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A simple classification of malignant bowel obstruction for determining palliative surgery strategies. The results of 260 cases following palliative surgery

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Abstract

Background

Malignant bowel obstruction (MBO) worsens patients' quality of life and overall survival by hindering chemotherapy. We introduced a simple categorization of MBO to determine the strategy for palliative surgery.

Methods

The MBO classification used in this study comprised Type I, single-site pelvis obstruction; Type II, single-site obstruction outside the pelvis; Type III, multi-site obstruction; and Type IV, bowel obstruction due to peritonitis carcinomatosa. We retrospectively analyzed 260 consecutive patients who underwent palliative surgery for MBO.

Results

Type I included a significantly higher ratio of gynecological malignancy patients than other types, whereas type II included a significantly higher ratio of gastroenterological malignancy patients ($P < 0.0001$). Malignant urinary dysfunction co-existed in type I patients with a higher ratio than other types ($P < 0.0001$). Stoma was needed in 100% of type I patients, whereas bypass or palliative resection was performed in 86% of patients with type II or III avoiding stoma. Four type IV patients (4%) had only surveillance laparotomy without an effective palliative procedure. A normal food intake was achieved in 90%, 92%, 96%, and 80%, of patients with types I, II, III, and IV, respectively, with type IV having a significantly lower proportion than others ($P = 0.010$). A normal food intake at the 3- and 6-month follow-ups in type IV patients was significantly rarer ($P < 0.0001$) than in other types. The overall survival rate was significantly higher in type I than in other types ($P = 0.0002$).

Conclusion

The MBO classification can simplify the surgical strategy and predict the prognosis of patients after palliative surgery.

Mini-abstract:

A simple MBO classification can simplify the surgical strategy and predict the prognosis of patients after palliative surgery.

Clinical trial registration

N/A

Introduction

Malignant bowel obstruction (MBO) is a common pre-terminal event in patients with advanced or end-stage cancers. MBO occurs in 28%-51% of end-stage gynecological, urological or gastrointestinal cancers but also in a small portion of various cancers, such as lung, breast, or soft tissue malignancies[1–3]. MBO worsens not only the quality of life of patients with symptoms such as nausea and vomiting, but also the overall survival by hindering or terminating chemotherapy. Palliative surgery can improve the quality of life of patients with MBO; however, palliative surgery has been reported to be associated with high mortality and morbidity rates due to a poor oncologic or nutritional status[4–7]. A preoperative assessment of the obstruction sites, precise surgical planning, risk assessment, and sufficient informed consent from the patient are essential for successful palliation.

We introduced a simple classification system to determine the strategy for palliative surgery in MBO. MBO patients were categorized into four types preoperatively based on clinical symptoms and imaging examinations, and appropriate surgical procedures were discussed and proposed to patients. This study evaluated the outcomes of palliative surgery in patients with MBO and assessed the usefulness of the MBO classification in deciding the surgical strategy and predicting the prognosis after palliative surgery.

Patients and methods

We retrospectively reviewed the medical records of consecutive case series of patients who underwent palliative surgery for MBO (ileus or fistula) due to disease progression or recurrence of malignant tumors between 2008 and 2023 at Hokkaido Cancer Center. Patients with colorectal cancer were excluded from the study. All patients included in this study were diagnosed with MBO and were unable to consume a normal diet through preservation therapy or stenting. All surgeries were performed with palliative intent to relieve MBO and create opportunities for food intake. Patients who underwent surgery with curative intent were excluded from this study. Demographic information, clinical parameters, operative procedures and treatment-related variables were retrospectively collected.

All patients underwent physical examination, plain radiography, and computed tomography (CT) and were diagnosed with MBO. Some patients also underwent upper endoscopy, colonoscopy, and gastrografin enema examination. Nasogastric or ileus tubes were used for decompression before surgical intervention in some patients. In the preoperative evaluation, patients were categorized into four types according to the original classification of MBO to discuss surgical strategies and estimate palliation rates. The classification of MBO used in the case series consisted of four types: Type I, single-site obstruction at the pelvis; Type II, single-site obstruction out of the pelvis; Type III, multi-site obstruction; and Type IV, bowel obstruction due to peritonitis carcinomatosa (Fig. 1).

Palliative resection or bypass surgery was preferred, if possible, and colostoma or ileostoma was placed when needed for MBO palliation. Some patients underwent a combination of these procedures. Until 2013, all palliative operations were performed as open surgeries; laparoscopic procedures were subsequently used from 2014 at the surgeon's discretion when technically possible.

Surgical outcomes were evaluated by resuming the ability to consume a normal diet, removal of the nasogastric or ileus tube, discharge from the hospital, operative morbidity and mortality within 30 days, and survival time after palliative surgery. Surgical complications within 30 days after surgery were graded according to the Clavien-Dindo classification.

Associations between the clinical variables were analyzed using Fisher's exact test and Student's t-test, and survival rates after surgery were estimated using the Kaplan-Meier method. $P < 0.05$ was considered to indicate a statistically significant[8]. This study was approved by the ethics committee of our institute, and informed consent was obtained from all patients. We used the STROBE reporting guideline[9] to draft this manuscript, and the STROBE reporting checklist[10] when editing,

Results

Patients background and classification of MBO

Between 2008 and 2023, 260 patients underwent palliative surgery to relieve MBO symptoms due to disease progression or recurrence of malignant tumors. Patient characteristics are shown in **Table 1.** The primary malignancies were gynecological cancer (n = 103, uterus 56 cases, ovary 40, and vagina 7), gastrointestinal cancer (n = 77, stomach 32 cases, pancreas 28, duodenum 4, gall bladder 4, appendix 3, mesothelioma 1, and peritoneum 5), urological cancer (n = 42, bladder 24 cases, kidney 5, prostate 5, urinary duct 5, urachal tube 2, and seminoma 1), soft-tissue sarcoma (n = 13), lung cancer (n = 12), breast cancer (n = 8), and malignant lymphoma (n = 5). Ileus was the main symptom in 218 patients, and fistula due to a malignant tumor was observed in 42 patients.

According to the classification of MBO, 60 cases were categorized as type I, 52 as type II, 25 as type III, and 123 as type IV (**Table 1**). Patients categorized as type I had a significantly higher proportion of gynecological malignancy patients (58%, $P < 0.0001$), whereas type II patients had a significantly higher proportion of gastroenterological malignancy patients (63%, $P < 0.0001$). Patients categorized as type I had co-existing urinary dysfunction such as hydronephrosis (60%, $P < 0.0001$), and had a history of radiation therapy (47%, $P < 0.0001$) with a significantly higher ratio. Malignant bowel obstruction from the onset of the disease was observed in a significantly higher proportion of type II patients (38%, $P = 0.0007$). Distant metastasis was present at a significantly higher rate in patients with type III disease than those with other types (64%, $P = 0.0038$), while ascites was observed in a significantly higher ratio of type IV patients (70%, $P < 0.0001$).

Surgical procedures performed to palliate MBO

The palliative procedures performed were stoma (n = 135), bypass (n = 82), bypass+stoma (n = 21) palliative resection (n = 13), resection+bypass (n = 4), resection+stoma (n = 1), and survey-only (n = 4). A laparoscopic approach was performed in 101 cases, and conversion to open surgery was performed in 19 cases. Open surgery was performed on 159 patients. The surgical procedure performed for each type is shown in Fig. 2. Stoma was needed in 100% of patients with type I, whereas bypass or palliative resection was performed in 88% and 68% of patients with type II and III, avoiding stoma. Four patients (4%) categorized as type IV underwent only surveillance laparotomy without an effective palliative procedure.

Short-term outcomes of palliative surgery for MBO

Of the patients who underwent palliative surgery for MBO, 87% (225/260) were able to resume normal diet postoperatively. The nasogastric or ileus tube was removed in 95% (112/118) of the patients, and discharge from the hospital was achieved in 88% (229/260). Mortality within 30 days was observed in 6% (17/260) of patients, and morbidity was observed in 43% (111/260; Clavien-Dindo grade I, 30 cases; grade II, 46; grade IIIa, 14; grade IIIb, 6; and grade V, 15).

The short-term outcomes according to the MBO types are shown in **Table 2**. A normal food intake was achieved in 90%, 92%, 96%, and 80% of patients with type I, II, III, and IV disease, respectively. The achievement rate of a normal diet intake in type IV patients was significantly lower than that in the other patients (P = 0.010). The mortality and morbidity rates did not differ markedly by type of MBO. The nasogastric or ileus tube was removed in all type I, II, and III patients; however, removal of the tube was not achieved in 7% (6/80) of type IV patients. The median hospital stay was slightly longer for patients with type IV disease than for other patients.

Long-term outcomes of palliative surgery for MBO

The median survival time of the 260 patients after palliative surgery for MBO was 5.2 months. The 1- and 2-year survival rates were 27% and 11%, respectively. The survival periods after palliative surgery according to MBO type are shown in Fig. 3. The 1-year overall survival rates were 46% for type I, 19% for type II, 25% for type III, and 19% for type IV, with the rate for type I being significantly higher than that for others (P = 0.0002).

A normal-diet intake by 3-months after palliative surgery was achieved in 77%, 54%, 76%, and 41% of patients with type I, II, III, and IV patients, respectively, and by 6-months in 55%, 35%, 48%, and 22%, respectively. The normal-diet intake ratio at three- and six-months was significantly lower in type IV patients than in other types. (Fig. 4)

Discussion

Acute or subacute MBO is a common pre-terminal event in patients with advanced cancer, with an incidence exceeding 28% in gastrointestinal, gynecological, urological, or other cancers[1–3]. Supportive care with nasogastric tube decompression, intravenous hydration, and the use of octreotide and analgesics has been applied with some clinical relief; however, a normal food intake cannot be achieved with conservative treatments. Palliative surgery gives patients a chance to eat again and achieve discharge from the hospital. Previous reports have described the outcomes of palliative surgery for MBO, and the ability to tolerate normal food was achieved in 42%-85% of patients, with 45%-80% able to be discharged without the need for intravenous infusion [6, 11, 12].

However, although palliative surgery helps improve the quality of life of end-stage cancer, operative treatment of MBO is associated with significant mortality (5%-32%) and morbidity (25%-64%) [6, 7, 11–13]. Choosing an adequate surgical procedure for each patient is often difficult in palliative MBO surgery. Furthermore, it is often difficult to decide whether to recommend surgery because it may not lead to symptom resolution, even after surgery. To date, several authors have attempted to prospectively evaluate candidate patients undergoing palliative surgery for MBO[7, 11, 14–16]; however, there is no MBO classification to guide palliative surgery. In this case series, a simple classification of MBO based on preoperative physical and imaging examinations was used, and patients were categorized into four types in order to discuss and determine surgical strategies. The results show that the MBO classification is useful for selecting surgical procedures for each patient and predicting the palliation rate.

Type I is defined as single-site obstruction in the pelvis. This type of MBO is commonly seen in end-stage uterine cancer, as well as in bladder, prostate, ovarian, and other cancers that recur mainly in the intrapelvic space. In the present study, 88% (53/60) of the patients categorized as type I had gynecological or urological cancer. In most type I cases, malignant bowel obstruction occurs only in the rectum, and symptoms include colonic ileus or rectovaginal fistula. A stoma is 100% needed to palliate MBO symptoms in type I. Surgeons should consider whether or not the rectum is the only site responsible for cancerous bowel obstruction, confirming that the ileum or jejunum are not involved in malignant tumors in the pelvis. If the ileum or jejunum is suspected to be involved in pelvic tumors on laparoscopic or laparotomy surveys, ileostomy or jejunostomy should be considered. Urinary dysfunction, such as hydronephrosis, coexisted in 60% (36/60) of the type I patients. In this situation, ureteral stenting or nephrostomy should be considered to preserve renal function. Since malignant tumors exist only in the pelvic space in the majority of type I patients, the survival prognosis of type I patients is significantly better than that of other types, and 46% of type I patients can survive for 1-year after palliative surgery for MBO.

Type II is defined as single-site obstruction outside the pelvis. Gastric outlet obstruction due to distal-side gastric cancer and duodenal stenosis due to pancreatic cancer are the main manifestations of this type, whereas oligo metastasis from sarcoma, lung, breast cancer, and malignant lymphoma also develop type II MBO at various sites in the small or large intestine. MBO due to gastric outlet obstruction or duodenal stenosis can be palliated using gastrojejunostomy. Most single site obstructions in the small intestine or colon can be palliated by bypass anastomosis or lesion resection. Therefore, 88% of

patients with type II MBO can avoid stoma creation. Although type II MBO has only one obstruction site, the one-year survival rate of type II patients is as poor as that of type IV (carcinomatosa) patients, presumably due to the malignant characteristics of gastric and pancreatic cancer.

Type III is defined as multi-site obstruction, without peritonitis carcinomatosa. Type III MBO is seen mainly as a result of hematogenous oligo metastasis from lung cancer or sarcoma, or intraperitoneal oligo metastases from gynecological or gastrointestinal cancer, not by direct invasion of the tumor. Type III was the lest common (9%) among the four categories in our study. Due to the characteristics of hematogenous metastasis, distant metastasis of the primary cancer was seen at the highest rate (64%) among the 4 types, suggesting that surgeons should be alert for the presence of potential undetected metastasis. Whole body screening for distant metastasis is recommended in type III patients.

Finally, type IV is defined as a bowel obstruction due to peritonitis carcinomatosa. As many experienced surgeons believe, palliative surgery for MBO due to carcinomatosa is often difficult because of many negative factors, including the presence of ascites, multiple obstruction sites, hardened and shortened intestinal tract due to tumor invasion, and poor nutritional status. In the present study, an effective surgical procedure for palliation was not performed in 4% of type IV patients, resulting in laparotomy only. The hardened and shortened intestines due to cancer invasion hindered the creation of ileostoma in these cases. Both the short- and long-term outcomes of palliative surgery were the worst in type IV among the four types. Removal of the nasogastric or ileus tube was not achieved in 7% of type IV patients, whereas all type I, II and III patients achieved removal of the nasogastric or ileus tube. Furthermore, the achievement rate of a normal food intake in type IV patients was lower than that in other types. The rate of achieving a normal diet intake at both three- and six-months later was also lower than that of the other types. Poor outcomes of palliative surgery for MBO associated with carcinomatosa have been reported, with normal food intake rates of only 45%-75% and mortality rates of 6%-32%[1].

Palliation surgery for MBO remains challenging for surgeons; however, the laparoscopic approach has been shown to be a promising strategy associated with superior perioperative outcomes compared to open surgery in some studies[17–19]. Standardization of surgical procedures and advances in laparoscopic instruments have steadily expanded the indications for laparoscopic surgery and helped make laparoscopic surgery safe. A laparoscopic approach for MBO palliative surgery enabled operations to be performed without large incisions and with less bleeding than open approach, consequently, leading to a lower incidence of morbidity without worsening palliation or mortality rates[20].

There are some limitations for this study. The study is a retrospective analysis at single institute. The study does not include MBO patients who did not undergo palliative surgery.

Conclusion

Palliative surgery for MBO enabled a normal food intake in 87% of patients with MBO, improving their quality of life. The present study demonstrated that the simple classification of MBO used in this study

could simplify the surgical strategy and predict the prognosis of patients after palliative surgery. The MBO classification can help surgeons and patients to consider and discuss surgical treatment options.

Abbreviations

MBO: Malignant bowel obstruction

CT: computed tomography

Declarations

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Clinical trial registration

N/A

Authors' contribution

Study conception and design: Maeda, Minagawa

Acquisition of data: Okada, Harada, Takemoto, Sakamoto

Operator of palliative surgery: Maeda, Minagawa, Okada, Harada, Takemoto

Drafting manuscript: Maeda, Kameda

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Data availability

The datasets that support the findings of this study are not publicly available due to the institutional and legal restrictions on sharing individual clinical data, but de-identified data are available from the corresponding author on reasonable request and with permission of the Ethics Committee of Hokkaido Cancer Center.

Ethics approval and consent to participate

We confirm that all experiments were performed in accordance with the Declaration of Helsinki. This study was approved by the Ethics Committee of NHO Hokkaido Cancer Center (No. 06-05). Informed consent was obtained from all patients involved in this study. The patients were informed of their inclusion in the database and were given the opportunity to opt out upon request.

Consent for publication

This study does not contain any individual details, images or videos that could lead to the identification of a participant. Therefore, consent for publication is not applicable.

Competing interests

The authors declare no competing interests.

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Tables

Table 1. Characteristics of the patients who underwent palliative surgery for MBO

	Classification of MBO				
Factors	I	II	III	IV	P
Classification of MBO	60	52	25	123	
Primary cancer					
Gynecological	38*	6	7	52	0.0006
Urological	15	6	3	18	
Gastrointestinal	4	29*	6	38	<0.0001
Bowel obstruction from onset	15%	38%*	24%	14%	0.0007
Ileus/Fistula	35/25*	48/4	22/3	113/10	<0.0001
Distance metastasis	17%	48%	64%*	35%	0.0038
Moderate or massive ascites	12%	29%	32%	70%*	<0.0001
Coexisting urinary tract disorders	60%*	12%	20%	34%	<0.0001
Prior radiation therapy	47%*	8%	12%	15%	<0.0001
Prior chemotherapy	80%	58%*	76%	79%	0.0039
Prior operation	60%	25%*	48%	67%	<0.0001
Age (y.o.)	64	68*	61	63	0.025
WBC count	8300	6700	8000	6700	N.S.
Lymphocyte %	16	19	18	18	N.S.
Albumin (g/dL)	3.0	3.0	3.1	3.0	N.S.
Cholinesterase (U/l)	199	165*	196	187	0.012
CRP (mg/dL)	4.3	4.7	3.5	3.2	N.S.

Table 2. Surgical outcomes of palliative surgery for MBO

	Classification of MBO				
Factors	I	II	III	IV	P
Laparoscopic approach	25/60	16/52	11/25	49/123	N.S.
Conversion to open surgery	4/25	1/16	1/11	13/49	0.075
Emergency operation	15/60	4/52	8/25	26/123	N.S.
Op time (min)	106	114	119	97	N.S.
Blood loss (ml)	26	63	78	25	N.S.
30-days mortality	7% (4/60)	6% (3/52)	8% (2/25)	7% (8/123)	N.S.
Morbidity (Clavien-Dindo III≥)	13% (8/60)	13% (7/52)	12% (3/25)	14% (17/123)	N.S.
Removal of NG tube	100% (7/7)	100% (18/18)	100% (13/13)	93% (74/80)	N.S.
Achievement of normal food intake	90% (54/60)	92% (48/52)	96% (24/25)	80%* (99/123)	0.010
Hospital stay (day)	21	18	21	25*	0.011
Survival rate at 1-year	46%*	19%	25%	19%	0.0002
MST (month)	10	5	7	4	
Food intake at 3 months	77%	54%	76\5	41%*	<0.0001
Food intake at 6 months	55%	35%	48%	22%*	0.0001

Figures

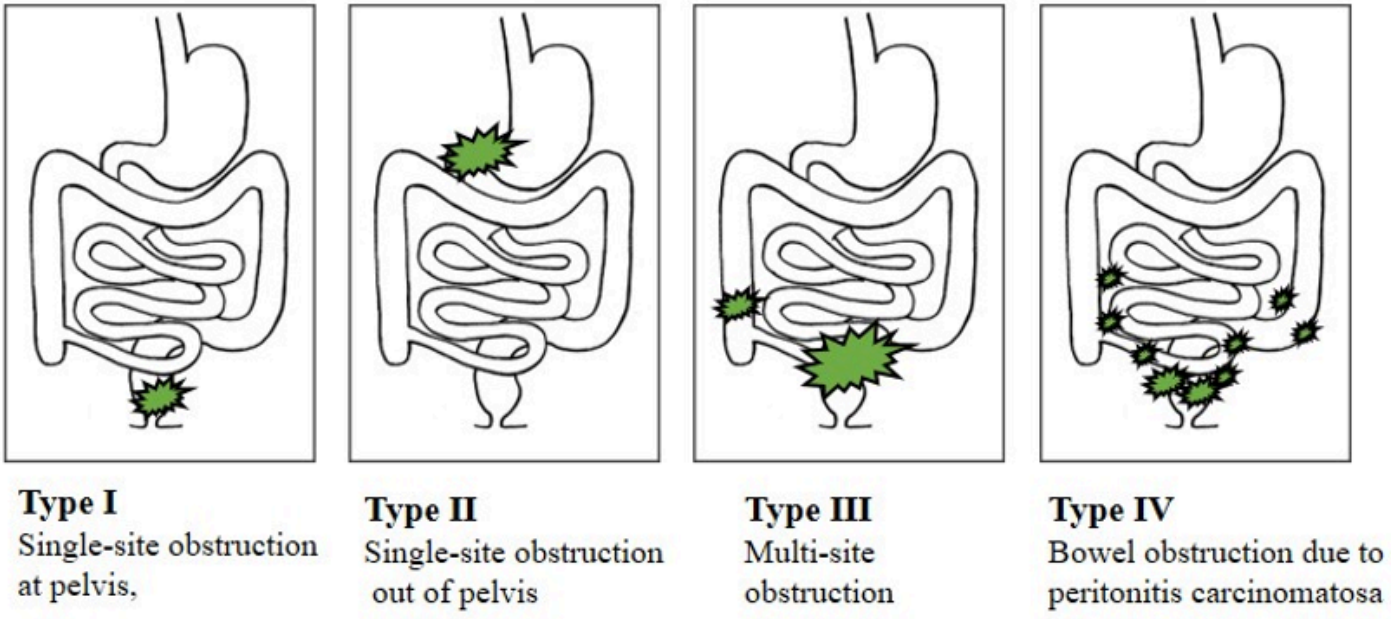


Figure 1

Classification of MBO. **Type I**, single-site obstruction at the pelvis. **Type II**, single-site obstruction out of the pelvis. **Type III**, multi-site obstruction. **Type IV**, bowel obstruction due to peritonitis carcinomatosa.

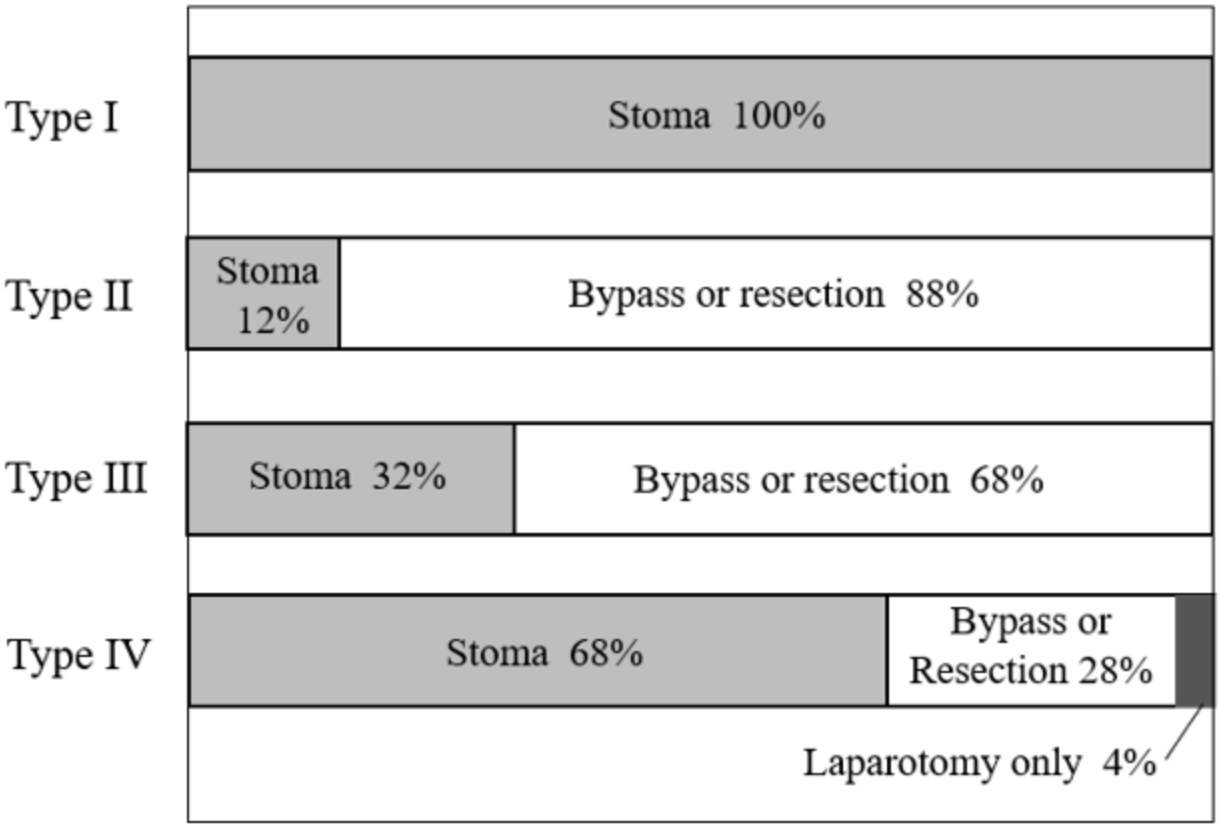


Figure 2

Operative procedures performed to palliate MBO.

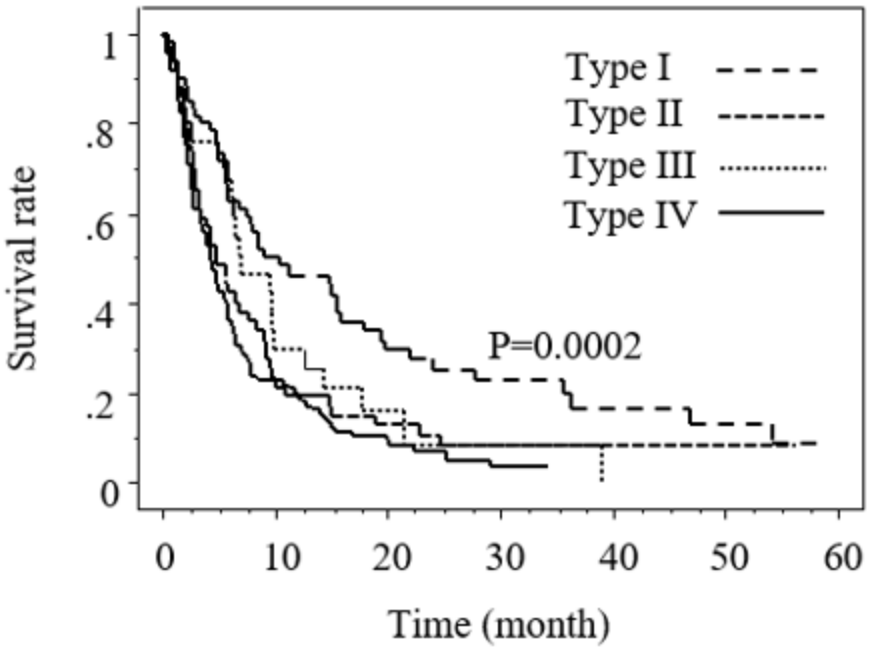


Figure 3

The survival after palliative surgery for MBO.

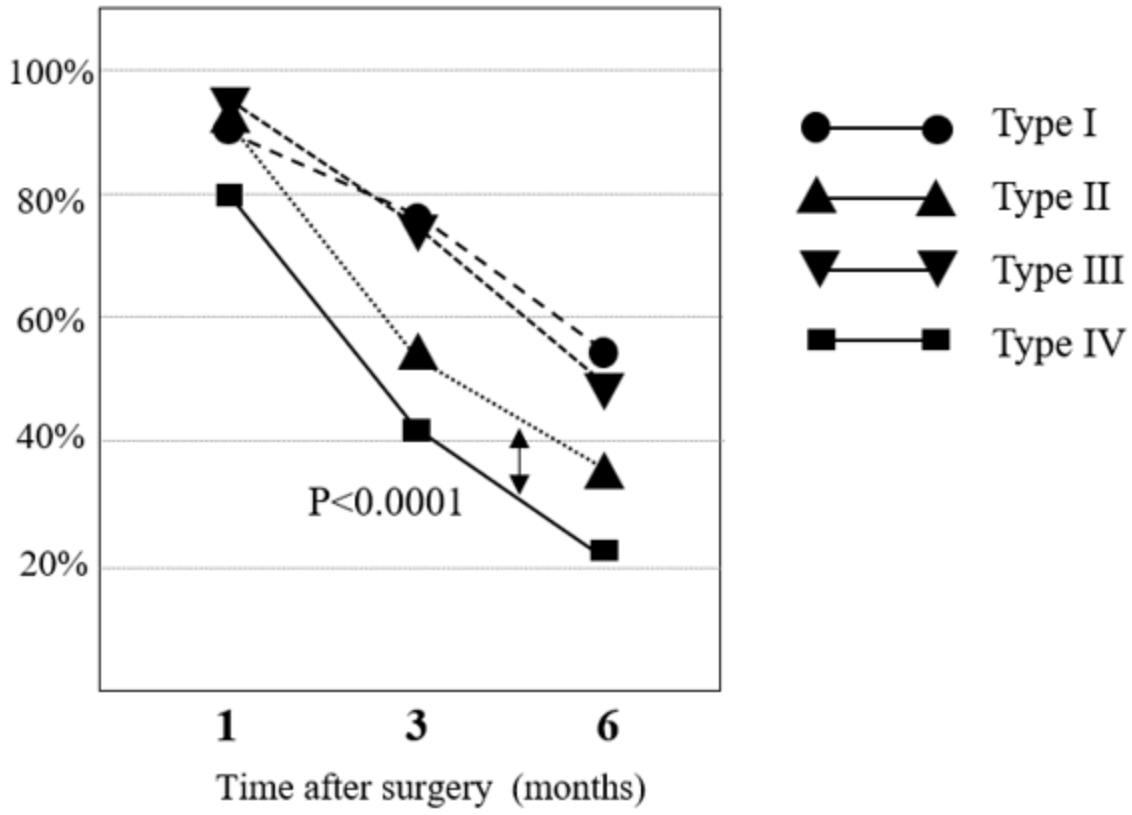


Figure 4

Duration of normal food intake after palliative surgery for MBO