

Minimally Invasive Management for Acute Small Intestine Obstruction: An Outcome Analysis

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ABSTRACT

Background: As minimally invasive surgery gains ground, it is entering realms previously considered to be relative contraindications for laparoscopy. We reviewed our experience with the laparoscopic approach to the management of small bowel obstruction (SBO).

Methods: From 2010- 2014, 65 patients underwent laparoscopic treatment for SBO. The operating surgeon attempted to identify a transitional point between distended and collapsed bowel and then address the obstruction at that point.

Results: Postoperative adhesions were the cause of the obstruction in 44 patients. Tumor was identified in five cases, hernia in four, bezoar in three, intussusception in three, acute appendicitis and pseudoobstruction in two cases each, and terminal ileitis in one case. The diagnostic accuracy of laparoscopy was 96.9%. Thirty-four patients (52%) were treated by laparoscopy alone. Thirteen patients (20%) required a small target incision for segmental resection. Eighteen operations were converted to formal laparotomy. The mean laparoscopy time was 40 min (range, 25–160). Patients resumed oral intake in 1–3 days. The complication rate was 6.4%. There were two deaths, but none related to laparoscopy. The mean hospital stay was 4.2 days.

Conclusions: Laparoscopy is a useful minimally invasive technique for the management of acute SBO. It is an excellent diagnostic tool and, in most cases, a therapeutic surgical approach in patients with SBO. However, a significant number of patients will require conversion.

Keywords: Small Intestine Obstruction, Laparoscopy, Adhesions, Minimally Invasive Technique.

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INTRODUCTION

Small bowel obstruction (SBO) is a common cause of emergency hospital admissions. In Western countries, the most common cause is postoperative adhesions, followed by hernias, primary and metastatic tumors, and inflammatory disorders.¹ Many patients with SBO require operative release and until recently were subjected to conventional laparotomy. In the early days of laparoscopy, a previous abdominal operation was considered a relative contraindication, because of a perceived increased risk of iatrogenic bowel injury. As our experience with laparoscopic surgery has grown, we, like others, have increasingly used laparoscopy in the management of different acute abdominal conditions. We present our experience with the use of laparoscopy as an initial procedure in patients with SBO of various etiologies. Our aim is to define the indications for the laparoscopic approach in such cases.

PATIENTS AND METHODS

Sixty-five consecutive patients admitted from the emergency room with SBO underwent initial laparoscopic treatment in our department. There were 43 women and 22 men; their mean age was 60.3 years (range, 19–91). Forty-five patients had had previous abdominal operations. Patients with early postoperative SBO were excluded from further study. Small bowel obstruction was diagnosed on the basis of clinical findings, as confirmed by plain films. Patients who had undergone previous abdominal operations were initially treated with intravenous fluids and nasogastric suction. Severe abdominal pain was an indication for immediate operation within a few hours from admission. Surgery was reserved for patients who failed to respond clinically to nonoperative treatment within 48–72 h from admission. Patients with virgin abdomens were usually operated on immediately.

Informed consent for laparoscopy and possible conversion was obtained. Either the Hasson technique or a Veress needle was used to establish the pneumoperitoneum. In either case, the initial port was placed as far away as possible from previous scars. If a Veress needle was used, it was usually inserted in the left upper quadrant. A periumbilical location was chosen in cases of virgin abdomen. Pressures were kept between 10 and 15 mmHg; lower pressures were used with sicker patients. A 45-degree side-view 10-mm telescope was preferred. After thorough examination of the peritoneal cavity, additional 5- or 10-mm ports were inserted under direct vision. The location of the additional ports depended on the operative findings. As required, the camera was repositioned to enable the viewpoint to be changed for the release of adhesions. Using a pair of atraumatic laparoscopic forceps, the surgeon followed the distended loops of bowel, in an attempt to identify the zone of transition from dilated to collapsed loops. This maneuver requires patience and the use of both hands. If the

zone of transition could not be clearly identified, laparoscopy was aborted and the operation converted to a midline laparotomy. Adhesions were usually lysed with scissors; occasionally, bipolar coagulation was used for strands of omentum. We only lysed the band causing the obstruction or adhesions that obstructed the view. No attempt was made to lyse all adhesions present.

If there were signs of strangulation, we observed the released loop of bowel for 5 min for return of color and peristalsis. When there was doubt about the viability, a second-look laparoscopy was scheduled in 24-36 h. Whenever it was necessary to resect a loop of bowel, a small, transverse target incision was made, and the resection and anastomosis were performed outside the abdomen.

The following outcome measures were used to evaluate the results: diagnostic accuracy, duration of operation, postoperative oral intake time, conversion rate, morbidity, mortality, and length of hospital stay.

Table 1: Reasons for conversion

Operative findings	Target incision	Laparotomy
Bowel tumor	6	2
Bowel necrosis	2	2
Milking of bezoar	0	3
Iatrogenic bowel perforation	1	2
Dense adhesions	2	6
Absence of transitional point	0	2
Groin hernia repair	2	0
Technical difficulties	0	1
Total	13	18

Table 2: Postoperative complications

Complications	Laparoscopic	Converted
Intraabdominal abscess	0	1
Anastomotic leak	0	1
Small bowel fistula	0	1
Paralytic ileus	1	2
Wound infection	0	2

RESULTS

Initial laparoscopy was attempted in 65 patients. In 44 of the patients (68%), SBO was caused by postoperative adhesions. Of the 44 patients with adhesions, 28 (59%) were released laparoscopically. In all of these cases, a clear transitional zone was identified, and a single band caused the obstruction. All laparoscopically treated patients did well. Thirty-one patients were converted (Table 1). Target laparotomy was used for the resection of small bowel tumor and intussusception, ischemic small bowel loop, and the release of localized dense adhesions. Formal laparotomy was used for right hemicolectomy, the resection of ischemic bowel, and the division of dense adhesions. Two patients in whom the bowel was dilated throughout the abdomen were converted. Both of them were chronically ill patients with paralytic ileus, who had been misdiagnosed preoperatively as suffering from mechanical obstruction.

Three patients required conversion due to iatrogenic bowel injury during the release of adhesions. In one case without spillage, a

target incision was made, loop release was performed, and the tear was sutured. Two other patients with gross spillage of the bowel contents required laparotomy, repair of the tear, abdominal toilet and conventional adhesiolysis. The laparoscopic diagnosis was made correctly in 63 patients (96.9%). One patient had a kinked loop of bowel adherent to an inflamed distal ileum. The adhesion was lysed laparoscopically, and an operative diagnosis of Crohn's disease was made. She had a rapid recovery after high-dose steroid treatment, but came back with recurrent obstruction 2 months later. At that time, she underwent open exploration with resection of the diseased segment. Surprisingly, the pathology report showed adenocarcinoma of the distal ileum. The other diagnostic error was in a patient with a previous appendectomy. Adhesions were divided around the cecum as at the transitional point, and the procedure was terminated. Further evaluation during the same hospitalization revealed cancer of the ascending colon. He underwent a successful right hemicolectomy. Patients in whom treatment was completed laparoscopically had a

much easier postoperative course than those for whom conversion was necessary. In most patients, the nasogastric tube was taken out on the 1st postoperative day and a liquid diet was started at 1.2 days on average (range, 0.8–3). The morbidity rate was lower in the laparoscopic group (Table 2). The mean duration of operation was 40 min (range, 25–160). The mean hospital stay was 4.2 days (range, 2–18). There were two deaths. One patient had a forward milking of a bezoar after conversion. She developed a perforation of the small bowel at the site where the bezoar was stuck and died from septic complications. The other patient, who was chronically ill with severe ischemic heart disease and unstable angina, presented with a strangulated internal hernia in a virgin abdomen. There was no way to avoid an operation. Laparoscopic bowel release took 25 min using intraabdominal pressures of 10 mmHg and was uneventful, but the patient died in the recovery room after a premature extubation. During a mean follow-up of 24.4 months (range, 1–60), we did not observe any recurrences of the bowel obstruction.

DISCUSSION

Small bowel obstruction remains a serious and common abdominal emergency, with a morbidity rate that can reach 30% if strangulation is present.² In 1991, Bastug et al.³ reported the laparoscopic section of a single band responsible for SBO. Since then, the role of laparoscopy in the management of SBO has received increasing attention. A few large series describing the laparoscopic management of SBO have shown promising results. The decision to operate on a patient with SBO laparoscopically must be made early (within 24–48 h), and the procedure requires an experienced laparoscopic surgeon and a well-trained surgical team.^{1,4-9}

In this study, laparoscopy established the cause of obstruction in 97% of patients. Their treatment was completed laparoscopically in 52% of cases and as a laparoscopy-assisted procedure in 20% of cases. Minimally invasive and reduced-access approaches were totally successful, thus obviating the need for a formal laparotomy in 72% of our patients. The main cause of obstruction in our series was postoperative adhesions. In 59% of these cases, division was achieved by laparoscopy. In >50% of patients, mechanical SBO is caused by postoperative adhesions, and a single band is often responsible. The single band is found more frequently in post-appendectomy patients.

As we have demonstrated in this series, the single band can often be lysed using minimally invasive methods. Multiple dense adhesions, which are difficult to release laparoscopically, are present after pelvic surgery. Due to the reduced posterior view and the small closed pelvic cavity, adhesiolysis by laparoscopy may be difficult and conversion may be necessary.

A potential problem in operating on patients with adhesions is that the new operation causes even more adhesions. Indeed, every surgeon has encountered patients who have been operated on a number of times for SBO caused by adhesions. Each additional operation is more difficult and more dangerous than the previous one. Laparoscopy is thought to induce fewer postoperative adhesions than laparotomy^{10,11} and therefore appears to be an attractive alternative to laparotomy for the treatment of this type of patient.

Sato et al.¹² reported two cases of recurrent SBO after laparoscopic adhesiolysis. During a follow-up of 24 months,

neither patient was forced to return with a recurrent obstruction. However, the true impact of laparoscopy on recurrent adhesions and bowel obstruction can only be established by studies with long follow-up. In most cases, the Veress needle was inserted in the left hypochondrium to initiate the pneumoperitoneum.

The first trocar was placed as far as possible from the site of the previous operation. Franklin et al.¹³ have routinely used this technique without complications. Caprini et al. have used ultrasound mapping of the adhesions as a way of avoiding the complications of Veress needle puncture.¹⁴ Most authors recommend mandatory open insertion of the initial trocar as a means of preventing small bowel injury.^{2,5,9,15} However, we did not have any bowel injuries after blind insertion of the needle and first trocar by the closed technique. One of the problems with emergency laparoscopy for SBO is that it is difficult to find the site of the obstruction in the presence of distended bowel loops. Tilting the operating table and changing the scope port enables visualization from different angles, especially in the pelvis or right lower quadrant. If the transitional point is not found, conversion should be performed for formal bowel exploration. In one of our cases, where the adhesions were divided in an appendectomy scar as a transitional zone, colonic carcinoma was missed.

Levard et al.⁶ and Suter et al.⁹ have used laparoscopic ultrasound to identify intraluminal masses in cases of obstruction. However, although it is difficult, bowel palpation by laparoscopic devices is possible for the diagnosis of obstructive intraluminal findings. In two of our cases, no transitional point could be found, so the operation was converted. Paralytic ileus was diagnosed after open exploration did not reveal the cause of the obstruction. In these patients with severe abdominal distention, the diagnosis of SBO had been made by preoperative radiograph. In such comorbid patients, the preoperative diagnosis should be made with the most noninvasive diagnostic tools available so that unnecessary surgery can be avoided. Safety has been a primary concern for surgeons performing laparoscopy in cases of acute SBO. Patients with bowel distention associated with obstruction are prone to perforation. We recommend beginning the bowel exploration from the collapsed are loops, as described by Bailey et al.,² as a way of preventing incidental bowel injury. The need for enterotomy can be reduced if meticulous care is taken in the use of atraumatic graspers only and if the manipulation of friable, distended bowel is minimized by handling the mesentery whenever possible. The ability to work with a different instrument in each hand a grasper for bowel traction and a pair of scissors for the division of adhesions, or two graspers for bowel exploration is an important skill for the operating surgeon. Maintaining a low threshold for conversion in cases of severe dense, extensive adhesions or when pelvic adhesions are found will further decrease the risk of bowel injury. It is our policy not to persevere in this venture for hours but rather to convert readily to laparotomy. In cases of iatrogenic perforation and minor contamination with bowel contents in the presence of minimally dilated loops, laparoscopic closure can be performed. We believe that the lysis of all intraabdominal adhesions is unnecessary. However, it should be done as necessary to create a viable working space and optimize the view of the operating field. Release of the stuck band with improvement of the obstruction under direct vision is sufficient for completion of the operation. The division of multiple adhesions far from the sites of the obstruction is unnecessary and dangerous

due to the risk of bowel injury and small hemorrhages, which lead to the formation of new bands.

When pathology other than adhesions is found on laparoscopy, a target incision is needed for the performance of either a bowel resection or an enterotomy. We believe that laparoscopic resection for bowel obstruction is feasible, but too expensive. There is a high risk that the peritoneal cavity will be contaminated by bowel content due to distended loops. Bowel resection via a small target incision is a safe and cheap procedure, however, time-consuming. Specimen removal after laparoscopic resection can be done via the same small incision. In the virgin abdomen, the cause of obstruction should be sought. Laparoscopy is a nice diagnostic tool that may visualize the source of obstruction. Thus, diagnostic laparoscopy enables the other expensive and time-consuming investigations to be excluded from the preoperative workup. In the present study, patients with successful laparoscopic treatment had a lower incidence of postoperative morbidity, resumed intestinal function and oral intake earlier, and had a shorter hospital stay than those in whom conversion was necessary. The early decision for operation in patients with SBO may reduce the rate of bowel resection for closed loop obstruction and bowel necrosis.

CONCLUSION

We have found laparoscopy to be a safe and effective technique for the management of acute SBO. We strongly recommend its use as the first line of treatment by surgeons with experience in this area.

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