Mechanical Bowel Obstruction and Related Risk Factors on Morbidity and Mortality

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Abstract

Background: Mechanical bowel obstruction is a common emergency problem resulting in high morbidity and mortality. In this study, we aimed to investigate the clinical presentation and outcome of the patients who underwent surgery due to mechanical bowel obstruction, as well as the effective risk factors on morbidity and mortality.

Methods: Between January 2005 and December 2010, 148 patients who underwent surgery with a diagnosis of MBO were evaluated retrospectively.

Results: The common cause of mechanical bowel obstruction was benign diseases (79.1%), such as adhesions (48.6%) and sigmoid torsion (15.5%), while 20% of causes were malignancies, like colorectal (16.2%) and small bowel tumors (3.4%). The 56.8% of the patients underwent surgery in the first 24 hours. Intra-operatively, severe ischemic features in the bowel were determined in 48% of the patients, while perforation in 2.7% and necrosis in 7.4%. Resection procedures were performed in 60.1%, while 37.8% of the patients underwent adhesiolysis. Morbidity rate was 41.9%, and 12.8% of the patients had died. While age, comorbidity, etiology, admission time and respiratory complications were the risk factors for mortality, age, comorbidities, admission time, and surgical procedures were effective on morbidity. Independent risk factors were comorbidity and admission time for morbidity and mortality, while age for only mortality.

Conclusions: Morbidity and mortality rates may be decreased with considering the etiological causes and the related risk factors of the patients, and increasing the awareness of the public about mechanical bowel obstruction.

Keywords: Mechanical bowel obstruction; Morbidity; Mortality

Introduction

Mechanical bowel obstruction (MBO) is a common emergency surgical problem, which consists 20% of all admissions to the emergency surgical departments [1]. The etiological factors of MBO may vary according to the age of the patients, years, and socio-economical status of the countries [2-4]. The most common cause of MBO is the obstruction due to the abdominal wall hernias in the first half of the century, while intraabdominal adhesions in the second half of the century [2, 3]. And also, the most common cause of MBO is abdominal wall hernias in developed countries, and intraabdominal adhesions in developing countries [4]. In addition, MBO can be seen more frequently due to the intraabdominal adhesions and abdominal wall hernias in young people, and due to the obstructive tumors and torsions of the bowel in elderly [5].

The appropriate treatment of MBO is very important to conclude the implementation of emergency surgery or non-operative management, as well as, early and accurate diagnosis [6, 7]. Despite advances in diagnosis and treatment methods, clinical evaluation, laboratory and radiological findings are not adequate for the accurate diagnosis, resulting in high morbidity and mortality [5, 9].

In this study, we aimed to investigate the clinical presentation, management and outcome of the patients who underwent surgery due to mechanical bowel obstruction, as well as the effective risk factors on morbidity and mortality.

Table 1. The Demographic and Characteristics of the Patients With Mechanical Bowel Obstruction

Age (years)*	51.5 ± 19.9 (16 - 94)
< 50, n (%)	67 (45.3)
50 - 75, n (%)	64 (43.2)
> 75, n (%)	17 (11.5)
Gender	
Male, n (%)	104 (70.3)
Female, n (%)	44 (29.7)
Comorbidity	32 (21.6)
Cardiovascular disease, n (%)	16 (50.0)
Respiratory disease, n (%)	9 (28.1)
Diabetes mellitus, n (%)	7 (21.9)
Referal symptoms	
Abdominal pain, n (%)	148 (100)
Abdominal bloating, n (%)	124 (86.1)
Absence of the passage of gas and/or stool, n (%)	97 (67.4)
Nausea and vomiting, n (%)	90 (62.5)
Physical findings	
Abdominal tenderness, n (%)	135 (93.8)
Distension, n (%)	124 (86.1)
Increase in bowel sounds, n (%)	105 (72.9)
Tympanic sounds, n (%)	30 (20.8)
Rebound, n (%)	30 (20.8)
Palpabl mass, n (%)	1 (0.7)
Prior history of operation, n (%)	74 (50.0)
Admission time to the emergency unit (hours)*	36.2 ± 25.0 (6 - 102)
≤ 24 hours, n (%)	84 (56.8)
> 24 hours, n (%)	64 (43.2)
Leukocytosis (mm^3)*	11431 ± 5000 (1500 - 28800)
Normal (≤ 11500/mm^3)	80 (54.1)
High (> 11500/mm^3)	68 (43.2)
Morbidity, n (%)	62 (41.9)
The length of hospital stay (days)*	16.2 ± 12.8 (1 - 85)
Mortality, n (%)	19 (12.8)

*Data were given as; mean ± standart deviation (minumum - maximum).

Table 2. The Prior Operations of the Patients

	N (%)
Appendectomy	30 (40.5)
Small bowel surgery	17 (23.0)
Gastric surgery	10 (13.5)
Colorectal surgery	8 (10.8)
Cholecystectomy	6 (8.1)
Liver surgery	1 (1.4)
Gynecological surgery	2 (2.7)
Total	**74 (100.0)**

Materials and Methods

Between January 2005 and December 2010, 148 patients who underwent surgery at General Surgery Department, Dicle University Medical Faculty with a diagnosis of MBO were evaluated retrospectively. Patient's age, sex, symptoms, admission symptoms, duration of hospital admission, comorbidities, history of prior surgery, laboratory and radiological imaging findings, surgical procedures, length of hospital stay, morbidity and mortality were recorded. Paralytic ileus and MBO cases, who are monitorized and treated without surgical intervention, were excluded from the study. The diagnosis of MBO was based on the availability of the symptoms, such as; abdominal pain, nausea, vomiting, abdominal bloating, inability to pass gas or stool, the air-fluid levels due to the small and large bowel obstruction on plain abdominal X-ray, leukocytosis, peritoneal reactive fluid and dilated bowel segments on abdominal ultrasonography (Usg) in all of the patients. In addition, abdominal computed tomography (CT) and colonoscopy were used for diagnosis of some of the patients. All of the patients were admitted to the intensive care unit (ICU), and fluid replacement, nasogastric decompression, monitorizing of urine output, central venous pressure and vital signs were performed. Cardiovascular diseases (CVD); ischemic heart disease and/or heart failure, respiratory diseases (RD); chronic obstructive pulmonary disease and/or asthma, and diabetes mellitus (DM) was considered as comorbidities. The vital signs were followed up for 4 hours intervals, while clinical evaluation in an interval of 6 hours, and plain abdominal X-ray imaging and blood electrolyte levels in an interval of 12 hours in all of the patients. The patients who had closed bowel segment, the suspicious for necrosis and the findings of peritonitis underwent surgery within 1 - 12 hours, while the patients who initially treated with non-operative management, but the obstructive symptoms were not disappeared, and had partially obstructive symptoms and diagnosed as colonic tumor with further studies were operated within 24 - 72 hours. All patients received prophylactic antibiotics before the surgery and underwent laparotomy with a median incision. The strangulation was defined as disorder of the circulation of bowels at the surgical exploration. During the surgery, bowel resection was not applied in the patients, whose bowel segments had viability symptoms in terms of color and motility. However, bowel resection was applied in the patients, who had persistent disorder of bowel circulation, necrosis, and perforation. Resection and anastomosis procedures were performed in the patients who had no or less edema and dilatation of the bowels and fecal contamination, while resection and stoma was performed in the others. The application of polyprolene mesh was used as a standard procedure in inguinal and incisional hernia repairs.

Statistical analysis

Data analysis was performed with SPSS 11.5 (SPSS Inc., Chicago, IL, USA). Quantitative values were represented as mean ± standard deviation. Normal distribution was evaluated with Kolmogorov-Smirnov test. In group comparisons, Mann Whitney-U test was used for nonparametric data, and independent T-test was used for parametric data, while independent categories were evaluated by Chi-Square test. The risk factors for morbidity and mortality were evaluated by logistic regression test. P value of < 0.05 was considered to be statistically significant.

Results

One hundred forty four adult patients with MBO were admitted and composed to our study. There were 104 male and 44 female patients, with a mean age of 51.5 ± 19.9 years. Demographic, clinical, and laboratory data of the patients are presented in Table 1. In terms of the clinical presentation of the patients, abdominal pain (100%) and bloating (86.1%) were the most common presenting symptoms, and abdominal tenderness (93.8%) and distension (86.1%) were the most regular physical findings on clinical examination. Half of the patients had a prior history of operation, and the most frequent prior operation was appendectomy (40.5%). The types of prior operations are presented in Table 2. Regarding the etiology of the obstructions, the most common cause was benign disease (79.1%), such as adhesions (48.6%) and sigmoid torsion (15.5%), while part of the other 20% causes were malignant diseases, like colorectal (16.2%) and small bowel malignancies (3.4%). Obstruction

Table 3. The Etiological Causes of Mechanical Bowel Obstruction in the Patients

	N (%)
Benign disease	117 (79.1)
Adhesions	72 (48.6)
Sigmoid torsion	23 (15.5)
Hernia	8 (5.4)
Intestinal invagination	5 (3.4)
Small bowel torsion	5 (3.4)
Appendicitis	3 (2.0)
Inflammatory bowel disease	1 (0.7)
Malign disease	31 (20.9)
Colon and rectum malignancy	24 (16.2)
Small bowel malignancy	5 (3.4)
Gastric carcinoma	1 (0.7)
Gynecological malignancy	1 (0.7)
Total	**148 (100.0)**

was originated from the small bowel in 92 (62.2%) patients, while originated from the large bowel in 50 (33.7%) patients, and both of them in 6 (4.1%) patients. The etiological causes of MBO in the patients are presented in Table 3. The 56.8% of the patients underwent surgery in the first 24 hours. Intra-operatively, severe ischemic features in the bowel was determined in 71 (48%) of the patients with MBO, while perforation in 4 (2.7%) and necrosis in 11 (7.4%) patients. Resection procedures were performed in 89 (60.1%) of the patients, while 56 (37.8%) of the patients underwent adhesiolysis. Morbidity was developed in 62 (41.9%) patients, and the most frequent complication was respiratory complications (23, 6%), such as; pleural effusion, pneumonia, atelectasis, pulmonary embolism and respiratory failure. 19 (12.8%) of the patients had died. The surgical procedures and related morbidity and mortality are presented in Table 4. After excluded the patients who had died, the mean length of hospital stay in the patients with or without morbidity were 24.3 ± 17.6 and 11.0 ± 5.2 days, respectively (P < 0.001).

Comparing the patients with and without morbidity, age (P = 0.032), comorbidities (P < 0.001), admission time to the hospital (P = 0.0039), and surgical procedures (P = 0.03) were significantly different. Morbidity was more frequent in the patients who admitted to the hospital lately, underwent resection procedures, had comorbidities, and with advanced ages. In regression tests, comorbidity (β = 2.090 and P = 0.001) and admission time to the hospital (β = 0.400 and P = 0.001) were determined as an independent risk factors on the developing of morbidity.

In terms of mortality, age (P < 0.001), comorbidity (P < 0.001), etiological cause (P < 0.019), admission time to the hospital (P < 0.001), and respiratory complications (P < 0.001) were significantly different in the patients who had died and living. Mortality were developed more common in the patients who underwent resection and stoma procedures with a diagnosis of sigmoid torsion or colorectal malignancy, was developed respiratory complications, had comorbidity, and with advanced age. Age (β = 0.181 and P = 0.028), comorbidity (β = 2.526 and P = 0.001), and admission time to the hospital (β = 0.687 and P < 0.001) were independent effective risk factors on mortality.

Discussion

MBO is a most common encountered emergency surgical disease and leading to high medical expenditures depend-

Table 4. The Type of Operations, Operation Related and Overall Morbidity and Mortality

Surgery	n (%)	Respiratory complications, n	Wound infection, n	Cardiovascular complications, n	Intraabdominal abscess, n	Acute renal Failure, n	Fistula, n	Ileus, n	Morbidiy, n	Mortality, n
Resection + stoma	56 (37.8)	19	8	2	8	3	0	1	30	14
Adhesiolysis	49 (33.1)	5	4	2	2	0	1	1	12	1
Resection + anastomosis	33 (22.3)	10	8	3	6	1	3	0	19	3
Hernia repair	5 (3.4)	1	0	0	0	0	0	0	1	1
Appendectomy	3 (2.0)	0	0	0	0	0	0	0	0	0
Detorsion	2 (1.4)	0	0	0	0	0	0	0	0	0
Total, n(%)	148 (100)	35 (23.6)	20 (13.5)	7 (4.7)	16 (10.8)	4 (6.1)	4 (6.1)	2 (1.4)	62 (41.9)	19 (12.8)

ing on the related increased morbidity at the worldwide [8, 9]. In the recent studies, the average age of the patients with MBO was reported as ranged between 54 and 59 years [5, 10, 11]. The male and female ratio in the patients with MBO varies between 54.6 - 62.5% and 37.5 - 45.4%, respectively [10-12]. In our study, the male and female ratios were 70.3% and 29.7%, respectively, with an average age of 51.5 years.

At the admission to the hospital, it was reported that the most regular presenting symptoms were absence of passage of gas and/or feces (52 - 90%) and abdominal distension (56 - 66%). In addition, abdominal pain, abdominal discomfort, vomiting and nausea were the most regular symptoms on arrival [13, 14]. In accordance with the literature, abdominal pain, abdominal bloating and absence of the passage of gas and/or feces were the most frequent referral symptoms, and also abdominal tenderness, distension and increasing in bowel sounds were the most common findings on clinical examination.

MBO is usually originated from the small bowel secondary to the diseases accounting for approximately 80% of all obstructions [13]. In the other reports, it is reported that the obstruction secondary to small bowel disease are responsible for the 67.8 - 80% of the total obstruction cases, while large bowel causes form only part of 20 - 30% [11, 12, 15]. In our study, MBO is originated from the small bowel in 62.2% and large bowel in 33.7% of the patients, while both small and large bowel in 4.1%. In the previous studies from our country, the most common etiological causes were reported as strangulated hernias (32.2 - 54%), malignancies (10.2 - 27%), and adhesions (16 - 23%), respectively [11, 12, 16, 17]. In developed countries, the rate of strangulated hernias as a cause of MBO is decreased, while the rate of adhesions is increased with the advances in surgery and anesthesiology, the effective use of antibiotic and fluid replacement therapy, the prolongation of the average life expectancy, and the increasing number of the elective hernia surgery, and also increasing number of the patients who underwent surgery [7-9, 13]. In developing and undeveloped countries, strangulated hernias are still remaining in the first place of MBO etiology [17]. Kucuk et al. [13] have been reported that the most common three causes of MBO were adhesions (45.5%), colon tumors (21.6%) and sigmoid colon torsion (7.4%). In other studies, it is reported that adhesions generated the 45 - 80% of all MBO cases [12, 18, 19].The rate of the performed abdominal surgeries in the etiology of the adhesions is about 65 - 90% [18-21], while the most common performed abdominal surgery is appendectomy [5, 13]. Half of our patients had a prior history of abdominal surgery. The rate of prior abdominal surgery is was 93.1% of the patients with MBO secondary to the adhesions. In accordance of the literature, the most frequent prior surgical procedure performed to our patients was appendectomy. In our study, we found that the most regular causes were adhesions (48.6%), colorectal malignancies (16.2%), and sigmoid colon torsion (15.5%), like

Kucuk et al [13]. We are concluding that adhesions become the most regular cause of MBO in our country with the increased rates of elective abdominal and hernia surgery, depending on the recent developments in the field of health and the increasing rates of the reaching health care services.

The complication rate in the patients with MBO varies between the range of 14.7 - 53.6% [5, 11, 17]. Kagızman et al [5] and Uludag et al. [11] have been reported that the postoperative systemic complications were most common in the patients with MBO, while Kaya et al. [17] stated that the wound infections were more common. In our study, the morbidity rate was 41.9%, and the most common was systemic complications (27.7%), such as respiratory and cardiovascular complications, and acute renal failure. Wound infection (13.5%) was the second most common complication in our study. These results may depend on the advanced age and comorbidities. All of the complications managed with conservatively, and none of the patients was not required any early surgical treatments.

Fevang et al [10] reported an increased risk of complication in the patients who had advanced age, comorbidity, previous abdominal surgery and who admitted to the hospital lately. Uludag et al. [11] have been reported that male gender, advanced age, comorbidity, previous abdominal history, the presence of malignancy was the effective risk factors on the developing of morbidity. Similarly, Halis et al. [22] reported that tachycardia, leukocytosis/ leucopenia, comorbidity was the efficient factors on morbidity, while the presences of strangulation, the duration of symptoms, and advances age was reported by Akgun et al. [23]. In our study, advanced age, comorbidity, admission time to the hospital and surgical procedures were determined as effective risk factors on morbidity in univariant analyses. Admission time to the hospital and comorbidity was the independent predictive risk factor on the developing of morbidity in multivariant analyses. Comorbidities were increasing the development of complications 1.7 - 3.2 times, and these complications were frequently related with cardiovascular and respiratory systems, like our study [10, 11]. Although MBO was seen more frequently in males in our study, the gender was not found as a significant factor on morbidity.

In previous studies, it is reported that the mortality rates in MBO varies between 1.5% - 11.5% [4, 20]. In accordance to the literature, the mortality rate of our patients was 12.2% in our study. Ti and Yong [24] have been reported that advanced age, comorbidity, bowel gangrene, large bowel obstruction and malignancy were the risk factor for the development of mortality. While Arenal et al. [25] determined advanced age and delay of treatment as risk factors, Fevang et al. [10] revealed that comorbidity, bowel necrosis and previous abdominal history were effective on the development of mortality, additionally. In another study, bowel necrosis was reported as an independent risk factor for the development of mortality, by Uludag et al [11]. In our study, ad-

vanced age, comorbidity, etiology, admission to the hospital, and respiratory complications were determined as effective risk factors on mortality in univariate analysis. In multivariate analysis, we determined that advanced age, comorbidity, and admission to the hospital were the independent risk factor on the development of mortality. Especially, the mortality rate was higher in elderly patients who had comorbidities and admitted to the hospital lately. Fevang et al. [10] showed that the mortality rate was increased 2.4 times in the patients who admitted to the hospital 24 hours later from the onset of the symptoms. In contrast to the literature, we did not observe any effects of the presence of bowel necrosis on the development of mortality.

Conclusion

The present study revealed that adhesions, colorectal malignancies and sigmoid torsion were the most common cause of MBO. Morbidity and mortality rates are still high, and the most regular complications were respiratory disorders and wound infection. Advanced age, comorbidity and admission to the hospital were established to be associated with higher mortality, while morbidity was related with the presence of co-existing diseases. Depending on these results, we believe that morbidity and mortality rates may be decreased with considering the etiological cause of MBO and the related risk factors of the patients, and increasing the awareness of the public about MBO.

Conflict Interests

The authors declared that there were no conflict interests.

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