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Case Report

Usability of Elective Laparoscopic Sigmoidectomy and Feasibility of Single-Incision Laparoscopic Surgery for Sigmoid Volvulus: Report of Three Cases

Masami Ueda[1,2], Tadashi Onishi[1], Taishi Hata[3], Kentaro Nishida[1], Takehiro Yanagawa[1], Shoichiro Fujita[1], Junya Fujita[1], Tetsuya Yoshida[1], Takeshi Tono[1], Takushi Monden[1], Shingi Imaoka[1], Masaki Mori[3]

[1]*Department of Surgery, NTT West Osaka Hospital, Osaka, Japan.*

[2]*Department of Surgery, Kyushu University Beppu Hospital, Beppu, Japan*

[3]*Department of Gastroenterological Surgery, Graduate School of Medicine, Osaka University, Osaka, Japan*

A therapeutic guideline for sigmoid volvulus (SV) has not been established, and the most recommended surgical procedure for SV has not been determined. Our objective is to assess the usability of elective laparoscopic sigmoidectomy and the feasibility of single-incision laparoscopic surgery for SV following endoscopic reduction. SV typically affects the elderly and accounts for 1% to 7% of intestinal obstructions in Western countries. We report on 3 patients with SV who underwent elective laparoscopic sigmoidectomy following endoscopic reduction, and we first describe single-port surgery for SV. We discuss the 3 patients (a 79-year-old male, an 88-year-old female, and a 67-year-old female) with SV who underwent elective laparoscopic sigmoidectomy following endoscopic reduction. All 3 patients underwent laparoscopic sigmoidectomy, and 2 patients underwent single-port laparoscopic surgery without complications. Recurrence of volvulus was not seen during the course of 12 to 24 months. In experienced hands, elective laparoscopic sigmoidectomy after colonoscopic detorsion is a valuable alternative, and single-port surgery is also feasible.

Key words: Sigmoid volvulus – Laparoscopic sigmoidectomy – Single-port surgery

Tel.: +81 977 27 1650; Fax: +81 977 27 1651; E-mail: mueda@beppu.kyushu-u.ac.jp

Fig. 1 View of patient 1's umbilical scar on postoperative day 7.

Sigmoid volvulus (SV) typically occurs in the elderly and is caused by a redundant segment of colon.[1,2] It is the third leading cause of colon obstruction, after cancer and diverticulitis, and is the cause of 1% to 7% of intestinal obstructions in Western countries.[1–3] Associated morbidity is higher in regions where high-fiber diets are the norm, including Africa, India, the Middle East, and Latin America.[2,4] SV can cause ischemic changes through bowel entanglement with the mesentery,[5] and if intestinal gangrenous signs are present, urgent surgical treatment is required.

For the nonoperative treatment cases, colonoscopic repositioning is extremely useful and common, but the recurrence rate 3 months later for patients undergoing colonoscopic detorsion has been about 45%.[6,7] Therefore, nonoperative treatment should be used primarily to move patients from emergency surgery status to semielective surgery status.[8]

Because SV is most common among elderly and frail patients, less invasive surgery is desirable after the urgent situation is addressed with conservative treatment. The laparoscopic approach is a relatively recent technical advance in surgery, with advantages that include lower morbidity, lessened postoperative pain, faster recovery, and improved cosmesis. Therefore, laparoscopic surgery could be a feasible or even preferable alternative for elderly patients. Moreover, reduced-port laparoscopic surgery has proven to be a less invasive procedure, in particular single-port surgery (SPS).

We describe 3 instances of laparoscopic-assisted sigmoidectomy for SV after colonoscopic repositioning, including 2 patients who underwent surgery performed with SPS.

Case Reports

Case report 1

A 79-year-old man was admitted to our institution with abdominal pain and distention. Twice previously, his symptoms had been resolved with conservative treatment. On physical examination he was afebrile and his abdomen was only mildly distended, but his abdominal pain was severe. Abdominal X-ray revealed a remarkably distended sigmoid loop with an inverted U shape, also known as the "coffee bean sign," consistent with SV. Computed tomography revealed a dilated sigmoid colon with stenosis and swirling of the mesentery. The patient underwent an emergency colonoscopy, degasification, and detorsion of the volvulus, which restored normal bowel function. Considering the history of relapse with the same symptoms, we decided to undertake surgery 3 months after the procedure. We performed laparoscopic sigmoidectomy with 2-cm single-incision surgery. A multichannel access device, EZ Access (Hakko, Nagano, Japan), was placed through the incision in the umbilicus, followed by the insertion of three 5-mm ports through the umbilical port site. The findings were a remarkably long sigmoid colon without dilation and redundant mesentery of the sigmoid colon. We resected 10 cm of sigmoid colon with a primary anastomosis and performed mesosigmoidoplasty, in which a vertical incision was made in the mesosigmoid followed by a horizontal suture to shorten the mesosigmoid. We needed the relatively long operation time (213 minutes). The patient got the cosmetic result, was discharged uneventfully on postoperative day 13, and had no recurrence at 15 months postoperatively (Fig. 1).

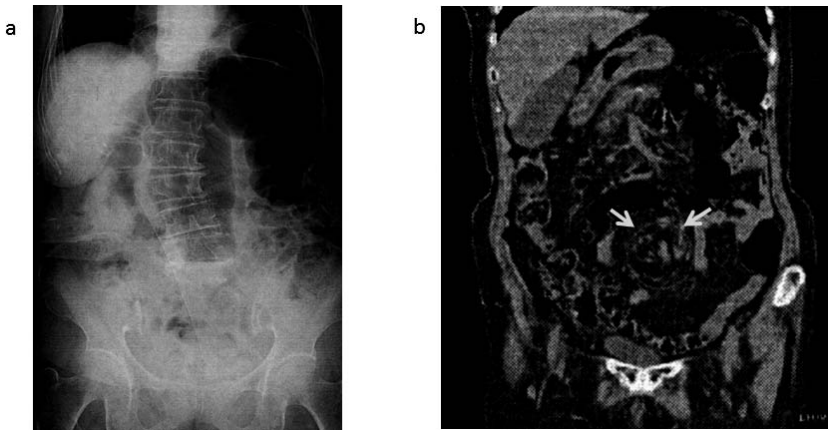

Fig. 2 (a) Preoperative plain X-ray of abdomen in erect position showing the "coffee bean sign," indicating the dilated sigmoid colonic loop (patient 2). (b) Computed tomography showing dilated sigmoid colon with whirled sigmoid mesentery (patient 2).

Case report 2

An 88-year-old woman was admitted to our institution with abdominal pain and abdominal distention, which she had never experienced previously. On physical examination her abdomen was only mildly distended, but abdominal pain was severe. X-ray revealed the classic "coffee bean sign" of SV, and computed tomography showed a dilated sigmoid colon with stenosis and swirling of the mesentery, as well as slight ascites in the Douglas pouch (Fig. 2). Thus, a working diagnosis of SV was established. The patient underwent an emergency colonoscopy, by which degasification was possible but complete detorsion of the volvulus was not achieved. Because the symptoms were improved, we decided to undertake an elective operation 1 week after the colonoscopy and performed laparoscopic sigmoidectomy. Considering the incomplete detorsion of the volvulus, we inserted 4 ports through the abdomen. The findings were a remarkably dilated sigmoid colon, and an inverted U loop of the sigmoid colon was extended to the right upper abdominal cavity. We resected all of the dilated colon, with dissection of the inferior mesenteric artery, and performed primary anastomosis. The operation took a total of 195 minutes. The patient was discharged uneventfully on postoperative day 17 and had no recurrence at 15 months postoperatively.

Case report 3

A 67-year-old woman with severe abdominal pain and distention was taken to our institution in an emergency. The patient had undergone two cesarean deliveries and had twice required hospital care for adhesive intestinal obstruction. In addition, she took laxatives to excess because of severe constipation. On physical examination her abdomen was soft but severely painful and distended. Abdominal X-ray demonstrated a remarkably distended sigmoid colon loop, the "coffee bean sign." Computed tomography revealed a dilated sigmoid colon, a twist of the sigmoid colon, and swirling of the mesentery (Fig. 3). These findings helped us to

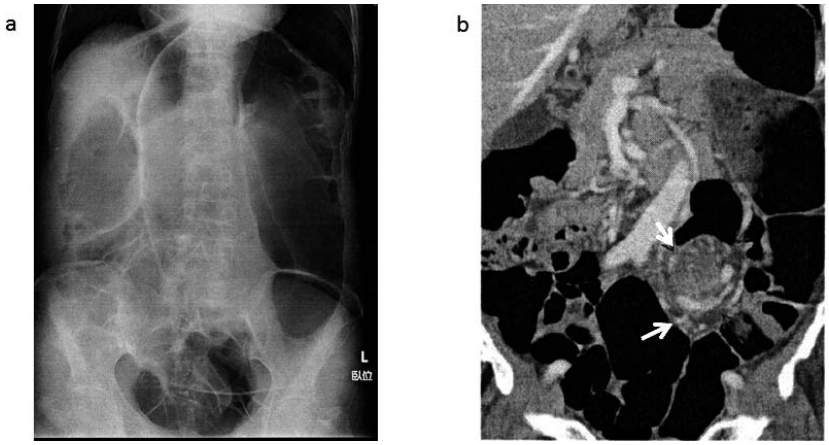

Fig. 3 (a) Preoperative plain X-ray of abdomen in erect position showing the "coffee-bean sign," indicating the dilated sigmoid colonic loop (patient 3). (b) Computed tomography showing dilated sigmoid colon with whirled sigmoid mesentery (patient 3).

Fig. 4 Laparoscopy of patient 3 revealed that the dilated sigmoid colon was so long that it extended to the hepatic flexure.

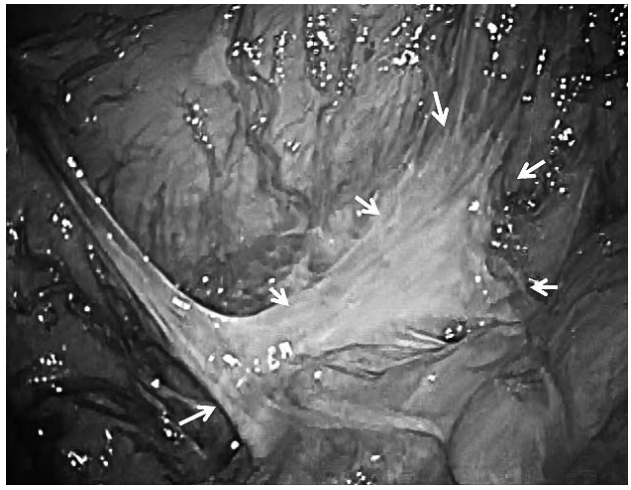

Fig. 5 Laparoscopic view of the sigmoid mesentery of patient 3. The white, fibrous scars of the mesosigmoid extended over the left iliac vessels and left ureter.

diagnose SV in this patient. An emergency colonoscopy achieved detorsion of the volvulus, which restored normal bowel function, and the patient was discharged. We decided to operate 1 month after the discharge, based on her strong symptoms and the high recurrence rate with SV. We performed laparoscopic sigmoidectomy with 2-cm single-incision surgery, and a multichannel access device, EZ Access (Hakko), was placed through the incision in the umbilicus, where we inserted three 5-mm ports. The findings were severe adhesions between the intestines and abdominal wall and the dilated sigmoid colon, which was so long that it extended to the hepatic flexure, having redundant mesentery of sigmoid colon (Figs. 4 and 5). It was difficult to remove the adhesion layer, but we were able to mobilize the sigmoid colon using only the single incision. We resected the 40 cm of sigmoid colon without dissecting the inferior mesenteric artery, and we performed primary anastomosis. The operation time was 140 minutes. The patient was discharged uneventfully on postoperative day 13 and had no recurrence at 5 months postoperatively.

Discussion

SV is one of the leading causes of ileus strangulation and can induce intestinal ischemia and perforation.[5] Several factors are associated with the development of SV. Anatomically, the presence of a redundant and mobile sigmoid colon, and bowel adhesions related to abdominal operations have been reported as major factors.[1] People who have chronic constipation or reduced intestinal motility, such as the aged on prolonged bed rest and patients medicated with psychotropic drugs, tend to have a higher risk of SV.[9,10]

With acute onset, the major symptoms are sudden abdominal pain and distension, but these features can be reduced in chronic SV.[11,12] Diagnosis is based on clinical, radiologic, and endoscopic findings; in 80% of the cases, diagnosis can be made only with an abdominal X-ray that shows a remarkably distended sigmoid loop with an inverted U shape, known as the "coffee bean sign."[13] Computed tomography indicates a whorl pattern in the mesentery of the sigmoid colon and dilated ahaustral segments around it.[14] In the present report, all 3 patients showed the above-mentioned findings, which were consistent with SV.

A therapeutic guideline for SV treatment has not been established. Colonoscopy is a diagnostic method and is also extremely useful as a conservative treatment for performing colonic repositioning and removing other causes of obstruction. Indeed, it is the first-line modality, by which 80% to 90% of SV patients can regain intestinal function.[15] However, colonoscopic detorsion is a contraindication in patients with intestinal necrosis or perforation, who must be treated with urgent surgery.[16] The physical baseline status of SV patients requiring urgent surgery after acute onset is usually quite poor, and a mortality rate of 10% to 25% has been reported; in addition, primary anastomosis is also uncommon for the high morbidity rate.[17] Elective

surgery after colonoscopic detorsion should be indicated for patients presenting with repeat SV.[18,19]

Many surgical procedures for SV have been described in the literature, including mesosigmoidoplasty, mesosigmoidopexy, and sigmoidectomy.[15,20–22] Mesosigmoidoplasty or mesosigmoidopexy is associated with a high recurrence rate (16%–70%), but sigmoidectomy has an incidence of recurrent volvulus close to zero.[7] However, Morrissey and Deitch[23] reported that residual concomitant megacolon increases the recurrence rate to 82%, and a more extensive subtotal colectomy approach to patients with associated megacolon is recommended. We conducted sigmoidectomy only in the 3 patients, considering that they had only megasigmoid colons.

Many reports have suggested that laparoscopic-assisted colectomy may be a useful option in high-risk patients or in the elderly who cannot undergo conventional colon surgery.[15,24,25] Although there is no randomized controlled data to support the superiority of laparoscopic operation for SV, we consider that laparoscopic surgery is more useful for whole-abdominal observation, adhesiolysis, and sigmoidomesentery plication than conventional open surgery through small incision. Laparoscopic-assisted colectomy also decreases the level of postoperative pain and enables patients to breathe more normally and move around more freely.[15,26–28] Moreover, laparoscopic colectomy is associated with lower cost compared with an open colectomy.[29] We also successfully performed laparoscopic surgery for all 3 patients, with a small amount of bleeding and with no complications.

Laparoscopic surgery with reduced ports, in particular SPS, has been introduced in many operations to reduce visible scars. For SV, umbilical incision laparoscopic surgery with one assist port has been reported.[30] In our cases, the umbilical incisional approach was useful for keeping a better laparoscopic view with one assist port to grasp the distended sigmoid colon. This approach led not only to a better cosmetic outcome, but also to less risk of hernia development than a standard laparoscopic approach.

We first conducted laparoscopic-assisted sigmoidectomy only with umbilical incision for SV. Sundin *et al*[20] reported that the sigmoid colon is exteriorized at an early stage of the operation because of the dense fibrous scarring of the mesentery, which prevents a view via laparoscopy and makes surgery difficult. However, this paradoxically suggests that resection and anastomosis can be worked on extracorporeally if we can perform the required mobilization of the colon by laparoscopic surgery.

We successfully performed SPS without morbidity for 2 patients. There was severe adhesion in the third patient, but we were able to remove it and mobilize enough length of the colon with umbilical incision only, followed by resection of the sigmoid colon and anastomosis extracorporeally. However, more extensive colectomy or subtotal colectomy is needed if patients have massive megacolons, which might require adding more assist ports or converting to open surgery. This decision should be made with consideration of the specific patient conditions, but starting by performing SPS is worthwhile because more assist ports can be added at any time.

In our experience, elective laparoscopic sigmoidectomy after colonoscopic detorsion and degasification is the most effective procedure for SV if there is no evidence of intestinal necrosis or perforation. Moreover, in terms of cosmesis and invasiveness, laparoscopic surgery with reduced ports is even a preferred option to treat SV.

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