

## Standardized technique for single-incision laparoscopic-assisted stoma creation

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### Abstract

To describe the procedure, efficacy, and utility of single-incision laparoscopic-assisted stoma creation (SILStoma) for transverse colostomy. Using single-incision laparoscopic surgery, we developed a standardized technique for SILStoma. Twelve consecutive patients underwent SILStoma for transverse colostomy at Osaka Medical Center for Cancer and Cardiovascular Diseases from April 2013 to March 2016. A single, intended stoma site was created with a 2.5-3.5 cm skin incision for primary access to the intra-abdominal space, and it functioned as the main port through which multi-trocars were placed. Clinical and operative factors and postoperative outcomes were evaluated. Patient demographics, including age, gender, body mass index, and surgical indications for intestinal diversion were evaluated. SILStoma was performed in nine cases without the requirement of additional ports. In the remaining three cases, 1-2 additional 5-mm ports were required for mobilization of the transverse colon and safe dissection of abdominal adhesions. No cases required conversion to open surgery. In all cases, SILStoma was completed at the initial stoma site marked preoperatively. No intraoperative or postoperative complications greater than Grade II (the Clavien-Dindo classification) were reported in the complication survey. Surgical site infection at stoma sites was observed in four cases; however, surgical interventions were not required and all infections

were cured completely. In all cases, the resumption of bowel movements was observed between postoperative days 1 and 2. SILStoma for transverse loop colostomy represents a feasible surgical procedure that allows the creation of a stoma at the preoperatively marked site without any additional large skin incisions.

**Key words:** Laparoscopic surgery; Colostomy; Stoma; Postoperative complications; Cosmetic outcomes

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**Core tip:** We described the procedure, efficacy, and utility of single-incision laparoscopic-assisted stoma creation (SILStoma) for transverse colostomy. Using single-incision laparoscopic surgery, we developed a standardized technique for SILStoma. Twelve consecutive patients underwent SILStoma for transverse colostomy. In all cases, SILStoma was completed at the initial stoma site marked preoperatively. No complications were reported in the complication survey. SILStoma for transverse loop colostomy represents a feasible surgical procedure allowing stoma creation at ideal stoma sites marked preoperatively. Reductions in the number of port sites and the avoidance of additional skin incisions may result in improved cosmetic outcomes and patient quality of life.

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## INTRODUCTION

In the last decade, laparoscopy has been effectively utilized for colorectal surgery in many institutions and is associated with decreased blood loss, shorter hospital stays, decreased postoperative pain, faster postoperative recovery, and improved quality of life<sup>[1-4]</sup>. Conventional multiport laparoscopic colorectal surgery, such as for colorectal cancer, is generally performed using 4-5 trocar: 1 trocar for a laparoscopist, 2 trocars for an operator, and 1-2 trocars for an assistant. To reduce patient stress (*i.e.*, wound pain and cosmetic outcome), efforts have been made to decrease the number of port sites and shorten the length of skin incisions. Therefore, reduced port surgery (RPS), including single-incision laparoscopic surgery, has been developed for colorectal surgery<sup>[5-8]</sup>.

In general, RPS utilizes an umbilical incision as the main port for multi-trocar (generally, 2-4 trocars) access to remove specimens and perform anastomosis at bowel ends during colorectal surgery. The skin incision length of the main port depends on the surgical

procedure performed. Although shorter skin incisions and decreased numbers of port sites limit the work space for laparoscopic handling, they have been shown to reduce wound pain and improve cosmetic outcome.

Stoma creation for intestinal diversion is a common surgical procedure. Compared with ileostomy, the stoma site of colostomy is limited by the length and mobilization of the target section of the colon such as transverse colon. Utilizing single-incision laparoscopic surgery, we developed a standardized technique for single-incision laparoscopic-assisted stoma creation (SILStoma). Herein, we describe the procedure, technical details, efficacy, and utility of SILStoma for transverse colostomy.

## CASE REPORT

Twelve consecutive patients with bowel obstruction at a left-sided colon or rectum underwent SILStoma for transverse colostomy at Osaka Medical Center for Cancer and Cardiovascular Diseases from April 2013 to March 2016. A surgeon and an experienced enterostomal therapy nurse preoperatively marked an appropriate stoma site. A single, intended stoma site was created with a 2.5-3.5 cm skin incision for primary access to the intra-abdominal space, and it functioned as the main port through which multi-trocars were placed. SILStoma was performed as follows: An initial skin incision was made at the stoma site marked preoperatively and Lap-Protector (Hakko Co. Ltd., Nagano, Japan) and EZ Access (Hakko Co. Ltd., Nagano, Japan) were placed into the incision site. Three devices were introduced through the EZ Access and were adjusted to fit the Lap-Protector, including a flexible laparoscope (Olympus, Tokyo, Japan) and two operating forceps (Figure 1). An operator used two trocars and an assistant handled the laparoscope. In cases where the completion of the surgical procedure using a single port proved technically challenging, an additional port was introduced *via* the lateral abdomen.

The entire abdominal cavity was inspected laparoscopically. In the head-up tilt position with right side up, the transverse colon was detected and the target section of the intestinal tract was identified. Using forceps laparoscopically, dissection of greater omentum and mobilization were performed to construct a loop colostomy at the initial stoma site, and the mobilized transverse colon was extracted through the Lap-Protector, which was placed at the stoma site (Figure 2). Depending on the size of the transverse colon, the fascia was closed with Vicryl (size 1; Johnson and Johnson, New Brunswick, NJ, United States) to prevent stoma site hernia. The skin and intestine were sutured and fixed with vicryl.

Clinical and operative factors and postoperative outcomes were evaluated. Surgical complications were assessed according to the Clavien-Dindo classification system<sup>[9]</sup>, in which all complications were graded from I to IV. The present study was approved by the institutional review board of Osaka Medical Center for Cancer and



**Figure 1** Image of the single-incision laparoscopic-assisted stoma creation technique. At the preoperatively-marked ideal stoma site (A), three trocars were placed in the EZ Access device (B).

#### Cardiovascular Diseases.

Patient demographics, including age, gender, body mass index, and surgical indications for intestinal diversion are shown in Table 1. Previous history related to surgical interventions, such as previous abdominal surgeries, operation time, intraoperative bleeding, number of additional port sites, conversion to laparotomy, postoperative complications, and median days until stoma functioned were investigated (Table 2).

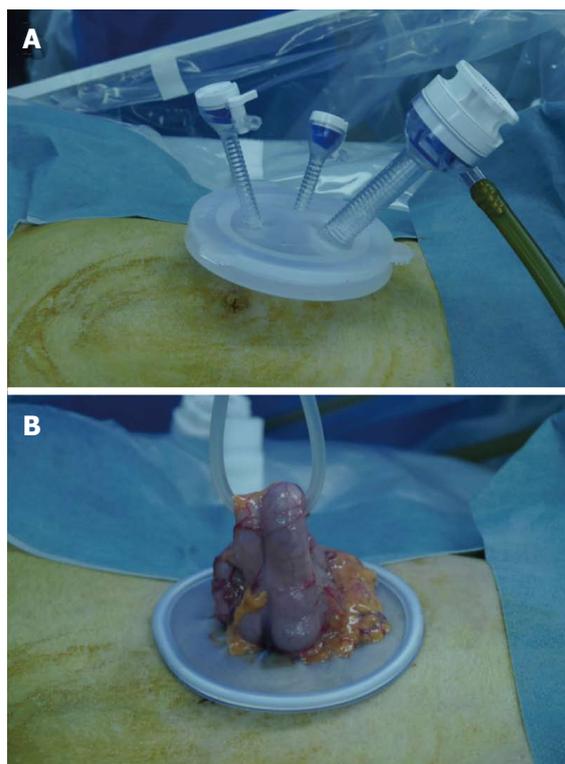
SILStoma was performed in nine cases without the requirement of additional ports. In two cases, one additional port (5 mm at the left-side lateral abdomen) was required, and in another case, two additional ports (5 mm trocars at left- and right-side lateral abdomen) were required. In the remaining three cases, additional ports allowed mobilization of the transverse colon and the safe dissection of abdominal adhesions. No cases required conversion to open surgery. In all cases, SILStoma was completed at the initial stoma sites marked preoperatively with a success rate of 100%.

No intra- or postoperative complications greater than or equal to Grade II were reported in the postoperative complication survey. Surgical site infection at the stoma sites was observed in four cases; however, surgical interventions were not required and all infections were completely cured within 30 d after the operation.

In all cases, the resumption of bowel movements was observed between postoperative days 1 and 2. Postoperative diets were provided after confirmation of the resumption of bowel movements.

## DISCUSSION

Laparoscopic surgery was introduced to improve patient quality of life by reducing wound length and pain, leading to quicker postoperative recovery. Results from several randomized studies have demonstrated the non-inferiority of laparoscopic surgery in terms of short-term oncological outcomes compared with conventional open surgery<sup>[1,10,11]</sup>. Laparoscopic surgery has been applied in the treatment of colorectal cancer, where radical resection is the overall goal of treatment to reduce disease



**Figure 2** Image of single-incision laparoscopic-assisted stoma creation utilizing multi-trocar access via EZ Access at the stoma site. SILStoma was performed using a total of 3 trocars: 2 trocars for an operator and 1 trocar for a laparoscopist (A). After the mobilization to construct a loop colostomy the transverse colon was extracted through the Lap-Protector at the stoma site (B).

recurrence and improve patient survival<sup>[1,10-12]</sup>.

The introduction of RPS, including single-incision laparoscopic surgery, has been shown to improve cosmetic outcomes; however, reducing the number of port sites limits laparoscopic handling space. In recent years, a small number of reports have compared the clinicopathological factors and outcomes between single-incision laparoscopic surgery and conventional laparoscopic surgery for colectomy<sup>[13-15]</sup>. These studies reported no differences in operative duration, conversion rate to open surgery, number of lymph nodes harvested, length of hospital stay, postoperative complications, or mortality<sup>[13-15]</sup>. Among the 12 cases included in the present study, no intra- or postoperative complications greater than or equal to Grade II were reported. No cases required conversion to open surgery.

In the present study, we performed colostomy at the transverse colon because the obstructive effect such as colitis and edema at the sigmoid colon. The stoma site was a major concern as the surgical procedure was performed *via* a single port site; however, we were able to mobilize the transverse colon by laparoscopic surgery and create the stoma at the site initially marked preoperatively. Resultant stoma sites were those marked preoperatively in all cases, indicating the substantial benefit of this rational approach to stoma creation. Another concern was the reduction in the number of port sites that may have increased the technical difficulty of

**Table 1 Patient demographics**

Age (yr)	61.5 (54-76)
Sex (male/female)	5/7
Body mass index	21.85 (13.7-24.5)
Previous surgical history	1
Indications	
Unresectable obstructive descending colon cancer	1
Unresectable obstructive rectal cancer	10
Recurrence of uterine corpus cancer with rectal obstruction	1
Preoperative decompression of intestine	7

All continuous variables are expressed as medians (range).

**Table 2 Perioperative factors associated with single-incision laparoscopic-assisted stoma creation**

All continuous variables are expressed as medians (range)	
Operative duration (min)	58.5 (28-140)
Blood loss (mL)	0 (0-5)
Additional port (except single incision)	0 (0-2)
Conversion to open	0
Complications (Grade $\geq$ II <sup>1</sup> )	0
Median days until stoma functioning	1 (1-2)
All continuous variables are expressed as average and standard deviation	
Operative duration (min)	76.9 $\pm$ 38.3
Blood loss (mL)	0.4 $\pm$ 1.4
Additional port (except single incision)	0 (0-2)
Conversion to open	0
Complications (Grade $\geq$ II <sup>1</sup> )	0

<sup>1</sup>Postoperative complications  $\geq$  Grade II are listed.

operative handling during the surgical procedure. In order to reduce the difficulty caused by the limited work space at the main port for multi-trocar access, we placed three trocars in the EZ Access device and make differences of the trocar length. In the first five cases, the surgical procedure took long time (supplementary table S1); however, the relatively short operation time observed in the succeeding cases indicates that SILStoma is no more time-consuming than comparable techniques, and indirectly demonstrated that technical challenges encountered during the surgical procedure may be less than anticipated. Although we included consecutive cases in the present study, we did not perform a comparison of open vs single-incision laparoscopic surgery using patient randomization. Therefore, selection bias may have been introduced to the results of the present study. There have been several previous studies of single-incision laparoscopic surgery for ileostomy and sigmoid colostomy, however small number of cases was evaluated for transverse colostomy<sup>[16-18]</sup>. Although further studies are required to fully determine the potential benefit of the presented technique, SILStoma did not impede stoma creation, indicating its utility in transverse loop colostomy.

SILStoma for transverse loop colostomy represents

a feasible surgical procedure allowing stoma creation at ideal stoma sites marked preoperatively. Reductions in the number of port sites and the avoidance of additional skin incisions may result in improved cosmetic outcomes and patient quality of life.

## COMMENTS

### Case characteristics

The procedure, efficacy, and utility of single-incision laparoscopic-assisted stoma creation (SILStoma) for transverse colostomy.

### Clinical diagnosis

A single, intended stoma site was created with a 2.5-3.5 cm skin incision for primary access to the intra-abdominal space, and it functioned as the main port through which multi-trocar were placed.

### Differential diagnosis

SILStoma was performed as follows: An initial skin incision was made at the stoma site marked preoperatively and Lap-Protector (Hakko Co. Ltd., Nagano, Japan) and EZ Access (Hakko Co. Ltd., Nagano, Japan) were placed into the incision site.

### Treatment

The skin and intestine were sutured and fixed with vicryl.

### Related reports

Laparoscopic surgery was introduced to improve patient quality of life by reducing wound length and pain, leading to quicker postoperative recovery. Results from several randomized studies have demonstrated the non-inferiority of laparoscopic surgery in terms of short-term oncological outcomes compared with conventional open surgery.

### Experiences and lessons

SILStoma for transverse loop colostomy represents a feasible surgical procedure allowing stoma creation at ideal stoma sites marked preoperatively. Reductions in the number of port sites and the avoidance of additional skin incisions may result in improved cosmetic outcomes and patient quality of life.

### Peer-review

The paper is interesting, and well-presented and developed and consequently.

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