

Single-port surgery (SPS) strategy for small bowel obstruction (SBO) caused by postoperative internal hernia

A series case report

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Abstract

Rationale: Internal hernia due to postoperative adhesions sometimes causes small bowel obstruction (SBO) and requires emergency surgery. The difficulties in the management of SBO with internal hernia include accurate diagnosis and estimation of its ischemic degree and of the risk of SBO recurrences following the surgical procedure. Laparoscopic surgery is a noninvasive to reduce postoperative adhesions and therefore has been widely used recently. However, surgeons often tend to hesitate in applying laparoscopic surgery for SBO because of some situational disadvantages such as poor operating space or iatrogenic bowel injury. Hence, laparoscopic surgery is still not yet the standard procedure for SBO caused by internal hernia. Thus, the establishment of an appropriate procedure for SBO due to internal hernia is required.

Patient concerns: We experienced 3 SBO cases caused by postoperative internal hernia. The first patient was a 59-year-old man who had temporary loop-ileostomy for a perforated sigmoid colon due to diverticulitis. Severe hypogastralgia and vomiting occurred suddenly on the 33rd postoperative day. The second patient was an 81-year-old man who had been hospitalized due to epigastralgia of unknown origin. He had a surgical history of omentum patching for a perforated duodenum 20 years ago. The third patient was a 72-year-old female who presented at our hospital after sudden and severe hypogastralgia. She had a surgical history of sigmoidectomy for her sigmoid colon cancer 22 years ago.

Diagnosis: A contrast computed tomography (CT) revealed a suspected closed loop obstruction of their bowels and immediate surgical treatments were required.

Intervention: We tried SPS using the surgical glove method as an initial approach for their SBO caused by postoperative internal hernia.

Outcomes: Two of these 3 cases completely underwent SPS treatment, which afforded accurate diagnosis of SBO. Laparotomy following SPS, which allowed accurate diagnosis, was judged to be appropriate and was performed in the third case. All the patients were discharged without any complications and SBO have not recurred after their discharge. Finally, we established a new strategy using SPS for SBO with internal hernia.

Lessons: Our experience suggests that SPS is a promising strategy as an initial surgical approach for SBO with internal hernia.

Abbreviations: CT = computed tomography, POD = postoperative day, SBO = small bowel obstruction, SPS = single-port surgery.

Keywords: internal hernia, SILS, small bowel obstruction, SPS

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1. Introduction

Internal hernia results in a small bowel obstruction (SBO) and often requires emergency surgery. Postoperative adhesions are the most common cause of an internal hernia.^[1] The surgical procedures for SBO with an internal hernia can in itself cause new-onset adhesions and subsequent SBO recurrence, the possibility of which a clinical dilemma. In addition, accurate diagnosis or estimation of the degree of ischemia accompanying SBO is relatively difficult. Recently, procedures for single-port surgery (SPS) have been applied to various surgeries, for example, cholecystectomy and appendectomy, because of the advantages due to minimal invasiveness.^[2] However, in the case of SBO, surgeons tend to hesitate to perform laparoscopic surgery, including SPS, because of the risk of intraoperative complication such as iatrogenic bowel injury due to poor manipulation space or bowel weakness.^[1,3] Herein, we report our techniques and strategy using SPS as a diagnostic tool for initial surgical management for suspected SBO with postoperative internal

hernia and show 3 SBO cases in which SPS was applied for postoperative internal hernias.

2. Methods and case report

2.1. Methods

In our facility, the surgical glove method is routinely used as SPS for appendectomy or cholecystectomy, even in the case of torsion of an accessory spleen.^[4,5] Our procedures of SPS are as follows (briefly): a 1.5-cm skin incision is made on the umbilicus without subcutaneous tissue being dissected; an XS size wound retractor is inserted into the umbilical wound. This procedure allows enough space (2.5 cm × 2.0 cm) to prevent interference of surgical devices. A nonpowdered and nonlatex surgical glove (5.5 in.) is fitted on the wound retractor, and 5-mm slim trocars are inserted into the fingers tips of the surgical glove (Fig. 1). A semi-flexible laparoscopic camera is inserted into the middle finger port. The remaining finger tips are used for other laparoscopic operating devices such as forceps and electrocautery instruments.^[6] The operations of all patients of SBO with internal hernia were started by SPS in this report.

2.2. Case report 1

The first patient was a 59-year-old man who had temporary loop ileostomy for a perforated sigmoid colon due to diverticulitis. Severe hypogastralgia and vomiting occurred suddenly on the 33rd postoperative day (POD). A contrast computed tomography (CT) revealed a suspected closed loop obstruction of his small bowel (Fig. 2A), requiring immediate surgical treatment. SPS revealed that the loop ileum had herniated through an orifice formed by an adhesive greater omentum, which was attached to the perforated part of the sigmoid colon (Fig. 2B). The adhesive band was resected and the closed ileum released by SPS. Resection of the ileum was not performed, because the released ileum was vital. The patient was discharged on the 15th post-SPS day without complications. Also, at 29 months after the operation no recurrence of SBO was observed.

2.3. Case report 2

The second patient was an 81-year-old man who had been hospitalized due to epigastralgia of unknown origin during the night. He had a surgical history of omentum patching for a perforated duodenum 20 years ago. The pain continued into the next day following his admission. SBO with internal hernia was suspected following our interpretation of a contrast CT image



Figure 1. Photograph of our SPS methods. The surgical glove method with a 1.5-cm umbilical incision was used for all 3 patients. Case 3 is shown in this photograph.

(Fig. 3A). SPS was performed and showed that a loop jejunum had herniated through an orifice between the adhesive greater omentum and the abdominal wall (Fig. 3B). The incarcerated jejunum showed slight hyperemia but could be released smoothly by SPS. The adhesion was resected as much as possible, and an anti-adhesive film was inserted. The patient was discharged on the 11th POD without complications. Also, at 7 months after the operation no recurrence of SBO was observed.

2.4. Case report 3

The third patient was a 72-year-old female who presented at our hospital after sudden and severe hypogastralgia. She had a surgical history of sigmoidectomy for her sigmoid colon cancer 22 years ago. A contrast CT revealed a closed-loop obstruction around her sigmoid colon (Fig. 4A). SPS was performed and showed that the ileum had been incarcerated in an orifice of an adhesion of ileal mesentery to her sigmoid colon. However, massive dark hemorrhagic fluid and a gangrenous strained

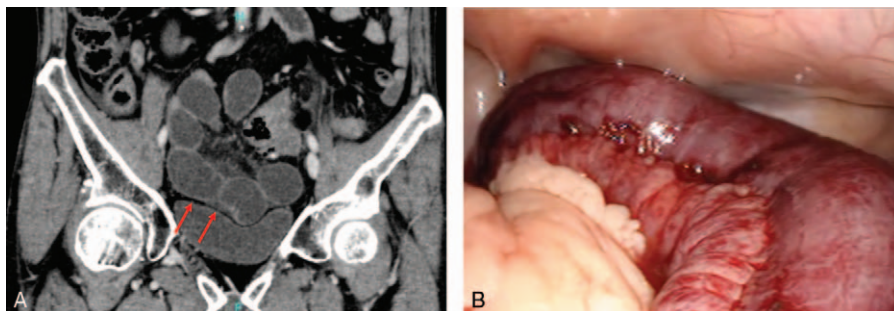


Figure 2. (A) Contrast CT images in Case 1. A closed loop obstruction was detected around sigmoid colon (red arrow). (B) Representative photograph of Case 1 during surgery. A loop ileum had herniated through an orifice formed by adhesion of the greater omentum to the perforated part of the sigmoid colon.

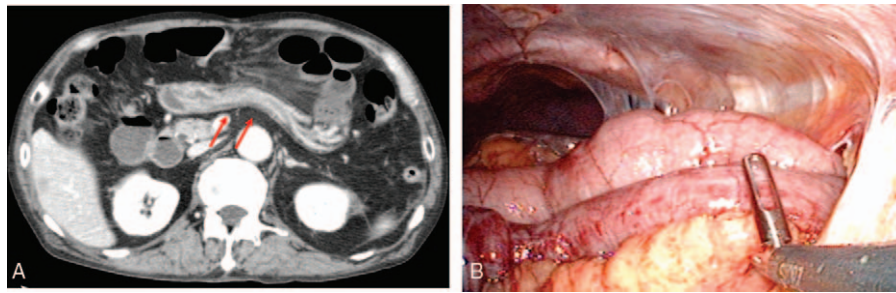


Figure 3. (A) Contrast CT image in Case 2. The closed loop obstruction was detected above the stomach, which had been crushed flat (red arrow). (B) Representative photograph of Case 2 during surgery. SPS clearly showed that a loop jejunum had herniated through an orifice due to adhesion of the greater omentum to the abdominal wall.



Figure 4. (A) Contrast CT images in Case 3. A closed loop obstruction was detected around sigmoid colon (red arrow). (B) Representative photograph of Case 3 during surgery. The obstructive bowel was very strained, and so SPS was converted to laparotomy immediately. (C) Representative photograph showing the released internal hernia in Case 3. After releasing, the bowel viability was returned, thus avoiding bowel resection.

small intestine were also detected (Fig. 4B). Based on these findings, we immediately converted to laparotomy along the incision made for the previous surgery. The adhesive band was resected, after which the bowel recovered its vitality and thus required no resection (Fig. 4C). The patient experienced pain from the incision but was discharged on POD 17. Also, at 5 months after the operation no recurrence of SBO was observed. The detail of 3 patients including of follow-up time period is shown in Table 1. Based on our experiences with these 3 cases described here, the strategy using SPS for SBO with internal hernia has been established (Fig. 5).

3. Discussion

To our knowledge, the usefulness of SPS for SBO with internal hernia has been indicated by only a few reports.^[1,3,7,8] The reasons why laparoscopic surgeries including SPS for SBO are not widely used might be the following: the operation space is limited, identification of the obstruction site is relatively difficult, the expanded bowel might easily be injured. However, SPS should be more frequently applied to SBO situations because it is a relatively easy approach, requires only an incision at the umbilicus even in multi-adhesion cases, and can be performed without making an additional space for a trocar. In addition, SPS

Table 1

Details of our 3 cases in which SPS was performed for their postoperative internal hernia.

Case	Age	Sex	Past surgical history	Presenting symptom	Site of closed loop	Conversion	Bowel resection	Operating time	Complication	Outcome	Follow-up duration
1	59	M	Loop colostomy	Hypogastralgia vomiting	Around sigmoid colon	—	—	1 h 15 min	—	POD15, discharge	No recurrence for 29 mo
2	81	M	Omentum patching for perforated duodenum	Epigastralgia	Above stomach	—	—	51 min	—	POD11, discharge	No recurrence for 7 mo
3	72	F	Sigmoidectomy	Hypogastralgia vomiting	Around sigmoid colon	+	—	1 h 16 min	Postoperative pain	POD17, discharge	No recurrence for 5 mo

mo = month, POD = postoperative day, SPS = single-port surgery.

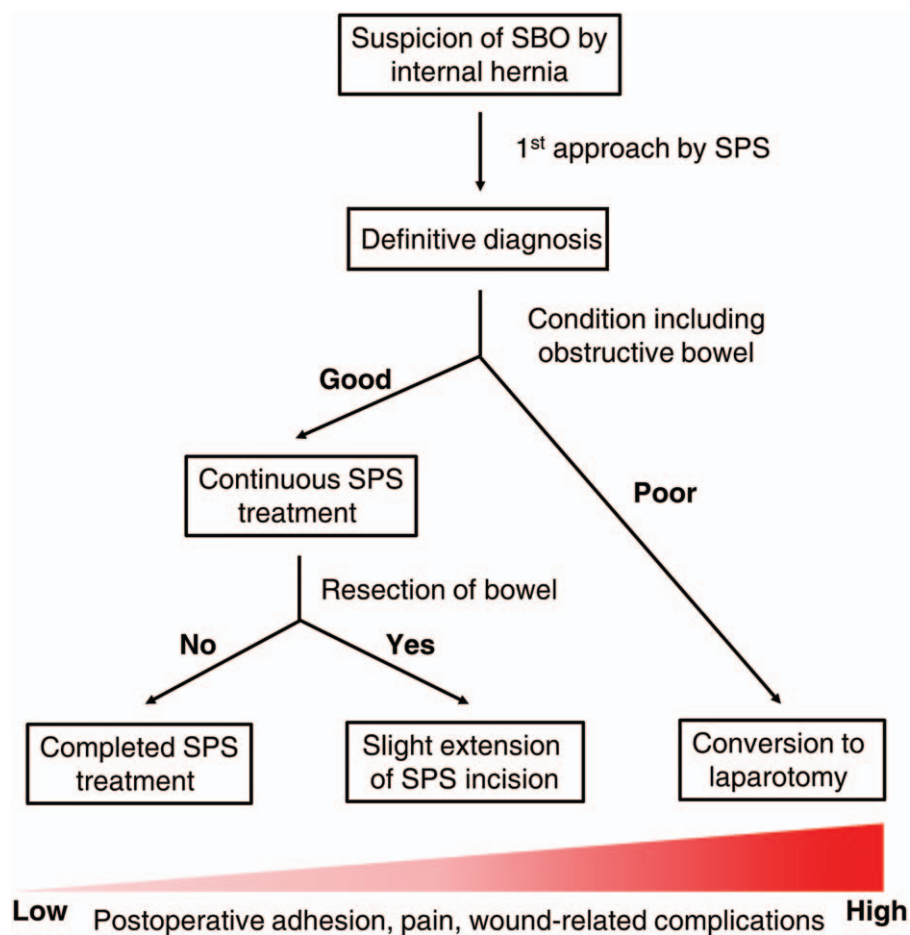


Figure 5. Our treatment strategy for SBO caused by internal hernia. We use SPS as the initial approach in all cases of SBO with internal hernia, as it is a good diagnostic and treatment tool. The wound-related complication refers to postoperative infection and incisional hernia.

may be able to confirm a definitive diagnosis directly and can accommodate various situations, such as enlargement of incision as required. Moreover, the small incision is very easy to close compared with that for laparotomy and contributes to less pain, reduced potential for wound infection, and prevention of incisional hernia. The most important advantage is the prevention of a postoperative adhesion, the main cause of new-onset SBO. Furthermore, our method makes it unnecessary to purchase new expensive devices. This is particularly important from the standpoint of cost-effectiveness.

Our most essential concept is that the operation starts with SPS in any SBO cases of internal hernia. Namely, when an internal hernia is suspected, SPS is initially used as a tool for a definitive diagnosis. At almost the same time, operating conditions including an obstructive bowel are explored to assess whether SPS can be continued safely. In difficult cases, SPS can be converted to laparotomy with a minimal incision and resection of the damaged bowel can be performed, if needed (Fig. 5). Conversion to the conventional multiport laparoscopic surgery with additional insertions of trocars might be optional. In our institution, SPS has been used for appendectomy and cholecystectomy and is a relatively safe procedure. Therefore, it can probably be applied to SBO with internal hernia unless serious conditions are seen. We considered using SPS for SBO with internal hernia because of our institutional experience of using SPS for common procedures such as cholecystectomy. SPS for

SBO with internal hernia was not considered if there were surgical contraindications related to this condition.

The priority of acute-care surgery is to allow the patient to recover from a critical state. For this purpose, new surgical procedures should be introduced or developed while considering safety, cost-effectiveness, and minimizing postoperative complications. Although additional experience is needed to establish a firmer strategy with SPS, we conclude that SPS is an appropriate procedure as an initial surgical approach for SBO, especially in the case of an internal hernia, and is effective for accurate diagnosis, application to various situations, and prevention of subsequent adhesions even if conversion to laparotomy is finally required.

4. Conclusion

SPS is a promising strategy as an initial surgical approach for SBO, especially in the case of an internal hernia, and is effective for accurate diagnosis and treatment.

Author contributions

KT and RI performed the patients' operation and MA gave technical advice. KO collaborated in the patient's perioperative care. KT and AT designed and drafted the manuscript. MA and KU reviewed and revised the manuscript.

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