Feasibility of Single-Incision Clipless Laparoscopic Total Colectomy for intractable slow transit constipation

Hidejiro Kawahara (✉ kawahide@outlook.jp)

Kokuritsu Byoin Kiko Nishisaitama Chuo Byoin <https://orcid.org/0000-0002-8618-1556>

Nobuo Omura

Kokuritsu Byoin Kiko Nishisaitama Chuo Byoin

Tadashi Akiba

Tokyo Jikeikai Ika Daigaku Fuzoku Kashiwa Byoin

Technical advance

Keywords: single incisional surgery, laparoscopic total colectomy, clipless surgery slow transit constipation

Posted Date: August 5th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-49057/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: In 2014, we reported single-incision clipless laparoscopic total colectomy (SCLTC) with ileorectal anastomosis (IRA) as a type of reduced-port surgery for several benign diseases. Patients with intractable slow transit constipation (STC) have undergone SCLTC with IRA since it was introduced in our institution. However, the feasibility and usefulness of the surgical procedure for patients with intractable STC has not been elucidated.

Methods: From January 2011 to December 2018, twenty-two patients with intractable STC underwent SCLTC with IRA at Kashiwa Hospital, Jikei University, were retrospectively registered in this study. We compared the first 12 consecutive patients undergoing the double stapling technique (DST) with IRA (DST group) with the last 10 consecutive patients undergoing functional end-to-end anastomosis (FEEA) with IRA (FEEA group).

Results: The mean surgical time was 200.2 (150-249) min for the FEEA group and 230.7 (180-266) min for the DST group. A significant difference was identified between the two groups (0.035). There were no significant differences between the groups with respect to the mean age, sex, constipation type, intraoperative blood loss, or postoperative hospital stay. No postoperative complications were encountered in either group.

Conclusion: Although SCLTC cannot be easily introduced for intractable STC, SCLTC with IRA using FEEA is feasible and safe.

Introduction

Total colectomy with ileorectal anastomosis (IRA) has been the gold standard surgical procedure for patients with slow transit constipation (STC) since this procedure was reported [1, 2]. This surgical procedure may be performed safely and effectively using an open or laparoscopic approach [4–7]. In 2014, we reported single-incision clipless laparoscopic total colectomy (SCLTC) with IRA as a type of reduced-port surgery for several benign diseases [8]. Patients with intractable STC have undergone SCLTC with IRA since it was introduced in our institution. However, the feasibility and usefulness of the surgical procedure for patients with intractable STC has not been elucidated.

Methods

From January 2011 to December 2018, twenty-two patients with intractable STC underwent SCLTC with IRA by our original procedure, were retrospectively registered in this study. The medical records of all patients were reviewed, and patients were divided into two groups: the first 12 consecutive patients underwent the double stapling technique (DST) with IRA (DST group), and the last 10 consecutive patients underwent functional end-to-end anastomosis (FEEA) with IRA (FEEA group).

The Ethics Committee for Biomedical Research of the Jikei Institutional Review Board approved the protocol [30–344 (9365)], and all patients or their family members provided written informed consent to participate.

Surgical Techniques Of Scltc With Ira

General surgical procedure

With the patient in the lithotomy position, a 3-cm longitudinal skin incision was made in the umbilical fossa, where a SILS port was placed with three 5-mm trocars. After pneumoperitoneum, the laparoscopic procedure was started under observation using a 5-mm flexible laparoscope.

First, the great omentum was divided with a LigaSure. After the division was extended to the splenic side, the splenic flexure of the colon was removed, and the left side of the colon from the descending colon to the sigmoid colon was mobilized from the retroperitoneum. Second, after the division was extended to the hepatic side, the hepatic flexure of the colon was removed, and the ascending colon was mobilized from the retroperitoneum.

Third, a mesocolon window was created at the descending to horizontal portion of the duodenum in the mesocolon (Fig. 1). The mesocolon, including vessels from the left side of the window to the sigmoid colon, was incised clockwise with a LigaSure (Fig. 2). This procedure was carried out on the upper side of the rectum, preserving the inferior mesenteric artery and the superior rectal artery.

Resection and reconstruction in the DST group

One of the three 5-mm trocars at the SILS port was changed to a 12-mm trocar, and intestinal transection was performed at the upper side of the rectum with an EndoGIA60. After the intestinal transection was performed, the SILS port was removed and replaced by a wound protector. A total colectomy specimen was delivered through the wound, and the transection of the terminal ileum with an EndoGIA60 extracorporeally. An anvil of EEA25 was placed at the resected stump of the ileum. After the SILS port was replaced at the umbilical wound with pneumoperitoneum, IRA was performed using DST with an EEA25.

Resection and reconstruction in the FEEA group

The SILS port was removed and replaced by a wound protector. After transection of the terminal ileum with an EndoGIA60 through the wound under direct vision, a total colectomy specimen was delivered through the wound, and intestinal transection was performed at the upper side of the rectum with EndoGIA60 extracorporeally. When the surgical specimen was delivered through the wound, the umbilical incision was enlarged approximately 5 cm because the delivered colectomy specimens were expanded with intestinal contents. After the intestinal transection was performed, IRA was performed using FEEA with an EndoGIA60.

Statistical Analysis

Continuous variables are expressed as the means and ranges. The Wilcoxon rank-sum test was used to compare the continuous variables, and the Chi-square test was used to compare the categorical data. A p-value of less than 0.05 was used to indicate significance. All data were analyzed using the Statistical Package for Social Sciences (SPSS) 24.0, (IBM SPSS, Tokyo, Japan).

Results

Comparison of clinical features between the DST and the FEEA groups (Table 1).

The mean surgical time was 200.2 (150–249) min for the FEEA group and 230.7 (180–266) min for the DST group. A significant difference was identified between the two groups (0.035). There were no significant differences between the groups with respect to mean age, sex, constipation type, intraoperative blood loss, or postoperative hospital stay. No postoperative complications were encountered in either group.

Table 1: Comparison of characteristic between DST group and FEEA group

Characteristic	DST group (n=12)	FEEA group (n=10)	p value
Mean age (range), years	50.3 (29 - 75)	42.2 (30 - 71)	0.939
Gender, n (%)			1.000
Male	3 (25)	3 (30)	
Female	9 (75)	7 (70)	
Constipation type, n(%)			0.293
Colonic inertia type	11 (92)	7 (70)	
Spastic constipation type	1 (8)	3 (30)	
Operation time (range), minutes	230.7 (180 - 266)	200.2 (150 - 249)	0.035
Intraoperative blood loss (range), ml	20.0 (0 - 90)	< 10	0.099
Postoperative hospital stay (range), days	11.2 (10 - 14)	12.6 (8 - 14)	0.079

The data are presented as mean (range) or as n (%).

Discussion

Total colectomy with ileorectal anastomosis is the most effective and widely used treatment strategy in patients with STC who fail to respond to medical or rehabilitative therapy. The laparoscopic approach, which is a multiport surgery, has been reported to be as safe and effective as open surgery [4–7]. However, it is very difficult for patients with intractable STC to undergo multiport laparoscopic surgery

because their colons expand with intestinal contents that cannot be removed by preoperative preparation and occupy their abdominal cavity. During surgery, there is concern about the risk of colonic perforation due to colonic injury by surgical movement of the forceps, which cannot be confirmed with a flexible laparoscope, and when inserting the forceps through the ports. We previously reported SCLTC with IRA for patients with intractable STC as a type of reduced-port surgery [8]. In this procedure, every surgical movement of the forceps, including their insertion through the ports, can be confirmed with a flexible laparoscope during surgery.

In single-incision surgery, intestinal resection is very difficult. Because the direction of the stapler inserted through an umbilical port and the direction of view obtained by the camera inserted through another umbilical port are the same, it is very difficult to confirm the apical part of the stapler [9–11]. It is believed that single-incision surgery is technically more difficult than multiport surgery [12–14]. In the FEEA group, the terminal ileum was divided with an EndoGIA60 through the umbilical wound under direct vision, and intestinal transection was performed at the upper side of the rectum with an EndoGIA60 extracorporeally. These surgical procedures contributed to a shorter operative time than DST. Almost all patients with intractable STC had large quantities of intestinal contents in the rectum that could not be removed by preoperative preparation. These rectal contents are prevented from intestinal reconstruction using DST, which is generally used with IRA. In the FEEA group, IRA was performed using FEEA with an EndoGIA60 extracorporeally without transanal approach after intestinal transection. This surgical procedure also contributed to a shorter operative time than DST.

In the present study, no postoperative complications were encountered in either group. SCLTC with IRA seems feasible and safe for patients with intractable STC. Furthermore, SCLTC with IRA using FEEA is an operative procedure that is more advanced than SCLTC with IRA using DST.

Conclusion

Although SCLTC cannot be easily introduced for intractable STC, SCLTC with IRA using FEEA is feasible and safe.

Abbreviations

IRA: ileorectal anastomosis; STC: slow transit constipation; SCLTC: single-incision clipless laparoscopic total colectomy; DST: double stapling technique; FEEA: functional end-to-end anastomosis

Declarations

Ethics approval and consent to participate

The Ethics Committee for Biomedical Research of the Jikei Institutional Review Board approved the protocol [30-344 (9365)], and all patients or their family members provided written informed consent to participate.

Consent for publication

The written consent to publish images or other personal or clinical details of participants was obtained from the patient.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare no competing interests.

Funding

None.

Authors' contributions

HK and NO performed operation. All authors analyzed and interpreted the patient data, and have been involved in drafting the manuscript. TA had given final approval of the version to be published. All authors read and approved the final manuscript.

Acknowledgements

None.

Author details

¹ Department of Surgery, Kashiwa Hospital, Jikei University School of Medicine

163-1 Kashiwashita, Kashiwashi, Chiba 277-8567, Japan.

² Department of Surgery, Nishisaitama-chuo national Hospital, 2-1671 Wakasa, Tokorozawashi, Saitama 359-1151, Japan.

References

1 Arbuthnot Lane W. The results of operative treatment of chronic constipation. Br Med J 1908; I:1:26 – 30.

2 Arbuthnot Lane W. Chronic intestinal stasis. Br Med J 1909; I:1:408–411.

3 Pinedo G, Zarate AJ, Garcia E, Molina ME, Lopez F, Zúñiga A. Laparoscopic Total Colectomy for Colonic Inertia: Surgical and Functional Results. Surg Endosc. 2009 Jan;23(1):62-65.

- 4 Sohn G, Yu CS, Kim CW, Kwak JY, Jang TY, Kim KH, et al. Surgical outcomes after total colectomy with ileorectal anastomosis in patients with medically intractable slow transit constipation. *J Korean Soc Coloproctol* 2011;27(4):180–187.
- 5 McCoy JA, Beck DE. Surgical management of colonic inertia. *Clin Colon Rectal Surg* 2012;25(1):20–23.
- 6 Reshef A, Alves-Ferreira P, Zutshi M, Hull T, Gurland B. Colectomy for slow transit constipation: effective for patients with coexistent obstructed defecation. *Int J Colorectal Dis* 2013;28(6): 841–847.
- 7 Sheng QS, Lin JJ, Chen WB, Liu FL, Xu XM, Hua HJ, et al. Comparison of hand-assisted laparoscopy with open total colectomy for slow transit constipation: a retrospective study. *J Dig Dis* 2014;15(8):419–424.
- 8 Kawahara H, Watanabe K, Tomoda M, Enomoto H, Akiba T, Yanaga K. Single-incision clipless laparoscopic total colectomy. *Hepatogastroenterol* 2014;61:453-455.
- 9 Kawahara H, Watanabe K, Ushigome T, Noaki R, Kobayashi S, Yanaga K. Umbilical incision laparoscopic surgery with one assist port for anterior resection. *Dig Surg* 2010;27:364-366.
- 10 Kawahara H, Watanabe K, Ushigome T, Yanagisawa S, Kabayashi S, Yanaga K. Usefulness of One Suprapubic Assist Port in Umbilical Incision Laparoscopic Surgery for Right-side Colon Cancer. *Hepatogastroenterol* 2011;58:1956-1958.
- 11 Kawahara H, Watanabe K, Tomoda M, Enomoto H, Akiba T, Yanaga K. Umbilical Single Incisional Approach Plus One Port For Partial Transverse Colectomy: Initial Operative Experience. *Hepatogastroenterol* 2014;61:1954-1956.
- 12 Markar SR, Wiggins T, Penna M, Paraskeva P. Single-incision Versus Conventional Multiport Laparoscopic Colorectal Surgery-Systematic Review and Pooled Analysis. *J Gastrointest Surg*. 2014;18(12):2214-2227.
- 13 Hirano Y, Hattori M, Douden K, Ishiyama Y, Hashizume Y. Single-incision Laparoscopic Surgery for Colorectal Cancer *World J Gastrointest Surg*. 2016;8(1):95-100.
- 14 Aldeghaither S, Zubaidi A, Alkhayal K, Al-Obaid O. Single-incision Laparoscopic Colorectal Surgery: A Report of 33 Cases in Saudi Arabia. *Ann Saudi Med*. 2016;36(4):282-287

Figures

Figure 1

View of the mesocolon window. The mesocolon window was created below the descending to horizontal portion of the duodenum (white arrows pointed out).

Figure 2

View of the incised mesocolon. The mesocolon including vessels was incised by LigaSure.