Comparison of Short-Term Outcome Between Single Port Robot-Assisted and Laparoscopic Surgery in colorectal cancer

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Purpose

The newly launched single port robot (SPR) - assisted colorectal surgery is being used in many hospitals for the treatment of colorectal cancer. The purpose of this study was to compare the short term outcomes between single port robot assisted surgery and single incision laparoscopic surgery in colorectal cancer.

Materials and Methods

From April 2019 to April 2020, a retrospective study was conducted with 141 patients diagnosed with rectal cancer who underwent surgery. This study compared the short term outcomes of single incision laparoscopic surgery (SILS) group and SPR assisted surgery group. The operation was performed by a single surgeon. We identified the patient's baseline characteristics, perioperative characteristics, post operation pathology, and postoperative complications. This study was reviewed and approved by the institutional review board.

Results

Of a total of 141 patients, 134 were enrolled. (SILS = 53, SPR = 81) The number of patients who underwent low anterior resection (LAR) was 83 (SILS = 35, SPR = 48), and the number of patients who underwent ultra low anterior resection (uLAR) was 32 (SILS = 13, SPR = 19) were the second most common. When the perioperative outcome between the two groups was confirmed, there was no statistically significant difference other than the operation time. When comparing the TNM stage in the pathologic outcome obtained after surgery, the SILS group had a higher overall stage outcome. However, there was no significant difference between the two groups in pathologic results. There was no mortality after surgery. Postoperative morbidity was classified by Clavian-Dindo classification (CD). Comparing complications according to CD, severe complications occurred in 3 of 14 patients in the SILS group and 5 out of 28 patients in the SPR group. There was no statistically significant difference between the two groups. The most common minor complications were urinary retention.

Conclusion

SPR for rectal cancer is a technically safe and feasible, less scar making procedure. And SPR showed no significant difference in short term outcome when compared to SILS.

Table 1 Patients characteristics of rectal cancer surgery, n=134

	SILS(N = 53)	SPR(N = 81)	P - value
Sex			0.142
Male	38(71.7%)	48(59.3%)	
Female	15(28.3%)	33(40.7%)	
Age (year)	61.51 ± 12.32	58.05 ± 11.04	0.414
BMI (kg/m²)	24.51 ± 3.53	24.38 ± 3.23	0.535
ASA			0.64
1	9(17%)	19(23.5%)	
2	39(73.6%)	56(69.1%)	
3	5(9.4%)	6(7.4%)	
Previous abdominal operation history	6(11.3%)	14(17.3%)	0.344
Double primary cancer	1(1.9%)	2(2.4%)	0.688
Underlying disease	37(69.8%)	41(50.6%)	0.028
Preoperative c T stage			0.134
T1, Tx	7(13.2%)	4(4.9%)	
T2	12(22.6%)	21(25.9%)	
T3	17(32.1%)	40(49.4%)	
T4a	16(30.2%)	15(18.5%)	
T4b	1(1.9%)	1(1.2%)	
Preoperative c N stage			0.693
N0	22(41.5%)	28(34.6%)	
N1	27(50.9%)	45(55.6%)	
N2	4(7.5%)	8(9.9%)	
Preoperative c M stage			0.025
M0	48(90.6%)	80(98.8%)	
M1	5(9.4%)	1(1.2%)	
Location of tumor, n (%)			0.318
Rectosigmoid	4(7.5%)	3(3.7%)	
Upper rectum	24(45.3%)	27(33.3%)	
Mid rectum	14(26.4%)	29(35.8%)	
Lower rectum	11(8.2%)	22(16.4%)	
Neoadjuvant chemoradiotherapy, n (%)			<0.001
No	38(71.7%)	31(38.3%)	
Yes	15(28.3%)	50(61.7%)	
Preoperative CEA	2.70 ±3.07	4.59 ±11.45	0.113
Preoperative CA19-9	32.69 ±121.31	13.57 ±11.87	0.039

SILS, Single incision laparoscopic surgery; SPR, Single port robot assisted surgery; ASA, American Society of Anesthesiologist; BMI, body mass index; CEA, carcinoembroyonic antigen; CA19-9

Table 2 Perioperative clinical outcome and surgical procedure of rectal cancer patients (N = 134)

	SILS(N = 53)	SPR(N = 81)	P - value
Type of resection			0.444
LAR	35(66.0%)	48(59.3%)	
uLAR	13(24.5%)	19(23.5%)	
ISR	5(9.4%)	11(13.6%)	
APR	0	3(3.7%)	
Operation time (min)	147.85 ± 55.13	231 ± 87.07	0.002
Estimated blood loss (ml)	120.38 ± 93.52	175.93 ± 228.58	0.237
Intervention, n (%)			0.215
TME	52(98.1%)	81(100%)	
TSME	1(1.9%)	0	
Transfusion			0.824
	1(1.9%)	2(2.5%)	
Combined resection, n (%)			0.011
	12(22.6%)	6(7.4%)	
Laparoscopic conversion, n (%)			0.362
	1(1.9%)	4(4.9%)	
Stomy formation, n (%)			0.96
	10(18.9%)	15(18.5%)	

SILS, Single incision laparoscopic surgery; SPR, Single port robot assisted surgery; LAR, low anterior resection; uLAR, ultra low anterior resection; ISR, intersphincteric resection; APR, abdominoperineal resection; TME, total mesorectal excision; TSME, tumor-specific mesorectal excision;

Table 3. Pathologic outcomes of rectal ca patients

	SILS(N = 53)	SPR(N = 81)	P - value
Pathologic TNM stage			0.04
0	1(1.9%)	5(6.2%)	
I	18(34.0%)	29(35.8%)	
II	4(7.5%)	19(23.5%)	
III	24(45.3%)	24(29.6%)	
IV	6(11.3%)	4(4.9%)	
Number of harvested nodes	16.13 ± 5.16	15.99 ±7.25	0.074
Tumor location AV (cm)	5.19 ± 2.99	4.6 ± 6.27	0.615
Tumor size (cm)	3.26 ±2.34	2.97 ±1.58	0.059
Proximal resection (cm)	7.91 ± 3.59	7.24 ± 3.26	0.27
Distal resection (cm)	2.15 ± 1.65	2.18 ± 1.36	0.919
CRM			0.341
Negative	50(94.3%)	79(97.5%)	
Positive	3(5.7%)	2(2.5%)	
Histologic grade			0.596
WD	14(26.9%)	26(32.5%)	
MD	36(69.2%)	49(61.3%)	
PD	1(1.9%)	1(1.3%)	
Mucinous	0	3(3.8%)	
Squamous	1(1.9%%)	1(1.3%)	
Lymphatic invasion			0.247
Negative	30(65.2%)	57(75.0%)	
Positive	16(34.8%)	16(25.0%)	
Perineural invasion			0.882
Negative	26(56.5%)	44(57.9%)	
Positive	20(43.5%)	32(42.1%)	
Vascular invasion			0.201
Negative	38(82.6%)	67(90.5%)	
Positive	8(17.4%)	7(9.5%)	
Tumor budding			0.063
Negative	23(50.0%)	49(67.1%)	
Positive	23(50.0%)	24(32.9%)	

SILS, Single incision laparoscopic surgery; SPR, Single port robot assisted surgery; CRM, Circumferencial Resection Margin; AV, anal verge;

Table 4. Post operative complications and patient outcome

Outcome	SILS(N = 53)	SPR(N = 81)	P - value
Hospital day	9.49 ± 4.82	11.47 ± 16.97	0.864
Day to sips of water	2.96 ± 1.59	3.23 ± 1.68	0.667
Day to soft diet	4.02 ± 1.59	4.27 ± 1.71	0.11
Day to first flatus	3.32 ± 1.43	3.80 ± 2.34	0.239
Readmission (30day), n (%)	1(1.9%)	2(2.5%)	0.824
Morbidity (30day), n (%)			0.781
CD grade I,II and IIIa	11(78.6%)	23(82.1%)	
CD grade IIIb and IV	3(21.4%)	5(17.9%)	
Type of morbidity (n =41)			0.579
Operation related	14(100%)	25(89.3%)	
Operation unrelated	0	3(10.7%)	
Complications			0.775
Ileus	1(7.1%%)	2(7.1%)	
Anastmosis leakage	1(7.1%%)	3(10.7%)	
Rectovaginal fistula	0	1(3.6%)	
Fluid Collection	1(7.1%%)	1(3.6%)	
Intraabdominal Bleeding	0	1(3.6%)	
Chylous drainage	1(7.1%%)	7(25.0%)	
Urinary retension	6(42.9%)	9(32.1%)	
Hb chage to transfusion	2(14.3%)	3(10.7%)	
Others	2(14.3%)	1(3.6%)	

SILS, Single incision laparoscopic surgery; SPR, Single port robot assisted surgery; CD, Clavian Dindo grade