American Journal of Case Reports

Received: 2018.08.11
Accepted: 2018.09.24
Published: 2018.12.14

e-ISSN 1941-5923
© Am J Case Rep, 2018; 19: 1488-1494
DOI: 10.12659/AJCR.912676

Internal Hernia Associated with Colostomy After Laparoscopic Surgery for Rectal Malignancy: A Report of 3 Thought-Provoking Cases

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF 1 Daiki Yasukawa
D 1 Yuki Aisu
D 1 Yusuke Kimura
D 1 Yuichi Takamatsu
D 1 Taku Kitano
CE 1,2 Tomohide Hori

1 Department of Digestive Surgery, Tenri Hospital, Tenri, Nara, Japan
2 Department of Surgery, Shiga General Hospital, Moriyama, Shiga, Japan

Corresponding Author: Tomohide Hori, e-mail: horitomo55office@yahoo.co.jp
Conflict of interest: None declared

Case series
Patients: Male, 70 • Male, 75 • Male, 85
Final Diagnosis: Internal hernia
Symptoms: Abdominal and/or epigastric pain
Medication: —
Clinical Procedure: —
Specialty: Surgery

Objective: Diagnostic/therapeutic accidents

Background: Colostomy creation via intraperitoneal route is often performed during laparoscopic Hartmann's operation or abdominoperineal resection (APR). Herein, we report 3 rare cases of internal hernia associated with colostomy (IHAC).

Case Reports: The first case involved a 70-year-old man with IHAC after laparoscopic APR. Laparoscopy revealed the small intestine passed through a defect between the lifted sigmoid colon and left lateral abdominal wall in a cranial-to-caudal direction. The dislocated bowel with ischemic change was restored to its normal position and the lateral defect was covered with lateral peritoneum and greater omentum. The second case involved a 75-year-old man with IHAC after laparoscopic APR. Intraperitoneal findings were similar to those in the first case, except for the size of the lateral defect. This defect was too large for primary closure or patching; therefore, no surgical repair was performed. Unfortunately, this led to IHAC recurrence and creation of a new colostomy via extraperitoneal route. The third case involved an 85-year-old man with acute peritonitis resulting from IHAC after laparoscopic Hartmann's operation. Surgery revealed incarcerated bowels forming a closed loop and a perforation in the lifted sigmoid colon. The perforated colon was compressed by the dilated herniated bowel. The resected sigmoid colon showed perforation at the ulcer, which was shown on pathology to be caused by ischemia.

Conclusions: IHAC can lead not only to ischemia of strangulated bowel, but also to secondary damage to the lifted colon. During laparoscopic Hartmann's operation or APR, the colostomy should be created via extraperitoneal route to avoid IHAC.

MeSH Keywords: Colostomy • Hernia, Abdominal • Ileus • Laparoscopy • Postoperative Complications

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/912676

2232 — 4 14

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

Background

As advanced surgeries have become progressively more common, anus-preserving procedures have become available for patients with rectal malignancy [1]. However, surgical procedures with colostomy for rectal malignancy (e.g., Hartmann's operation [HO] and abdominoperineal resection [APR]) are still performed in patients for whom anus-preserving procedures are not indicated [2].

Surgery-related complications associated with colostomy after HO or APR involve stoma stenosis, retraction, or prolapse; parastomal hernia; and intestinal obstruction [3]. Major causes of postoperative intestinal obstruction are intraperitoneal adhesions and unexpected torsion. There have been few reports of intestinal obstruction resulting from internal hernia associated with colostomy (IHAC). We herein present 3 thought-provoking cases of IHAC after laparoscopic surgery for rectal malignancy. We also discuss diagnostic methods and therapeutic strategies for this rare complication.

Case Report

Case 1

A 70-year-old man presented with a history of laparoscopic APR for low rectal cancer. A sigmoid colostomy had been created via the intraperitoneal route during laparoscopic APR. Two months after surgery, the patient experienced severe abdominal pain and visited our hospital. Contrast-enhanced computed tomography (CE-CT) showed that part of the small intestine and its regional mesentery were positioned in the lateral space between the lifted sigmoid colon and the lateral abdominal wall. A medially displaced and decompressed sigmoid colon was observed (Figure 1A). The herniated small intestine in the pelvic space was dilated and fluid-filled, but had persistent contrast uptake on the image study (Figure 1B). The patient was diagnosed with strangulation ileus of the small intestine resulting from IHAC. Emergency laparoscopic exploration was performed. Laparoscopy revealed that the small intestine passed through a defect between the lifted sigmoid colon and left lateral abdominal wall (Figure 1C) in a cranial-to-caudal direction; the herniated bowel formed a closed loop with ischemic changes. This dislocated bowel was restored to a normal position laparoscopically. The lateral defect was covered with lateral peritoneum and greater omentum (Figure 1D) to avoid postoperative recurrence of IHAC. Bowel resection was not required, because the color of the incarcerated small intestine immediately normalized. No recurrence of IHAC was observed after surgery.

Laparoscopic surgery was effective for this patient with bowel strangulation resulting from IHAC after laparoscopic APR. The lateral defect was covered with a patch made from surrounding tissues, which prevented IHAC recurrence.

Case 2

A 75-year-old man presented with a history of laparoscopic APR for rectal melanoma. A sigmoid colostomy had been created via the intraperitoneal route during APR. Two months after APR, the patient experienced moderate abdominal pain and nausea almost simultaneously. The CE-CT findings were similar to those in *Case 1* (Figure 2A, 2B). A clinical diagnosis of strangulation ileus related to IHAC was made. Emergency laparoscopic exploration was performed. Laparoscopy revealed that the small intestine passed through a defect between the lifted sigmoid colon and the left lateral abdominal wall, in a cranial-to-caudal direction. The herniated bowel formed a closed loop; this malposition resulted in partial occlusion of blood flow (Figure 2C, D). The incarcerated bowel was restored to its normal position laparoscopically. Bowel resection was not required, because the herniated small intestine recovered from ischemic changes. The lateral defect was too large for primary closure or patching. The defect measured approximately 10 cm by 5 cm was observed based on image and intraoperative findings. We therefore chose not to surgically repair this large defect, an intraoperative decision that was, in retrospect, a mistake. As might be expected, IHAC recurred 1 month after initial inadequate herniorrhaphy and repeat laparoscopic surgery was needed. During the second surgery for IHAC, the small bowel strangulation was resolved and a new colostomy was made via the extraperitoneal route. After extraperitoneal creation of the colostomy, no recurrence of IHAC was observed.

Leaving IHAC unrepaired is not recommended, because recurrent IHAC will occur. This case illustrates that surgeons should not hesitate to recreate a colostomy via the extraperitoneal route to prevent recurrence of IHAC.

Case 3

An 83-year-old man presented with a history of laparoscopic HO for low rectal cancer. A sigmoid colostomy had been created via the intraperitoneal route. Follow-up CE-CT 2 months after surgery showed that the small intestine passed through a defect between the lifted sigmoid colon and left lateral abdominal wall, in a cranial-to-caudal direction. The patient was asymptomatic and no disturbance of bowel passage was observed (Figure 3A). Therefore, we concluded that surgical repair was not indicated at that time. Thereafter, the patient received systemic chemotherapy to treat multiple liver and lung metastases. Fifteen months after HO, the patient developed vomiting and diarrhea during the course of systemic chemotherapy. CE-CT showed dilation of the fluid-filled small intestine, but no obvious small intestinal obstruction was found.

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

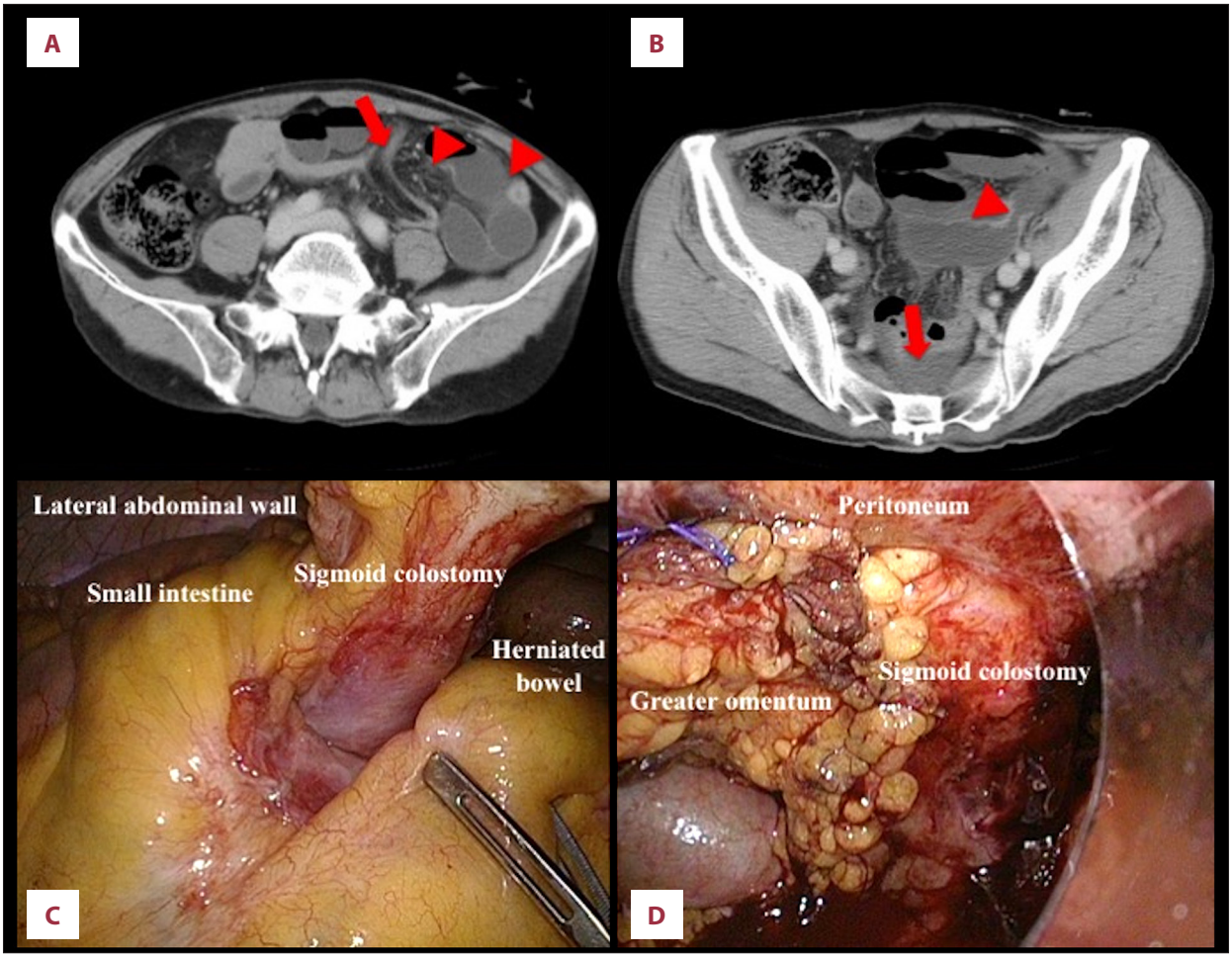

Figure 1. (**A**) Contrast-enhanced computed tomography shows part of the small intestine and its regional mesentery positioned in the lateral space between the lifted sigmoid colon and the lateral abdominal wall (arrowheads). The medially displaced and decompressed sigmoid colon is also observed (arrow). (**B**) The herniated small intestine in the pelvic space is dilated and fluid-filled but has persistent contrast uptake (arrowhead). A small amount of ascites is confirmed in the pelvis (arrow). (**C**) Laparoscopic exploration reveals the small intestine passing through the defect between the lifted sigmoid colon and left lateral abdominal wall in a cranial-to-caudal direction. The incarcerated bowel forms a closed loop with ischemic changes. (**D**) The lateral defect was covered with lateral peritoneum and greater omentum to avoid postoperative recurrence of internal hernia associated with colostomy.

Gastroenteritis resulting from systemic chemotherapy or adhesion ileus with incomplete obstruction was suspected. The patient was admitted to our hospital for medical management and close observation. Two days after hospitalization, the patient's abdominal pain and distention worsened. CE-CT revealed intraperitoneal free air and marked dilation of the small intestine with ascites (Figure 3B, 3C). A clinical diagnosis of acute peritonitis with digestive tract perforation was made and immediate emergent laparotomy was performed. Surgery revealed that the small intestine passed through a defect between the lifted sigmoid colon and left lateral abdominal wall, in a cranial-to-caudal direction. The incarcerated bowel formed a closed loop and had ischemic color change (Figure 3D). The position of the herniated small intestine was normalized. An intestinal perforation was identified in the lifted sigmoid colon, but not in the incarcerated bowel (Figure 3E). The perforated colon had been secondarily compressed by the dilated herniated bowel. Although the herniated intestine had an ischemic color, this ischemic bowel was preserved after flow restoration. The perforated sigmoid colon was resected and a new colostomy was created. The patient's condition was critical because of septic shock and acute peritonitis; therefore, operative time and anesthesia duration were minimized. The new colostomy was made with the descending colon via a conventional intraperitoneal route, because colostomy creation via this route is easy and simple. Intraperitoneal lavage was performed and 2 surgical drains were placed in the pelvic cavity. Although the postoperative course was complicated by paralytic ileus and pneumonia, the patient was discharged 26 days after surgery. The resected bowel showed a perforation at the

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

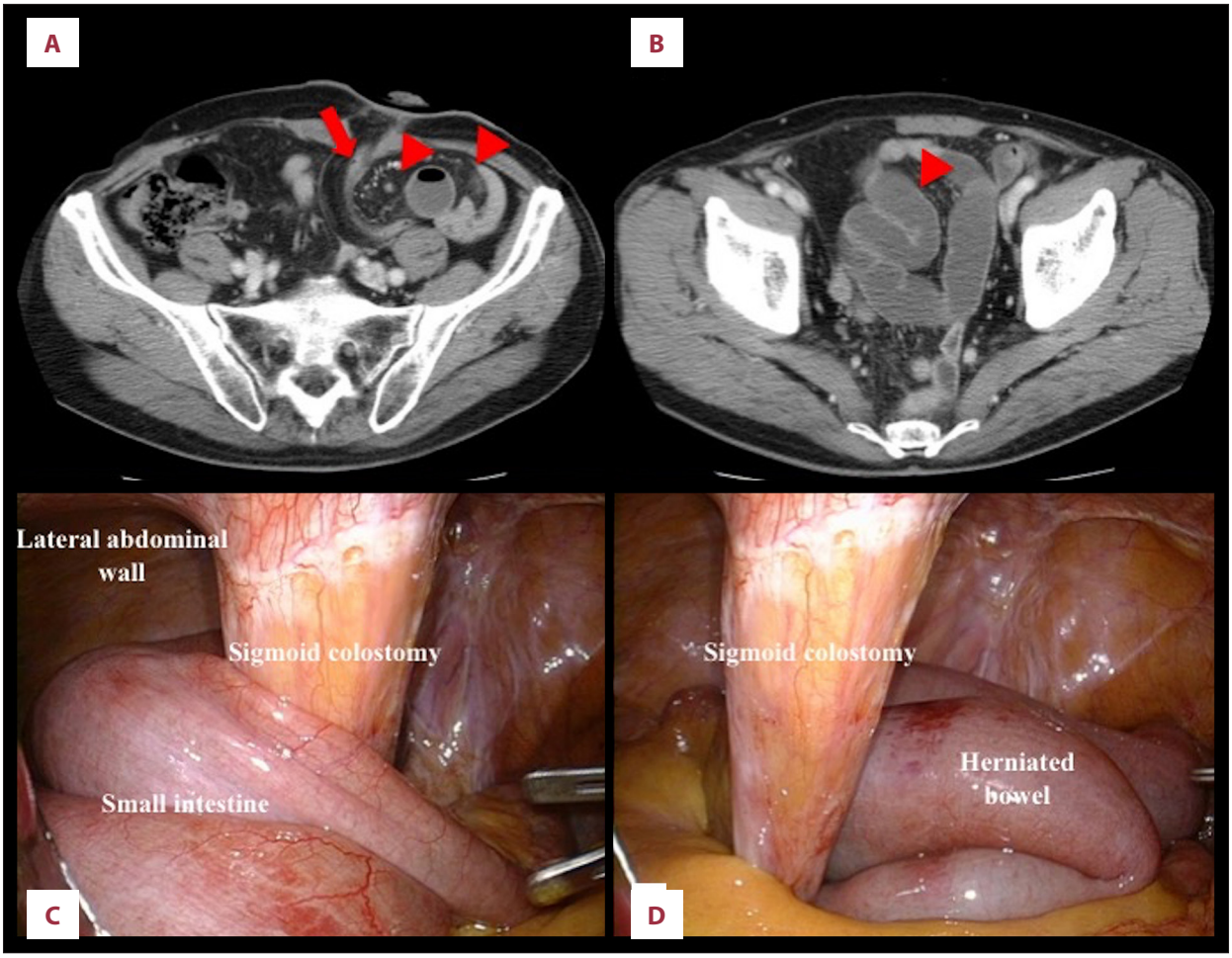

Figure 2. (**A**) Contrast-enhanced computed tomography shows part of the small intestine and its regional mesentery positioned in the lateral space between the lifted sigmoid colon and lateral abdominal wall (arrowheads). The medially displaced and decompressed sigmoid colon is observed (arrow). (**B**) The herniated small intestine in the pelvic space is dilated and fluid-filled but has persistent contrast uptake (arrowhead). (**C, D**) Laparoscopic exploration revealed that the small intestine passed through the defect between the lifted sigmoid colon and left lateral abdominal wall in a cranial-to-caudal direction, and that the incarcerated bowel formed a closed loop. This malposition resulted in partial occlusion of blood flow.

site of an ulcer (Figure 3F), which was shown on pathology to be caused by ischemia.

IHAC easily leads to ischemic damage of incarcerated small intestine. Moreover, IHAC can affect the lifted colon. Perforation of the lifted colon and subsequent peritonitis are clinically serious and require emergency surgery. Accurate diagnosis and prompt treatment are crucial for IHAC. A colostomy should be intentionally created via the extraperitoneal route at initial surgery to avoid IHAC.

Discussion

Surgical procedures with concurrent colostomy creation (e.g., HO or APR) are still performed worldwide for patients with rectal malignancies. Stoma stenosis, retraction, or prolapse; parastomal hernia; and intestinal obstruction are the main reported surgery-related complications. The major cause of intestinal obstruction is postoperative intraperitoneal adhesions; intestinal obstruction resulting from internal hernia is a rare clinical complication. Almost all reported postoperative internal hernias were caused by mesenteric defects after gastrointestinal tract or colorectal surgery [4,5]. A mesenteric internal hernia often results in intestinal obstruction, which requires subsequent surgical treatment. Surgical closure of mesenteric defects during initial surgery is recommended to avoid mesenteric internal hernias. However, IHAC is considered extremely rare, with only 2 documented case reports [6,7].

Laparoscopic surgery has developed markedly in recent years and is now widely performed, especially in general surgery.

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

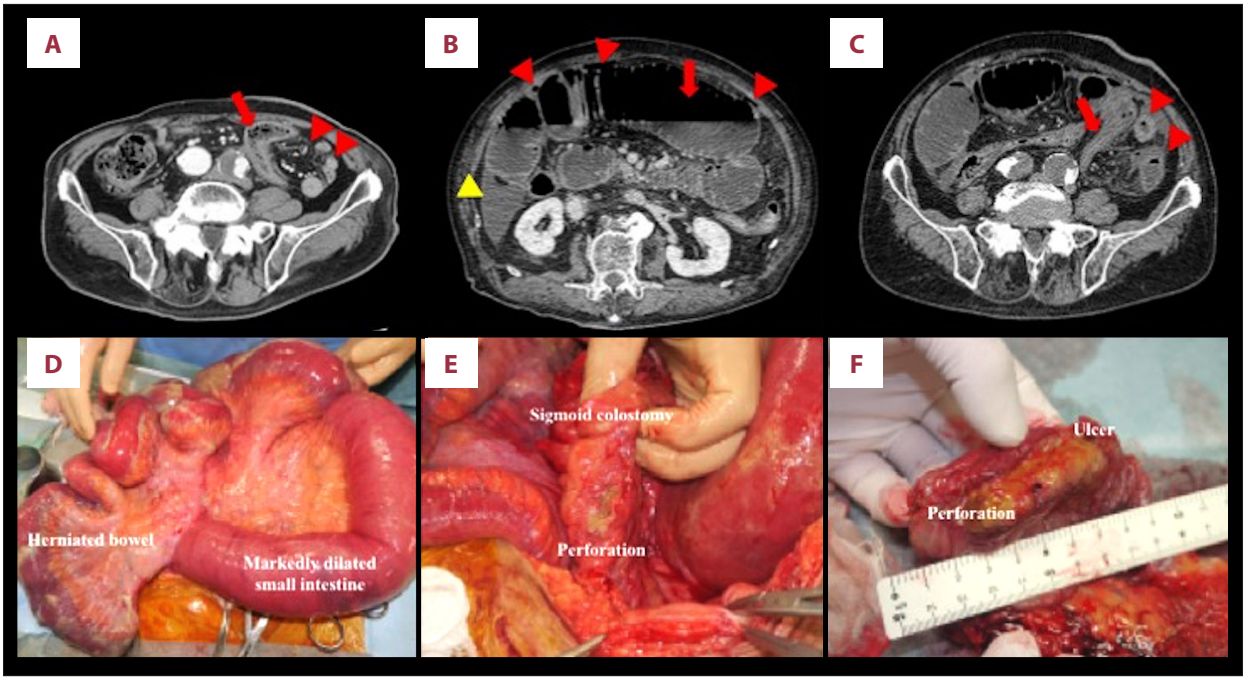

Figure 3. (**A**) Follow-up contrast-enhanced computed tomography 2 months after surgery shows the small intestine passing through a defect between the lifted sigmoid colon and left lateral abdominal wall (arrowheads) in a cranial-to-caudal direction. No disturbance of bowel passage was observed, and the lifted sigmoid colon is seen (arrow). (**B**) Contrast-enhanced computed tomography 2 days after hospitalization reveals intraperitoneal free air (red arrowheads) and marked dilation of the small intestine (arrow) with ascites (yellow arrowhead). (**C**) Contrast-enhanced computed tomography shows part of the small intestine and regional mesentery positioned in the lateral space between the lifted sigmoid colon and lateral abdominal wall (arrowheads). The medially displaced and decompressed sigmoid colon is observed (arrow). (**D**) Emergent laparotomy revealed that the small intestine passed through the defect between the lifted sigmoid colon and left lateral abdominal wall in a cranial-to-caudal direction. The incarcerated bowel formed a closed loop and had ischemic color change. (**E**) A perforation was identified in the lifted sigmoid colon, which was secondarily compressed by the dilated herniated bowel. (**F**) Resected specimen had a perforation at the site of ulceration, which was shown on pathology to be caused by ischemia.

Laparoscopic surgery has many advantages compared with open surgery, including better cosmesis, less postoperative pain, earlier postoperative recovery, and fewer intraperitoneal adhesions [8,9]. Intraperitoneal adhesions often cause postoperative intestinal obstruction. Laparoscopic surgery results in fewer cases of postoperative intestinal obstruction compared with open surgery. Paradoxically, intraperitoneal adhesions may prevent intestinal herniation; we therefore speculate that laparoscopic surgery may have the disadvantage of increasing the likelihood of internal hernias compared with open surgery. Although over 1200 cases of colorectal surgery and more than 200 cases of sigmoid colostomy have been performed in the past 10 years at our institute, only 3 cases of IHACs occurred. During this period, laparoscopic colostomy creation was employed via the intraperitoneal route in all cases because laparoscopic colostomy creation via the extraperitoneal involves technical difficulty, especially in the launching stage of laparoscopic surgery. In contrast, conventional open surgery was performed via both routes (i.e., intra- and extraperitoneal routes). The incidences of IHAC in open and laparoscopic colostomy creations were evaluated, and the incidence rate of IHAC was approximately 1.5%. Note that all IHACs were observed not in conventional open surgery but, rather in laparoscopic colostomy creation. Conventional open surgery easily causes postoperative adhesions in the intra-abdominal cavity, but intraperitoneal adhesions after laparoscopic surgery are less common than after open surgery. The incidence of IHAC is very low, and our experiences with these 3 cases may involve a bias. In our results, all IHAC cases happened after laparoscopic surgery (not after conventional open surgery), and all IHAC were diagnosed in the early postoperative period (i.e., within 2 months after laparoscopic surgery). One possible explanation for our results is that less intraperitoneal adhesion after laparoscopic surgery resulted in IHAC, even in the early postoperative period, because under the non-adherent conditions in the intra-abdominal cavity, digestive tracts can anytime enter into anywhere. Hence, in the era of laparoscopic surgery, we strongly recommend that a colostomy under laparoscopic surgery should be created via the extraperitoneal route to prevent IHAC. With the further development of laparoscopic surgery, the incidence of internal hernias may increase. Adequate management of internal hernias is required and preventive strategies for IHAC should be established.

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

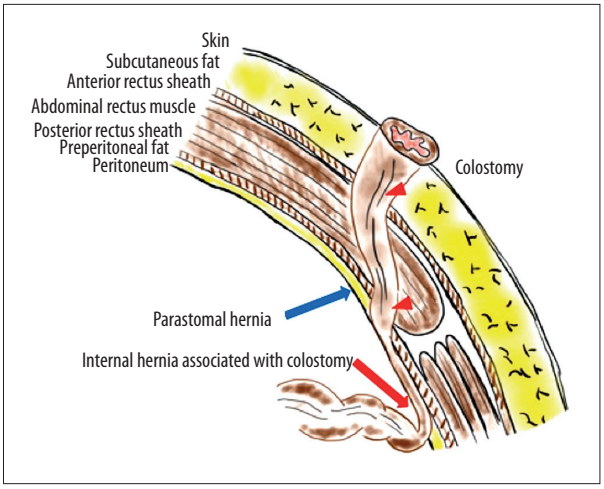

Figure 4. Colostomy is created, via an extraperitoneal route to prevent IHAC (red arrow) even in fewer adhesions by laparoscopic surgery, and via a staggered fascia incisions (arrowheads) to avoid common parastomal hernia (blue arrow).

Internal hernias are often difficult to diagnose; imaging plays an important role in diagnosis. The most useful examination for diagnosing internal hernia is CE-CT [10]. Our experience indicates that the following 2 findings on CE-CT are important in diagnosing IHAC: (i) positioning of the small intestine and its regional mesentery in the lateral space between the lifted sigmoid colon and left lateral abdominal wall, and (ii) medial displacement and decompression of the sigmoid colon. We believe that these findings support a precise diagnosis of IHAC.

Intra- and extraperitoneal routes are available for colostomy creation. Both routes are used worldwide [11] and each has its own advantages and disadvantages. The intraperitoneal route has the advantage of simplicity; therefore, this conventional route is preferred by many surgeons and is performed worldwide during HO and APR. With the intraperitoneal route, the small intestine can pass through the lateral defect, and IHAC may result in strangulation ileus and severe ischemia. Thus, the intraperitoneal route has the inherent possibility of resulting in IHAC, and we have no complete solution to prevent IHAC in cases via the intraperitoneal route. Hence, we strongly recommend that a laparoscopic colostomy should be created via the extraperitoneal route, even though the laparoscopic approach is accompanied with technical difficulties. In contrast, in the extraperitoneal route there is no space between the lifted sigmoid colon and the dissected lateral abdominal wall. Therefore, IHAC should in theory not occur, although cases have been reported even with this route [6,7]. The extraperitoneal route requires additional techniques (e.g., additional dissection of the extraperitoneal space and mobilization of the left-sided colon). Previous reports have documented that the extraperitoneal route was associated with a lower incidence of parastomal hernias compared with the intraperitoneal route; the risks of other complications were similar for both routes [11,12].

Though parastomal hernia is a common complication after colostomy [13,14], intraperitoneal internal hernia and parastomal hernia are different. We here focused on a rare complication (i.e., IHAC). At our institution, we performed sigmoid colostomy via the intraperitoneal route until we experienced these three cases. Currently, we employ an extraperitoneal route for colostomy creation to avoid IHAC. Our technical solution for not only IHAC but also parastomal hernia are summarized in schema (Figure 4). Colostomy is created via an extraperitoneal route to prevent IHAC even in fewer adhesions by laparoscopic surgery, and via staggered fascia incisions to avoid the most common complication (i.e., parastomal hernia) [13,14].

At our institution, we performed sigmoid colostomy via the intraperitoneal route until we experienced these 3 cases. Currently, we use an extraperitoneal route for colostomy creation to avoid IHAC. IHAC can lead not only to ischemia of the strangulated bowel, but also to secondary damage to the lifted colon. The small bowel is likely to repeat torsion and/or incarceration once the IHAC occurs. We strongly recommend creating a new colostomy via the extraperitoneal route in patients who once experienced IHAC and who received no closure or patch of the lateral defect (similar to the patient in *Case 2*). Severe damage to the lifted colon will cause a critical situation. As described above, we fear that the incidence of internal hernias may increase in the era of laparoscopic surgery and we recommend that even subtle defects should be carefully closed. We believe that the extraperitoneal route is superior to the intraperitoneal route for colostomy creation to avoid unexpected IHAC, and that no defects should remain after laparoscopic surgery.

Conclusions

During laparoscopic HO or ARP, a colostomy should be intentionally created via an extraperitoneal route to avoid IHAC. Careful closure of even subtle defects is important in the era of laparoscopic surgery.

Acknowledgement

None of the authors received financial support for this report. All authors have no conflicts of interest to disclose. Daiki Yasukawa and Tomohide Hori contributed equally to this report.

Conflict of interest

None.

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

References:

1. Scala D, Niglio A, Pace U et al: Laparoscopic intersphincteric resection: Indications and results. Updates Surg, 2016; 68: 85–91
2. Mariani P, Ghanneme A, De la Rochefordiere A et al: Abdominoperineal resection for anal cancer. Dis Colon Rectum, 2008; 51: 1495–501
3. Robertson I, Leung E, Hughes D et al: Prospective analysis of stoma-related complications. Colorectal Dis, 2005; 7: 279–85
4. Xu Z, Guo W: [Clinical research progress of mesenteric internal hernia after Roux-en-Y reconstruction]. Zhonghua Wei Chang Wai Ke Za Zhi, 2017; 20: 352–56 [in Chinese]
5. Toh JW, Lim R, Keshava A, Rickard MJ: The risk of internal hernia or volvulus after laparoscopic colorectal surgery: A systematic review. Colorectal Dis, 2016; 18: 1133–41
6. Yokota H, Hoshino I, Sugamoto Y et al: Internal hernia associated with colostomy after laparoscopic abdominoperineal resection. Clin Imaging, 2013; 37: 590–92
7. Yokoyama Y, Kawai K, Kazama S et al: A case of extraperitoneal stoma-associated internal hernia after abdominoperineal resection. World J Surg Oncol, 2014; 12: 141
8. Lee SH, Kim IH, Kim IH et al: Comparison of short-term outcomes and acute inflammatory response between laparoscopy-assisted and totally laparoscopic distal gastrectomy for early gastric cancer. Ann Surg Treat Res, 2015; 89: 176–82
9. Kim YW, Baik YH, Yun YH et al: Improved quality of life outcomes after laparoscopy-assisted distal gastrectomy for early gastric cancer: Results of a prospective randomized clinical trial. Ann Surg, 2008; 248: 721–27
10. Ramos-Andrade D, Andrade L, Ruivo C et al: Imaging the postoperative patient: Long-term complications of gastrointestinal surgery. Insights Imaging, 2016; 7: 7–20
11. Lian L, Wu XR, He XS et al: Extraperitoneal *vs.* intraperitoneal route for permanent colostomy: A meta-analysis of 1,071 patients. Int J Colorectal Dis, 2012; 27: 59–64
12. Wang FB, Pu YW, Zhong FY et al: Laparoscopic permanent sigmoid stoma creation through the extraperitoneal route versus transperitoneal route. A meta-analysis of stoma-related complications. Saudi Med J, 2015; 36: 159–63
13. Antoniou SA, Agresta F, Garcia Alamino JM et al: European Hernia Society guidelines on prevention and treatment of parastomal hernias. Hernia, 2018; 22: 183–98
14. Styliński R, Alzubedi A, Rudzki S: Parastomal hernia – current knowledge and treatment. Wideochir Inne Tech Maloinwazyjne, 2018; 13: 1–8

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]