

Feasibility of Single-incision Laparoscopic Surgery plus One Assist Port for Anterior Resection

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Abstract. *Background:* We previously reported single-incision laparoscopic surgery plus one assist port (SPO) in 2010 as a type of reduced-port surgery for anterior resection. However, the feasibility and usefulness of SPO for patients with rectal cancer has not been elucidated. *Patients and Methods:* Between January 2009 and December 2011, 49 patients with rectal cancer underwent laparoscopic surgery, 36 of these patients underwent multiport surgery (MPS) and the remaining 13 patients underwent SPO at the Kashiwa Hospital, Jikei University. *Results:* The mean surgical time was 178.5 (range: 115.0-245.0) min for SPO, and 173.3 (110.0-240.0) min for MPS. The mean intraoperative bleeding was 7.7 (0-60) ml for SPO, and 11.4 (0-70) ml for MPS. The postoperative hospital stay was 10.3 (9-12) days for SPO, 10.8 (6-12) days for MPS. There were no significant differences between the groups with respect to surgical time, intraoperative blood loss, and postoperative hospital stay. No postoperative complications or postoperative recurrences were encountered in either group. *Conclusion:* Although single-incision laparoscopic surgery cannot be easily introduced for anterior resection, SPO for the treatment of rectal cancer yields outcomes comparable to MPS and is feasible, safe, and oncologically acceptable.

Single-incision laparoscopic surgery (SILS) for colorectal cancer requires specific laparoscopic surgical skills. Anterior resection, and specifically low anterior resection, by SILS is one of the most difficult procedures in laparoscopic colorectal surgery. We have been performing SILS plus one port (SPO), which is easier to perform than SILS (1).

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However, the feasibility and usefulness of SPO for patients with rectal cancer has not been determined. Herein, we report that the feasibility and usefulness of SPO for the anterior resection of rectal cancer is comparable to that of multiport surgery (MPS).

Patients and Methods

Between January 2009 and December 2011, 49 patients with rectal cancer underwent laparoscopic surgery, 36 patients were treated with MPS, and 13 patients were treated with SPO at Kashiwa Hospital, the Jikei University (Table I). The medical records of patients were retrospectively reviewed, and classified according to the Japanese classification of colorectal carcinoma (2).

Port setting. A multichannel port is placed at the umbilicus in SILS. A 12-mm port is inserted into the right lower quadrant as an additional port (Figure 1). This port is used for drainage after resection. Therefore, the final abdominal view is identical to that for SILS except for the drain insertion.

Follow-up after surgery and postoperative adjuvant chemotherapy. All patients were followed-up every 6 months with measurements of serum carcinoembryonic antigen and computed tomography. The patients also underwent yearly colonoscopy for 5 years. The patients with stage III disease were administered oral S-1 (Taiho Pharmaceuticals Co. Ltd., Tokyo, Japan) or capecitabine (Xeloda; Hoffmann-La Roche, Basel, Switzerland) for 6 months after surgery. The endpoint of this study was recurrence.

Statistical analysis. All data were analyzed using the Statistical Package for Social Sciences (SPSS) 22.0, (IBM SPSS, Tokyo, Japan). The statistical significance was determined by the Mann-Whitney U-test or the χ^2 test. A *p*-value of less than 0.05 was considered significant.

Results

Comparison of SPO and MPS patient characteristics. The mean surgical time was 178.5 (range: 115.0 to 245.0) min for the SPO group and 173.3 (110.0 to 240.0) min for the MPS group (Table I). The mean intraoperative bleeding was 7.7 (0 to 60) ml for the SPO group vs. 11.4 (0 to 70) ml for

Table I. Clinicopathological characteristics of the patients SILS plus one (SPO) and multiport surgery (MPS). The data are presented as the mean (range) or as n (%).

Variable	SPO (n=13)	MPS (n=36)	p-Value
Age (years)	63.7 (46-86)	62.8 (36-90)	0.439
Gender			
Male	9 (69)	23 (64)	0.994
Female	4 (31)	13 (36)	
Surgical procedure			
High anterior resection	3 (23)	15 (42)	0.392
Low anterior resection	10 (77)	21 (58)	
Operation time (minutes)	178.5 (115.0-245.0)	173.3 (110.0-240.0)	0.085
Intraoperative blood loss (ml)	7.7 (0-60)	11.4 (0-70)	0.943
Postoperative hospital stay (days)	10.3 (9-12)	10.8 (6-12)	0.984
Postoperative complications			
Anastomotic leakage	0 (0)	0 (0)	
Small bowel obstruction	0 (0)	0 (0)	
Tumor diameter (mm)	29.1 (14-70)	42.6 (10-95)	0.485
Depth of tumor			
T1	6 (46)	7 (19)	0.074
T2	3 (23)	5 (14)	
T3	4 (31)	24 (67)	
Pathological type			
Well-differentiated	8 (62)	12 (33)	0.149
Moderately	5 (38)	24 (67)	
Recurrence	0 (0)	0 (0)	

the MPS group. The postoperative hospital stay was 10.3 (9 to 12) days for the SPO group vs. 10.8 (6 to 12) days for the MPS group. Although low anterior resection was more frequent in the SPO group than in the MPS group, there were no significant differences with respect to surgical time, intraoperative blood loss, and postoperative hospital stay. There were no postoperative complications, such as leakage or bowel obstruction in either groups. Approximately 70% of the patients had a T1 or T2 tumor in the SPO group. However, approximately 70% of the patients had a T3 tumor in the MPS group. At more than 4 years after surgery, no postoperative recurrences had been observed in either group.

Discussion

SILS, also known as single-port access surgery and laparoscopic single-site surgery, has been performed since the late 1990s for a wide variety of surgical procedures (3-8). SILS is one type of solo surgery where counter-traction is produced by changing body position and retracting with only one forceps (9). An electrocautery or an energy device can then be inserted through the other umbilical port to perform bowel mobilization and lymph node dissection. There are three major difficulties in performing SILS for anterior resection. The first difficulty is associated with obtaining an acceptable surgical view because a camera port is often linked to the surgeon's action (9). The second difficulty is

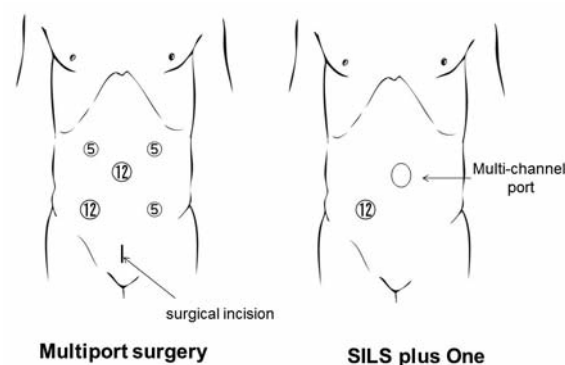


Figure 1. Port setting of multiport surgery and single-incision laparoscopic surgery with one assist-port. Size of units are described in the circle.

due to the interference between surgical devices, such as a camera, forceps and energy devices, which are inserted through different channels of the umbilical port (10). The third difficulty is the transection of the lower rectum with a stapler because when the stapler is inserted through the umbilical port, its position is parallel to the rectum.

To address these issues, we inserted a port into the right lower quadrant in SPO, which was the most frequently used port during MPS. Therefore, the surgeons are comfortably able to perform laparoscopic anterior resection by SPO as in

MPO. Additionally, no special training is required to perform this reduced-port surgery.

No postoperative recurrences were observed after more than four years in either group. Thus, SPO is oncologically comparable with MPS. However, MPS should be performed for advanced rectal cancer because the indications for SPO are a tumor depth ranging from T1 to T2 (11, 12).

In conclusion, SILS cannot be easily introduced for rectal cancer surgery. However, SPO is comparable to MPS and is feasible, safe, and oncologically acceptable.

Conflicts of Interest

The Authors have no conflicts of interest to disclose and received no financial support for this study.

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