



Case Report

Reduced Port Surgery for a Pregnant Woman With Strangulated Small Bowel Obstruction: A Case Report

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Introduction: Intestinal obstruction in pregnancy is very rare, but the maternal mortality rate and the fetal loss rate are high. Therefore, an early diagnosis and appropriate treatments for small bowel obstructions (SBOs) during pregnancy are crucial for the mothers and fetuses. On the other hand, laparoscopic surgeries are widely used in pregnant patients, although laparoscopic surgeries for SBOs can have higher risks of complications. Then, reduced port surgery (RPS) can reduce the risk of intestinal injury by minimizing the number of ports the operator could not control alone. There is no previous report of RPS for SBOs in pregnant patients. We report on a pregnant patient with a strangulated SBO treated with RPS without complications.

Case presentation: A 37-year-old Japanese pregnant woman complaining of severe abdominal pain was admitted by ambulance. Her gestational age was 9 weeks. Her medical history included surgery for acute perforated appendicitis and deep vein thrombosis due to anti-thrombin III deficiency. Abdominal computed tomography revealed a strangulated SBO. We performed RPS and the cause of strangulated SBO was a string at the postoperative site of the appendectomy. The ischemic region of the small bowel recovered after we cut the string and released the adhesion. The patient's postoperative course was uneventful and the fetus was not harmed. **Conclusion:** This is the first report of RPS performed for the pregnant patient with the strangulated SBO. Our findings indicate that RPS is a feasible treatment for strangulated SBOs in pregnant women.

Key words: Pregnant woman – Reduced port surgery – Small bowel obstruction

Laparoscopic surgeries are widely used in patients with various diseases as well as pregnant patients.^{1–3} However, laparoscopic surgeries for small bowel obstructions (SBOs) can have higher risks of complications, such as bowel injuries due to distended and fragile small bowels.⁴ Thus, reducing the number of ports that the operators cannot control by themselves may mitigate the risks. Here, we report on a pregnant patient with a strangulated SBO cured by reduced port surgery (RPS) with no complications.

Case Presentation

A 37-year-old pregnant woman complaining of acute severe abdominal pain was admitted by ambulance. Her gestational age was 9 weeks and 5 days. Her medical history included surgery for acute perforated appendicitis at 29 years old and deep vein thrombosis due to anti-thrombin III deficiency. Her father died of pulmonary embolization. She presented with tenderness in the right lateral abdomen, but no rebound tenderness. We conducted contrast-enhanced computed tomography, which indicated a strangulated SBO (Figs. 1a, b). Therefore, we performed RPS under general anesthesia. A multiport platform for RPS with a 12-mm port and two 5-mm ports (EZ Access, Hakko, Nagano, Japan) was inserted through a 2.5-cm incision at the umbilicus.⁵ We first explored all around the abdomen with the single incision. The serosa of some of the small bowel looked dark red. There was a string around the cecum, which caused the strangulated SBO (Fig. 2). An additional 5-mm port was placed carefully in the lower abdomen to safely cut the string. The strangulation was released after the string was cut and all adhesions were dissected. All parts of the small bowel were extracted through the umbilical wound, which was enlarged to 4.5 cm, and checked directly (Fig. 3). The appearance of serosa improved but did not normalize, so we inserted a nasointestinal long tube. A drainage tube was placed through the lower port site.

It took 20 minutes to release the strangulated SBO and the total operation time was 126 minutes because we waited until the appearance of the small bowel recovered before we inserted the long tube. Estimated blood loss was 130 mL, including ascites. No transfusion was conducted. We started to inject

heparin sodium intravenously on the day after surgery and human antithrombin III 2 days after surgery. The nasointestinal long tube and intra-abdominal drainage tube were extubated, due to little drainage 3 days after surgery. The mode of heparin administration was changed from intravenous to subcutaneous and we administered aspirin orally 4 days after surgery. Oral intake of food began 5 days after surgery, and the patient was discharged 14 days after surgery. Intravenous injection of acetaminophen as an analgesic was only needed



Fig. 1 (a, b) Computed tomography images. White arrows indicate the strangulated small bowel obstruction.



Fig. 2 Intraoperative laparoscopic visualization. The string caused the strangulated small bowel obstruction. The appearance of the small bowel was dark red, indicating ischemia.

once a day on the next day and second day after surgery. The patient's postoperative course was uneventful and the fetus was unaffected.

Discussion

Although a SBO in pregnancy is rare, it is the second most common non-obstetric reason for surgical intervention during pregnancy. The incidence rate of SBO in pregnancy is reported to range from 1 out of every 1500 deliveries to 1 out of every 66,000 deliveries.⁶ In pregnant patients with SBOs, the maternal mortality rate is 2% to 20% and the fetal loss rate is 14% to 50%.^{7,8} Therefore, an early diagnosis and appropriate treatments for SBOs during pregnancy are essential for the mothers and fetuses. In particular, surgical treatments are required for patients with a strangulated ileus, even if they are pregnant.

Recently, laparoscopic surgeries for pregnant patients have become common. Cox *et al* reported that the laparoscopic approach to appendectomy and cholecystectomy for pregnant patients resulted in significant decreases in the operative time, length of stay, and minor complications compared with open surgery, even when controlling for confounding variables.¹ Although the use of laparoscopy in all trimesters has not always been widely accepted, there are many reports in which laparoscopic surgeries are used during all trimesters.^{1,2} Laparoscopic surgeries for patients with SBOs have been popular in recent years.^{4,9} However, surgeons should consider the risk of intestinal injury because the small bowels are distended and vulnerable in the patients with SBOs. Ming-She Li *et al* conducted a meta-analysis comparing laparoscopic versus



Fig. 3 The assessment of the small bowel. The small bowel was extracted through the umbilical wound. The appearance of serosa recovered over time.

open adhesiolysis and concluded that laparoscopic surgery was advantageous in most of the analyzed outcomes. There were 16 bowel injuries out of 142 cases, although there was no statistically significant difference between laparoscopic and open surgeries.⁹ Ramy Behman *et al* conducted a population-based analysis of 8584 patients with SBOs. They concluded laparoscopic procedures for adhesive SBOs were associated with a greater likelihood of intervention for bowel injury and or repair than open ones and that surgeons should approach laparoscopic lysis of adhesions with a higher level of awareness and use strategies to mitigate this risk.⁴ Pregnant patients have larger than usual uteruses, and this interferes with the view, so the risk of intestinal injury can be higher. On the other hand, RPS is associated with better outcomes in postoperative pain and cosmesis.^{5,10–13} In our institute, we performed RPS, including single-incision laparoscopic surgery, for more than 100 cases of colorectal cancer per year, and also performed RPS for the patients with SBOs and inflammatory diseases. RPS has additional advantages for this patient and the cosmetic one was not the main reason we chose this procedure. We conducted the single-incision plus one port laparoscopic surgery mainly because we wanted to reduce the risk of intestinal injury by minimizing the number of ports the operator could not control alone. This advantage of RPS can be

greater in later pregnancy because the view may be interfered with more by the uterus. Furthermore, RPS can reduce the risks of abdominal wall hernia, surgical site infection,¹⁰ vessel injury during induction of ports, and ugly scarring caused by continuous tension to the abdominal wall due to pregnancy.

In conclusion, we performed RPS for a SBO in a pregnant patient with an antithrombin III deficiency without any complication to mother or fetus. Thus, our findings indicate RPS is a feasible treatment for strangulated SBOs in pregnant women. To our knowledge, there is no previous report of RPS for SBO in pregnant patients, so this report may help significantly advance knowledge of this surgical area in pregnancy. Further studies are required to validate this.

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There are no conflicts of interest to declare. The patient gave informed consent and patient anonymity is preserved. The Ethics Committee's approval is unnecessary for this submission. All authors are in agreement with the content of the manuscript.

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