A rare case of secondary small bowel volvulus laparoscopically repositioned: literature review and classification

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Abstract

Background: Secondary small bowel volvulus is a rare condition caused by adhesions after laparotomy or tumors. There are no clear guidelines for indication of laparoscopic surgery.

Case presentation: A 69-year-old male visited our hospital complaining of epigastric pain. He had a history of hypopharyngeal carcinoma treated via pharyngolaryngoesophagectomy with restoration of esophageal continuity by harvesting a free jejunal autograft 6 years ago. Enhanced computed tomography revealed the whirl sign. An emergency laparoscopic operation was performed following a diagnosis of small bowel volvulus. This revealed rotation of the whole small bowel, involving the superior mesenteric artery as the center, and originating at the adhesion of the proximal and distal small bowel. Laparoscopic manipulation of volvulus and lysis of the adhesion were performed. The patient’s postoperative course was uneventful, and he was discharged on hospital day 5.

Conclusions: Laparoscopic surgery may be useful for treating small bowel volvulus; however, the patient’s treatment indications should be judged carefully.

Keywords: Small bowel volvulus, Laparoscopy, Free jejunum flap

Background

Secondary small bowel volvulus is a rare condition reported to be caused by adhesions after laparotomy or tumors. As a complication after harvesting of free jejunum flap, secondary small bowel volvulus is especially rare [1]. There are no clear guidelines for indication of laparoscopic surgery. We experienced a case of secondary small bowel volvulus, which was successfully treated laparoscopically. Herein, we present this case, particularly based on literature discussion, and investigate the indications and points to consider during laparoscopic treatment.

Case presentation

A 69-year-old man developed a sudden epigastric pain. He was presented at this hospital as an emergency outpatient. Six years earlier, he underwent laryngoesophagectomy, bilateral lymph node dissection for hypopharyngeal cancer, and esophageal reconstruction with a free jejunum flap. On physical examination, the abdomen was flat and soft with tenderness in the epigastric region, but no sign of peritoneal irritation. Blood biochemistry findings revealed elevated values: creatinine, 1.16 mg/dl; lactate dehydrogenase, 364 U/l; and creatine phosphokinase, 622 U/l. Abdominal contrast computed tomography (CT) revealed twisted mesentery with the small intestine around the point of torsion (whirl sign) and the superior mesenteric artery as the axis. Contrast enhancement was weakened in the same area of the small bowel (Fig. 1). Given this information, we suspected small bowel volvulus and performed emergency surgery on the same day.
Surgical findings
A 5-mm camera port was placed in the umbilicus and 5-mm ports in the lower and right lower abdomen. During laparoscopic examination, the upper jejunum adhered to the small bowel close to the terminal ileum with overlapping of the small bowel. The entire part from the upper jejunum to the terminal ileum was twisted clockwise with the superior mesenteric artery and vein as the axes and the adhesion site as the starting point. There were areas of poor color enhancement throughout the twisted section of the small bowel (Fig. 2). We laparoscopically separated the adhesion between different sections of the intestinal tract and traced the bowel from the small bowel in the region of the ligament of Treitz toward the anus to confirm the absence of adhesions or torsion up to the terminal ileum. The color of the small bowel improved; hence, the surgery was completed without resecting any part of the intestine.

Postoperatively, the patient made good postoperative recovery, resumed oral intake on day 2, and was discharged on day 5 after surgery. No recurrence has been reported 1 year postoperatively.

Discussion
Small bowel volvulus is often congenital. It is caused by malrotation of the intestine or incomplete mesenteric fixing or a primary condition without an underlying disease or anatomical anomaly. Secondary cases caused by acquired factors, such as postoperative adhesions or tumors, only account for 19.5% [2]. Abdominal contrast CT is effective for diagnosis, with the intestine wrapping around the mesenteric blood vessel in a spiral, forming a characteristic whirl sign [3, 4].

We searched for secondary small bowel volvulus requiring surgery using the Japan Medical Abstracts Society (Ichushi) between 1990 and January 2018 using “secondary” and “small bowel volvulus” as keywords, and we found 29 reports (Table 1). Of these cases, 12 cases of small bowel volvulus were caused by postoperative adhesions, similar to the present case. All 12 patients underwent laparotomy prior to developing the condition, with gastrectomy as the most common procedure. Other than our case, there were no reports of the condition developing after harvesting free jejunum flap. Of 10 cases, nine (excluding two unknown cases) presented with the whirl sign on CT, making preoperative diagnosis possible.

When we examined the cause of the torsion in the 29 cases, many cases (n = 13) had organic anomalies such as small bowel tumors or small bowel intussusception prior to the torsion, and these cases were classified as type A (Fig. 3a). The second most common presentation (n = 12) was partial adhesion of the small bowel to the abdominal wall or a strangulated hernia, with the same site forming a fixed site, and the bowel twisting around that site as the axis, and these cases were classified as type B (Fig. 3b). In the present case, adhesion between two different parts of the small bowel formed the origin of the torsion, with the distal and proximal sides of the small intestine twisting upon itself. A similar form of volvulus was reported by Sakamoto et al. There was only one case where adhesion between the upper jejunum
| Case | Author         | Year | Age | Sex | History of abdominal surgery | Cause of volvulus          | Surgical procedure | Whirl sign | Classification of volvulus | Bowel necrosis | Complications                  |
|------|----------------|------|-----|-----|-------------------------------|-----------------------------|---------------------|------------|---------------------------|----------------|-------------------------------|
| 1    | Ii             | 1993 | 60  | M   | Appendectomy                 | Mesenteric lipoma           | Laparotomy         | +          | A                         | –              | None                          |
| 2    | Takeuchi       | 1993 | 66  | F   | Gastrectomy                  | Adhesion after laparotomy   | Laparotomy         | +          | B                         | –              | None                          |
| 3    | Sakamoto       | 1994 | 51  | M   | Distal gastrectomy           | Adhesion after laparotomy   | Laparotomy         | NA         | C                         | +              | Intestinal hurry              |
| 4    | Kakihara       | 1997 | 58  | F   | None                          | Ileal lipoma                | Laparotomy         | NA         | A                         | –              | NA                            |
| 5    | Tani           | 1998 | 34  | F   | None                          | Ileal lipoma                | Laparotomy         | +          | A                         | –              | None                          |
| 6    | Taka           | 1999 | 83  | F   | Gastrectomy                   | Incarcerated femoral hernia | Laparotomy         | +          | B                         | –              | None                          |
| 7    | Kawasaki       | 1999 | 83  | F   | Appendectomy                  | Adhesion after laparotomy   | Laparotomy         | +          | B                         | –              | None                          |
| 8    | Nakamura       | 2002 | 53  | F   | None                          | Small intestinal GIST       | Laparotomy         | +          | A                         | –              | NA                            |
| 9    | Hisada         | 2002 | 67  | M   | None                          | Adhesion after laparotomy   | Laparotomy         | +          | NA                        | –              | None                          |
| 10   | Yamamoto       | 2002 | 84  | F   | Distal gastrectomy, cholecystectomy, hysterectomy | Adhesion after laparotomy | Laparotomy         | +          | B                         | –              | NA                            |
| 11   | Yoshida        | 2003 | 26  | M   | None                          | Traumatic hematoma          | Laparotomy         | +          | A                         | –              | NA                            |
| 12   | Uchiyama       | 2003 | 80  | M   | Distal gastrectomy            | Adhesion after laparotomy   | Laparotomy         | +          | NA                        | –              | None                          |
| 13   | Uchiyama       | 2004 | 87  | M   | Cholecystectomy               | Adhesion after laparotomy   | Laparotomy         | +          | NA                        | +              | Sepsis                        |
| 14   | Minato         | 2004 | 83  | F   | None                          | Phalomesenteric duct remnant | Laparotomy         | –          | B                         | –              | None                          |
| 21   | Yada           | 2004 | 47  | M   | None                          | Small intestinal GIST       | Laparotomy         | NA         | A                         | –              | None                          |
| 15   | Okada          | 2005 | 67  | F   | Cesarean section              | Mesenteric cyst              | Laparotomy         | +          | A                         | –              | None                          |
| 16   | Kato           | 2005 | 77  | F   | Cholecystectomy               | Jejunal diverticulum        | Laparotomy         | +          | B                         | –              | None                          |
| 17   | Meguro         | 2006 | 79  | F   | Hysterectomy                  | Small intestinal GIST       | Laparotomy         | +          | A                         | –              | NA                            |
| 18   | Waranabe       | 2006 | 81  | M   | None                          | Jejunal GIST                | Laparotomy         | +          | A                         | –              | None                          |
| 19   | Uzuki          | 2007 | 81  | M   | None                          | Jejunal GIST                | Laparotomy         | +          | A                         | –              | None                          |
| 20   | Nakashima      | 2008 | 64  | M   | None                          | Ileal GIST                  | Laparotomy         | NA         | A                         | –              | None                          |
| 22   | Harada         | 2010 | 86  | M   | None                          | Incarcerated inguinal hernia | Laparotomy         | NA         | B                         | –              | None                          |
| 23   | Ito            | 2011 | 26  | M   | Bladder augmentation          | Adhesion after laparotomy   | Laparotomy         | –          | NA                        | +              | None                          |
| 24   | Tanaka         | 2012 | 35  | M   | Total gastrectomy             | Adhesion after laparotomy   | Laparotomy         | +          | B                         | –              | None                          |
| 25   | Tanaka         | 2012 | 72  | M   | Total gastrectomy             | Adhesion after laparotomy   | Laparotomy         | +          | B                         | –              | Delirium, Wound dehiscence    |
| 26   | Tanaka         | 2012 | 66  | M   | Total gastrectomy             | Adhesion after laparotomy   | Laparotomy         | NA         | B                         | –              | None                          |
| 27   | Kuroda         | 2013 | 81  | M   | None                          | Idiopathic intussusception  | Laparotomy         | NA         | A                         | +              | None                          |
and the transverse mesocolon formed the origin of the torsion [5]. In this paper, this special form of torsion was classified as type C (Fig. 3c). In type C, the torsion origin is formed due to the adhesion of the proximal and distal bowel or the adhesion between the bowel and the mesocolon, with peristaltic torsion forming in the intestine between the two points. This is considered a rare form of volvulus.

Emergency surgery was required to treat this case. The ileus is removed with reduction of the torsion, and if intestinal necrosis is suspected, small bowel resection is required. Of the 29 cases, only four had intestinal necrosis. Recently, laparoscopic examination and laparoscopic surgery have been proactively performed for small bowel obstruction, and reports indicate that the outcomes are better than laparotomies in terms of improved postoperative intestinal motility and duration of hospitalization [6]. Laparoscopic procedures have smaller surgical wounds than laparotomies and are considered effective for diagnosis of small bowel obstruction and for finding the cause of obstruction. However, laparoscopic procedure is not suitable in some cases because the relationship of the overall position of the bowel should be confirmed, such as in small bowel volvulus. Hence, this procedure should be performed with caution. Specifically, with post-laparotomy secondary small bowel volvulus, the surgical field may be limited by adhesions and intestinal dilatation within the abdominal cavity. In these cases, surgeons must not hesitate to transition to laparotomy to accurately ascertain the alignment of the intestine.

During laparoscopic procedures, it is possible to examine the treatment guidelines by referencing the aforementioned classifications. Type A often requires intestinal resection due to organic anomalies in the small bowel. Therefore, please consider transitioning to laparotomy, and if possible, the cause should be identified using single incisional laparoscopic surgery and bowel resection with a mini-laparotomy should be performed. For type B cases, there is normally one fixation point. Therefore, if it is possible to secure the surgical field, the adhesion causing the torsion can be separated or a strangulated hernia, which can be reduced laparoscopically. With type C cases, as in our case, we could promptly perform laparoscopic examination. Given that the abdominal surgery procedure history was only a normal free jejunum flap harvest, there was almost no reduction of the operation field due to adhesion to the abdominal wall; hence, the procedure could be completed laparoscopically. However, laparoscopically separating adhesions between different parts of the intestine is an extremely difficult procedure; thus, the procedure must be implemented with extreme care, as it can be associated with intestinal dilatation. Therefore, this procedure should be performed with great care, while always considering the possibility of transitioning to laparotomy. There are few cases of laparoscopic surgery for small bowel volvulus, and more cases are needed to examine indications for this procedure.

**Conclusion**

We presented a unique case of secondary small bowel volvulus after harvesting of a free jejunal autograft. Laparoscopic surgery may be useful for treating small bowel volvulus; however, the patient’s treatment indications should be judged carefully.
Abbreviations
CT: Computed tomography

Availability of data and materials
All the data generated or analyzed during this study are included in this published article.

Authors’ contributions
KI drafted the manuscript. HK, SU, HM, NT, MY, KK, MT, and TH were involved in revising it critically for important intellectual content. MT is a chairperson of the department who supervised the writing of the manuscript. All the authors have given final approval for the version to be published.

Ethics approval and consent to participate
Not applicable

Consent for publication
Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Competing interests
The authors declare that they have no competing interests.

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