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The long-term outcomes of recurrent adhesive small bowel obstruction after colorectal cancer surgery favor surgical management

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Abstract

An adhesive small bowel obstruction (ASBO) is generally caused by postoperative adhesions and is more frequently associated with colorectal surgeries than other procedures. We compared the outcomes of operative and conservative management of ASBO after primary colorectal cancer surgery.

We retrospectively reviewed 5060 patients who underwent curative surgery for primary colorectal cancer; 388 of these patients (7.7%) were readmitted with a diagnosis of SBO. We analyzed the clinical course of these patients with reference to the cause of their surgery.

Of the 388 SBO patients analyzed, 170 were diagnosed with ASBO. Their 3-, 5-, and 7-year recurrence-free survival rates were 86.1%, 72.8%, and 61.5%, respectively. The median follow-up period was 59.2 months. Repeated conservative management for ASBO without surgical management led to higher recurrence rates: 21.0% after the first admission, 41.7% after the second, 60.0% after the third, and 100% after the fourth ($P = .006$). Surgical management was needed for 19.2%, 22.2%, 50%, and 66.7% of patients admitted with ASBO on the first to fourth hospitalizations, respectively. Repeated hospitalization for obstruction led to a greater possibility of surgical management ($P = .001$). Of 27 patients with surgical management at the first admission, 6 (17.6%) were readmitted with a diagnosis of SBO, but there were no further episodes of SBO in the surgically managed patients.

Patients who undergo operative management for ASBO have a reduced risk of recurrence requiring hospitalization, whereas those with repeated conservative management have an increased risk of recurrence and require operative management. Operative management should be considered for recurrent SBO.

Abbreviations: ASBO = adhesive small bowel obstruction, CRC = colorectal cancer, NG tube = nasogastric tube.

Keywords: adhesive small bowel obstruction, colorectal cancer, recurrent small bowel obstruction, surgical management

1. Introduction

Abdominal adhesions represent the most common cause of intestinal obstruction and are responsible for 60% to 75% of small bowel obstructions (SBOs).[1,2] Previous surgery is the most important factor predisposing the development of adhesions, with a reported incidence of >90% following laparotomy.[3] Adhesive SBO (ASBO) is a common medical problem that typically requires hospital admission. The incidence of ASBO after open abdominal surgery has been estimated at between 12% and 53%, but this incidence increases after major laparotomy.[3–6] The operative procedures usually associated with SBO are colectomy, hysterectomy, and appendectomy; colorectal surgeries are reported to result in more adhesions than other procedures.[1,7–9]

ASBOs require appropriate management with a proper diagnostic and therapeutic pathway. Because the natural course of this clinical problem is still unclear, there is an ongoing debate over whether to operate. Current management options include emergent operation for clinical signs of acute abdomen or compromised bowel perfusion, conservative management, and exploratory surgery to determine the cause of the failure of SBO resolution. However, the indications for conservative management, its length, and the timing of appropriate operations remain controversial. In many patients, SBOs resolve without surgery. However, successful conservative treatment may leave adhesions that could cause the recurrence of obstruction. Operative management can lead to the formation of new adhesions, which in turn can contribute to recurrence.[9,10] Thus, the treatment method (operative or conservative) significantly influences the risk of recurrence, and patients who are treated conservatively show the highest recurrence rate.[7,11,12]

In present study, we evaluated the outcomes of operative and conservative management and exploratory surgery in patients with ASBO after primary surgery for colorectal cancer (CRC).

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2. Methods

The medical records of 6054 patients who had surgery for CRC at Asan Medical Center (Seoul, Korea) from January 2005 to December 2009 were retrospectively reviewed. Of these 6054 cases, 994 who underwent palliative surgery or surgery for recurrent cancer were excluded; 388 of the remaining 5060 patients (7.7%) were readmitted with a diagnosis of SBO. Of these 388 cases, 218 patients were not analyzed further in accordance with our exclusion criteria (Fig. 1). We also excluded patients who were admitted within 30 days of their initial colorectal surgery. A final cohort of 170 patients (3.36%) was analyzed in this study.

All patients received laboratory exams and plain abdominal radiography. More than 90% of these patients also received an abdominopelvic CT. Oral contrast was not typically used for the initial diagnosis in present study patients because it can cause vomiting or aggravate bowel dilation. However, some surgeons used gastrografin, given orally, for diagnostic and therapeutic purposes if the patient was not completely obstructed.

Most surgeons at our hospital use the same protocol for postoperative management and conservative treatment of SBO. The usual postoperative management regimen comprises sips of water on the first day after surgery, a liquid diet on the second day, and a soft diet on the third day. We do not routinely use a nasogastric (NG) tube at our center during the postoperative period. Standard conservative treatment involves fasting, the use of intravenous fluid infusion, and bowel decompression with an NG tube for patients with obstructive symptoms (nausea or vomiting). Surgical treatment involves an exploratory laparotomy with adhesiolysis, with or without small bowel resection.

The present study protocol was approved by the institutional review board of Asan Medical Center (registration no: S2016–1685–0001), in accordance with the Declaration of Helsinki.

2.1. Statistical analysis

All data were analyzed using Statistical Package for the Social Sciences software (version 18.0; SPSS Inc, Chicago, IL). A χ^2 test was used to compare the clinicopathologic parameters between groups. Cumulative survival rates were calculated using the Kaplan-Meier method. Univariate and multivariate analyses of factors associated with relapse were performed using multivariate logistic regression analyses and the Cox proportional hazards model to estimate hazard ratios and yield 95% confidence intervals. Statistical significance was defined as $P < .05$. Poisson regression analyses were used to compare recurrence rates of SBO according to the episode number.

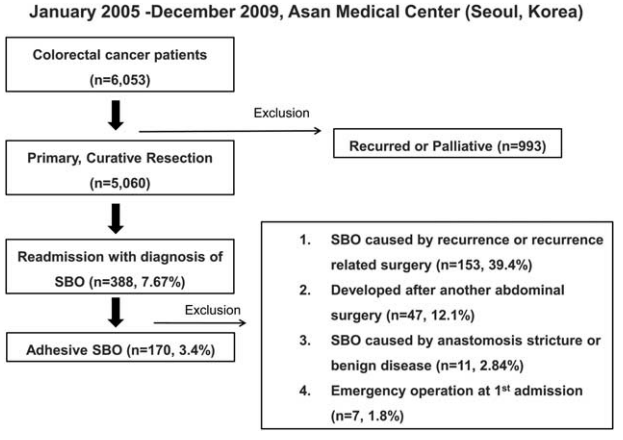

Figure 1. Patient inclusion criteria.

3. Results

3.1. Patient characteristics

The median follow-up time of the 170 study patients was 59.2 (± 26.3) months. The physical status and tumor characteristics of these cases are summarized in Table 1. Of the 5060 initially screened patients with CRC, 4132 underwent open surgery and 928 underwent laparoscopic surgery. Among these cases, 388 (7.7%) were readmitted with a diagnosis of SBO of which 218 patients met the following exclusion criteria and were not analyzed:

1. SBO caused by peritoneal seeding or that developed after recurrence-related surgery (n = 153, 39.4%);
2. SBO that developed after a different abdominal surgery (another primary cancer, cholecystectomy, or appendectomy; n = 47, 12.1%);
3. SBO caused by an anastomosis stricture, an abdominal wall hernia, or radiation enteritis (n = 11, 2.8%);
4. Emergency operation at the first admission (n = 7, 1.8%) because of bowel ischemia (n = 5) and unstable vital signs (n = 2).

ASBO occurred in 158 patients (3.8%) in the open surgery group and in 12 patients (1.3%) in the laparoscopic group ($P < .001$). A total of 170 patients were hospitalized for primary ASBO after CRC surgery (3.4%). Of these, 27 (15.9%) underwent an operation (surgical group) and 143 (84.1%) were managed medically (conservative group) (Fig. 2A).

In total, 16 (59%) patients at the first admission, 5 (63%) patients at the second, and 4 (80%) patients at the third underwent surgical management due to a failure of conservative management. The average time from the beginning of conservative management to surgery was 7 days at the first admission, 4 days at the second, 1 day at the third, and 1.5 days at the fourth. Eight patients at the first admission (30%), 1 at the second (12%), and 1 at the third (20%) underwent surgical management for a worsening of symptoms (intractable pain, unstable vital signs, and strangulation) during conservative management (Table 2).

In the surgical group, the causes of surgery were the failure of conservative management (59%), ischemic signs (intractable pain, leukocytosis, or unstable vital signs) during conservative management (30%), and a CT finding of ischemia or closed-loop obstruction at diagnosis (11%). Within 5 days, 13 patients had undergone surgery, and their average length of stay after surgery was 11 days (Supplementary Table 1, http://links.lww.com/MD/B906). Among these 13 cases, 5 patients had adhesiolysis, 6 had a resection and anastomosis of the small intestine, and 2 underwent bypass surgery. By contrast, the 14 patients who underwent surgery after 5 days had an average length of stay of 19 days. Among these cases, 3 patients had adhesiolysis, 7 had a resection and anastomosis of the small intestine, 3 underwent bypass surgery, and 1 had extensive right hemicolectomy. Patients who underwent surgery over 5 days had longer hospital stays after surgery ($P = .022$) but did not have higher rates of complication

Table 1

Clinicopathologic characteristics of the ASBO patients in this study.

	Surgical management (n = 27)	Conservative management (n = 143)	*P* value
Age, y (mean ± SD)	59.2 ± 10.8	58.2 ± 12.1	.667
Sex			.83
Male	16 (59.3%)	89 (62.2%)	
Female	11 (40.7%)	54 (37.8%)	
Tumor location			.149
Colon	13 (48.1%)	90 (62.9%)	
Rectum	14 (51.9%)	53 (37.1%)	
Follow-up, mo (mean ± SD)	59.7 ± 27.4	57.0 ± 21.1	.595
Tumor size, cm	4.72 ± 2.6	4.23 ± 2.9	.34
Radiation therapy	10 (37.0%)	31 (21.7%)	.087
Combined operation	4 (11.8%)	17 (11.9%)	1.000
Presence of stoma	7 (20.6%)	32 (22.4%)	.821
Previous operation Hx	8 (29.6%)	25 (17.5%)	.143
Operative time, min (mean ± SD)	158 ± 63	149 ± 65	.331
Use of antiadhesive agent	17 (63%)	87 (61%)	.457
Type of initial surgery			.939
Laparoscopy	2 (7.4%)	10 (7.0%)	
Open	25 (92.6%)	133 (93.0%)	
Stage			.965
I	6 (22.2%)	35 (24.5%)	
II	10 (37.0%)	54 (37.8%)	
III	11 (40.7%)	54 (37.8%)	
Interval between initial surgery and admission for ASBO, mo (mean ± SD)	16.6 ± 22.5	14.4 ± 20.0	.619
Interval between admission and soft diet, d (mean ± SD)	15 ± 7.9	7 ± 5.4	.004

ASBO = adhesive small bowel obstruction, SD = standard deviation.

(*P* = .117) or bowel resection (*P* = .094, Supplementary Table 1, http://links.lww.com/MD/B906).

The patients who underwent surgical management at the first admission had longer hospital stays (23 days) than the conservatively managed patients (11 days), and this difference was statistically significant (*P* < .05). These longer stays were due to failures in conservative management that then led to operative management (and therefore a longer preoperative lag period).

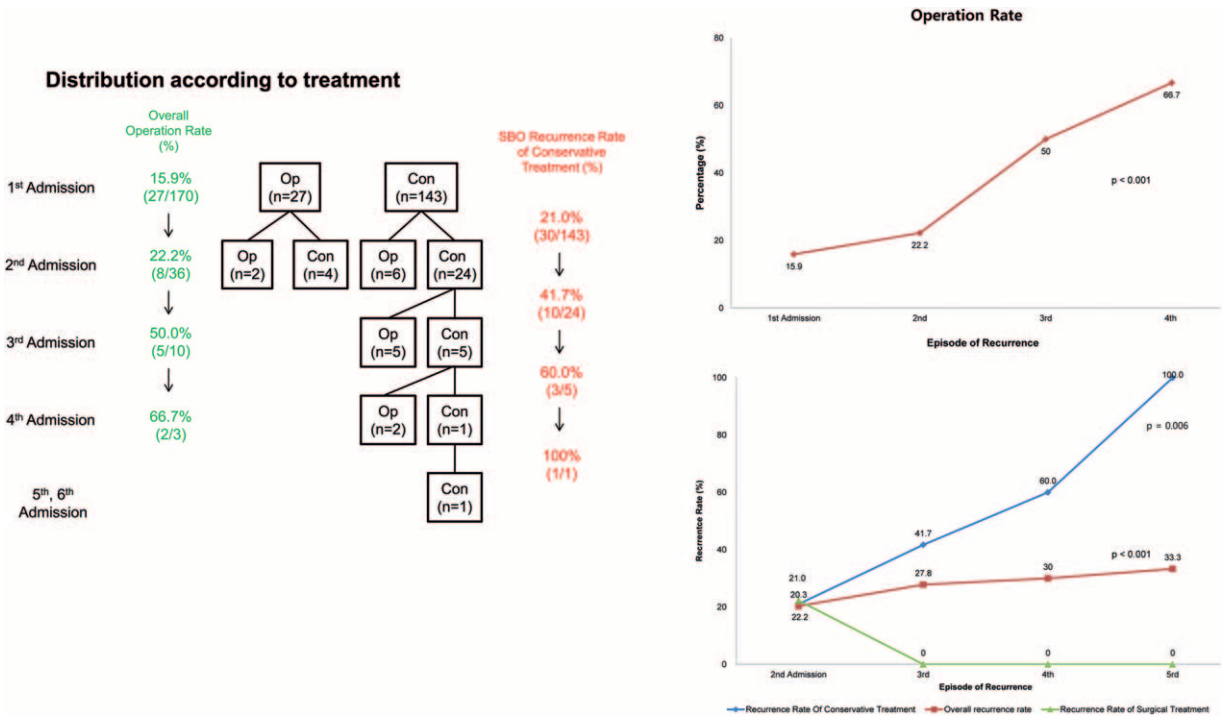

Figure 2. (A) Patient distribution according to treatment management. (B) SBO recurrence rate and operation rate according to recurrence episode. SBO = small bowel obstruction.

Table 2

Surgical outcomes in the study patients according to the number of admissions.

	Surgery at the first admission (n=27)	Surgery at the second admission (n=8)	Surgery at the third admission (n=5)	Surgery at the fourth admission (n=2)
Mean operation time (min, ±SD)	150±65	103±77	93±95	119±4
Average interval between Dx and surgery (d, median)	7 (1–30)	4 (0–13)	1 (0–3)	2.5 (2–3)
Interval between surgery and soft diet (d, median)	7 (4–37)	6 (3–12)	7 (5–12)	6 (5–7)
Duration of keeping NG tube after surgery (d, median)	3 (0–18)	1 (0–4)	2 (0–10)	1 (0–2)
Type of surgery				
Bowel resection (n, %)	14 (52%)	3 (38%)	3 (60%)	1 (50%)
Bypass (n, %)	0 (0%)	1 (12%)	1 (20%)	1 (50%)
Adhesiolysis (n, %)	13 (48%)	4 (50%)	1 (20%)	0 (0%)
Length of postoperative hospital stay (d, median)	11 (6–64)	12 (7–17)	17 (6–25)	9 (8–10)
Morbidity (n, %)	1 (4%)	1 (13%)	0 (0%)	0 (0%)
Cause of operation				
Failure of conservative management (n, %)	16 (59%)	5 (63%)	4 (80%)	1 (50%)
Ischemic sign				
at diagnosis of ASBO (n, %)	3 (11%)	2 (25%)	0 (0%)	0 (0%)
during conservative management (n, %)	8 (30%)	1 (12%)	1 (20%)	1 (50%)

ASBO = adhesive small bowel obstruction, NG = nasogastric, SD = standard deviation.

3.2. Recurrence

Six patients (22%) in the surgical group and 30 (21%) in the conservative group were rehospitalized for SBO recurrence (OR, 0.8; 95% CI, 0.3–2.1; $P=.665$). No patients in the surgical group were readmitted twice but 10 patients (7%) in the conservative group required >1 readmission ($P=.212$). Among the study patients initially assigned to the surgical group, 2 (6%) needed surgical treatment for recurrent SBO, whereas 13 patients (9%) in the conservative group required surgery (OR, 0.6; 95% CI, 0.1–2.9; $P=.549$).

Patients who underwent repeated conservative management showed higher rates of recurrence (Fig. 2A). A total of 143 patients in present series received conservative management at their first admission, and 30 of these cases (21%) had recurrent ASBO. Among these 30 recurrent cases, 24 patients underwent conservative management at the second admission and 10 (42%) had recurrent ASBO. Five of these recurrent ASBO patients were managed conservatively again of which 3 were admitted due to repeated ASBO. Repeated conservative management was significantly associated with a higher recurrence rate ($P=.006$, Fig. 2B). The overall operation rate was 16% at the first admission, 22% at the second, 50% at the third, and 67% at the fourth ($P<.001$, Fig. 2B).

The bowel resection rate, morbidity, length of postoperative hospital stay, and operation time in the patients treated surgically were similar regardless of the number of admissions (Table 2). The bowel resection rate of patients treated surgically was 52% for the first admission, 38% for the second, 60% for the third, and 50% for the fourth. The length of postoperative hospital stay was 11 days for the first admission, 12 days for the second, 17 days for the third, and 9 days for the fourth. The average length of the operation was 150 minutes for the first admission, 103 minutes for the second, 93 minutes for the third, and 119 minutes for the fourth. The interval between surgery and diet (soft diet) was 7 days for the first and third admission and 6 days for the second and fourth admission. The duration of NG tube use in the postoperative period was 3 days for first admission, 1 day for second admission, 2 days for third admission, and 1 day for fourth admission (Table 2). There were 2 cases of postoperative morbidity from a wound, one at the first and one at the second admission, but there were no postoperative deaths.

The mean interval between hospitalizations for primary colorectal surgery and the first admission for adhesive SBO was 14.8±20.4 months. The 3-, 5-, and 7-year SBO recurrence-free survival rates for the whole patient group were 86.1%±3.0%, 72.8%±4.5%, and 61.5%±6.9%, respectively (Fig. 3).

4. Discussion

The management of an SBO caused by adhesions is still controversial because although conservative treatment does

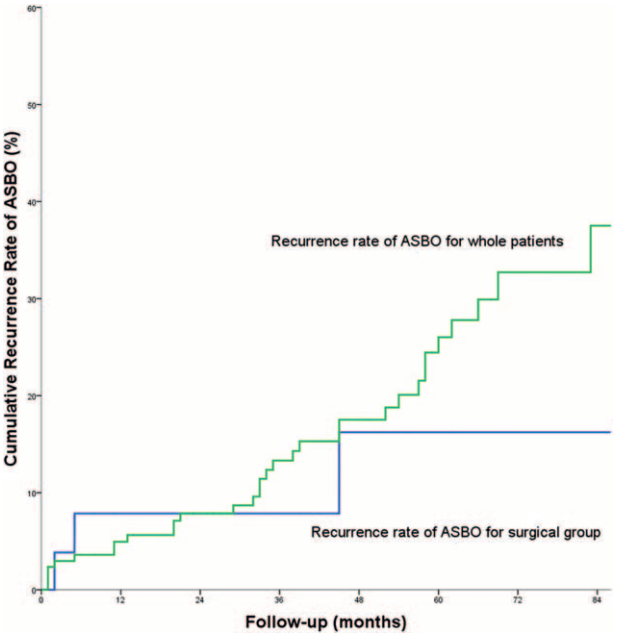

Figure 3. Overall cumulative ASBO recurrence rate for the whole study cohort and the surgical group (patients who underwent an operation at first admission). ASBO = adhesive small bowel obstruction.

not remove the cause of the obstruction, surgery can induce new adhesions.[12] The first step in the treatment of an ASBO is nonoperative management, because it is a safe approach even for cases of high grade or complete obstruction. Hence, without evidence of bowel ischemia or strangulation, most cases of intestinal obstruction are resolved with nonoperative treatment.[2,13–15]

In present study, we compared the outcomes of operative or conservative management in patients with ASBO. This condition is a common clinical problem after abdominal surgery, particularly colorectal resections and appendectomies.[2,5] Our results indicated an SBO rate after primary CRC surgery of 7.7% (388/5060) and an ASBO rate of 3.4% (170/5060). These rates are consistent with those reported previously in the literature, and may reflect improvements in operative techniques, devices, and antiadhesive materials. However, the follow-up period in our study was relatively short (59.2 months), which may also have influenced the low ASBO rate in present patient series.

The current practice for the management of SBO presumed to be secondary to adhesions is to perform a conservative management trial in patients that are clinically stable and have no evidence of bowel ischemia or strangulation. Previous studies have suggested that the symptoms improve in 43% to 70% of patients who are managed conservatively.[1,5,16,17] In our present study, the symptoms improved in 84% of the patients managed conservatively on the first admission and in 78% of those managed conservatively on the second. Out of 32,583 patients with an index admission for SBO in a prior US population study in 1997,[8] 24% had surgery during the first admission and, regardless of the treatment during the first admission, 81% of surviving patients had no additional ASBO readmissions during the subsequent 5 years. In another smaller study, Miller and associates[1] reported that 67% of their patients admitted for SBO had not required a readmission for this condition at a 10-year follow-up. In present study, 21% of our patients showed recurrent ASBO after their first admission, regardless of the treatment received. On the other hand, 79% of our study patients had no additional readmission for ASBO, a rate that is consistent with that reported in other studies. Hence, the majority of our patients was treated effectively with conservative management and had no recurrence.

The outcomes of repeated conservative management for recurrent ASBO have seldom been investigated. Our present study findings have demonstrated that repeat admissions for ASBO increased the risk of recurrence, especially in patients who underwent repeated conservative management only. The number of prior conservative management treatments greatly influenced the risk of recurrence for ASBO. Patients under only conservative management showed 21% recurrence after the first admission, 42% recurrence after the second admission, and 60% recurrence after the third admission. Hence, repeated conservative management of ASBO without surgical treatment leads to higher recurrence ($P=.006$). Moreover, only 50% of our patients at their second admission and 33% at their fourth had improved with conservative management. Miller et al[1] reported that both conservative and operative treatment of ASBO was associated with a 21.2% recurrence after the first admission, 27.8% recurrence after the second admission, and 30% recurrence after the third admission. In that study, most of the ASBO cases did not have a recurrent SBO that required admission, but the risk of recurrence increased with increasing number of admissions for ASBO. Nonoperative management has thus proved to be an effective treatment for ASBO but different treatment strategies should be considered depending on the number of recurrences.

Repeated admission for ASBO leads to a higher likelihood of surgical management. From our current analysis, among the patients who were admitted with SBO, surgical management was performed in 19%, 22%, 50%, and 67% of cases on the first to fourth hospitalizations, respectively. Patients underwent surgery due to the failure of conservative management or worsening of symptoms. In addition, surgical treatment for adhesive SBO seemed to reduce the risk of future hospital admissions. In our present study series also, the patients who underwent operations at their second, third, and fourth admissions needed no additional admission for recurrent ASBO. Several reports have evaluated the outcomes of operative or conservative management and found that the operative management of ASBO can reduce its recurrence.[8,15,18] Consistently, another prospective study with a long-term follow-up reported that the risk of recurrence was lower after surgical treatment than after conservative management.[14,19] In the previous study of Williams et al,[7] the frequency of recurrence for SBO (or ASBO?) patients treated nonoperatively was 40.5% versus 26.8% for cases treated operatively ($P=.009$). Landercasper et al[11] found a statistically significant difference between the rehospitalization rates of patients treated surgically (21%) and those treated conservatively (38%) ($P=.001$) and described recurrence rates of 29% and 53% for patients that did and did not undergo surgery, respectively. Fevang et al[14] found that the risk of SBO (or ASBO?) recurrence was significantly lower in patients when the last adhesive SBO episode was surgically treated than when it was nonsurgically treated. Surgery was thus shown to be effective treatment for recurrent ASBO and seemed to reduce the readmission rate for recurrent ASBO.

Delays in surgical treatment for SBO (or ASBO?) may cause substantial increases in morbidity and length of hospital stay. Some articles have reported that nonoperative management should not extend beyond 3 to 5 days for nonresolving SBO, even in the absence of clinical deterioration. Teixeira et al[20] reported that a delay in surgery of >72 hours results in 3-fold greater mortality and 2-fold more systemic infectious complications, than surgery performed within 24 hours of SBO (or ASBO?) presentation. Schraufnagel et al[21] reported that delays in surgical interventions for ASBO of >4 days were associated with higher mortality and longer hospital stays but not with complications or bowel resection. Similarly, present analysis has demonstrated that ASBO patients who underwent surgery after 5 days had longer hospital stays ($P=.022$) but not higher rates of complications ($P=.117$) nor bowel resection ($P=.094$).

The initial ASBO occurred 1 year after the abdominal operation in 66% of present study patients and between 1 and 5 years after the last operation in 31% of the cases in our series. This result is similar to that reported by Fevang et al[14] in which 41% of the patients presented with adhesive SBO within 1 year and 26% between 1 and 5 years after surgery. Miller et al,[1] examining 410 patients with 675 admissions for adhesive SBO from 1986 to 1996, found that 33% were readmitted for adhesive SBO after the initial adhesive SBO episode. Fevang et al[14] reported that 29% of their patients were readmitted. Similar results were found in our present cohort, with 21% of our current patients showing recurrence after their initial adhesive SBO episode during the follow-up period.

Repeated surgeries can cause multiple complications such as short bowel syndrome, intestinal fistula, or enterocutaneous fistula. In our hospital, patients who undergo repeated operations

for Crohn disease sometimes show multiple complications.[22] To avoid these adverse events, the operative management approach should be carefully determined. However, since the rate of recurrent ASBO was low among present study patients after operative management, only 2 of these cases underwent a second surgery and they did not show severe complications.

Unlike the findings of other studies, the length of time to readmission was not significantly different between our patients who had operations for ASBO during their first admission and those that were conservatively managed (median, 467 vs 454 days). Miller et al[1] reported previously that the time interval to readmission was significantly different between the operative group (median 2 years) and conservative group (median 0.7 years) in their patient series. Similarly, Williams and coworkers[7] demonstrated that patients treated conservatively had a shorter time to readmission for recurrent ASBO (153 days) than patients who had been surgically treated (411 days). Several studies have also reported that laparoscopy can potentially reduce adhesion formation by decreasing the injury to serosal and peritoneal surfaces, lowering the level of manipulation and retraction with surgical instruments, requiring smaller incisions, and reducing blood loss.[23] The significantly lower rate of ASBO in the laparoscopic group in present study is consistent with the findings of previous clinical studies of colorectal surgery.[23,24]

Our present study had some limitations of note. The retrospective nature of the analysis is an important limitation. Our sample size was also small and larger series will thus need to be analyzed in the future to validate our findings. Despite these limitations however, our analysis included only patients treated by experienced surgeons in a single center using standardized procedures, which should effectively control for any potentially confounding variables. A future large-scale, randomized controlled trial would help to definitively determine whether surgery is beneficial in terms of recurrence in nonstrangulated SBO patients. Notably however, it would not really be possible from an ethical standpoint to expose patients with no signs of severity to the risks of a surgical operation.

5. Conclusion

Most patients who are first diagnosed with ASBO do not have recurrent disease, regardless of whether they receive operative or conservative management. However, patients with repeated occurrences of ASBO show different outcomes depending on their treatment. Operative management for repeated ASBO reduces the rate of its recurrence requiring hospitalization. By contrast, conservative management of repeated ASBO cases is significantly associated with a higher rate of recurrent ASBO. Furthermore, the overall rate of surgical intervention increases with the number of admissions. Operative management should therefore be considered for recurrent ASBO, especially on the third admission.

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