

## Two Cases of Laparoscopic Diagnosis and Treatment of Intersigmoid Hernia

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We present two cases of intestinal obstruction due to intersigmoid hernia that were diagnosed and treated laparoscopically. The first case was a 42-year-old woman with no surgical history. She was treated conservatively with the insertion of an ileus tube. Although the intestinal obstruction improved temporarily, since it subsequently worsened, laparoscopic surgery was performed, which revealed incarceration of the ileum in the intersigmoid fossa. Although there were no signs of necrosis after intestinal release, partial resection of the small bowel was performed before the hernial orifice was closed due to the evidence of serous damage. The second case was a 53-year-old man with no surgical history. An ileus tube was inserted for intestinal decompression, following which laparoscopic surgery was performed. Operative findings revealed incarceration of the ileum in the intersigmoid fossa, and, since there were no signs of necrosis after intestinal release, the hernial orifice was closed without performing intestinal resection. This condition is a good indication for laparoscopic surgery, given that intestinal necrosis is frequently absent and the operation can usually be completed simply by release of the incarcerated intestine and closure of the hernia orifice. Intersigmoid hernia should be suspected in cases of intestinal obstruction with no surgical history.

**Key words:** intersigmoid hernia, intestinal obstruction, laparoscopic surgery

### INTRODUCTION

Recent years have seen the proactive use of laparoscopic surgery for the diagnosis and treatment of intestinal obstruction. Intersigmoid hernia is a rare cause of intestinal obstruction due to incarceration of the intestine in an abnormal fossa at the attachment of the left leaf of the sigmoid mesocolon to the retroperitoneum [1]. We report here two cases of intersigmoid hernia that were successfully diagnosed and treated laparoscopically, together with a discussion of the literature.

### CASE REPORT

#### Case 1: Forty-two-year-old woman

Chief complaints: Lower abdominal pain, vomiting  
Previous medical history: Nothing of note. No history of laparotomy.

History of current condition: The patient consulted another medical institution for lower abdominal pain and vomiting 9 days earlier, where she was diagnosed with acute enterocolitis. However, since her symptoms did not improve, she was referred to our hospital.

Condition on admission: Temperature 36.5 °C, blood pressure 107/62 mmHg, heart rate 70 bpm, respiratory rate 24 breaths per minute. Her abdomen was mildly distended and the lower abdomen was tender, although there was no muscular guarding or signs of peritoneal irritation.

Blood biochemistry test results on admission: Her white blood cell count (WBC) was mildly elevated to 9200/ $\mu$ L and C-reactive protein (CRP) was 2.3 mg/dL, although there was no elevation of creatine kinase (CK) or lactate dehydrogenase (LDH).

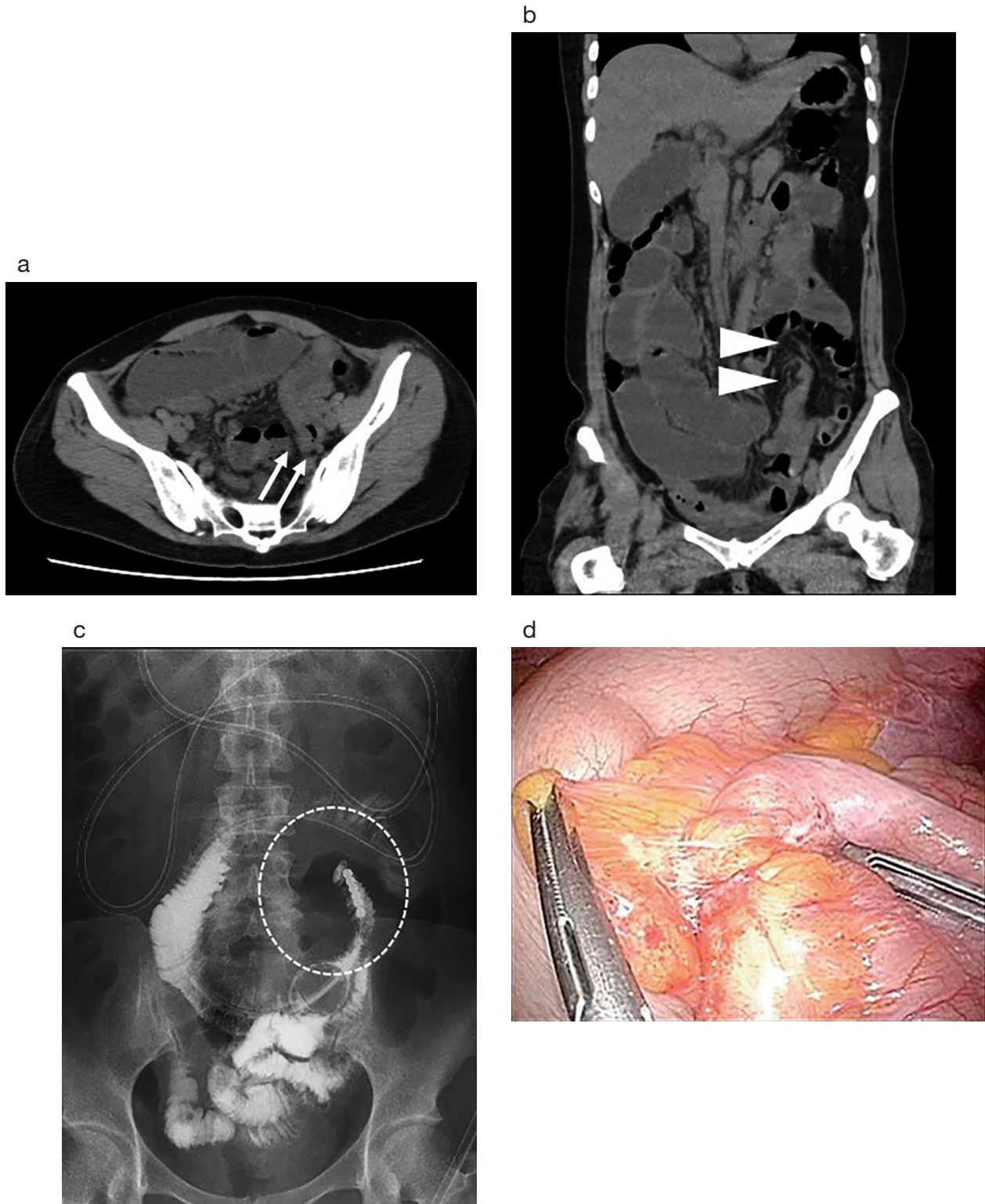
Plain abdominal X-ray: A large amount of gas was present in the small intestine.

Plain abdominal computed tomography (CT): Stenosis of the small intestine was present in the left lower abdomen, and the small intestine on the dorsal side of the sigmoid colon was dilated (Fig. 1a, b).

Findings of contrast enhancement via the ileus tube: Signs of stenosis with regular small intestine wall were apparent in the small intestine distal to the tip of the ileus tube in the left lower abdomen (Fig. 1c).

Post-admission course: Intestinal obstruction was diagnosed, and since there were no signs of intestinal necrosis, she was started treated conservatively with the insertion of an ileus tube. This resulted in improvement in her abdominal symptoms and hence, she was discharged. However, 7 days later she was readmitted due to recurrence of the abdominal pain and vomiting. After intestinal decompression with an ileus tube was repeated, surgery was performed on day 7 after readmission.

Operative findings: Surgery was begun with the insertion of a 12-mm trochar via the umbilicus and 5-mm trochars in the right upper and lower abdomen. Peritoneal observations revealed that the ileum was



**Fig. 1** a. Abdominal computed tomography showing stenosis of the small intestine in the left lower abdomen (arrows)  
 b. Obstructed small intestine behind the mesentery of the sigmoid colon (arrowheads)  
 c. Intestinal gastrograffin contrast study through a long tube showed a small intestinal stricture in the left lower abdomen (circle)  
 d. Laparoscopy showed that the small intestine was strangulated through the intersigmoid fossa.

incarcerated in a gap that had developed at the site of fusion between the sigmoid mesocolon and the parietal peritoneum, leading to the diagnosis of intersigmoid hernia (Fig. 1d). Severe adhesions had formed between the incarcerated ileum and the surrounding tissue,

and although these were successfully released laparoscopically, damage was caused to the serous surface. Partial resection of the small intestine was, therefore, performed despite the absence of any signs of necrosis. The hernial orifice was sutured closed intracorporeally

using an absorbable closure device to complete the operation. The operative time was 139 minutes and the blood loss was 19ml. The patient started to take liquid diet orally at day 3 after surgery. The postoperative course was uneventful, and the patient was discharged on postoperative day 7.

## Case 2: Fifty-three-year-old man

Chief complaints: Left lower abdominal pain, vomiting

Previous medical history: Nothing of note. No history of laparotomy.

History of current condition: The patient consulted another medical institution after developing left lower abdominal pain and vomiting 4 days earlier, and was referred to our hospital with suspected intestinal obstruction.

Condition on admission: Temperature 36.0 °C, blood pressure 130/63 mmHg, heart rate 67 bpm, respiratory rate 15 breaths per minute. His abdomen was mildly distended and the left lower abdomen was tender, although there was no muscular guarding or signs of peritoneal irritation.

Blood biochemistry test results on admission: Inflammatory markers were elevated, with a WBC count of 14500/ $\mu$ L and CRP of 0.3 mg/dL, although there was no elevation of creatine kinase (CK) or lactate dehydrogenase (LDH).

Plain abdominal X-ray: Dilation of the small intestine with multiple niveau was observed, mainly in the left upper abdomen.

Abdominal contrast-enhanced CT: The incarcerated small intestine was folded and twisted into a figure 8 shape on the dorsal side of the sigmoid mesocolon (Fig. 2a, b).

Findings of contrast enhancement via the ileus tube: Stenosis of the small intestine was evident in the left lower abdomen (Fig. 2c).

Post-admission course: Internal hernia involving the sigmoid mesocolon was suspected. As intestinal necrosis was ruled out, laparoscopic surgery was scheduled after intestinal decompression with ileus tube insertion on day 7.

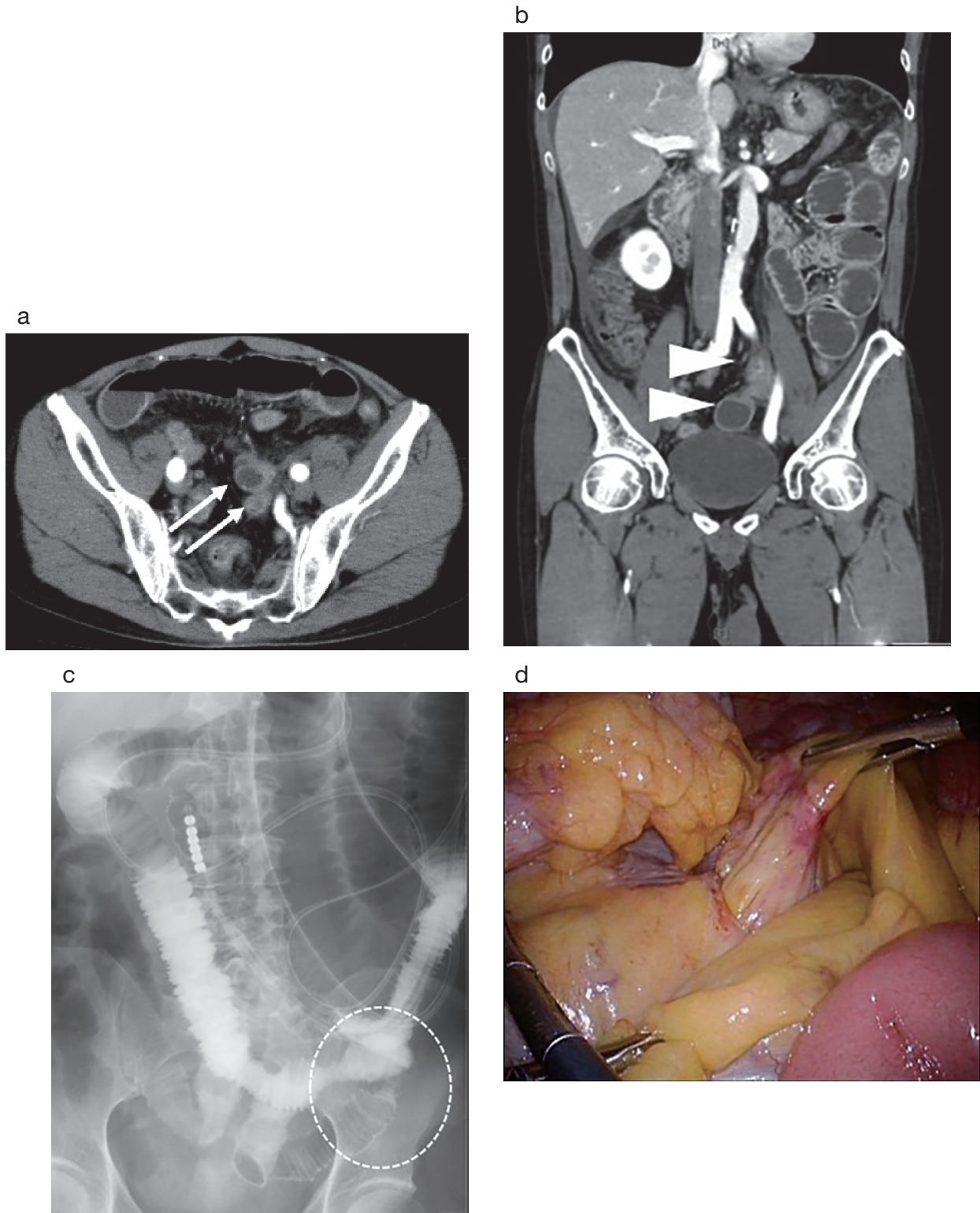
Operative findings: Surgery was begun with the insertion of a 12-mm trochar via the umbilicus and 5-mm trochars in the right upper and lower abdomen. Due to difficulty in securing a medical operation field, additional 5-mm trochars were also inserted in the left upper and lower abdomen before surgery was commenced. Peritoneal observations revealed that the ileum had become trapped in a gap that had developed at the site of fusion of the sigmoid mesocolon and parietal peritoneum, and hence, intersigmoid hernia was diagnosed (Fig. 2d). The incarcerated intestine was released comparatively easily, with no signs of intestinal necrosis. The hernial orifice was sutured closed intracorporeally using an absorbable closure device to complete the operation. The operative time was 84 minutes with minimal blood loss. The patient started to take liquid diet orally at day 4 after surgery. The postoperative course was uneventful, and the patient was discharged on postoperative day 8.

## DISCUSSION

Internal hernia accounts for only about 1 %-2 % of intestinal obstructions [2, 3], and sigmoid mesocolon hernia for only about 5 % of all internal hernias, making it an extremely rare condition [1]. Benson *et al.* [4] classified internal hernias involving the sigmoid mesocolon into three categories: (1) intersigmoid hernia, in which the intestine is incarcerated in a fossa at the site of attachment of the sigmoid mesocolon; (2) transmesosigmoid hernia, in which the intestine is incarcerated in a patent defect in the left and right leaves of the sigmoid mesocolon; and (3) intramesosigmoid hernia, in which the intestine is incarcerated in a defect of the left or right leaf of the sigmoid mesocolon. In Benson *et al.*'s study, 88.2 % of sigmoid mesocolon hernias were intersigmoid hernias [4], but most Japanese studies have found that intramesosigmoid hernias account for approximately half the cases (50 %-57.3 %), followed by intersigmoid hernia (24.5 %-35 %) and transmesosigmoid hernia (15 %-18 %) [5, 6]. The intersigmoid fossa is believed to result from incomplete in utero fusion between the posterior leaf of the sigmoid mesocolon and the parietal peritoneum. During the process of organ formation in fetal development, after the descending colon has taken up its position on the left side of the peritoneum, the left leaf of the mesentery fuses with the primary parietal peritoneum at around 5 months gestation, with the mesentery disappearing and becoming fixed to the retroperitoneum, although the process of fusion may be delayed or incomplete in the left paracolic gutter region, leaving a space in the shape of an inverted V at the peak of the attachment of the sigmoid mesocolon, which is what forms the intersigmoid fossa. The intersigmoid fossa is comparatively common, occurring in 50 %-75 % of autopsy cases [7-9]. It is, thus, rare for the presence of the intersigmoid fossa alone to cause development of an internal hernia; other possible triggers, such as (1) excessive length of the mesentery of the small intestine, (2) entrapment of the small intestine in the pelvic cavity by adhesions, and (3) presence of an opening in the intersigmoid fossa caused by upward traction or inversion of the sigmoid mesocolon resulting from sigmoid colon adhesions, also probably exist [7, 8, 10].

A search of the Japan Medical Abstracts Society database (1976-2016) for the Japanese keyword intersigmoid hernia identified 31 reports (in 37 cases) with detailed information, and we analyzed these patients along with our own two cases (total 39 cases) (Table). The cases included 26 men and 13 women, with men tending to be more common, and a wide range of ages, ranging from 28 to 81 years. Only five (12.8 %) of the previously reported cases had a history of laparotomy, with most developing intestinal obstruction in the absence of previous laparotomic surgery. Contrast enhancement via an ileus tube and abdominal contrast-enhanced CT were useful tests for the diagnosis of intersigmoid hernia. Contrast enhancement via an ileus tube is useful if signs of smooth stenosis are observed at two points on either side of a normal length of small intestine in the left lower abdomen. Typical CT findings include (1) intestinal dilation on the laterodorsal side of the sigmoid colon, (2) mesenteric





**Fig. 2** a. Abdominal computed tomography showing the small intestine extending in the shape of the figure 8 in the left lower abdomen (arrow)  
b. Obstructed small intestine behind the mesentery of the sigmoid colon (arrowheads)  
c. Intestinal gastrograffin contrast study through a long tube showed a small intestinal stricture in the left lower abdomen (circle)  
d. Laparoscopy showed that the small intestine was strangulated through a hernial orifice under the sigmoid mesocolon.

accumulation toward the midline, (3) arc-shaped extension of the sigmoid colon, and (4) folding and twisting of the incarcerated small intestine into a loop or figure 8 shape [11, 12]. However, similar signs have also been reported in cases of intramesosigmoid hernia, another

type of internal hernia involving the sigmoid mesocolon, making the two difficult to distinguish [13]. In fact, in another study, a definitive diagnosis of intersigmoid hernia was reached preoperatively in only 15.9 % of cases [11]. However, these two conditions have

**Table** Reported cases of intersigmoid hernia in Japan from 1979 to 2016 (n=39) \* Data is presented as mean (range) or number (percentage)

Age (years)*	51.3 (28-81)
Gender	
Male	26 (66.7 %)
Female	13 (33.3 %)
Past history of abdominal surgery	
Yes	5 (12.8 %)
No	34 (87.1 %)
Placement of decompression tube	
Yes	14 (35.8 %)
No	25 (64.1 %)
Observation period (days)*	6.1 (0.3-27)
Surgical procedure	
Open	25 (64.1 %)
Laparoscopic	14 (35.9 %)
Bowel resection	
Yes	6 (15.4 %)
No	33 (84.6 %)
Method of repair of the hernial orifice	
Closure	25 (64.1 %)
Opened	11 (28.2 %)
Unknown	2 (5.1 %)
None	1 (2.6 %)

similar pathologies and both their intestinal resection rates are low compared with that of transmesosigmoid hernia, another form of internal hernia involving the sigmoid mesocolon [14], and they are less likely to become clinically problematic. Although the existence of this condition must be borne in mind it is difficult to diagnose in patients with intestinal obstruction with no previous history of laparotomy. None of the patients in our survey of the Japanese literature recovered from intersigmoid hernia with only conservative treatment, and in cases such as Case 1, in which the patient appeared to improve although the incarcerated intestine was not completely released, surgery was performed to treat recurrence. Surgical treatment involved release of the incarcerated bowel, treatment of the hernial orifice (closure or opening), and, if necessary, intestinal resection. The hernia orifice was repaired by closure in 25 cases (64.1 %) and opening in 11 (28.2 %), and was left untreated in 1 patient (2.5 %), with closure by suturing being generally performed. Intestinal resection was carried out in 6 cases (15.3 %), with few patients requiring intestinal resection, as mentioned above. This was because both intersigmoid and intramesosigmoid hernias are true hernias, with the formation of a hernia sac in the retroperitoneum and mesentery, and, since only a short length of intestine is incarcerated, necrosis due to impaired perfusion is considered to be unlikely to occur [15].

Laparoscopic surgery for patients with intestinal obstruction has recently been introduced as minimally invasive surgery. 14 cases of its use to treat intersigmoid hernia has been reported so far. The reported in-

dications for laparoscopic surgery to treat intestinal obstruction are as follows: (1) the patient is not in a state of shock, with stable hemodynamics; (2) no widespread peritonitis or intra-abdominal abscess; (3) obstruction of the proximal small intestine; (4) non-severe or localized intestinal dilation; (5) severe adhesions are not anticipated; (6) intestinal obstruction due to a band; (7) intestinal obstruction following acute appendicitis or benign hysterectomy or first obstruction of the small intestine; and (8) obstruction of the small intestine in patients with no previous surgical history [16-19]. Compared with laparotomic surgery, laparoscopic surgery has the following advantages: (1) less postoperative pain; (2) early recovery of intestinal function; (3) shorter hospitalization time; (4) earlier return to society; (5) fewer wound-related complications; and (6) less recurrence of adhesions [20, 21]. In patients with conditions such as this that are difficult to diagnose preoperatively and those with suspected strangulated intestinal obstruction, laparoscopy can be performed to provide a definitive diagnosis and determine whether the condition is treatable with laparoscopic surgery or laparoscopic-assisted surgery via minilaparotomy, thus reducing the number of unnecessary laparotomies. However, laparoscopic surgery involves the following issues: (1) locating the insertion point for the first trocar; and (2) ensuring sufficient space in the abdominal cavity to carry out operations. As neither of our two patients had previously undergone a laparotomy, we inserted a 12-mm trocar as the first trocar by the open technique via the umbilicus, but if adhesions are a concern, then studies have found that it is safer

to insert the first trochar in the left upper abdomen, where adhesions are generally less likely [17]. To ensure sufficient space for operations, it is important to attempt intestinal decompression by inserting an ileus tube, as long as strangulated intestinal obstruction has been ruled out. The probability of having to switch to laparotomy has been found to increase if the intestine is dilated by more than 4 cm [22]. Further, it should be noted that not only does insufficient surgical space due to inadequate decompression make intestinal damage more possible, but the intestinal wall is also more likely to be fragile as a result of intestinal edema. Ileus tube insertion has the advantage of making identification of the lesion by preoperative contrast enhancement possible, and also the tube can be used as a guide to search for the lesion intraoperatively, making laparoscopic surgery less challenging despite the greater difficulty in searching the entire intestine during laparoscopic as compared to laparotomic surgery.

Although intersigmoid hernia and other internal hernias are difficult to diagnose preoperatively, intestinal necrosis is uncommon, and as long as incarceration-induced necrosis can be ruled out, there is adequate time to perform preoperative decompression with an ileus tube. In addition, since the surgical procedure consists only of release of the incarcerated portion of the intestine and closure of the hernial orifice, this condition is a good indication for laparoscopy.

### CONCLUSION

We treated two patients with intersigmoid hernia that was diagnosed and treated laparoscopically. Although this condition is difficult to diagnose preoperatively, intestinal necrosis is uncommon, and preoperative decompression by the insertion of an ileus tube enables its safe laparoscopic diagnosis and treatment. This condition should be suspected in cases of intestinal obstruction with no previous history of laparotomy, and, if a treatment strategy can be established, then laparoscopic surgery may be the first-choice option as minimally invasive treatment.

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