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Original Research Article

Malignant bowel obstruction: a comparison among pre-operative factors, surgical approaches, and survival. Is surgery worthwhile?

Tarsila G. Caldas, Rodrigo A. Pinto*, Caio S. R. Nahas, Leonardo E. Corbi, Ulysses R. Júnior, Carlos F. S. Marques

Discipline of Surgery of the Digest System, Department of Gastroenterology, Hospital das Clínicas, Faculdade de Medicina, Universidade de São Paulo, São Paulo, Brazil

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***Correspondence:**
Dr. Rodrigo A. Pinto,
E-mail: rodrigo.ambar@hc.fm.usp.br

ABSTRACT

Background: Malignant bowel obstruction (MBO) is defined as the evidence of obstruction distally to the Treitz ligament in the presence of a malignant peritoneally disseminated neoplasm. Patients with this condition suffer from decreased quality of life due to impaired food intake, recurrent nausea, and abdominal pain. The objective was to investigate the outcome of patients with MBO surgically treated, considering post-treatment survival, surgical morbidity, and length of hospital stay, in order to assess the efficiency and impact of surgery at this advanced stage of disease.
Methods: We reviewed retrospectively data collected from 198 patients diagnosed with MBO at Instituto do Câncer do Estado de São Paulo (ICESP), operated between 2018 and 2021.
Results: Among preoperative factors, advanced stages and poor clinical status were associated with earlier death (stage IV had 4.53 higher chance of death). On the other hand, patients considered candidates for invasive life support measures had longer postoperative survival (non-candidates had a chance 1,000,000 times higher of death). Primary diagnosis also showed to be an important risk factor: ovary malignancies had higher risk of surgical complications (OR of 14.28), when compared to gastric and colon cancers. Considering intraoperative factors, patients who underwent resections had better long-term survival (9.9 months) than those who underwent bypass (1.3 months) or stomas (2 months); p=0.017. Finally, considering post-operative factors, long-term survival was associated with shorter hospital stay (p=0.001).
Conclusions: Medical and surgical treatment should be employed on a case-by-case basis, after taking into consideration multiple pre-operative factors, such as KPS and primary tumor stage.

Keywords: Malignant bowel obstruction; cancer; palliative care; surgery; stent; medical management

INTRODUCTION

Malignant bowel obstruction (MBO) is an advanced condition observed in patients with metastatic neoplasms and with high incidence mainly in gastrointestinal (28%) and ovarian (51%) tumors.[1-3] It is defined as the evidence of bowel obstruction distal to the Treitz ligament in the presence of a primarily intra or extra abdominal neoplasm with peritoneal dissemination.[4] Patients presenting MBO have reduced quality of life due to impaired food intake, abdominal pain, nausea, and vomiting.[1]

Currently, treatment options include medical (non-operative), endoscopic, or surgical palliative management. Non-operative management consists of gastric drainage, antiemetics, corticosteroids, and antisecretory drugs. Endoscopic management varies from decompressive gastrostomy or, in obstructive lesions, stent placement.[5-7] Finally, surgical management

possibilities include resections, stomas or bypasses.[1,5] Few studies have compared the efficiency of these management modalities and there are no guidelines on MBO. Therefore, there is great controversy about deciding between medical and/or surgical management, especially about the ideal time to submit the patient to surgery.[2,8-10]

Our study aimed to analyze the outcome of patients with MBO undergoing surgical management, evaluating postoperative survival, surgical morbidity, complications, and time of hospital stay. The objective was to assess the efficiency and relevance of submitting these patients to surgical trauma, mainly at this point of advanced neoplasm. Moreover, we compared surgical procedures to discover which approaches are associated with poorer outcomes, especially in terms of higher morbidity and shorter postoperative survival.

METHODS

This was a retrospective study based on prospective data collection of electronic medical records. We collected data from 198 patients with MBO at ICESP operated between 2018 and 2021, after approval of the institution ethics committee (4.834.729). The data review followed the STROBE checklist for retrospective cohort studies.

In this analysis, we obtained the following information from ICESP's electronic charts (Tasy® system): demographics, oncologic diagnosis, type of surgical procedure performed, time of follow-up, complications based on the Clavien-Dindo classification, time of survival, date, and cause of death. The collected data were then transferred to a Google Forms spreadsheet and organized in three categories (pre, intra and post-operative factors).

The analysis was performed considering three main outcomes: death up to 30 days of surgery, after 30 days of surgery and morbidity among those patients who were alive during the period between surgery and this study. Based on this review, we compared time of hospital stay, according to the surgical procedure the patient underwent, and found the most frequent causes of death and which surgical procedures offered longer postoperative survival. We also analyzed which primary tumors were associated with poorer outcomes, which pre-operative factors contributed to higher mortality and, finally, which pre-operative factors were more frequent among the main outcomes.

Inclusion criteria for the study were patients who had malignant intestinal obstruction after Treitz, with single or multiple obstructions and underwent surgery.

Exclusion criteria were patients who had gastric and/or duodenal obstruction, without other forms of malignant intestinal obstruction in addition to Treitz, those who were not candidates for surgery for malignant bowel obstruction and surgeries for other causes of obstruction such as adhesions.

Statistical analysis

The quantitative variables were summarized as mean, standard deviation, median, minimum value, maximum value, and number of valid observations, whereas the categorical variables were summarized as simple frequency and percentage. To compare two independent groups regarding quantitative values, we used the Chi-Square test or, when necessary, the likelihood-ratio test. For the comparison of two dependent groups, we used the Chi-square or Fisher exact test.

To compare more than two independent groups, in relation to quantitative variables with Gaussian distribution, we used the ANOVA test followed by multiple comparison test. When comparing non-Gaussian variables, we used the Kruskal-Wallis test, followed by the Mann-Whitney non-parametric test with Bonferroni's correction. For the comparison of two dependent quantitative variables, we used Spearman's correlation coefficient.

For pre-operative factors-Karnofsky performance status (KPS), body mass index (BMI), gender, age, primary tumor diagnosis, comorbidities, previous treatments, code blue/yellow eligibility and neoplasm stage-comparison with worse prognosis (morbidity and mortality) was made using univariate analysis with the appropriate tests, previously mentioned. The factors, which presented up to 10% significance on univariate analysis, were also submitted to multivariate analysis. We used the multinomial logistic regression model for surgical complications and binomial logistic regression for deaths, with a level of significance of 5% (value ≤ 0.05).

RESULTS

Between 2018 and 2021, 198 surgical procedures were performed in patients with MBO at ICESP. 56.1% of the patients were female and the median age was 59.1 years. Data review of pre-operative factors showed a median BMI of 21.9 and 50% of ASA III patients. Regarding primary tumor diagnosis, 50% of cases accounted for colorectal neoplasms (25.8% colon, 22.2% rectal), 13.1% gastric cancer and 5.1% ovarian cancer.

Regarding surgical procedures performed, 38.9% of the patients underwent stoma confection, 16.7% surgical resection resection and 16.7% (33 patients) internal bypass as main intervention. In the follow-up, 35.9% died within 30 days of surgery, 40.5% died 30 days after the surgical procedure and only 23.6% of the patients remained alive until the end of the analyzed period. The data are presented in Table 1.

As shown in Table 2, we observed that the patients who survived until the end of the study were those who had

shorter hospital stay, with a median of 10 days, while those who died within 30 days after the surgical procedure or later had medians of 17.5 and 18 days, respectively. The main cause of death was septic shock (33.55%) and the most frequent complication was bowel obstruction (18.79%).

The data presented in Table 3 show a significant difference in survival according to the surgical procedure performed. Median survival was longer in patients who underwent resections (9.9 months) as compared to bypasses (2 months) or stoma confection (1.3 months).

Table 1: Sample patients' profile (n=198 patients).

Variables analyzed	Data
	N (%)
Age (years)-mean (standard deviation)	59.12 (14.33)
Female, N (%)	111 (56.1)
BMI (kg/m^2)-mean (standard deviation)	21.9 (5.18)
ASA, N (%)	
II	69 (34.8)
III	99 (50%)
IV	29 (14.6)
V	1 (0.5)
Diagnosis of the cancer, N (%)	
Colon	51 (25.8)
Rectal	44 (22.2)
Gastric	26 (13.1)
Uterine body	11 (5.6)
Ovarian	10 (5.1)
Cervical	10 (5.1)
Other	46 (23.1)

Table 2: Assessment of surgery benefits for the patient-comparison of time of admission (after surgery) with the last follow-up (death or last outpatient visit).

Total time of admission (days) for death up to 30 days	No (n=76)	Yes (n=70)	Alive (n=46)	P value
Median (percentile 25-percentile 75)	18 (9.5-35)	17.5 (13-26)	10 (6-21)	0.001

Kruskal-Wallis non-parametric test.

Table 3: Comparison of worse outcome (survival) for each type of surgical procedure (bypass/stoma/resection).

Variables according to surgical approach	Survival (lifetime after surgery-months)					Total (n=196)	P value
	2 or 3 Approaches (n=39)	Bypass (n=33)	Stoma (n=76)	Other (n=15)	Resection (n=33)		
Median	2.8	2	1.3	1.2	9.9	2.2	0.017**
(Percentile 25-percentile 75)	(0.5-7.2)	(0.6-11.7)	(0.4-8.4)	(0.8-3.2)	(2.1-15.8)	(0.6-10.6)	

Kruskal-Wallis non-parametric test.

Table 4: Multivariate comparison of preoperative factors: age, diagnosis, code blue and yellow with poorer surgical outcome-complications.

Variables	Estimation (IC 95%)	P value
IVa or IVb or V		
Intercept		0.915
Age (years)	1.03 (0.99; 1.07)	0.122
Diagnosis of the cancer		
Diagnosis (cervical x ovarian)	-	-
Diagnosis (colon x ovarian)	0.07 (0.01; 0.91)	0.042

Continued.

Variables	Estimation (IC 95%)	P value
Diagnosis (gastric x ovarian)	0.01 (0.001; 0.33)	0.008
Diagnosis (rectal x ovarian)	0.07 (0.01; 0.997)	0.05
Diagnosis (uterine x ovarian)	-	-
Diagnosis (other sites x ovarian)	0.04 (0.003; 0.61)	0.02
Code blue (Yes x No)	0.12 (0.01; 1.39)	0.09
Code yellow (Yes x No)	3.57 (0.3; 42.19)	0.312
IIIa or IIIb		
Intercept		0.914
Age (years)	1.01 (0.98; 1.04)	0.675
Diagnosis of the cancer		
Diagnosis (cervical x ovarian)	0.51 (0.02; 16.01)	0.704
Diagnosis (colon x ovarian)	0.33 (0.01; 7.66)	0.488
Diagnosis (gastric x ovarian)	0.42 (0.02; 10.11)	0.594
Diagnosis (rectal x ovarian)	0.57 (0.02; 13.33)	0.724
Diagnosis (uterine x ovarian)	0.18 (0; 7.11)	0.36
Diagnosis (other sites x ovarian)	0.49 (0.02; 11.69)	0.662
Code blue (Yes x No)	0.91 (0.04; 20.1)	0.951
Code yellow (Yes x No)	0.48 (0.02; 11.02)	0.648

Results of the multinomial logistic regression model.

Table 5: Multivariate comparison of preoperative factors: KPS, diagnosis, code blue and yellow, and disease staging with the poorest surgical outcome-death.

Variables	Estimation (IC 95%)	P value
Karnofsky		0.045
Karnofsky (90×100)	4.83 (0.78; 29.72)	0.09
Karnofsky (80×100)	17.9 (2.37; 135.18)	0.005
Karnofsky (70×100)	17.67 (2.53; 123.19)	0.004
Karnofsky (60×100)	41.55 (2.13; 808.8)	0.014
Diagnosis of the cancer		0.356
Colon×other sites	0.65 (0.15; 2.79)	0.565
Cervical×other sites	0.63 (0.01; 65.22)	0.845
Gastric×other sites	1.23 (0.19; 7.91)	0.829
Ovarian×other sites	4093026582796.1 (0; -)	0.998
Rectal×other sites	0.31 (0.07; 1.36)	0.122
Uterine×other sites	0.15 (0.02; 1.1)	0.063
Code blue (yes×no)	0 (0; -)	0.998
Code yellow (yes×no)	1712354.24 (0; -)	0.999
Staging		0.018
Staging (3×1 or 2)	1.18 (0.29; 4.77)	0.816
Staging (4×1 or 2)	4.53 (1.05; 19.6)	0.043

Result of the binomial logistic regression model.

Table 6: Correlation of prior treatment, code blue/yellow, and disease staging with death up to 30 days after surgery.

Variables according to death up to 30 days	No	Yes	Alive	Total	P value
	N (%)	N (%)	N (%)	N (%)	
Prior treatment					
Chemotherapy	38 (48.7)	22 (31.4)	20 (45.5)	81 (41.7)	
Rdiotherapy	0 (0)	4 (5.7)	1 (2.3)	5 (2.6)	
None	17 (21.8)	35 (50)	12 (27.3)	65 (33.3)	0.001***
Both	23 (29.5)	9 (12.9)	11 (25)	44 (22.4)	
Total	78 (100)	70 (100)	44 (100)	192 (100)	
Code blue					

Continued.

Variables according to death up	No	Yes	Alive	Total	P value
Yes	45 (60.8)	31 (49.2)	43 (97.7)	122 (66.3)	< 0.001*
No	29 (39.2)	32 (50.8)	1 (2.3)	62 (33.7)	
Total	74 (100)	63 (100)	44 (100)	184 (100)	
Code yellow					
Yes	47 (63.5)	33 (53.2)	43 (97.7)	126 (68.9)	< 0.001*
No	27 (36.5)	29 (46.8)	1 (2.3)	57 (31.1)	
Total	74 (100)	62 (100)	44 (100)	183 (100)	
Staging					
Stage 1 or 2	8 (10.5)	4 (6.1)	8 (17.8)	20 (10.7)	0.003*
Stage 3	23 (30.3)	19 (28.8)	24 (53.3)	66 (35.3)	
Stage 4	45 (59.2)	43 (65.2)	13 (28.9)	101 (54)	
Total	76 (100)	66 (100)	45 (100)	187 (100)	

Chi-square test; * Likelihood-ratio test.*

Table 7: Multivariate comparison of the factors: mesenteric/peritoneal thickening, presence of thick peritoneal nodules, Karnofsky, diagnosis (primary tumor), prior treatment, code blue and yellow, and disease staging with death after surgery.

Variables	Estimation (IC 95%)	P value
Death up to 30 days		
CT: mesenteric/peritoneal thickening		
Mesentery×none	0.52 (0.03; 10.01)	0.668
Peritoneum×none	0.71 (0.06; 8.65)	0.785
Both×none	2.95 (0.12; 70.8)	0.506
CT: presence of thick peritoneal nodules (yes×no)	7.38 (0.614; 88.73)	0.115
Diagnosis of the cancer		
Ovarian×colon	3946433927.1463 (0; -)	0.996
Cervical×colon	0.46 (0.002; 124.61)	0.785
Gastric×colon	1.57 (0.14; 17.7)	0.715
Rectal×colon	1.15 (0.16; 8.49)	0.892
Uterine×colon	0.2 (0.006; 6.52)	0.366
Other site Ca×colon Ca	21.09 (2.0723; 214.64)	0.01
Prior treatment		
Chemotherapy×both	0.85 (0.11; 6.62)	0.88
Radiotherapy×both	0.26 (0; 1073.9)	0.748
None×both	7.51 (0.87; 65.07)	0.067
Code blue (yes×no)	0.0000006 (0.00000001; 0.00003)	< 0.001
Code yellow (yes×no)	8286.57 (872.89; 78666.26)	< 0.001
Staging		
1 or 2×4	0.03 (0.002; 0.43)	0.01
3×4	0.34 (0.06; 2)	0.232
Death after 30 days		
CT: mesenteric/peritoneal thickening		
Mesentery×none	0.78 (0.05; 11.35)	0.854
Peritoneum×none	0.44 (0.05; 4.07)	0.472
Both×none	1.43 (0.07; 28.81)	0.814
CT: presence of thick peritoneal nodules (yes×no)	5.03 (0.502; 50.3)	0.169
Diagnosis of the cancer		
Ovarian×colon	8550540591.4 (0; -)	0.996
Cervical×colon	0.23 (0,001; 64,87)	0.607
Gastric×colon	4.98 (0.64; 38.46)	0.124
Rectal×colon	0.84 (0.13; 5.29)	0.855
Uterine×colon	0.2 (0.015; 2.55)	0.213
Other site×colon	2.67 (0.2872; 24.86)	0.388

Continued.

Variables	Estimation (IC 95%)	P value
Prior treatment		
Chemotherapy×both	0.41 (0.07; 2.35)	0.317
Radiotherapy×both	0.000000001 (0; -)	0.998
None×both	0.9 (0.14; 6.02)	0.915
Code blue (Yes×No)	0.000001 (0.00000005; 0.00002)	< 0.001
Code yellow (Yes×No)	13581.07 (13581.07; 13581.07)	-
Staging		
1 or 2×4	0.06 (0.007; 0.48)	0.008
3×4	0.1 (0.02; 0.51)	0.006

Results of the multinomial logistic regression model.

In terms of outcomes, as shown in Table 4, patients who had ovarian cancer showed a chance of worse surgical outcome (Clavien-Dindo IVa, IVb, or V) 14.28 (1/0.07) times higher than those with colorectal cancer, 100 (1/0.01) times higher than those with gastric cancer and 25 (1/0.04) times higher than those with other neoplasms.

Patients with intermediate KPS had a higher chance of death than those presenting with KPS of 100, as shown in Table 5, 17.9 times higher for KPS of 80 and 41.5 higher for 60.

By analyzing preoperative characteristics that are more related to patients who died up to 30 days after surgery, as shown in Table 6, those patients with no prior treatment had a significantly worse outcome in comparison with the group of patients alive or patients who died 30 days or more after surgery.

The proportion of patients eligible to code blue/yellow is significantly greater in those who survived during the period of the study than in those who died at any point. Furthermore, stage 1 to 3 neoplasms are more frequent in patients who survived than in those who died, as opposed to stage 4 disease, which was less frequent.

As shown in Table 7, considering the group of patients who survived during the period of the study, none presented KPS <50, had ovarian cancer, nor were ineligible to code blue while in the hospital. Patients who were ineligible to code blue had a chance of death within 30 days of surgery 1,666,666.7 (1/0.0000006) higher than those who were eligible.

DISCUSSION

MBO is still a challenging condition for which treatments still have limited impact on outcomes. The goal of the treatment is basically to improve obstructive symptoms and, thus, offering better quality of life. In the present study, we observed that the MBO most correlated primary tumors were colorectal tumors, accounting for nearly half of the patients (25.8% colon and 22.2% rectal cancer), followed by gastric and gynecologic tumors-as Sousa et al had also observed in their study, with 49.5% of colorectal tumors and 21.9% of gynecologic tumors.[4]

Medical management with nasogastric tube drainage, pain control, antiemetics, antisecretory medication, and corticosteroids should be attempted at first and, if it fails, palliative surgical management may be considered. As suggested by Maddar et al surgical treatment should be considered in patients who were not in the active phase of dying and who potentially had a reversible obstruction. The ideal surgical approach, in the majority of studies, was decided intraoperatively, according to the point and number of obstructions in each segment of the gastrointestinal tract.[11-13]

Among the most frequently employed techniques were bypasses and stoma confections.[4] In our study, stoma confection was the most frequent procedure (38.9%), followed by resection and bypass, both accounting for 16.7% each. Sousa et al reveled that most used tactical surgery approach was intestinal bypass (20.48%), resection (18.57%), and loop ileostomy (17.62%). Caitlin et al reported in their review an increase in procedures such as gastrostomies in comparison to surgical procedures and suggested, based on other studies, that surgery should be reserved for patients with good performance status, young age, single obstruction and earlier stage tumors.[14-18]

Comparing survival among the different surgical procedures, resection provided longer survival, (median time of 9.9 months), as opposed to bypass (2 months), and stoma confection (1.3 months). Similar results were observed by Maddar et al which review showed that patients who underwent resection survived about 7.2 months compared to 3.4 months in stoma confection.[11] Several different studies suggested that resection should be the preferred surgical procedure due to its improvement in survival. However, according to Merchant et al only 10% of surgical procedures employed include resection.[16] Bypass should be used for those patients with no possibility of resection due to adherences or large portions of obstructed bowel.[19]

Another point that should be considered before surgical indication in MBO are the post-operative complications. Among the most frequent, we observed septic shock (33.5%) and bowel obstruction, in accordance with previous reports.[4]

Comparing length of hospital stay, we observed that patients who died, whether within or after 30 days of surgery, had longer stay than those who survived up to the end of the period of study. Those who died within 30 days had a median stay of 17.5 days and those who remained alive had a median of 10 days. We deduced from this observation a worse quality of life for the patients who died within 30 days, since they stayed most of their remaining lifetime inside the hospital. That was the reason why we questioned to what extent surgery was worthwhile, since our analysis suggested that patients with advanced stage disease, low performance status, and poor prognosis primary tumors (such as ovarian cancer) may not benefit from surgery as a treatment for MBO, but suffered from poor quality of life when submitted to surgical procedures.

Analyzing preoperative factors, we observed that lower KPS values (particularly below 50) were associated with more advanced tumors (stage III and IV). Moreover, no prior treatment and ineligibility to code blue/yellow were associated with poorer outcomes (deaths concentrated within 30 days of surgery, longer hospital stay, and complications graded Clavien-Dindo IVa, IVb, and V). Thus, in accordance with previous studies, the patients who benefit the most from surgical treatment (mainly resections) for MBO are those with good performance status, earlier stage tumors, and code blue/yellow eligibility.[4,7,20] On the other hand, patients with low performance status or in the active process of dying, medical management (gastric tube drainage, parenteral nutrition, and medication) are effective in symptom control at this late stage of disease.[11]

Our study, however, had a retrospective design with no direct intent to evaluate complications after procedures and deaths. Therefore, once the surgical approach was decided intraoperatively with no prior decision in a prospective design, there may be a bias in which bypass and stoma confection were performed in patients with initial poorer prognosis than those who underwent resection. On the other hand, reviews and audits of surgical procedures in emergency settings for MBO provide data to reflect upon the correct indication and limitations of surgical procedures in these patients.

BMO is a serious condition of difficult management in patients with advanced neoplastic disease. The use of medical and surgical therapies should be decided on a case-by-case basis, considering preoperative factors, such as KPS and primary tumor stage, because the incidence of morbidity and mortality is considerably high4. Treatment should be multidisciplinary, involving medical oncologists, surgeons, nutritionists, and palliative care professionals. The participation of the patients and their families is also of utmost importance, with due explanation of the prognosis of the condition and potential outcomes of the treatment, even with aggressive treatment.[12,13] There were some limitations of the study that should be acknowledged, such as the retrospective design that brings a higher risk of selection bias and do not warrant a control of the procedures performed. On the other hand, real life situations of malignant operated bowel obstructions bring a reliable impression of the outcomes of these severe patients.

CONCLUSION

In this study, we showed factors associated with worse outcomes in MBO patients submitted to surgical treatment. Among preoperative factors, advanced stage disease and lower performance status are more associated with early post-operative death. On the other hand, patients who were initially considered eligible for code blue/yellow had longer postoperative survival. Primary tumor diagnosis also proved to be an important prognostic factor-ovarian cancer increased surgical complications, as opposed to colorectal and gastric tumors. Regarding intraoperative factors, patients who underwent resections presented longer postoperative survival than those submitted to bypass or stoma confection. Finally, on postoperative factors, long-term survival was associated with shorter hospital stay.

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