

*Original Research*

# Malignant Bowel Obstruction in Ovarian Cancer Recurrence: The Role of Palliative Surgery in a Decision-Making Process

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## Abstract

**Background:** Malignant bowel obstruction (MBO) is often the latest stage in ovarian cancer (OC). The therapy of this condition ranges from medical waiting to surgery. The objective of this pilot study is to compare the two strategies so that we can provide a path forward for future studies. **Methods:** From 700 women diagnosed with OC in the database of the Division of Gynecologic Oncology we crossed the names of those admitted by the emergency services of the IRCCS Azienda Ospedaliero Universitaria of Bologna, Italy. We selected MBO patients with a history of OC as the only neoplastic condition and compared the results between medical conduct and surgery to restore intestinal transit. **Results:** Of the 700 women in our database, 36 were eligible for study according to the inclusion and exclusion criteria: 9 in surgery group and 27 in medical group. Surgical conduct (tumor biopsy and stoma) appears to be resolutive for the obstruction and have a better result than medical therapy regarding recurrence of MBO, despite the development of greater complications. Relapses of MBOs occurred in 11% of surgical patients and 44% of medical patients ( $p = 0.0714$ ). Furthermore, after surgical treatment, five patients (55%) experienced postoperative complications; in four cases, severe anemia requiring blood transfusion, while one patient developed post-surgical sepsis, which evolved into multiple organ failure and death. Of the 9 patients treated surgically, 2 (22%) were given surgery as a first choice. In most cases (78%), surgery was decided upon when medical treatment failed. The only discriminative factor appears to be age. The length of hospitalization increased with the patient's age ( $p = 0.0181$ ) as statistically significant factors for a worse outcome in surgery. **Conclusions:** MBO requires complex and multidisciplinary management where different factors need to be considered before initiating surgical therapy. Future studies are needed to deal with this complex problem.

**Keywords:** ovarian carcinoma; carcinosis; recurrence; malignant bowel obstruction; palliative care

## 1. Introduction

Epithelial ovarian cancer (EOC) is a relatively uncommon disease with the highest incidence rates in Western Countries like Europe and North America (8 cases per 100,000 women per year) [1]. This cancer is the most deadly and silent gynaecologic tumour, it is diagnosed in advanced stage in about 80% of cases and has a 5-year survival of 20–30% [2]. Primary tumours originate from the epithelium of the ovary, fallopian tube or peritoneum and subsequently propagate to the peritoneal surface and pelvis and abdominal viscera. Despite optimal surgery and proper chemotherapy, approximately 70% to 80% of patients will develop a recurrent disease [3,4]. Gradually relapsing patients, susceptible to platinum, experience shorter disease-free intervals, platinum resistance and poor prognosis.

Malignant bowel obstruction (MBO) is a relatively common complication in patients with peritoneal ovarian carcinosis. Its incidence, according to retrospective studies, ranges from 25% to 50%, with a higher frequency in cases of advanced, relapsed or end-stage disease [5,6]. To diagnose MBO, according to the 2007 Clinical Protocol Committee report, the following criteria should be met: clinical signs of bowel obstruction (history, objective tests and imaging techniques); intestinal blockage downstream of the Treitz ligament; obstruction associated with an incurable malignant intra-abdominal primary tumour [7]. In patients with advanced or terminal ovarian cancer, the development of MBO is usually an insidious event, which can last for several months. Sometimes MBO resolves spontaneously, even if recurrence is frequent, especially in cases of chemo-



resistant disease [8,9]. Medical and surgical treatments of MBO are in general palliative [10,11]. The treatment is aimed at restoring digestive flow, alleviating symptoms and restoring nutritional status [12].

At present, the management of MBO remains a clinical dilemma and a therapeutic challenge, which often depends on the experience of the individual physician/surgeon [13,14]. In MBO, the therapeutic purpose and approach vary depending on the overall health status of the patient, the extent of neoplasia, the response to previous treatments, the perspective of response to future treatments, the site and pathogenic mechanism of intestinal obstruction [15–17].

In this uncertainty of the literature, the purpose of our pilot study was to describe the experience of an Ovarian Cancer Centre in comparing outcomes of medical with surgical treatment in the management of MBO patients in the context of peritoneal carcinosis as a consequence of recurrence of ovarian carcinoma (ROC).

## 2. Materials and Methods

This is a retrospective observational study carried out at the *IRCCS Azienda Ospedaliero-Universitaria of Bologna*.

Between January 2010 and October 2019, OC patients were selected from the electronic database of the Division of Oncologic Gynaecology, and the names were cross-referenced with those who left medical and surgical emergency departments with an MBO diagnosis.

The criteria for inclusion in the study were: histologic diagnosis of epithelial carcinoma of the ovary; abdominal recurrence of OC documented by radiological imaging (abdominal radiography, computed tomography, 18F-FDG PET/CT), MBO with hospitalization for medical or surgical therapy, availability of MBO diagnostic criteria [7].

The exclusion criteria were represented by: benign intestinal occlusion (adhesions, radiation enteritis, chronic ischemia, inflammatory bowel diseases and infections); lack of documented abdominal relapse; isolated extra abdominal recurrence; patients with poor general conditions where surgical palliative therapy was not possible (Eastern Cooperative Oncology Group Performance Status (ECOG PS) >3); occlusion from a transient side effect of chemotherapy administration; MBO for non-ovarian cancer neoplasia.

### 2.1 Treatment Strategy

Patients with sub ileus/ileus were assessed by clinical examination, radiological imaging, biochemistry, assessment of patient performance status, extent and history of illness. The approach involved placing a nasogastric tube, intravenously and peristaltically administering stimulant drugs such as octreotide, metoclopramide and neostigmine, zero through the mouth. In case of persistence of ileus, Gastrografin was administered through the nasogastric tube to check for blockage and stimulate peristalsis. In case of good performance status, the subsequent treatment

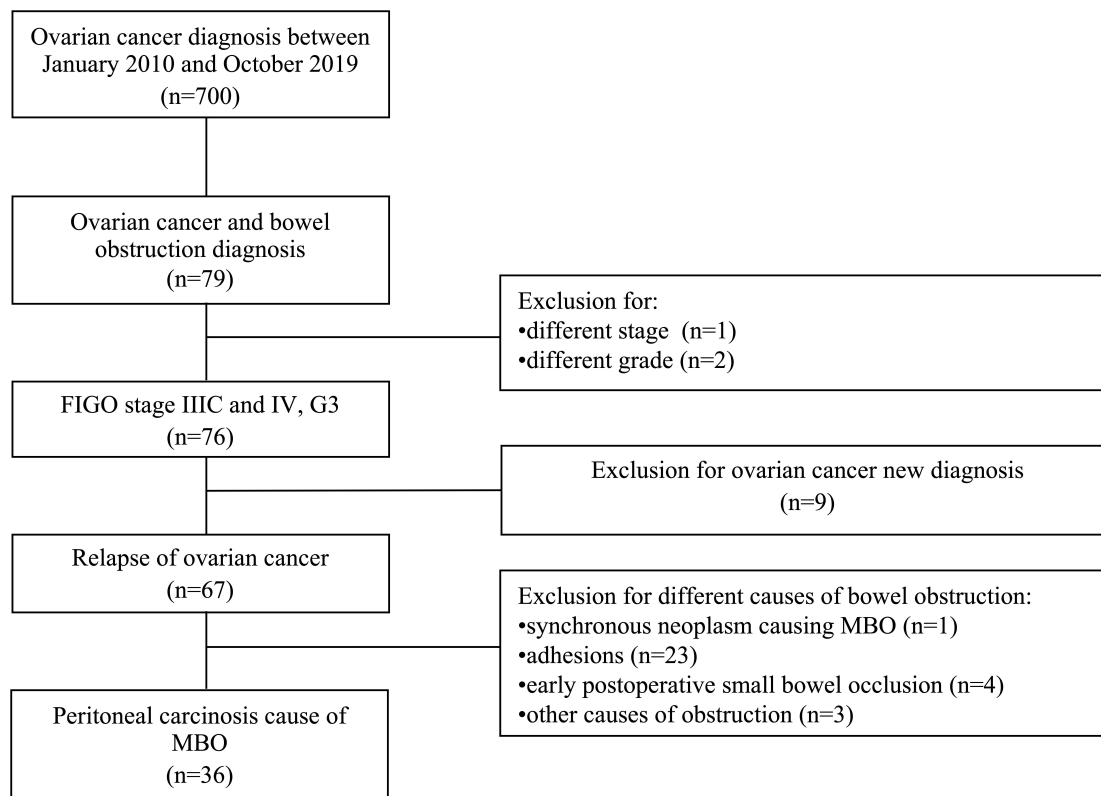
option was left to a multidisciplinary group with a surgical oncologist, a general surgeon, a medical oncologist, a gastroenterologist, a hospice physician and taking into account the patient's wishes.

After analysis of the entire series selected, the patients were divided into two groups according to the type of treatment (medical care or surgery). Patients undergoing palliative surgery after medical treatment failure were also placed in the surgical group.

The clinical data has been extrapolated from the medical records of patients in the Division of Oncologic Gynaecology, Medicine and Emergency Surgery Services. Patients' information, oncologic disease, occlusive event with associated therapies, complications and follow-up were reported. Specifically, the following information was evaluated: age, Body Mass Index (BMI), ECOG PS at hospitalization, histotype and tumour stage, type of cancer treatment at diagnosis (primary surgery, adjuvant chemotherapy, chemotherapy only); the number of recurrences, the site of recurrences, the number of hospitalizations for MBO, the presence of ascites during obstruction, the characteristics of antitumour treatments, the susceptibility to platinum during the first occlusion; occlusion treatments, length of hospital stay for the obstructive event. The main complications with medical and surgical treatments were recorded, particularly for surgical complications the Clavien-Dindo score was used [18]. The unobstructed time interval was calculated as the time between symptom relief and re-hospitalization for obstructive symptoms. Post-occlusion survival was defined as the time interval in days between the first diagnosis of MBO and death or the date of last follow-up. Follow-up data were obtained from the registries of the Division of Oncologic Gynaecology where patients were followed for oncological problems.

### 2.2 Statistical Analysis

All the analyses were carried out using the JMP13 software (SAS Institute, Cary, NC, USA). As descriptive indices, the mean (or median, where otherwise indicated) has been calculated to assess the central trend, the standard deviation and the range of values, as indices of variability of quantitative variables. While, in the case of categorical variables, the absolute and relative frequency of the different levels have been considered. To assess the relationship between the variables of interest, bivariate analyses were conducted separately for each outcome and independent variable. The following statistical tests were used: chi square test, *t*-test for independent samples and F-test (One-way analysis of variance). For the survival analysis, the Kaplan-Meier curves were derived, analyzed with the logarithmic rank test (Log Rank test), and the Cox Proportional-Hazard model was estimated. In all analyses, the level of significance was set at  $\alpha = 0.05$ .



**Fig. 1. Shows the recruitment flow chart of the study with the number of patients evaluated and the patients excluded from our study population group.** Legend: n, number; FIGO, International Federation of Gynecology and Obstetrics; G, grade; MBO, Malignant Bowel Obstruction.

### 3. Results

Out of a database of 700 patients from 2009 to 2019, 79 were admitted to emergency services for MBO and OC (11%); 36 of them met the inclusion criteria and were assessed as part of the current study. Fig. 1 shows the design of the study.

For the reported endpoints, statistically significant differences were not observed for both study groups except for chemoresistance (Table 1). The number of hospital admission per patient ranged from 1 to 3; 53% of patients were admitted one time, 39% twice and 8% three times. The interval between the first diagnosis of OC and the first MBO was  $28 \pm 18$  months (mean  $\pm$  standard deviation), with a range of 6–66 months. In 23 out of 36 cases (64%), the MBO occurred with the first recurrence of peritoneal cancer; in the remaining 36% with subsequent relapses: 28% in the second and 8% in the third relapse respectively. Most patients (70%) had the disease limited to the peritoneum. In the remaining cases it also affected abdominal parenchymatic organs in 7 patients (19%), extra abdominal organs in 3 patients (8%), and both parenchymatic and extra abdominal organs in 1 patient (3%). At the time of occlusion, 23 of the 36 patients (64%) were receiving chemotherapy and three patients (8%) were receiving maintenance therapy (Bevacizumab). Ascites was reported in 13 patients (36%).

The ECOG performance status was less than 2 for 22 patients (61%), while the rest had an ECOG PS of 2 and 3 (39%).

For the treatment of bowel obstruction, surgery was proposed in 25% of cases (9 patients), while medical treatment remained the final treatment in 75% of patients (27 cases). In most cases, MBO was caused by multilevel ileal obstruction. This is because the MBO associated with ovarian carcinoma is usually determined by a condition of peritoneal carcinosis involving multiple ileal loops [12]. In fact, in the surgical group, 7 patients (78%) had a multilevel small bowel obstruction, 1 patient (11%) had a unilevel left colon obstruction and 1 (11%) patient had an obstruction involving both the ileum and the colon at multiple levels. In the medical group, 20 patients (74%) had a multilevel small bowel obstruction, 3 patients (11%) had a unilevel small bowel obstruction and 4 patients (15%) had a unilevel colon obstruction.

Of the 9 patients treated surgically, in 2 cases (22%) surgery was performed as the first choice, while in most cases (78%) surgery followed the failure of medical treatment. In three of these cases the surgical approach was carried out during the second hospital admission for MBO, after a previous hospitalization in which a conservative approach with medical treatment was tried. Seven patients underwent surgery after failure of medical treatment. The

**Table 1. Clinical and pathological parameters of the study population.**

	All n = 36	Medical treatment n = 27	Surgical treatment n = 9	<i>p</i>
Age at diagnosis of OC				
mean ± SD	60 ± 11	59 ± 10	63 ± 12	0.48
Body Mass Index				
mean ± SD	24 ± 5	24 ± 5	24 ± 4	0.92
Hystotipe				
Serous	32 (89%)	24 (89%)	8 (89%)	1
Endometrioid	4 (11%)	3 (11%)	1 (11%)	
FIGO stage at diagnosis				
IIIC	26 (72%)	20 (74%)	6 (67%)	0.66
IV	10 (28%)	7 (26%)	3 (33%)	
Therapy of primary tumor				
Neoadjuvant chemotherapy + surgery	28 (78%)	21 (78%)	7 (78%)	0.10
Surgery + adjuvant chemotherapy	5 (14%)	5 (18%)	0	
Only chemotherapy	3 (8%)	1 (4%)	2 (22%)	
Number of relapses				
1	23 (64%)	16 (59%)	7 (78%)	0.43
2	10 (28%)	9 (33%)	1 (11%)	
3	3 (8%)	2 (8%)	1 (11%)	
Site of relapse				
Peritoneum	25 (70%)	19 (70%)	6 (67%)	0.91
Peritoneum and intrabdominal metastases	7 (19%)	5 (19%)	2 (22%)	
Peritoneum and extrabdominal metastases	3 (8%)	2 (7%)	1 (11%)	
Peritoneum and intra-extrabdominal metastases	1 (3%)	1 (4%)	0 (0%)	
Number of occlusions				
1	19 (53%)	15 (56%)	4 (44%)	0.36
2	14 (39%)	9 (33%)	5 (56%)	
3	3 (8%)	3 (11%)	0 (0%)	
Age at first occlusion				
mean ± SD	63 ± 11	62 ± 11	65 ± 11	0.39
Months between diagnosis of OC and first occlusion				
mean ± SD	28 ± 18	27 ± 17	31 ± 21	0.48
ECOG PS				
<2 (0–1)	22 (61%)	16 (59%)	6 (67%)	0.69
≥2 (2–3)	14 (39%)	11 (41%)	3 (33%)	
Ascites	13 (36%)	11 (41%)	2 (22%)	0.31
During chemotherapy	23 (64%)	17 (63%)	6 (67%)	0.84
During Bevacizumab	3 (8%)	2 (7%)	1 (11%)	0.72
Platinum sensitive	10 (28%)	5 (19%)	5 (56%)	0.03
Platinum Resistant	26 (72%)	22 (81%)	4 (44%)	0.03

Legend: n, number; OC, Ovarian Cancer; FIGO, International Federation of Gynecology and Obstetrics; ECOG PS, Eastern Cooperative Oncology Group Performance Status.

average length of hospitalization stay was  $22.5 \pm 9.8$  days (mean and SD) for surgery and  $10.5 \pm 0.7$  days (mean and SD) for medical treatment alone, respectively. The extended hospital stay is due to the first attempt of medical strategy followed by the postoperative period. Table 2 presents surgical procedures and complications in the operating group; 89% (8 patients) of the procedures involved tumour biopsy and stoma. In all nine cases, surgery was palliative as the setting of our patients was recurrence in chemoresistant women. Six patients (67%) under-

went ileostomy packing, including 5 (83%) ileostomy and 1 (17%) colostomy at the level of the transverse colon. Two patients (22%) underwent bowel resection and subsequent ostomy packing: in one case a resection of the last section of ileal loops and a total colectomy with ileostomy packing was performed, in the other case an ileal resection with ileostomy packing was performed. In a single case (11%) an ileal resection with latero-lateral anastomosis was carried out.

**Table 2. Surgical treatment characteristics.**

	All n = 9
Medical treatment failure	7 (78%)
Type of treatment performed	
Stoma	6 (67%)
Resection and stoma	2 (22%)
Resection and anastomosis	1 (11%)
Adhesiolysis	4 (44%)
Complications	
Anemia	4 (44%)
Sepsis and MOF	1 (11%)
Clavien-Dindo score	
1–2	8 (89%)
>3	1 (11%)

Legend: n, number; MOF, Multiple Organ Failure.

Five patients (55%) experienced post-operative complications: in four cases severe anemia requiring blood transfusion, while one patient developed post-surgical sepsis, which evolved into multiple organ failure and death.

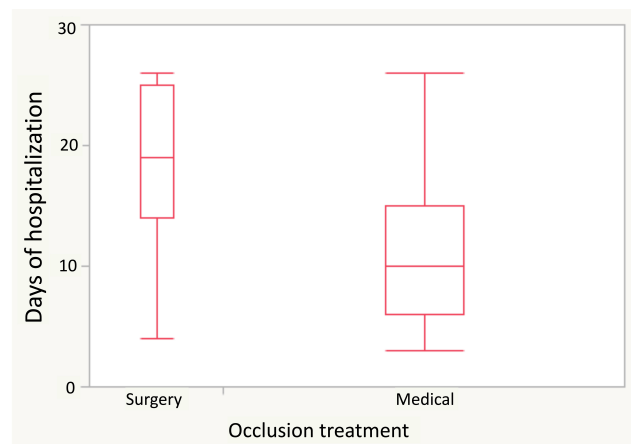
All patients treated conservatively received supportive measures, such as hydroelectrolyte supplementation, nil by mouth, and possibly parenteral nutrition. In 18 cases (67%), gastrointestinal decompression by placement of nasogastric tube and in one of these cases subsequent placement of a gastrostomy was necessary. Antiemetics/prokinetics (85%) and antisecretors (93%) were used in most cases. Metoclopramide was used in 78% of cases, followed by Ondansetron (41%). Almost all patients took gastroprotectors (89%), with which in some cases Octreotide (7%) and anticholinergic agents, such as Scopolamine N-butylbromide (7%), were associated. In addition, in 8 cases (30%), evacuation paracentesis or placement of an abdominal drainage had to be combined with medical treatment.

The medical group presented complications in four patients (15%); three patients (11%) complained of side effects of the nasogastric tube and one patient (4%) had a complication consisting of a strong increase in pain following administration of an oral contrast agent (Gastrografin). Table 3 shows the medical treatment characteristics.

Table 4 shows the outcomes in the two treatment groups. The mean length of hospitalization was not statistically different between the two groups; 20 days in surgery group and 14 days in medical group ( $p = 0.1817$ ) (Fig. 2). The rate of symptom remission was similar between the two groups; as patients without artificial feeding at discharge from hospital were 67% and 59% of cases in the surgical and medical group respectively ( $p = 0.6930$ ). Parenteral nutrition was needed in most cases because the patients suffered prolonged fasting because their occlusion and because they were malnourished because of the terminal state of their disease. Considering the poor general clinical condition of the patients, the main use of parenteral was as supportive therapy.

**Table 3. Medical treatment characteristics.**

	All n = 27
Type of treatment	
Supportive care	27 (100%)
Intestinal decompression	18 (67%)
Antiemetics/Prokinetics	23 (85%)
Antisecretors	25 (93%)
Corticosteroids	5 (19%)
Laxatives/Purgatives	16 (59%)
Gastrographin	19 (70%)
Enema/Rectoclysis	16 (59%)
Evacuative paracentesis/Drainage	8 (30%)
Complications	
Intolerance to the nasogastric tube	3 (11%)
Worsening of abdominal pain	1 (4%)

**Fig. 2. Distribution of hospitalization days according to occlusion treatment.**

Recurrence of MBO occurred in 11% of patients treated with surgery and in 44% of medical patients ( $p = 0.0714$ ). In all cases, MBO recurrences were treated conservatively with medical treatment. Survival at 30 days was 89% and 74% for patients in the surgical and medical group, respectively ( $p = 0.354$ ).

Overall, post-occlusion survival was longer in surgical patients than in medically treated patients: the mean survival of patients treated with medical treatment was of  $98 \pm 84$  days, while the average survival following surgery was  $185 \pm 115$  ( $p = 0.0414$ ) (Fig. 3).

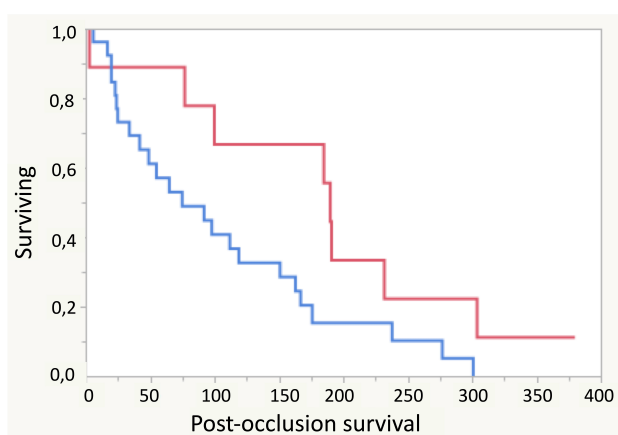
The length of time in hospital increased with the patient's age ( $p = 0.0181$ ) (Fig. 4).

Conversely, the need for parenteral nutrition on discharge from hospital ( $p = 0.7344$ ) and the rate of recurrence of MBO ( $p = 0.7029$ ) was not age dependent. Survival was inversely correlated with the patient's age at the time of the MBO diagnosis but did not reach any statistical significance ( $p = 0.7812$ ) (Fig. 5).

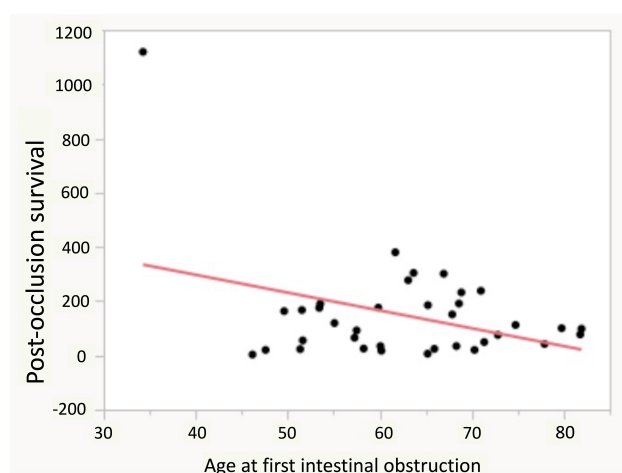
**Table 4. Outcomes according to treatment (medical and surgical).**

	All	Medical treatment	Surgical treatment	<i>p</i>
	n = 36	n = 27	n = 9	
Days of hospitalization				
mean ± SD	16 ± 12	14 ± 12	20 ± 10	0.18
Parenteral nutrition at admission	5 (14%)	4 (15%)	1 (11%)	0.78
Parenteral nutrition at discharge	14 (39%)	11 (41%)	3 (33%)	0.69
MBO recurrence	13 (36%)	12 (44%)	1 (11%)	0.07
MBO relapse free survival (days)				
mean ± SD	79 ± 89	73 ± 90	153 ± NA	
Post-occlusion survival (days)				
mean ± SD	121 ± 99	98 ± 84	185 ± 115	0.04
30 days survival	28 (78%)	20 (74%)	8 (89%)	0.35
90 days survival	21 (58%)	14 (52%)	7 (78%)	0.17

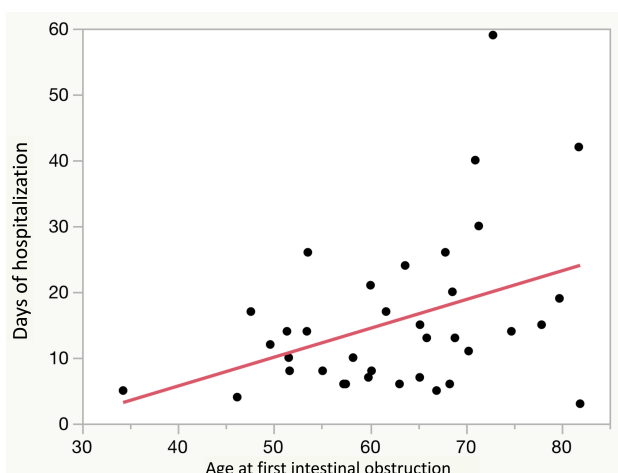
Legend: n, number; MBO, Malignant Bowel Obstruction.



**Fig. 3. Kaplan-Meier curve: post-occlusion survival (days) according to treatment.**



**Fig. 5. Distribution of post-occlusion survival according to the intestinal occlusion diagnosis age.**



**Fig. 4. Distribution of hospitalization days according to the intestinal occlusion diagnosis age.**

The need for parenteral nutrition at discharge and the recurrence of bowel obstruction did not depend on the time

elapsed between OC diagnosis and first MBO ( $p = 0.6755$  and  $p = 0.1184$ , respectively). Similarly, there was no statistically significant correlation between time elapsed between OC diagnosis and initial bowel obstruction and length of hospital stay ( $p = 0.9394$ ).

The ECOG performance status in both groups was not correlated with the need for parenteral nutrition at the time of discharge ( $p = 0.0731$ ) and MBO relapse ( $p = 0.4525$ ).

#### 4. Discussion

This study evaluated the results of surgical and medical palliative therapies in the management of MBO during ROC. Our data showed more favourable outcomes in the surgical arm with respect to MBO recurrence and survival despite increased hospitalization and post-operative complications. As far as we know, this is one of the few studies dealing with MBO and OC relapse.

Of the 36 patients eligible for this study, 9 (25%) had surgery and 27 (75%) received medical treatment, confirming published data with a higher probability of treating pa-

tients in a conservative manner [19]. The decision-making process is indeed complex and requires careful analysis of risk factors and the utility of surgery for critically ill patients. International guidelines are inconclusive as the Palliative Care Section's National Comprehensive Cancer Network (NCCN), offers surgery as the primary treatment of MBO, while the European Society of Gynaecological Oncology (ESGO) is concerned about the role of surgery, even in a well-organised algorithm [20,21]. Finally, the European Palliative Care Association recommends that surgery should not be routinely performed in patients with poor performance; intra-abdominal carcinomatosis and massive ascites [22].

The rate of relief from obstructive symptoms was similar in the surgical and in the medical group, 67% and 59% respectively. Similarly, Mangili *et al.* [23] reported the relief of obstruction and the possibility to take a low-residue diet in 22% of the patients submitted to surgery and in 30% of the patients treated conservatively. Conversely, in a systemic literature review, Paul Olson *et al.* [24] reported 868 cases of MBO and 427 cases of ovarian cancer: palliation was achieved in 32–100 % of cases with surgery and between 0 and 75 percent in the medical group. Also, a meta-analysis of a total of 1225 OC patients with intestinal obstruction treated by surgery and 1553 patients without surgical treatment confirmed surgical superiority in remission rate, with an odds ratio of 1.78 [19]. Such differences may be induced by different patient selections, because larger series are obtained by national registries, and a lack of accurate clinical and oncological data [25–27]. Another example of particular patient selection is a large recent series of Armbrust and Sehouli where 87 MBO patients were collected at two reference centers. The use of aggressive surgical intervention (resection of the large intestine) in 65% of cases and short bowel incidence in 46% of resection cases refers to a subset of patients where palliative surgery is not indicated. Consistent with a palliative procedure, the length of time for symptom relief in MBO patients was short, a rapid relapse of intestinal obstruction was observed in 11% and 44% of our patients undergoing surgery and medical treatment, respectively [28]. Usually, the rapid onset of MBO relapse is due to the spread of the tumour and to the presence of multiple obstructions which are poorly controlled through surgery and medical therapy [29].

Since the objective of treatment is to alleviate symptoms, additional morbidity is a significant problem. In our study, 55% of surgical patients (5 patients) experienced complications; in four cases, they developed anemia requiring a transfusion of red blood cells, while one patient developed post-surgical sepsis, which evolved into multiple organ failure and death. The only complication observed in the medical group was a severe increase in abdominal pain after administration of Gastrografin, a hyperosmolar agent stimulating intestinal motility.

Morbidity and type of therapies are associated with duration of hospital stay; in our series, hospitalization was longer in the surgical group (20 days) than in the medical group (14 days). The longer hospital stay in the surgical patients should take into account the time to evaluate the up-front medical strategy, the time of patient selection and the time of surgical booking, next to the postoperative time. Admittedly, very long hospitalization in advanced patients should be avoided, as they can be a part of the rest of their lives.

Survival nearly doubled in the surgical arm, 185 days versus 98 days in the medical group. Daniele *et al.* [30] series demonstrated 13.6 months survival in surgical treatment, and 5.7 months survival in non surgical therapy. In addition, the meta-analysis of Jin *et al.* [19] on 2778 patients reported prolonged survival after surgery (HR = 0.333,  $p = 0.000$ ). This may demonstrate a surviving benefit of the surgical procedure because of a return to a normal diet and other therapies.

Age could play an important part in decision-making. In our series, older patients had longer hospitalizations and shorter survivorship, but post-operative outcomes were similar to those of other patients. Santangelo *et al.* [31] in a systematic review of MBO in the elderly confirmed that age alone is not a predictor of post-operative complication. However, the state of performance is the most important factor in this group of patients. Finally, the difficulty of this decision-making process is primarily due to the capacity to assess all risk factors for morbidity, mortality and survival. Multidisciplinary evaluation of performance status, disease characteristics (tumour extent, chemotherapy, significant or ileal spread, ascites), and age should primarily consider surgery in patients who have a higher likelihood of longevity and low morbidity. The lack of data in literature about the quality of life of these patients should not prevent a careful discussion with the patient and the caregiver, with patients candidate for surgery about the probability of successful palliation, post-operative complication and end-of-life priorities, including the preferred treatment location. In patients who become resistant to chemotherapy, the first choice is always medical therapy. In case of failure of medical therapy should arise the question of whether or not to perform surgery. Therefore, it is important to consider that the possible benefit of a little higher overall survival should be read in relation to the extension of the hospital stay. Increased risk of complications and increased costs associated with surgery would not justify such a choice by the individual doctor. Instead, a multidisciplinary approach is needed to understand disease progress and available therapeutic perspectives.

Limitations of this study include the case selection bias inherent in the retrospective nature of the study; the small and heterogeneous sample of patients screened; patients lost to the follow-up (we have no information of patients not admitted to our emergency department or who

have been treated at oncology day service or at home), the lack of a clear indicator of patient quality of life and a clear definition of what is effective palliative treatment. Moreover, given the small sample size of the study, the predictors of medical therapy failure could not be determined. Further studies are needed to manage such a complex clinical condition as MBO related to ovarian cancer.

## 5. Conclusions

MBO in patients with ROC is a serious complication that requires a multidisciplinary approach. A decision-making process to evaluate the history and prognosis of the illness, the patient's health status and personal preferences should be undertaken in order to select patients for surgery after a medical conservative approach. In carefully selected patients, palliative surgery could be useful for longer survival and lower relapse, even at the cost of longer hospitalization and higher morbidity. Future studies are necessary to solve the problem.

## Author Contributions

These should be presented as follows: AMP, PDI and MF designed the research study. AMP, EDC, GD and MF performed the research. SF and PC provided help and advice on statistical analysis. MDS, MT, AB, ADP, MR and PB analyzed the data. AMP, GD, GR and EDC wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

## Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki. The study is a part of a large study about chemoresistance therapy and was approved by the local Area Vasta Emilia Ethical Committee (CE-AVEC) on 11th November 2011 (EC number 107/2011/U/Tess).

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## Conflict of Interest

AMP and PDI are serving as the guest editors for this special issue. We declare that AMP and PDI had no involvement in the peer review of this article and has no access to information regarding its peer review. The other authors declare no conflict of interest.

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