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Laparoscopic management of mechanical small bowel obstruction

Are there predictors of success or failure?

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Abstract
Background: Laparoscopy is used increasingly for the management of acute abdominal conditions. For many years, previous abdominal surgery and intestinal obstruction have been regarded as contraindications to laparoscopy because there is an increased risk of iatrogenic bowel perforation. The role of laparoscopy in acute small bowel obstruction remains unclear.
Methods: Since 1995, data from patients undergoing laparoscopic surgery have been entered prospectively into a database. Patients who underwent surgery before 1995 were added retrospectively to the same database. The charts of all patients treated surgically for mechanical small bowel obstruction were reviewed. Univariate analysis was performed to identify factors associated with success or failure, especially intraoperative complications, conversion, and postoperative morbidity. Stepwise logistic regression was used to assess for independent variables.
Results: This study included 83 patients (56 women and 27 men) with a mean age of 56 years (range, 17–91 years). Conversion was necessary in 36 cases (43%). Laparoscopy alone was successful in 47 patients (57%). Intraoperative complications were noted in 16% and postoperative complications in 31% of the patients. Eight reoperations (9%) were necessary. Mortality was 2.4%. Duration of surgery ($p < 0.001$) and a bowel diameter exceeding 4 cm ($p = 0.02$) were predictors of conversion. No risk factor for intraoperative complication was identified. Accidental bowel perforation ($p = 0.008$) and the need for conversion ($p = 0.009$) were the only independent factors associated with an increased risk of postoperative complications.
Conclusions: Laparoscopic management of small bowel obstruction is possible in roughly 60% of the patients selected for this approach. Morbidity is lower, resumption of a normal diet is faster, and hospital stay is shorter than with patients requiring conversion. No clear predictor of success or failure was identified, but intraoperative complications must be avoided. If the surgeon is widely experienced in advanced laparoscopic surgery and there is a liberal conversion policy, laparoscopy is a valuable alternative to conventional surgery in the management of acute small bowel obstruction.

Key words: Adhesiolysis — Adhesions — Laparoscopy — Small bowel obstruction

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Mechanical small bowel obstruction (SBO) is caused by postoperative adhesions in most patients if no incarcerated hernia is found on clinical examination. If conservative management fails, or if complications such as necrosis or perforation are suspected, traditional treatment has been laparotomy with adhesiolysis and resection of nonviable intestine. The goals of surgical treatment are relief of the obstruction and, if possible, prevention of recurrence. With open surgery, recurrence is relatively frequent, and up to 15% of the patients eventually require a second laparotomy [23]. Because laparoscopy is associated with fewer postoperative adhesions than open surgery [7, 16], it seems particularly suited for the management of SBO, inasmuch as fewer postoperative adhesions could lead to a lower rate of recurrent obstruction.

Until recently, laparoscopy has been regarded as contraindicated in patients with previous abdominal surgery because adhesions make dissection more difficult, and because there is a higher risk of accidental bowel perforation. Bastug et al. [4] in 1991 were the first to report on one patient in whom a single band responsible for acute SBO was cut by laparoscopy. Since then, various authors have reported on this subject, but in most studies, the patients are limited in number [1, 2, 3, 5, 6, 11, 12, 13, 14, 15, 17, 18, 19, 21, 22, 23, 26, 27, 29]. Clearly, the place of laparoscopy in the treatment of acute SBO is yet to be defined [24], and there is some reluctance concerning its use because of the technical difficulties associated with a distended bowel and

a reduced working space, but also because there is fear of accidental small bowel perforation.

In this study, we reviewed all the patients in whom laparoscopy was used as the first approach to acute SBO between 1991 and November 1998. We tried to define preoperative predictors of successful laparoscopy as well as intraoperative and postoperative complications.

Material and methods

Since April 1995, data from all patients managed surgically by laparoscopy have been collected prospectively in a database. Data from patients who underwent surgery before April 1995 were collected in a retrospective fashion and added to the database. Patients treated by laparoscopy for mechanical SBO until November 1998 were selected from this database, and their data were analyzed retrospectively for the purpose of this study.

The diagnosis of SBO usually was made on the basis of the patient's history, the clinical examination, blood tests, and plain abdominal films. Contrast-enhanced abdominal CT scan was performed in 13 patients.

The decision to use a laparoscopic approach in the setting of mechanical SBO was made by the surgeon on call based on his experience with laparoscopy, the availability of the equipment, and the history of the patient. There was a clear tendency for surgeons to prefer laparotomy for patients who had undergone multiple operations or former laparotomy for occlusion, especially surgeons with little experience in laparoscopy.

The patients underwent general anesthesia after correction of fluid and electrolyte imbalance. The bladder was catheterized. A nasogastric tube was placed, often before induction of anesthesia. No attempt was made preoperatively at locating adhesions between abdominal content and abdominal wall using echography or any other means.

At the beginning of the study period, no recommendation was made as to how the pneumoperitoneum should be created (Veress needle or Hasson technique). More recently, however, the open approach has been strongly advocated. In any case, the first trocar or the Veress needle always was placed in an area without former surgical incision, and very often in the left upper quadrant. Additional trocars (5 or 10 mm) then were placed according to intra-abdominal status and location of adhesions, to provide for a good triangulation between the instruments and to allow for an optimal placement of the optic.

The small bowel was followed proximally starting from the ileocecal junction whenever possible. Care was taken to manipulate the bowel gently and to avoid holding the bowel itself, but rather to grasp the mesentery. If a band was found that clearly was responsible for the obstruction, it was cut with scissors, sometimes after bipolar coagulation. We did not systematically look for a second band, especially if relief of the obstacle and progression of bowel content could be demonstrated clearly. When multiple adhesions were found, they were freed as completely as possible. The small bowel then was examined on its entire length until the operating surgeon was convinced that the obstruction was relieved.

If the cause of the obstruction could not be demonstrated clearly, or if division of adhesions was deemed too risky, especially when the bowel was very distended, the procedure was converted to laparotomy. Conversion was the rule also if accidental bowel perforation occurred with gross peritoneal contamination, in case of bowel necrosis, or if a tumor was found. However, small perforations with only minor leakage of intestinal content or seromuscular tears were sutured laparoscopically. The nasogastric tube was left in place at the end of the procedure, and removed according to clinical evolution. Food intake was resumed subsequently, often on the first or second postoperative day.

Multiple factors (age, number of previous operations, location of previous incisions, type of pain (colicky vs continuous), signs of peritoneal irritation, white blood cell (WBC) count, hemoglobin level, single-band versus multiple adhesions, duration of surgery) were tested to assess whether they were predictive of bowel necrosis, intraoperative complications (perforation), conversion, postoperative complications, or reoperations. Some of these factors were chosen for their reflection of the patients' general condition (age, hemoglobin, ASA score). Certain factors can be of technical importance during laparoscopic adhesiolysis (number of previous operations and location of the incisions, diameter of the distended small bowel, open versus closed induction of the pneumoperitoneum, location of the first trocar or the Veress needle, single-band versus multiple adhesions, duration of surgery). Other factors are associated with a high risk of bowel necrosis (WBC count, colicky versus continuous pain, signs of peritoneal irritation).

Table 1. Preoperative characteristics of the patients

		No. of patients	%
Age	Mean (extremes)	56 years (17–91)	
Gender	Males	27	32
	Females	56	68
Previous operations	No	14	17
	Yes	69	83
Type of abdominal pain	Colicky	47	57
	Constant	30	30
	Unknown	6	13
Signs of peritoneal irritation	Present	40	48
	Absent	43	52
Maximal diameter of small bowel	Mean (extremes)	4,5 cm (2.5–6.3)	
	<4 cm	26	32
	>4 cm	46	55
	Unknown	11	13
WBC count	Normal	25	30
	Elevated	58	70
ASA score	1	16	19
	2	41	49
	3	22	27
	4	4	5
	5	0	0

WBC = white blood cell

Statistical analysis was performed using the Systat 8.0 software (SPSS inc., Chicago, IL, USA), the Student's *t*-test for continuous numeric variables, the Mann-Whitney *U* test for nonparametric numeric variables, and the chi-square test or Fisher's exact test for proportions, as appropriate. After identification of significant variables by univariate analysis, multivariate logistic regression analysis was used to identify independent predictors. A p value of 0.05 determined statistical significance.

Results

Between 1991 and 1998, 83 patients with mechanical SBO were approached primarily by laparoscopy. Characteristics of these patients are given in Table 1. Interestingly, 14 patients had no prior abdominal surgery, whereas others had up to five previous abdominal operations (Table 2). Overall, our patients had a mean number of 1.2 previous operations. A total of 60 patients underwent surgery within 12 h of admission, and 23 were admitted for clinical observation up to 21 days (mean, 5 days) before the decision to operate was made. In these cases, the decision was based on the worsening of the patient's condition, the increasing diameter of the small bowel on sequential abdominal plain films, or the absence of resolution of what was qualified as a partial occlusion.

The pneumoperitoneum was performed using the Veress needle in 49 cases, and the Hasson technique was used in the remaining 34 patients. The site of first trocar insertion was the umbilicus in 56 patients, the left upper quadrant in 20, the midline either above or below the umbilicus in 6, and the right lower quadrant in 1. When the Veress needle was used, the site planned for trocar placement always was checked with needle punctures before the trocar was inserted. In these cases, the first trocar always was a so-called "security-trocar" (Surgiport®, USSC), which somehow prevents accidental puncture of intra-abdominal organs once the peritoneum is entered, but does not completely rule out iatrogenic perforation. Other trocars were inserted always

Table 2. Previous operations. The conversion rates were calculated only if at least five patients were available

	No. of patients	Conversion rate (%)
Total number		
0	14	43
1	47	49
2	16	19
3	5	80
5	1	
Appendectomy	47	34
Appendectomy only	28	46
Hysterectomy	11	18
Lysis of adhesions (laparotomy)	5	40
Cholecystectomy	7	14
Colectomy	6	50
Repair of aortic aneurysm	3	
Cesarean section	3	
Tube ligation	2	
Ovariectomy	3	
Small bowel resection	3	
Exploratory laparoscopy	2	
Cystectomy and ileal bladder	2	
Gastroplasty	1	
Nephrectomy	1	
Partial gastric resection	1	
Splenectomy	1	
Parietal cell vagotomy	1	
Nissen fundoplication	1	
Exploratory laparotomy	1	

Table 3. Causes of bowel obstruction

Origin of obstruction	*n* (%)	Treated by laparoscopy (%)
Isolated band	35 (42.2)	24 (68%)
Localized or diffuse adhesions	36 (43.4)	22 (61%)
Inflammatory stenosis	2 (2.4)	0
Internal hernia	2 (2.4)	1 (50%)
Food impaction	2 (2.4)	0
Small bowel tumor	1 (1.2)	0
Tumor of the cecum	3 (3.6)	0
Small bowel intussusception	1 (1.2)	0
Carcinomatosis	1 (1.2)	0
Total	83 (100)	47 (57%)

Table 4. Reasons for conversion

	n (%)
No visible cause of obstruction	8 (22)
Bowel necrosis/perforation	7 (19)
Tumor or suspicion of tumour	9 (25)
Iatrogenic perforation	5 (14)
Very dense and numerous adhesions	5 (14)
Technical difficulties	2 (6)
Total	36 (100)

under direct laparoscopic vision. In most cases, three or four trocars were used.

The cause of obstruction (Table 3) could be determined laparoscopically in 65 patients (78%). In 18 cases, it was established only after conversion. Overall, laparoscopic relief of the obstruction was successful in 47 patients (57%). In the remaining 36 patients (43%), conversion was necessary (Table 4). None of the factors tested was associated significantly with conversion except duration of surgery ($p < 0.001$) and a preoperative bowel diameter exceeding 4 cm ($p = 0.02$). The extent and number of previous operations did not influence the need for conversion (Table 2). Patients who had undergone only appendectomy as a previous operation had an increased tendency to present with a single-band adhesion or isolated adhesions in the right iliac fossa compared with others. However, the difference was not statistically significant (64% vs 40%; $\chi^2 = 2{,}95$; $p = 0{,}08$), and the previous appendectomy did not influence the conversion rate (46% vs 42%, $\chi^2 = 0{,}17$, $p = 0{,}68$).

In a total of 17 cases, small bowel resection or right hemicolectomy was performed because of necrosis in eight patients, a tumor or an inflammatory mass in six patients, and perforation, intussusception, stenosis in one patient each. The only predictor of bowel necrosis was a WBC count exceeding 11×10^9 per liter ($p = 0{,}01$). In one patient, enterotomy was used to retrieve a foreign body (apricot stone) responsible for food impaction. Ileocolic anastomosis was performed in one patient who had peritoneal carcinomatosis. Five patients underwent an additional procedure: one inguinal hernia repair, two cholecystectomies for gallstones, and two annexectomies for an ovarian mass.

Overall, there were 13 intestinal perforations (15.6%), nine of which were recognized intraoperatively. Conversion occurred in five of these patients, whereas laparoscopic suture was undertaken in four. Two additional serosal tears were repaired laparoscopically. Four other patients developed peritonitis 1 to 7 days after laparoscopy and required reoperation. A perforation found in each of these patients was attributed to operative trauma during laparoscopy. No relation could be found between any of the factors tested and the occurrence of intestinal perforation.

Postoperative complications are listed in Table 5. Overall, postoperative complications developed in 26 patients (31.3%), eight of which (9.6%) required reoperation. Four patients underwent reoperation because of a missed perforation at laparoscopy: Suture was performed in three, and one required a short small bowel resection. Four patients needed reoperation after conversion: In one, an ileocecal resection was performed because of an anastomotic leak. An evisceration was repaired, an intra-abdominal abcess was drained, and extensive adhesions were freed in each one patient. Mortality was 2.4% and included two patients in the ASA 4 risk category in the converted group. One was an 80-year-old alcoholic patient with liver cirrhosis who developed postoperative sepsis and multiple organ failure. The other one was a 53-year-old man with coronary heart disease who died from myocardial infarction on postoperative day 4.

There were significantly more complications after conversion than after laparoscopy alone, especially those of a cardiac, pulmonary, or septic nature. Duration of surgery exceeding 120 min ($p = 0.001$), bowel necrosis ($p = 0.02$), intraoperative bowel perforation ($p = 0.03$), and conversion ($p < 0.001$) were significant predictors of postoperative morbidity. Multivariate analysis identified accidental perforation ($p = 0.008$) and conversion ($p = 0.009$) as independent predictors of postoperative morbidity. No preoperative predictor could be found. Interestingly, the postoperative

Table 5. Postoperative complications and reoperations

	All (n = 83)	Nonconverted (n = 47)	Converted (n = 36)	p value
Angina/myocardial infarction/pulmonary edema/arrhythmia	5 (6%)	0	5 (13.8%)	0.008
Bronchopneumonia/atelectasia	6 (7.2%)	0	6 (16.6%)	0.003
Lung embolism	1 (1.2%)	0	1 (2.7%)	NS
Urinary tract infection	5 (6%)	0	5 (13.8%)	0.008
Phlebitis (superficial)	2 (2.4%)	1 (2.1%)	1 (2.7%)	NS
Dermohypodermitis	1 (1.2%)	0	1 (2.7%)	NS
Wound dehiscence	1 (1.2%)	0	1 (2.7%)	NS
Wound infection	9 (11%)	1 (2.1%)	8 (22.2%)	0.003
Intra-abdominal abcess	2 (2.4%)	0	2 (5.5%)	NS
Peritonitis (unrecognized or secondary perforation)	5 (6%)	4 (8.5%)	1 (2.7%)	NS
Anastomotic leak	2 (2.4%)	0	2 (5.5%)	NS
Gastric hemorrhage	1 (1.2%)	0	1 (2.7%)	NS
Recurrent obstruction	1 (1.2%)	0	1 (2.7%)	NS
Total patients with complications	26 (31%)	6 (12.7%)	20 (55.5%)	< 0.001
Total patients with reoperation	8 (9.6%)	4 (8.5%)	4 (11%)	NS
Mortality	2 (2.4%)	0	2 (5.5%)	NS

NS = not significant

course of patients in whom perforation was recognized at laparoscopy and repaired without conversion was uneventful.

Patients in whom treatment could be completed laparoscopically had a much easier postoperative course than those for whom conversion was necessary. Delay between operation and the first bowel movement (1.8 vs 4 days; $p <$ 0,0001), delay before resumption of a liquid diet (2.2 vs 5,2 days; $p < 0.0001$, delay before resumption of a normal diet (4.7 vs 9,8 days; $p <$ 0,0001, and duration of postoperative hospital stay (5.9 vs 15.7 days; $p <$ 0,0001) were very significantly shorter in the laparoscopy group, although some patients in this group developed postoperative complications and required secondary laparotomy.

Discussion

Until recently, previous abdominal surgery and suspicion of intra-abdominal adhesions have been considered as relative contraindications to laparoscopy. In more than 50% of patients, mechanical SBO is caused by postoperative adhesions, involving a single band in a significant proportion of cases [14, 27]. Laparotomy still is the method of choice for identifying and treating the cause of obstruction if conservative therapy fails to provide relief of symptoms, or if complications such as bowel necrosis or perforation are suspected. After laparotomy, recurrence of obstruction is relatively frequent, leading to relaparotomy in up to 15% of the patients [23]. Laparoscopy is thought to induce fewer postoperative adhesions than laparotomy [7, 16], and therefore looks like an attractive alternative to laparotomy in the management of acute SBO. Bastug et al. [4] in 1991 were the first to report on one patient who underwent laparoscopic section of a band responsible for SBO.

To our knowledge, the current series represents the largest single-center experience with laparoscopy for mechanical SBO ever published. It represents, however, only a selected subset of patients admitted for SBO in our department. During the years 1995–1997 for instance, a total of 91 patients were admitted and operated for SBO. Only 32 of these patients (35%) have been approached laparoscopically, whereas 59 were submitted directly to laparotomy.

In this study, laparoscopy established the cause of obstruction in 78% of the patients, and treatment was completed endoscopically in 57% of the cases. Of concern in the latter group are four patients in whom signs of peritonitis developed during the early postoperative period, requiring reoperation (laparotomy) for closure of a small bowel perforation probably of iatrogenic origin. Laparoscopy therefore was totally successful, avoiding laparotomy in 43 patients (52%). The patients successfully treated with laparoscopy had a very smooth postoperative recovery as compared with those in whom conversion was necessary, or compared with a group of 59 patients for whom laparotomy was the initial option [28].

Other groups have shown that laparoscopy can be successful in a significant proportion of patients with SBO. Conversion rates as low as 6% to 13% [13, 15] have been reported, sometimes with a significant reoperation rate resulting from incomplete exploration, adhesiolysis, or both [13]. In most studies, however, the conversion rate is higher, between 26% and 54% [1, 3, 5, 18, 21, 22, 23, 29]. Reasons for conversion are mainly inability to identify the origin of the obstruction (usually in relation to a reduced working space because of intestinal distension), inability to relieve obstruction completely because of special anatomic features or adhesions that are too extensive, accidental bowel perforation, bowel necrosis, or causes not amenable to laparoscopic treatment (tumor, incarcerated hernia). A few reports have shown that in selected cases, laparoscopy can be successful even when SBO is caused by gallstone ileus [15, 26], intussusception [10], or food impaction [25]. Laparoscopic small bowel resection also has been reported [9].

For the laparoscopic approach of SBO, proper installation of the patient and the equipment are important. Both arms must be placed along the patient and, ideally, two monitors should be available. In this way, the surgical team can move around the patient according to the operative findings. Tilting of the operating table can be useful for adequate exposure. An open technique must be used to create the pneumoperitoneum. The trocars must be placed in rela-

tion to previous incisions, and according to the position of the adhesions to be divided. Manipulation of the distended bowel with atraumatic forceps must be very cautious and limited.

The decision to operate on a patient with SBO laparoscopically or openly is most often made by the attending surgeon empirically on the basis of his or her experience with laparoscopy and factors related to the patient. Preoperative knowledge of factors that prevent successful laparoscopy in this setting could help in the decision. We tried in this study to identify such factors by comparing patients successfully treated with laparoscopy and those who needed conversion on one hand, and by comparing patients without postoperative morbidity and those who had complications on the other. A small bowel diameter exceeding 4 cm, as seen on the preoperative plain abdominal film, predicted an increased risk of conversion in this study. This is not surprising, because the working space in the abdominal cavity is considerably reduced as dilation of the intestinal loops increases. Additionally, intestinal fragility increases with distension and makes accidental perforation more likely. Others consider only patients with moderate intestinal distension as candidates for laparoscopy [6, 8, 12, 20].

In the current study, 24 patients with a small bowel diameter exceeding 4 cm, including 11 with a diameter exceeding 5 cm, have been successfully treated without conversion. On the basis of these results, we still consider laparoscopy in patients with important dilation, but set a lower threshold for conversion. Neither the number or type of previous operations nor the location of the previous incisions influenced the location and type of adhesions or the need for conversion. Evidence of bowel necrosis obviously could be considered as an indicator for immediate laparotomy. The only preoperative predictor of bowel necrosis was a WBC count exceeding 11×10^9 per liter, as was shown by Benoist et al. [6]. In this study, however, 25 patients with an WBC count higher than 11×10^9 per liter were successfully managed through the laparoscope. We therefore do not consider an elevated WBC count as a contraindication to laparoscopy. Furthermore, if bowel necrosis is found at laparoscopy, a minilaparotomy incision can be placed properly according to the operative findings. Contrarily to the belief of many, neither the number and type of previous operations nor the location of previous abdominal incisions influenced the outcome in this study.

There was a striking difference in the incidence of postoperative complications between the group of patients successfully treated with laparoscopy alone and the group that underwent conversion. Significantly more general complications and also more incision-related complications developed in patients who experienced conversion. There was a trend for an increased rate of postoperative peritonitis and reoperation in the laparoscopy group as compared with the group that underwent conversion, but the difference was not statistically significant.

Conversion cannot always be avoided, and in a significant proportion of our patients (55%), it is related to more severe disease (necrosis, tumor, multiple adhesions). The occurrence of intraoperative small bowel perforation and the need for conversion were the only independent factors associated with a highly significant increased postoperative morbidity. Four of five patients converted because of iatrogenic perforation developed complications, including two parietal abcesses. On the other hand, none of the patients in whom accidental perforation was sutured laparoscopically experienced any postoperative complication. Simple serosal tears were not included in this analysis. All patients with unrecognized intraoperative perforation suffered from postoperative complications and required reoperation. Iatrogenic perforation represents a significant risk factor for postoperative complications, however, only if it is not recognized, or if conversion is required because of gross abdominal contamination with intestinal content. The intestinal wall is very fragile in the presence of intestinal dilation resulting from mechanical SBO.

During laparoscopy, intestinal trauma can result from two steps: establishment of the pneumoperitoneum and intraoperative handling of the small bowel. In this study, the Veress needle was used in more than half the patients. It was thought to be responsible for an unrecognized perforation in one case. Although some other authors have used the Veress needle without any problem [13, 14, 17], we strongly recommend the open technique for inserting the first trocar and establishing the pneumoperitoneum, as do most authors [3, 18, 20, 22, 23]. Manipulation of the small bowel, also very dangerous, should be kept to a minimum. Ideally, the first step is to identify the ileocecal junction, and thereafter to run the intestine proximally until the cause of obstruction is found. In this way, the nondistended bowel is grasped using atraumatic forceps. Fenestrated forceps or large intestinal Glassman graspers, as advocated by Franklin [14], are the best suited instruments. In areas of bowel distension, the mesentery should be grasped rather than the intestinal wall itself. Single bands or adhesions can be divided using scissors or an ultrasonically activated scalpel. Bipolar coagulation can be used, but monopolar current should be avoided because of its associated risk of electrical tissue damage, which often is not recognized at the time the lesion occurs.

If accidental perforation occurs despite all of the preceding precautions, it can be sutured laparoscopically or after conversion [8]. We recommend laparoscopic closure only if contamination with bowel content is minimal, as is the case with small perforations of a not too dilated intestinal loop. Any serosal tear should be oversewn. In the other cases, conversion is probably safer to ensure a tight closure and to allow for complete clearance of the spilled intestinal fluid. In any case, if intraoperative manipulation of the small bowel is deemed dangerous because of massive dilation or reduced space, conversion is indicated to avoid accidental perforation.

In conclusion, we found that laparoscopy can be successful in managing mechanical SBO in 57% of the patients selected for this approach. A preoperative WBC count higher than 11×10^9 per liter predicts intestinal necrosis, and a maximal intestinal diameter exceeding 4 cm on the plain abdominal film is associated with an increased risk of conversion. We do not, however, consider these findings as a contraindication to laparoscopy. Accidental bowel perforation during surgery, especially if leading to conversion or not recognized, and conversion by itself are significant risk factors for postoperative morbidity. Patients with successful laparoscopic treatment have a lower postoperative morbidity, resume intestinal function and a normal diet earlier, and have a shorter hospital stay than those in whom conversion

is necessary. If the surgeon is widely experienced in advanced laparoscopic surgery, laparoscopy is a valuable alternative to conventional surgery in the management of mechanical SBO [3]. Laparotomy can be avoided in a significant number of cases; duration of hospital stay can be shortened; and costs, although not analyzed in the current study, are probably lowered. Conversion is not to be regarded as a failure, but as a useful adjunct for avoiding complications in selected cases.

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