Original Article

Short-term Clinical Outcomes of Robotic-assisted Total Mesorectal Excision in Low-lying Rectal Cancer

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Aims. The aim of the study is to evaluate the feasibility, safety and short-term oncological outcomes of robotic-assisted total mesorectal excision (TME) for patients with low-lying rectal cancer (≤ 5 cm from anal verge).
Methods. We enrolled 52 patients with stages I-III low-lying rectal cancer undergoing robotic-assisted TME at a single institution between July 2013 and December 2016.
Results. Of the 52 patients, 43 (82.7%) patients underwent preoperative concurrent chemoradiotherapy (CCRT). R0 resection was obtained in 49 (94.3%) patients. Circumferential resection margin (CRM) and distal resection margin (DRM) were positive in 3 (5.76%) and 1 (1.9%) patients respectively. The anastomotic leakage rate was 3.84% (2/52 patients). The overall complication rate was 25% (13/52 patients); most of these were mild and the patient recovered uneventfully.
Conclusions. The results demonstrated that robotic-assisted TME is safe and feasible for patients with low-lying rectal cancer.

Key Words
Robotic-assisted total mesorectal excision;
Low-lying rectal cancer;
R0 resection;
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It was estimated that in 2014, there were about 15,000 new cases of colorectal cancer (CRC) diagnosed, and about 5,600 CRC patients died of CRC in Taiwan. Total mesorectal excision (TME) surgery, reported by Heald and Ryall[1] in 1982, has been the standard surgical procedure for patients with rectal cancer because it remarkably improves clinical outcomes in these patients. MacFarlane et al. reported a 5-year local recurrence rate of 5% in patients who underwent TME surgery alone.[2] In addition, preoperative concurrent chemoradiotherapy (CCRT) considerably helps in improving the local recurrence rate in patients with locally advanced rectal cancer (LARC). A German study reported a considerable decrease in local recurrence in patients receiving preoperative CCRT.[3,4] Similar results have also been reported in other studies[5-7] and preoperative CCRT has been the recommended treatment for patients with LARC.

Laparoscopic rectal surgery with TME is another therapeutic strategy for rectal cancer,[8,9] but the robotic system (da Vinci® Surgical System, Intuitive Surgical, Inc., Sunnyvale, CA) has several advantages such as high-definition three-dimensional vision with up to 10 × magnification, the articulatory instruments of the system, the surgeon-controlled camera platform, and stable traction provided by the robotic arm. Thus, dissection in the confined pelvic cavity can be performed more precisely by using this robotic system. Since the first robotic colon surgery in 2002,[10] robotic systems have been expected to show more advantages compared with conventional laparoscopic colorectal surgery and improve clinical outcomes of minimally invasive surgeries for colorectal cancer (CRC). Several studies have reported that compared with conventional laparoscopic and open surgeries for rectal cancers, clinical and short-term oncological outcomes of robotic surgery are more favorable.[11-14]

Rectal cancer surgery is a multi-quadrant operation involving the left upper quadrant, left lower quadrant, and pelvic cavity. Surgical procedures include dissection of the lymph nodes; ligation of the inferior mesentery artery (IMA) and inferior mesentery vein (IMV); mobilization of the splenic flexure of the colon, descending colon, and sigmoid colon; and dissection of the pelvic region. In the present study, we present the short-term oncological outcomes of patients with low-lying rectal cancer who underwent totally robotic-assisted TME.

Materials and Methods

Patients

We included 52 patients with stages I-III low-lying rectal cancer (adenocarcinoma) who underwent totally robotic-assisted TME with the da Vinci® surgical system at a single institution between July 2013 and December 2016. This study was approved by the Institutional Review Board of our hospital. Informed consent was obtained from each patient before performing the robotic surgery.

All patients routinely underwent preoperative colonoscopy and abdominal and pelvic computed tomography (CT) or magnetic resonance imaging (MRI) for preoperative staging. On the basis of the distance from the anal verge, low-lying rectal cancer was defined tumor ≤ 5 cm from the anal verge. Patients with T3, T4, or N+ rectal cancer received preoperative CCRT. Furthermore, 5-fluorouracil, leucovorin, and oxaliplatin (FOLFOX) regimen or fluoropyrimidine-based regimen were prescribed. Long-course radiotherapy (LCRT, total 5000 cGy in 25 fractions) was concurrently administered. Totally robotic-assisted TME was scheduled after more than 6 weeks after radiotherapy completion.

Clinicopathological features and perioperative parameters or outcomes such as age; sex; histological type; tumor, node, and metastasis (TNM classification); vascular invasion; perineural invasion; pre-CCRT, preoperative, and postoperative serum carcinoembryonic antigen (CEA) levels; time interval between the completion of preoperative radiotherapy and robotic surgery; tumor location (distance from the anal verge); and body mass index (BMI) were evaluated. The TNM classification was defined according to the criteria of the American Joint Commission on Cancer (AJCC)/ International Union Against Cancer (UICC).[15] The tumor regression grade (TRG) was evaluated according to the AJCC system.[16] Perioperative outcomes includ-

ing surgical procedures, docking time, console time, operation time, estimated blood loss, time of the first flatus passage, time of resuming soft diet, duration of postoperative hospital stay, and postoperative first day visual analog scale (VAS) pain score were evaluated.

Patients were regularly followed up and their clinical outcomes and survival statuses were regularly recorded. History-taking and physical examination were conducted every 3 months for 2 years and then every 6 months for 3 years. Serum CEA levels were measured every 2-3 months postoperatively. Colonoscopy was recommended at approximately 1 year after resection. Repeat colonoscopy was typically recommended at 3 years, unless follow-up colonoscopy indicated advanced adenoma (villous polyp, polyp > 1 cm, or high-grade dysplasia). Abdominal and pelvic CT scans were annually performed for up to 3 years in patients with stages II-III disease.

Surgical procedure

The single-docking technique with five or six ports (Fig. 1) was used as the docking method. The da Vinci® Si Surgical System was docked over the left flank of a patient. We used medial to lateral dissection to ligate and divide the inferior mesenteric vessels (artery and vein). First, we started to perform peritoneal incision at the level of the sacral promontory by using the monopolar cautery. Then, the dissection was extended upward and downward. We performed D3 lymph node dissection and low-tie ligation of the IMA by using endo clips (Hem-O-Lok, Weck Closure Systems, NC) with preservation of the left colic artery (LCA) in all patients, referred as the high dissection and low ligation.[17] The inferior mesenteric vein (IMV) was also identified, but was not ligated immediately. If there was tension during the colonic anastomosis, the IMV would be ligated by using endo clips and divided (Hem-O-LoK). The splenic flexure of the colon was not routinely mobilized, if its mobilization was dependent on the tension of the anastomosis. Totally robotic-assisted TME with single-docking technique was performed in all patients.

After the completion of mobilization of the sigmoid or descending colon, mesocolon, and entire rectum and TME, low anterior resection (LAR) with the double-stapled technique, intersphincteric resection (ISR) with coloanal anastomosis and loop colostomy, or abdominoperineal resection (APR) was accordingly performed.[17] For atumor located in the lower rectum, the surgical procedure used was ISR. The Lone Star Retractor System® (Lone Star Medical Products Inc., Houston, TX) was used for ISR. Then the specimen was extracted and resected transanally (natural orifice specimen extraction). Coloanal anastomosis

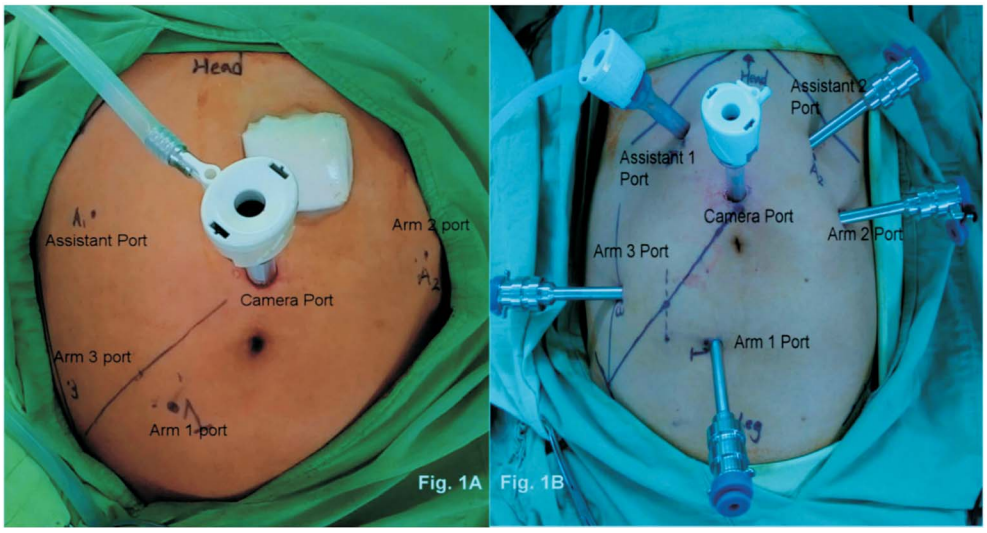

Fig. 1. (A) Port positions during single docking with the five-port technique. (B) Port positions during single docking with the six-port technique.

was performed using the hand-sewn method. A loop colostomy of the transverse colon was created. Finally, the traditional laparoscope was used to check any bleeding in the abdominal cavity. A drain tube was placed into the pelvic cavity.

Statistical analysis

All data were statistically analyzed using the Statistical Package for Social Sciences, Version 19.0 (SPSS Inc., Chicago, IL). All patients were followed up until their death, last follow-up, or December 31 2016. The operation time was defined as the time between the initial skin incision and wound closure completion. A p value of < 0.05 denoted statistical significance. Overall survival (OS) was defined as the time from the date of primary treatment to the date of death from any cause or the date of last follow-up. Disease-free survival (DFS) was defined as the time from the date of primary treatment to the date of diagnosis of recurrence or metastatic disease or the date of last follow-up. OS and DFS were calculated by using the Kaplan-Meier method.

Results

Patients' characteristics and perioperative outcomes

The baseline characteristics and perioperative outcomes of 52 patients with low-lying rectal cancer who underwent totally robotic-assisted TME with the single-docking technique are summarized in Table 1.

Table 1. Baseline characteristics and perioperative outcomes of 52 patients with stages 0-III low-lying rectal cancer undergoing robotic-assisted total mesorectal excision

Characteristics	
Age (years, median) (range)	61 (32-81)
Gender	
Female	20 (38.5%)
Male	32 (61.5%)
Distance from anal verge (cm, median) (range)	3.6 (1-5)
Pre-operation CCRT	
Yes	43 (82.7%)
No	9 (17.3%)
Pre-operation chemotherapy regimen	43
FOLFOX	30 (69.8%)
Fluoropyrimidine-based	13 (31.2%)
Time interval between radiotherapy completion and robotic surgery (day, median) (range) (43 patients undergoing pre-operation chemotherapy)	86 (47-203)
ASA classification	
II	30 (57.7%)
III	22 (42.3%)
BMI kg/m^2 (median) (range)	22.87 (17.50-30.9)
Procedure	
LAR	16 (30.8%)
ISR	32 (61.5%)
APR	4 (7.7%)
Protective diverting colostomy	
Yes	38 (73.07%)
No	14 (26.93%)
Docking time (min, median) (range)	5 (3-10)
Console time (min, median) (range)	215 (150-527)
Operation time (min, median) (range)	335 (240-710)
Estimated bloodloss (mL, median)	100 (15-450)
Time of first flatus passage (day) (median, range)	2 (1-10)
Time of resuming soft diet (day) (median, range)	4 (2-13)
Postoperative hospital stay (day) (median, range)	6 (5-30)
Postoperative first day VAS pain score (median, range)	3 (1-7)

APR, abdominoperineal resection; AR, anterior resection; ASA American Society of Anesthesiologists; BMI, body mass index; CCRT, concurrent chemoradiotherapy; ISR, intersphincteric resection; LAR, low anterior resection; VAS, visual analog scale.

The median age and BMI of the patients was 61 (range, 32-81) years and 22.87 (range, 17.50-30.9) kg/m^2 respectively. The median distance of the tumor from the anal verge was 3.6 (range, 1.0-5.0) cm.

The most frequent surgical procedure was ISR (32/52, 61.5%). ISR with coloanal anastomosis was performed in 32 patients, and APR was performed in 4 patients. Moreover, of the 32 patients undergoing ISR, 3 underwent transabdominal ISR and their tumor distances from the anal verge were 2-4 cm. Protective diverting loop transverse colostomy was performed in 38 patients, including 32 patients and 6 patients who underwent ISR and LAR respectively. Sphincter preservation rate was 92.3%. The median estimated blood loss including tissue fluid after CCRT was 100 mL. The median time of the first flatus passage and resuming soft diet postoperatively was 2 and 4 days respectively. The median duration of postoperative hospital stay was 6 days (range, 5-30).

Postoperative complications

The postoperative complications are summarized in Table 2. Postoperative complications were observed in 11 patients with 13 episodes. In one patient who developed intra-abdominal abscess, CT-guided pigtail drainage was subsequently performed. Anastomosis leakage was observed in 2 (3.8%) patients who underwent LAR with the double-stapled technique, and loop transverse colostomy was subsequently performed. Two (3.8%) patients developed stenosis of coloanal anastomosis and underwent dilation using a colonoscope. Urethral injury during ISR was noted in one (1.9%) patients. According to the Clavien-Dindo Classification, all postoperative ileus, urinary tract, and pulmonary complications were of grade1, and the patients recovered after conservative treatment. Moreover, no 30-day hospital mortality occurred.

Pathological outcomes and oncological outcomes

The pathological characteristics and oncological outcomes of all 52 patients are listed in Table 3. Preoperative clinical staging demonstrated that the majority of the patients had locally advanced rectal cancers including T3 in 36 (69.3%) patients, T4 in 7 (13.4%) patients, or N+ in 29 (55.8%) patients. Therefore, preoperative CCRT was performed in 43 patients, including FOLFOX regimen in 30 (69.8%) patients and fluoropyrimidine-based regimen in 13 (30.2%) patients. The median number of harvested lymph nodes and apical lymph nodes was 8 (range, 0-36) and 1 (range, 0-6) respectively. However, positive apical lymph node metastasis was observed in only 2 (3.85%) patients. The median distance of the distal resection margin (DRM) and circumferential resection margin (CRM) was 1.8 and 0.6 cm respectively. CRM and DRM were positive in 3 (5.78%) and 1 (1.9%) patients respectively. R0 resection for primary rectal cancer was performed in 49 (94.3%) patients. Of the 43 patients who received preoperative CCRT, a pathologic complete response (pCR) of the primary tumor was observed in 17 patients. 17 (39.5%), 14 (32.6%), 8 (18.6%), and 4 (9.3%) patients exhibited complete response (TRG 0), moderate response (TRG 1), mini-

Table 2. Postoperative complications in 52 patients with stages 0-III low-lying rectal cancer undergoing robotic-assisted total mesorectal excision

Complications	Number (%)	Management
Post-operative bleeding	1 (1.9%)	Laparotomy
Intra-abdominal infection/abscess	2 (3.8%)	1: conservative treatment 1: CT-guided pig-tail drainage
Coloanal anastomosis stenosis	2 (3.8%)	Colonoscopic dilation
Ileus	3 (5.8%)	Conservative treatment
Anastomosis leakage	2 (3.8%)	Loop transverse colostomy
Urethral injury	1 (1.9%)	Conservative treatment
Pulmonary complication	2 (3.8%)	Conservative treatment
Total	13 (25.0%)	

Table 3. Clinicopathologic characteristics and oncological outcomes of 52 patients with stages 0-III low-lying rectal cancer undergoing robotic-assisted total mesorectal excision

Preoperative clinical staging	
Tumor depth	
T1	2 (3.8%)
T2	7 (13.4%)
T3	36 (69.3%)
T4	7 (13.4%)
Lymph node metastasis	
N0	23 (44.2%)
N1	20 (38.5%)
N2	9 (17.3%)
AJCC[a] Stage (clinical)	
I	7 (13.4%)
II	16 (30.8%)
III	29 (55.8%)
Postoperative pathological outcomes	
Histology	
Well differentiation	12 (23.1%)
Moderate differentiation	38 (73.1%)
Poor differentiation	2 (3.8%)
Tumor size	
< 5 cm	48 (92.3%)
≥ 5 cm	4 (7.7%)
Tumor size (cm, mean ± SD) (range)	2.23 ± 1.352 (0-8)
Tumor depth	
T0	17 (32.7%)
Tis	1 (1.9%)
T1	9 (17.3%)
T2	11 (21.2%)
T3	13 (25%)
T4	1 (1.9%)
Lymph node metastasis	
N0	39 (77.1%)
N1	11 (19.8%)
N2	2 (3.1%)
AJCC Stage (pathologic)	
0	17 (32.7%)
I	14 (26.9%)
II	8 (15.4%)
III	13 (25%)
Tumor regression grade (43 patients with preoperative CCRT)	
0	17 (39.5%)
1	14 (32.6%)
2	8 (18.6%)
3	4 (9.3%)
Harvested lymph node (median) (range)	8 (0-36)
Harvested apical node (median) (range)	1 (0-6)
Postoperative pathological outcomes	
Distance of distal resection margin (cm, median) (range)	1.8 (1.0-4.0)
Distance of circumferential resection margin (cm, median) (range)	0.6 (0.1-3.5)
Distal resection margin	
Free	51 (98.1%)
Positive	1 (1.9%)
Circumferential resection margin	
Free	49 (94.3%)
Positive	3 (5.7%)
Resection degree of primary tumor	
R0	49 (94.3%)
R1	3 (5.7%)
Oncological outcomes	
Follow-up periods (months, median) (range)	25 (12-53)
R0 resection	
Locoregional recurrence	2
Distant metastasis	5
Liver + lung	1
Lung	1
Liver	2
Peritoneal carcinomatosis	1
R1resection	
Local recurrence	1
Lung	1
Peritoneum	1

[a] AJCC: American Joint Commission on Cancer.

mal response (TRG 2), and poor response (TRG 3) respectively. The median time interval between radiotherapy completion and robotic surgery was 86 (range, 47-203) days.

The median follow-up duration of 52 patients from the primary treatment was 25 (range, 12-53) months. Of 49 patients undergoing R0 resection, local recurrence and distant metastases were noted in 2 (4.0%) and 5 (10.2%) patients respectively. At a median follow-up duration of 25 months, the 2-year OS was 96.2% and 2-year DFS was 86.5% (Fig. 2).

Discussion

In this current study, we present our initial experiences and short-term clinical and oncological outcomes of 52 patients with stages I-III low-lying rectal cancer

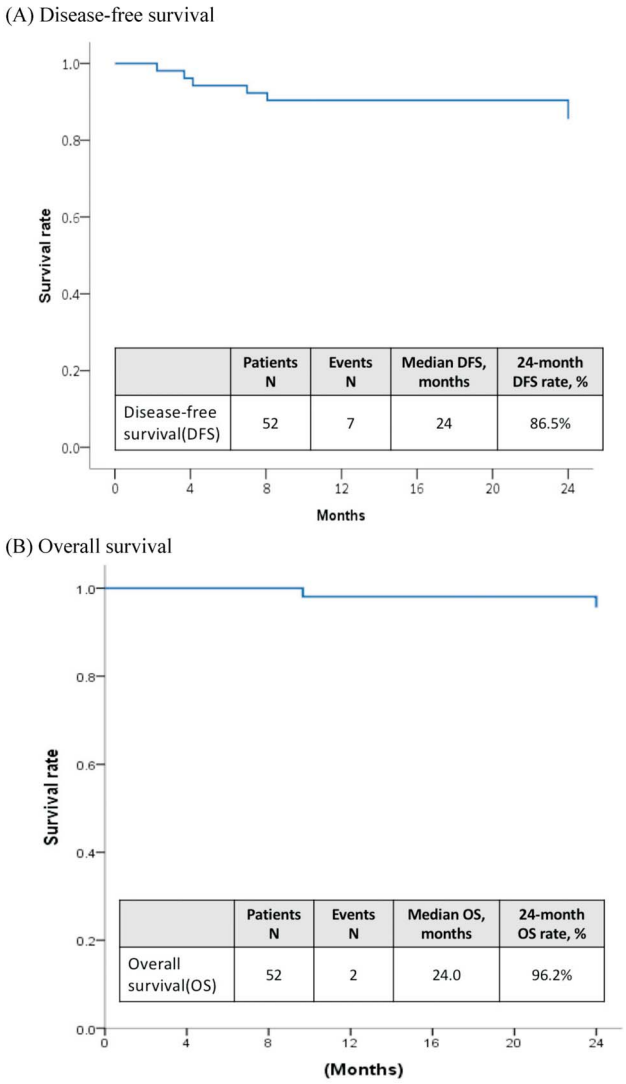

Fig. 2. The Kaplan-Meier survival curves.

who underwent totally robotic-assisted TME. Meanwhile, we demonstrated that this technique is safe and feasible for patients with low-lying rectal cancer, with or without preoperative CCRT. Of upmost importance, favorable short-term clinical and oncological outcomes can be achieved by combining this approach with appropriate preoperative CCRT. At least 12 lymph nodes should be examined for each surgical specimen of CRC as recommended in the guidelines of the AJCC/UICC. However, the recommendation was mainly based on the studies for colon cancers. Chou et al. reported that patients with rectal cancers and older patients who had distally located, early colon cancer were less likely to meet the recommended lymph node yield of 12.[18] Moreover, Persiani et al. found low lymph node count after neoadjuvant chemoradiotherapy for rectal cancer does not signify an inadequate resection or understating, but represents an increased sensitivity to the treatment. Besides, preoperative CRT significantly reduces the number of lymph nodes harvested, with the mean numbers of detected nodes ranging between 4 and 14 per specimen.[19] In the present study, the median number of harvested lymph nodes was 8 (range, 0-36), which is consistent with the literature.[19]

The preliminary results of this study were consistent with those of a meta-analysis conducted by Scarpinata et al.[20] The selection criteria for robotic surgery in this meta-analysis were obesity, male sex, preoperative radiotherapy, and tumors in the lower two-thirds of the rectum. The pCR rate observed in our study (39.5%) was relatively higher than that reported in previous studies (range, 10-30%, with less than 20% in most of studies),[21,22] of which the introduction of oxaliplatin-based chemotherapy and a longer interval might be the cause.[23] The sphincter preservation rate achieved in our study was 92%, which is comparable with that reported by Kim et al.[24] and Saklani et al.[25]

TME completeness is a representative of the quality of rectal cancer surgery. The two crucial parameters of TME completeness are CRM involvement and DRM distance. Moreover, CRM involvement has been reported as a prognostic factor for local recurrence and survival.[26-28] In this study, the rate of CRM involvement was 5.78%, with a median distance of 0.6 cm, which is comparable with that reported in previous studies (0-16.1%).[11,12,14,27-31] Moreover, the rate of DRM involvement was 1.9% with a median distance of 1.8 cm, which is comparable to that reported in previous studies.[11,12,14,27-31] R0 resection for primary rectal cancer was performed in 49 (94.2%) patients. Of the 49 patients with undergoing R0 resection, 2 (4.0%) developed local recurrence and 5 (10.2%) developed distant metastasis.

We try to do R0 surgery in each patient but three patients was R1 resection eventfully. The first patient is 59-year-old female and clinical stage is cT4bN2bM0 with direct uterus invasion. Neoadjuvant chemotherapy was performed first and robotic ISR was done 55 days later. Pathology report showed positive circum-

ferential margin, but distal resection margin was free. However, liver metastasis was noted 5 months after the operation and she finally died of cancer 2 years. The second patient is 61-year-old male and clinical stage is cT4aN2bM0, tumor penetrated to visceral peritoneum was noted. Neoadjuvant chemotherapy was performed first and robotic ISR was done 85 days later. Pathology report showed circumferential margin positive, distal resection margin was free. Paraaortic lymph metastasis was noted 6 months later after the operation, he died of pneumonia 9 months after the operation. The third patient is 53-year-old female and clinical stage is cT4bN2bM0 and posterior vaginal wall invasion was noted. Neoadjuvant chemotherapy was performed first and robotic ISR was done 203 days later. Pathology report showed positive circumferential margin, distal resection margin was also positive. Omentum metastasis was noted 9 months after the operation, and she remained alive under chemotherapy and target therapy.

Although low-lying rectal cancers occur with a median distance of 3.6 cmfrom the anal verge and 61.5% of our patients were men, we did not mobilize the splenic flexure in most of our patients and still could perform precise dissection during Robotic-assisted TME by the high dissection and low ligation techniques.[17] However, we still achieved acomparable distance of DRM and favorable negative rates of DRM and CRM. Protective diverting colostomy was performed in 73.1% of the patients undergoing sphincter preservation surgery; however, the anastomosis leakage rate in our study was comparable with that reported in the literature.[11,12,14,27,28]

This study has some limitations that should be addressed. First, this is a single-institution retrospective study including only 52 patients. Second, the interval of follow-up was short, with 25 months of median follow-up duration; thus, only short-term (2 year) survival and oncological outcomes were reported. Nevertheless, 2-year OS (96.2%) and the 2-year DFS (86.5%) observed in our study were consistent with those reported in previous studies (Table 4). Third, we did not evaluate the postoperative outcomes of urinary and sexual functions.

Conclusions

With comparable short-term clinical outcomes, we have demonstrated that this technique is safe and feasible for patients with low-lying rectal cancer, with or without preoperative CCRT. Moreover, favorable short-term oncological outcomes can be achieved by combining this approach with appropriate preoperative CCRT. However, long-term oncological outcomes should be further investigated by conducting studies having a longer follow-up duration.

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Table 4. Comparison of short-term oncological outcomes by robotic-assisted TME[a]

Study	Country (year)	Local recurrence (%)	Distant metastasis (%)	Disease-free survival	Overall survival
Present study (low-lying rectum)	Taiwan (2018)	4.0	10.2	86.5% (2-year)	96.2% (2-year)
Pai et al.[30] (all rectum)	USA (2015)	4	17	79.2% (3-year)	90.1% (3-year)
Kim et al.[31] (all rectum)	Korea (2016)	1.9	26.4	72.8% (4-year)	87.7% (4-year)
Feroci et al.[32] (mid and low-lying rectum)	Italy (2016)	1.9	17	79.2% (3-year)	90.2% (3-year)
Cho et al.[33] (all rectum)	Korea (2012)	1.8	12.2	81.8% (5-year)	92.2% (5-year)
Park et al.[34] (all rectum)	Korea (2015)	2.3	12.0	81.9% (5-year)	92.8% (5-year)
Ghezzi et al.[35] (all rectum)	Brazil/Italy (2014)	3.2	18.5	73.2% (5-year)	85.2% (5-year)
Hara et al.[36] (all rectum)	Korea (2014)	4.5	10	81.7% (5-year)	92.0% (5-year)
Baik et al.[37] (all rectum)	Korea (2013)	3.6	17.6	79.2% (3-year)	93.1% (3-year)

[a] TME: total mesorectal excision.

6R32, KMUH106-6M28, KMUH106-6M29, KMUH 106-6M30, KMUH106-6M31, KMUHS10522, KMUHS 10505, KMUHS10518, and KMUHGCRC2016002, KMUHS10601, KMUHS10608, KMUHA10664). In addition, this study was supported by Kaohsiung Medical University "Aim for the Top 500 Universities Grant" (KMU-TP105C01, KMU-TP105C11) Kaohsiung, Taiwan; "Aim for the Top University Grant," under grant nos. KMU-S105011, KMU-TP105A14, KMU-DK106005, and SH000113 (Give2Asia); and the Grant of Biosignature in Colorectal Cancers (grant no. T107-001), Academia Sinica, Taiwan.

Conflict of Interest

None.

Disclosure

The authors of this study have no financial or other conflicts of interest to disclose.

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原　著

在低位直腸癌使用達文西機械手臂輔助全直腸繫膜切除術之短期臨床成果

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目的　本研究吾人欲分析低位直腸癌 (距離肛門 ≤ 5 cm) 病患接受達文西機械手臂輔助全直腸繫膜切除術之安全性及短期臨床成果。

病人及方法　自 2013 年 7 月到 2016 年 12 月期間，在高雄醫學大學附設中和紀念醫院，共有 52 位第一至三期低位直腸癌的病人接受達文西機械手臂輔助全直腸繫膜切除術。

結果　在 52 位病人裡，其中 43 位 (82.7%) 有接受術前同步放射線化學治療。在 52 位病人裡，有 49 (94.3%) 人達到 R0 切除。圓周切緣 (CRM) 陽性的病人有 3 位 (5.76%) 而遠端切緣 (DRM) 陽性的病人有 1 位 (1.9%)。吻和滲漏率為 3.84% (2/52)。手術併發症率是 25% (13/52)。但沒有病人死於手術的併發症，大部分的病人的併發症經保守治療後都能自動康復。

結論　結果顯示達文西機械手臂輔助全直腸繫膜切除術對低位直腸癌患者來說是合適且安全的。

關鍵詞　達文西機械手臂輔助全直腸繫膜切除術、低位直腸癌、R0 切除、圓周切緣。