11} When peritoneal

TABLE 3. Predictors of inferior survival

Variable	Univariate		Multivariate	
	Survival, median (d)	P value	Hazard ratio (CI)	P value
Noncolorectal versus colorectal primary	50 vs. 120	.009	1.4 (1.1–1.9)	.04
Ascites versus no ascites	50 vs. 120	.002	1.2 (0.9–1.8)	NS
Synchronous versus delayed presentation	57 vs. 120	.03	1.0 (0.7–1.6)	NS

CI, confidence interval; NS, not significant.

cancer dissemination is accompanied by a bowel obstruction, treatment options and success are generally curtailed by oncological limitations and patient comorbidity. Although more instances of MBO are caused by locally recurrent disease compared with peritoneal carcinomatosis,⁵ the latter combination is not an infrequent cause for patient symptom development and suffering, futile therapeutic attempts, and significant treatment expenses. To maximize efforts and resources in advanced cancer care, pretreatment predictors of successful therapeutic outcomes are strongly desirable.

Palliative goals in the treatment of MBO and peritoneal carcinomatosis include control of vomiting and pain and, more stringently, restoration of the ability to TSF by mouth. We chose the latter as our definition of palliation success after laparotomy, because the former two can frequently be accomplished through nonoperative procedures of drainage or stenting and through pharmacological therapy. By using this definition, our review was to determine the outcomes of patient palliation after operations in a tertiary cancer center with a higher number of patients with advanced disease and to identify pretreatment predictors for palliation success.

Our results concur with those of other published reports (Table 4). Operative treatment of MBO in the setting of peritoneal carcinomatosis carries significant morbidity and mortality. The mortality rates range from 14% to 29%,^{2,4,12–16} with complications rates^{2,12,17} between 37% and 45%. Although the definition of palliation varies between series, palliative success has been reported for 50% to 75% of patients.^{12,15,17} Lasting palliation, i.e., the ability to TSF for longer than 2 months, or, not infrequently, during the remaining lifetime, was then described for as many as 50% of individuals.^{12,17} Although successful palliation represents a more substantial treatment goal compared with mere prolongation of survival, factors indicating limited survival may lend important input into the decision of which palliative treatment to choose. Dependent on the underlying malignancy, the resulting postoperative median survival ranges from 1 to 6 months.^{2,5,12,15–17} Aside from a noncolorectal primary cancer diagnosis, the presence of ascites, the extent of peritoneal involvement,² and a limited performance status¹⁸ have been found to predict inferior survival.

In light of these generally poor postoperative results, some emphasis has been placed on nonsurgical

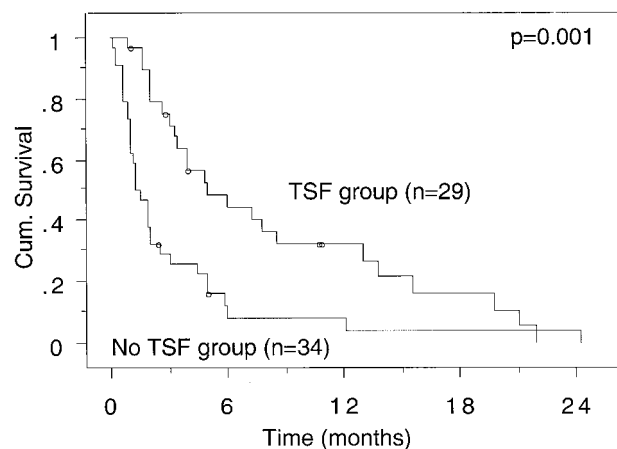


FIG. 2. Actuarial overall survival \times ability to tolerate solid food (TSF).

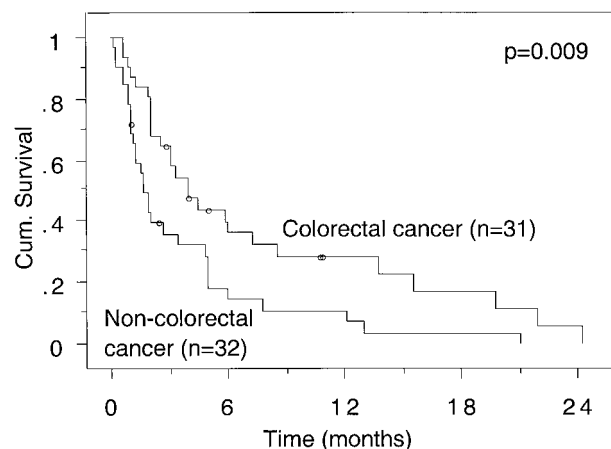


FIG. 3. Actuarial overall survival \times by underlying disease.

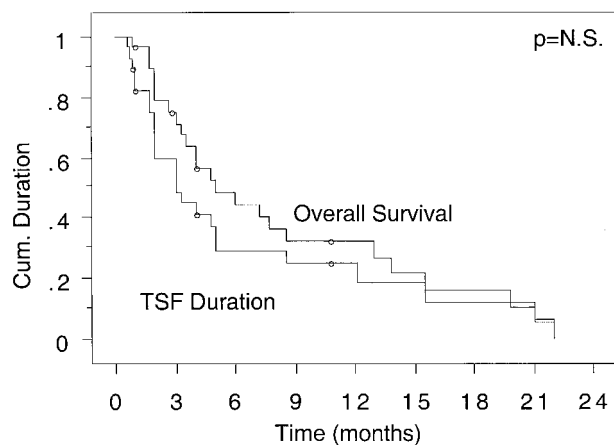


FIG. 4. Duration of solid food tolerance compared with overall survival in 29 patients with initially successful palliation. TSF, ability to tolerate solid food.

treatment for carcinomatosis-related MBO.¹⁹ Supportive care with gastrostomy tube decompression, intravenous hydration,²⁰ and the use of octreotide^{21,22} or analgesics and antiemetic medications²³ have been applied with some clinical success. The value of operative intervention for bowel obstruction in cancer patients has even been claimed to be limited to the presence of a benign obstruction cause, but not to carcinomatosis.¹⁵ Unfortunately, complete MBOs do not resolve after exclusively nonoperative treatment,¹⁷ and if the ability to take solid food is considered desirable, an operation seems to remain the only possible therapeutic option.

In this context, predictors of postoperative palliation failure become important parameters for therapeutic decision-making. Our experience identified small-bowel obstruction and ascites to be associated with poor palliation; type of operation, level of obstruction, disease type, and interval from the first diagnosis had no independent prognostic effect. Few other series have attempted to identify predictors of

palliation success in MBO. Woolfson et al.¹⁵ have correlated a superior postoperative quality of life with a lower histological grade and a genitourinary primary tumor. In patients with carcinomatosis from ovarian cancer, a palpable mass, >3 L of ascites, multiple sites of intestinal obstruction, and a preoperative weight loss of >9 kg have been linked to inferior palliation outcome after surgery.²⁴ Larger clinical investigations seem necessary to determine predictive parameters for MBO of gastrointestinal or other nongynecological malignancies with greater accuracy.

An important aspect of postsurgical outcome is the duration of palliation. In our experience, 22 of 29 patients discharged on solid food retained this ability for >2 months, mostly for a duration that approximates the remaining lifetime. We believe that for this reason the ability to TSF seems to be a worthy goal of operative interventions in patients with MBO and peritoneal carcinomatosis. Operative treatment seems to be indicated whenever predictors of successful TSF can be favorably balanced with morbidity risks and survival outlook. Operations should be avoided if successful TSF is unlikely to be established and if its odds are outweighed by surgical risks and survival limitations. Firmer recommendations do not seem possible on the basis of our results, because a few patients experienced successful palliation despite the presence of several inadvertent preoperative prognostic factors.

We conclude that only one third of patients with MBO from peritoneal carcinomatosis have prolonged postoperative palliation with significant, but acceptable, treatment-related morbidity. TSF is a good predictor of continued palliation for most patients. Patients with colorectal cancer may have superior survival outcome and better palliation; others are at risk for poor outcomes, especially in the presence of ascites and MBO of small bowel. In these patients, highly selective use of laparotomy has to be recommended.

TABLE 4. Outcomes of operative treatment for palliation of malignant bowel obstruction in peritoneal carcinomatosis

Reference	Interval	Patients with carcinomatosis (n)	Morbidity (%)	Mortality (%)	Hospital stay (d)	Successful palliation (%)	Recurrent obstruction (%)	Median survival
2	1995–1997	370	37	21	–	–	–	3.1 mo
16	1984–1987	100	–	29	–	–	–	colorectal, 6 mo; other nonsarcoma, 1 mo
12	1977–1986	89	44	13	25 (median)	74	38	98 d
17 ^a	1985–1993	43	45	12		50	–	5 mo
15	1987–1995	32		22	21 (mean)	53	48	1 mo
Current series	1995–2000	63	44	21	12 (median)	45	24	90 d

^a The series by Tang et al.¹⁷ includes patients with benign causes of obstruction.

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