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Laparoscopy for Small Bowel Obstruction Caused by Single Adhesive Band

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ABSTRACT

Background and Objectives: There are still concerns about the comparative outcomes of operative treatment (OT) and conservative (nonsurgical) treatment (CT) for small bowel obstruction (SBO), especially that caused by single adhesive bands. We performed a retrospective study to compare surgical with nonsurgical outcomes.

Methods: A total of 62 patients were enrolled. The OT group underwent laparoscopy (n = 16), and the CT group (n = 46) did not. We compared early and late outcomes between the 2 groups.

Results: Times to first flatus, oral intake, and defecation after treatment were shorter in the OT group (P = .030, .033, and .024), and the recurrence rate was lower in the OT group than in the CT group (6.2% vs 32.6%; P = .038). Time from discharge to first recurrence was longer in the OT group than in the CT group (172 vs 104.6 ± 26.5 days, P = .027).

Conclusions: SBO related to a single adhesive band is not effectively treated by CT. However, laparoscopic OT provides notable success if the surgery is performed early. Therefore, it should be the preferred treatment.

Key Words: Conservative treatment, Laparoscopy, Operative treatment, Single adhesive band, Small bowel obstruction.

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INTRODUCTION

Small bowel obstruction (SBO) is one of the most common causes of acute hospital admission and urgent surgery in surgical units.[1] Postoperative adhesions, including adhesive bands, are the most common cause of SBO, followed by hernia, intra-abdominal tumor, and inflammatory disorders.[2] Many differing opinions on the most appropriate management of SBO appear in the literature, with the main camps being operative treatment (OT) and conservative (nonsurgical) treatment (CT). Therefore, the treatment of SBO has become a clinical challenge.[3] Currently, most surgeons suggest an initial trial of CT for patients with SBO who show no clinical features of strangulation. However, in a considerable number of cases, the obstruction fails to resolve after CT. These patients eventually undergo OT, but the outcome is suboptimal, as morbidity and mortality are then increased because of the delayed surgery. In addition, hospital stays are prolonged in these cases, eventually leading to higher hospital costs.[4] In addition, the frequency of recurrence of SBO in patients who have received CT is reported to range from 34 to 40%, with recurrence frequently leading to surgery in these patients.[5–8]

We compared the early and late postoperative outcomes of patients between 2 groups (OT and CT) to evaluate which treatment provides better results for patients with SBO, especially that caused by single adhesive bands.

MATERIALS AND METHODS

Patient Selection

Among 228 patients who were admitted to the Chung-Ang University Hospital from March 2006 through March 2013 with a diagnosis of SBO, 62 patients with SBO caused by a single adhesive band were enrolled in the study. The study was retrospective and made use of a prospectively maintained database. This cohort study involved a questionnaire and was approved by the Institutional Review Board of Chung-Ang University Hospital (Seoul, Korea). The requirement to obtain informed consent was waived.

The diagnosis was based on clinical and radiological findings. All patients underwent abdominopelvic computed tomography (APCT) for evaluation of the type and severity of SBO. Patients were excluded if they had contraindications to laparoscopy, advanced and complete SBO leading to massive bowel distension that did not allow for adequate visualization, or generalized or localized peritonitis needing immediate surgery.

The following clinical data were collected for all patients at presentation: age, sex, body mass index (BMI), risk classification according to the physical status classification of the American Society of Anesthesiologists (ASA), operative history, vital signs such as heart rate and body temperature, and laboratory results, including white blood cell count (WBC), highly selective C-reactive protein (HS-CRP) level, and amylase level.

Early post-treatment outcomes (inpatient) such as duration of hospital stay and times to flatus, oral intake, and defecation after the start of treatment with OT or CT were determined, as well as morbidity and mortality rates. Even in the OT group, all time variables were counted from admission; thus, they corresponded to the variables in the CT group.

The recurrence rate and the time interval between discharge and recurrence of SBO were also investigated to assess late post-treatment outcomes. All patients were followed up for at least 1 year after treatment.

Operative Treatment Using Laparoscopy

All operations were performed with the patient under general anesthesia. An umbilical port using an 11-mm trocar was introduced into the peritoneal cavity by the Hasson technique, and the cavity was insufflated with CO_2 gas to establish pneumoperitoneum with an intraperitoneal pressure of 12–15 mm Hg. Under visual confirmation, other ports were inserted in the opposite direction to the obstructive adhesive band. Scope placement and port location were not consistent and depended on the location of the adhesions. In most of the cases, the 3-port technique was used, but if visualization of the operation field was inadequate, 1 or more additional ports were introduced for traction. A flexible laparoscope for visualization, a blunt dissector, a harmonic scalpel, and scissors with surgical clips were used. No surgical drain was inserted.

Conservative Treatment

CT consisted of the insertion of a nasogastric tube, putting the patient on a fast, and administering fluids and electrolytes. The patients were monitored with physical examination, serial abdominal radiographs, and laboratory tests.

Statistical Analysis

For intergroup comparisons, the distribution of the data was first evaluated for normality using the Shapiro-Wilk test. The normally distributed data are presented herein as the mean ± SD, and the groups were compared by using Student's *t* test. The nonnormally distributed data are expressed as medians (interquartile range), and these data were analyzed using the Mann-Whitney *U*-test. Descriptive variables were subjected to χ^2 analysis or Fisher's exact test, as appropriate, and $P < .05$ was regarded as statistically significant. Statistical analysis was conducted using SPSS ver. 18.0 (SPSS Inc., Chicago, Illinois, USA).

RESULTS

Sixty-two patients who presented with a diagnosis of SBO with a single adhesive band were enrolled in the study. Of these patients, 16 (25.8%) were enrolled in the OT group and 46 (74.2%) in the CT group. All patients in the CT group had been successfully treated without an operation. There were no significant differences in demographics such as age and sex and no significant differences in BMI and ASA score (**Table 1**).

Table 1.
Demographics of Patients

Characteristics	OT (n = 16)	CT (n = 46)	*P*
Age, years	50.81 ± 20.4	47.89 ± 18.31	0.595
Sex ratio (male/female)	7/9	22/24	0.778
BMI, kg/m^2 (range)	20.7 (19.13–22.53)	22.55 (20.50–23.90)	0.073
ASA risk, n (%)			
I/II	13 (81.3)	38 (82.6)	
III/IV	3 (18.7)	8 (17.4)	0.902

Fifty-five patients (88.7%) had a history of abdominal surgery before SBO developed. We classified the patients according to operation types, the most common being lower gastrointestinal surgery (**Table 2**). Vital signs (heart rate and temperature) and preoperative laboratory test results at admission, including white blood cell count (WBC), high-sensitivity C-reactive protein (HS-CRP) level, and amylase level showed no significant differences between the CT and OT groups (**Table 3**).

In the OT group, all patients had intraoperative findings of a single adhesive band and were operated on by laparoscopy; none of the procedures was converted to open surgery. **Table 4** shows a comparison of the early post-treatment outcomes between the groups. The mean hospital stay was slightly longer in the OT group, but this difference was not statistically significant. The times to first flatus, oral intake, and defecation were significantly shorter in the OT group ($P = .030$, .033, and .024). There were no significant differences in morbidity and mortality rates between the groups. The only morbidities were 1 case of wound infection (in the OT group) and 1 of pulmonary complications (in the CT group).

The recurrence rate and the time to first recurrence of SBO after discharge were investigated in the assessment of late postoperative outcomes. The recurrence rate was significantly lower in the OT group (6.3%) than in the CT group (32.6%; $P = .038$). The time to first recurrence after discharge was longer in the OT group (172 days) than in the CT group (104.6 ± 26.5 days), and this difference was statistically significant ($P = .027$; **Table 5**).

DISCUSSION

Today, with the increased incidence of abdominal surgery, SBO is a major cause of rehospitalization. It occurs in 12–17% of laparotomies and accounts for 0.9% of all hospital admissions in the Western world.[9] The socioeconomic impact of SBO is significant, but until now, the proper management of SBO has remained a clinical challenge.[10] Traditionally, CT involving the use of nasogastric decompression and fluid resuscitation with serial assessment has been successful in many patients with SBO. However, some patients fail to respond to CT and eventually undergo OT, resulting in increased morbidity and mortality rates for SBO, especially in the presence of bowel strangulation.[3,4,9,11]

There have been many reports of possible predictive indicators of OT in patients with SBO. One study suggested that clinically, older age, the presence of ascites, and a high nasogastric drainage volume on day 3 are critical factors in identifying patients who are most likely to need OT.[4] Another study focused on abdominal–pelvic computed tomography (APCT) findings and reported that the presence of free intraperitoneal fluid, mesenteric edema, and small bowel feces are useful signs aiding the decision-making process of whether to perform surgery.[12,13] Our research limited the study population to patients who had SBO with a single adhesive band. Delabrousse et al[12] reported that an adhesive band, which is usually constrictive and may easily lead to closed-loop obstruction, a complication that tends to involve the mesentery and make the bowel prone to infarction, is by far the most common cause of strangulation in SBO.

In SBO caused by matted adhesions, APCT reveals an acute-angle U- or J-shaped configuration that consists of the proximal dilated and distal collapsed intestine. However, in SBO with an adhesive band, APCT shows the fat notch sign, which represents extraluminal compression of the bowel by an adhesive band and can occasionally provide direct visualization of adhesive bands.[14] We diagnosed adhesive bands based on APCT findings when there was an abrupt change in bowel caliber without any other cause of obstruction, or when a transition zone associated with a dilated closed-loop appearance was observed, which is reported to be caused typically by adhesive bands.[13,15] The usefulness of APCT for identifying SBO with adhesive bands has been demonstrated in a previous study. Our study yielded similar results: APCT accurately identified SBO with adhesive bands in our patients. After surgery (which can verify APCT findings), none of the patients in the OT group were diagnosed with SBO of a different cause.[5,12]

Few studies have addressed the outcomes of patients with SBO after CT or OT. One study reported that patients undergoing OT experienced a lower recurrence rate and

Table 2.
Operation Type and History of Patients

Characteristics	OT (n = 16)	CT (n = 46)
Lower GI	7	27
Upper GI	3	4
Appendectomy	3	2
OBGY	2	6
Others	1	0
None	0	7

GI, gastrointestinal; OBGY, obstetrics and gynecology.

Table 3.
Preoperative Physical and Laboratory Findings of Patients

Characteristics	OT (n = 16)	CT (n = 46)	*P*
Heart rate (bpm)	76 (72–80)	76 (72–80)	0.482
Temperature (°C)	36.77 ± 0.28	36.6 ± 0.35	0.096
WBC	9,313 ± 3,487.73	10,520.51 ± 3,907.38	0.279
HS-CRP	7.62 (1.20–15.19)	2.11 (0.70–6.45)	0.145
Amylase	54.50 (38.75–77.50)	52.00 (42.00–71.25)	0.828

Table 4.
Early Posttreatment Outcomes in Inpatients

Characteristics	OT (n = 16)	CT (n = 46)	*P*
Hospital stay, days	7.5 ± 1.26	6.87 ± 2.01	0.247
Time to flatus, hours	29.00 (22.75–40.25)	42.00 (24.75–52.50)	0.030
Time to oral intake, hours	34.50 (29.00–44.50)	49.50 (29.00–58.00)	0.033
Time to defecation, hours	53.00 (44.00–64.00)	69.00 (50.50–81.25)	0.024
Morbidity, n (%)	1 (6.3)	1 (2.2)	0.427
Mortality, n (%)	0 (0)	0 (0)	NS

Values are expressed as the mean ± SD, median (interquartile range), or absolute number.

Table 5.
Late Post-treatment Outcomes

Characteristics	OT (n = 16)	CT (n = 46)	*P*
Recurrence rate, n (%)	1 (6.3%)	15 (32.6%)	0.038
Time to recurrence, days	172	104.6 ± 26.5	0.027

longer intervals between discharge and recurrence than did patients who received CT. These results were similar to those of the present study.[16] However, unlike the study that reported a significantly longer hospital stay for the OT group, we identified no such significant difference in our study. Furthermore, in the case of the CT group of patients who later switched to the OT group, if we adjust for the time this group spent in the hospital before moving to the other group (median length of time before switching treatment was 1.8 days), the OT group showed a better result in length of hospital stay than the CT group. Laparoscopy as a surgical technique may also be a factor in the improved outcomes. Laparoscopic surgery may offer many advantages to patients (more than open surgery), such as reduced postoperative pain, ileus, and hospital stay with fewer postoperative complications, and, in the long term, a decrease in the incidence of adhesions and incisional hernia.[17,18] Our study also demonstrated faster recovery for patients in the OT group with respect to shorter times to flatus, oral intake, and defecation when compared to the patients who underwent open surgery and whose results have been reported in previous studies.[2,16]

One of the more interesting results of this study is that the long-term outcomes for OT were superior to those for CT. OT showed a lower rate of recurrence and a longer interval between discharge and recurrence. Our results are similar to those of a study by Williams et al,[16] who found the recurrence rate and mean time to recurrence for patients with OT to be 26.8% and 411 days, compared with 40.5% and 153 days for those who received CT. In contrast to these results, other studies reported no differences in recurrence rate or time from discharge to recurrence between the treatment groups.[19,20] However, all patients in this study were treated with laparoscopy, and because laparoscopic surgery may offer advantages, such as lower incidences of postoperative adhesion and incisional hernia (the main causes of SBO recurrence after surgery), this fact may have contributed to the superior outcomes when compared with other surgical treatments.

Because the highest conversion rates (from CT to OT) have been reported when there has been no selection of patients, many studies have focused on the selection of proper candidates for laparoscopic surgery. One study showed that the rate of success was significantly higher in patients who had been operated on as early as 24 h after hospitalization, who had fewer than 3 prior operations, or who had a single-band obstruction rather than diffuse matted adhesions.[2] Another study reported that duration of surgery and a bowel diameter exceeding 4 cm were predictors of conversion to open surgery.[21]

In our study, none of the operations was converted to open surgery, and this surprising success rate for laparoscopic surgery may have depended on several factors. First, we routinely used the open Hasson technique, placing the first port safely in the periumbilical area, gently using atraumatic intestinal bowel clamps, and dividing adhesions with scissors or a harmonic scalpel rather than with monopolar electrocautery (the latter recommended by previous studies).[17,22] These procedures help to avoid iatrogenic bowel perforation. The second reason may be that we limited the study population to patients who had SBO with a single adhesive band. The diameter of the bowel proximal to the transition zone of the adhesive band and the diameter of the bowel distal to this location are clearly different in size, which allows for easier distinguishing of the adhesive band and the division of the band with minimal handling of other intra-abdominal contents when compared to SBO with multiple matted adhesions. Third, OT was performed within 2 days in our study (a mean of 1.8 days after hospitalization). Therefore, the likelihood that bowel distension and edema were still of a tolerable degree by the time surgery was performed was increased, allowing for adequate visualization of the working domain and reducing the chance that instrument movement would cause bowel injury.

Because of the retrospective nature of our study, we were forced to rely on the completeness of medical records for our analyses, and selection bias could not be completely eliminated. In addition, the study population was relatively small; further studies involving a larger number of patients are warranted to confirm these promising results.

In conclusion, based on our experience, many patients with SBO with a single adhesive band did not respond well to CT. All patients with typical APCT findings of a single adhesive band had the same operative findings, and laparoscopic OT had superior early outcomes, such as quicker recovery, and late outcomes, such as a lower rate of recurrence of SBO and a longer time interval between discharge and recurrence than CT. We propose that early OT after hospitalization (within 2 days) contributes to the notable success of laparoscopy in the treatment of SBO with a single adhesive band in our study. Therefore, we conclude that patients presenting with SBO with an adhesive band should be managed with laparoscopic OT and not with CT.

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