Original Article

Oncologic Outcomes for Patients with Anastomotic Leakage after Minimally Invasive Surgery for Colorectal Cancer

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Key Words
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Purpose. The study aimed to assess the differential impact of managing anastomotic leakage (AL) using diverting stoma versus non-diverting approaches on overall survival (OS) and disease-free survival (DFS) in patients with colorectal cancer (CRC) undergoing curative minimally invasive surgery.
Methods. A retrospective analysis was conducted on patients who underwent laparoscopic or robot-assisted minimally invasive colorectal surgeries at the National Taiwan University Hospital between January 2013 and June 2023. The assessment of AL was based on the characteristics of indwelling drainage and was confirmed through imaging or re-operation. Data on demographics, clinicopathological features, and postoperative outcomes were collected and analyzed.
Results. Out of 1,523 patients, 1,474 were eligible for the study after exclusions. AL was identified in 84 patients (5.7%), with the median time to onset at 8 days post-surgery. The observed 5-year OS rates across stages I-IV were 94.1%, 55.8%, 62.5%, and 19.2%, respectively. The documented 5-year DFS rates for stages I-IV were 84.4%, 50.8%, 23.6%, and 14.3%, respectively. Two main management groups were compared: those with diverting stoma (N = 44) and those without (N = 40). The median follow-up time was 35.65 months. No significant difference in long-term OS (58.1% vs. 67.2%, $p = 0.632$) and DFS (42.3% vs. 50.4%, $p = 0.799$) was found between the two groups. The stoma reversal rate was 54.5% (N = 24).
Conclusion. AL after minimally invasive colorectal cancer surgery has a consistent prevalence, with no discernible difference in survival whether managed with a stoma or conservatively. The risk of permanent stoma mandates prioritizing AL minimization.
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Colorectal cancer (CRC) is recognized as the third most common type of cancer worldwide. In the last 30 years, minimally invasive colorectal surgery has significantly evolved, mainly due to advancements in laparoscopic and robotic techniques,[1,2] complemented by the advent of sophisticated video technology. In colorectal surgical procedures, anastomotic leakage (AL) presents a critical challenge, occurring in 6% to

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30% of cases in clinical oncology.[3-5] During treatment, acute conditions such as peritonitis and sepsis often require immediate surgery, leading to increased morbidity.[6] Postoperatively, complications such as impaired bowel function and a nearly 30% chance of permanent stoma formation significantly affect patient outcomes.[7,8] While the influence of AL on short-term morbidity and mortality is widely acknowledged,[9,10] its effects on long-term oncological outcomes remain a subject of ongoing debate. Numerous studies have identified a correlation between AL and an increased local recurrence rate, alongside a reduction in disease-free survival (DFS) and overall survival (OS) rates.[11-14]

In 2010, the International Study Group of Rectal Cancer (ISREC) introduced a definition and grading system for colorectal AL, classifying them based on severity and treatment needs: Grade A for leaks requiring no active therapeutic intervention, Grade B for those needing active therapeutic intervention but without reoperation, and Grade C for leaks necessitating relaparotomy.[15] Management of AL should align with the patient's clinical course, ranging from asymptomatic cases to life-threatening emergencies. Despite the growth in nonoperative treatments, surgical intervention remains crucial, particularly for patients not responding to conservative measures or those with sepsis and peritonitis. Implementing a loop ileostomy or colostomy for proximal fecal diversion is a widely adopted strategy to reduce the severity of AL. The impact of managing AL on long-term survival and patient outcomes, whether treated with or without proximal fecal diversion, has been rigorously debated but still lacks a definitive conclusion. Therefore, this study aimed to assess the differential impact of AL management using either diverting stoma or non-diverting approaches on OS and DFS in patients with CRC undergoing curative minimally invasive surgery (MIS).

Materials and Methods

Patients

In this retrospective study, we reviewed the electronic medical records of CRC patients who underwent laparoscopy or robot-assisted MIS at the National Taiwan University Hospital, a tertiary center in Taiwan, from January 2013 to June 2023. Patients presenting with AL were recognized based on symptoms such as peritonitis, fever, feculent discharge from the wound, altered indwelling drainage characteristics, or radiological evidence. AL was diagnosed through computed tomography (CT) using rectal contrast or through reoperation based on clinical symptoms and biochemical indicators.

The application of diverting stoma for leakage recovery was based on surgeons' experience and their evaluation of the patient's condition. Patients suffering from generalized peritonitis due to AL necessitate prompt surgical intervention for diverting stoma and abscess drainage. Conversely, in symptomatic cases without hemodynamic instability, featuring a localized pelvic cavity abscess and minimal intra-abdominal contamination, a strategy of nonoperative CT-guided percutaneous drainage coupled with antibiotics is employed, avoiding ostomy creation. In clinical scenarios where asymptomatic patients exhibit altered drainage characteristics, such as feculent discharge, and are evidenced by efficient prophylactic drainage post-colorectal surgery, a conservative treatment regimen consisting solely of medical therapy is advocated, thereby obviating the need for additional interventions.

Data collection

In this study, all participants' characteristics were derived from prospectively collected and maintained databases. These characteristics encompassed patient demographics (age, gender, Charlson Comorbidity Index [CCI], comorbidities, and history of abdominal surgery), clinicopathological features (location, stage, lymphovascular invasion and perineural invasion [PNI], and metastasis), and treatment details (duration of operation, estimated blood loss, surgical procedures, laparoscopic or robotic approach, anastomotic configurations, and administration of neoadjuvant chemoradiotherapy). Tumor staging followed the TNM system, as outlined in the 8th edition of the Union Internationale Contre le Cancer/American Joint Committee on Cancer guidelines.

Study outcomes

The study's primary endpoints were OS and DFS in patients with AL. Comparative subanalyses centered on patients treated with stoma creation versus those managed without diverting stoma. OS is defined as the interval from surgery to death, and DFS is the period from surgery until disease progression. The secondary endpoints encompassed prognosis and the natural course of the created stomas. Patients were followed up every three months during the first two years post-surgery, biannually for the subsequent three years, and then once a year thereafter. Until June 2023, patient follow-up included comprehensive evaluations comprising clinical examinations, blood tests, chest CT, and abdominopelvic CT scans every 6-12 months, with regular colonoscopy performed post-surgery. Stoma reversal was typically performed 3-6 months after colorectal resection, provided no evidence of ongoing AL as confirmed by colonoscopy, lower GI series, or CT scan. In patients receiving adjuvant chemotherapy, stoma reversal was deferred until after completion of their treatment.

Statistical analysis

Statistical analysis was performed using the SPSS software ver. 26 (IBM, Armonk, NY, USA). Baseline and other perioperative and postoperative characteristics are presented as frequencies and percentages, while continuous variables are expressed as mean ± standard deviation. Comparisons between groups were performed with logistic regression analysis or an independent *t*-test for mean comparisons. Kaplan-Meier survival curves were used for plotting survival data, and differences were assessed using the log-rank test. All tests were two-tailed, considering a p value of < 0.05 as statistically significant. The Cox Proportional Hazards Model was also employed, and p-values < 0.05 were considered statistically significant.

Results

In this study, between 2013 and 2023, 1,523 patients underwent minimally invasive surgery (MIS) for colorectal cancer (CRC) without employing a protective diverting stoma. After excluding those without anastomosis, 1,474 patients were deemed eligible for the study (Fig. 1). Within the cohort, 84 patients (5.7%)

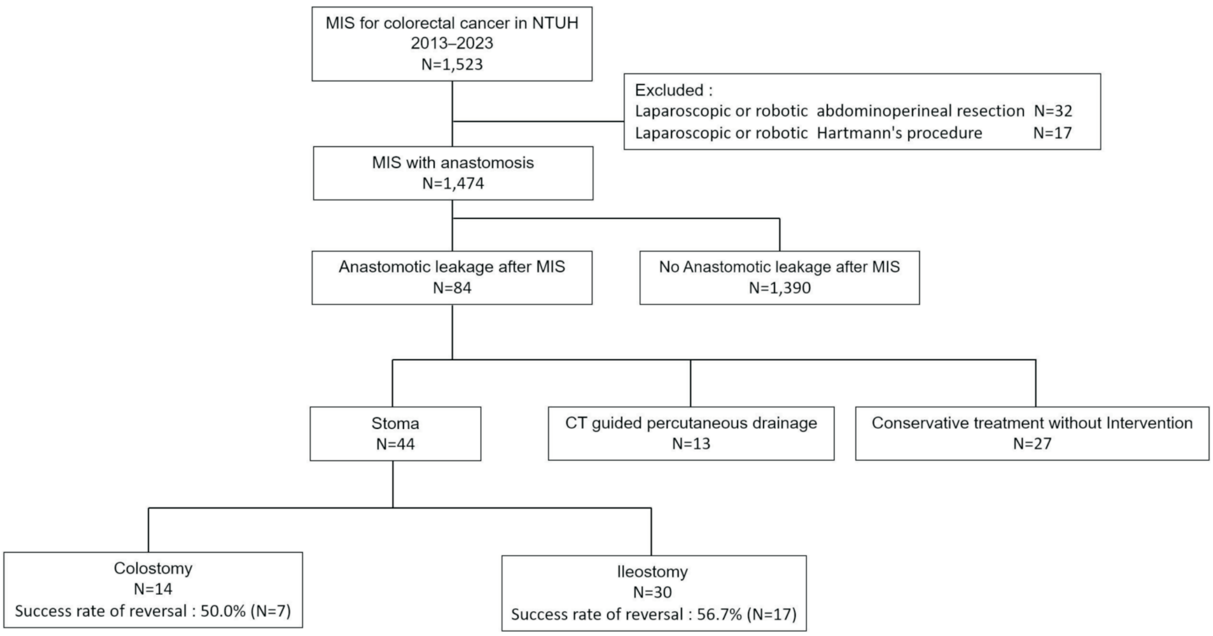

Fig. 1. Patient selection flowchart. NTUH, National Taiwan University Hospital; MIS, minimally invasive surgery.

experienced postoperative AL, with the median time from surgery to onset being 8 days, and 42% of these incidents occurring within the first week, as depicted in Fig. 2. Patients with AL were treated and divided into two groups based on their management approach: 44 patients (52.4%) underwent urgent surgery for diverting stoma (diverting stoma group). In contrast, 40 patients (47.6%) were managed with watchful waiting or percutaneous drainage (no-stoma group).

Patients' characteristics

The cohort's median age was 63.1 years (interquartile range [IQR]: 55-73), and males constituted approximately 62% of the study population. Within the group of 84 patients with AL, 57.1% underwent laparoscopic surgery, while 42.9% received robotic-assisted surgery. The mean CCI, used to evaluate the severity of comorbidities, was 5 ± 2. Among the patients, 25 (29.8%) were diagnosed with stage I disease, 22 (26.2%) with stage II, 23 (27.4%) with stage III, and 14 (16.7%) with stage IV disease. A notable 35.7% of the patients had a history of undergoing previous abdominal surgery. Additionally, 9.5% had undergone neoadjuvant radiation therapy, 10.7% received neoadjuvant chemotherapy, and 66.7% received adjuvant chemotherapy. Within the studied population, a more significant proportion of tumors (60.7%) were found in the rectum, while 39.3% were located in the colon. In AL patients, 36.9% had lymphovascular space invasion (LVSI), and 27.4% exhibited PNI, indicating high-risk features. The number of patients undergoing each type of surgery was as follows: right hemicolectomy, 10 (11.9%); left hemicolectomy, 3 (3.6%); anterior resection, 10 (11.9%); low anterior resection, 58 (69.0%); and subtotal colectomy, 3 (3.6%). Compared to the conservative no-stoma group's approach, diverting stoma is more commonly utilized in treating AL in rectal tumors (75.0% vs. 45.0%, $p = 0.005$) following low anterior resection (81.8% vs. 55.0%). Individuals with a history of prior abdominal surgery who subsequently developed leakage predominantly opted for conservative treatment, with about 70% receiving this approach and only 30% undergoing stoma creation. There were no significant differences between the two groups regarding age, gender, CCI, comorbidities such as diabetes mellitus and hypertension, operation duration, blood loss during surgery, neoadjuvant chemoradiotherapy, surgical procedures, abdominal approach, presence of LVSI and PNI, along with TNM stage. Patient demographics are summarized in Table 1.

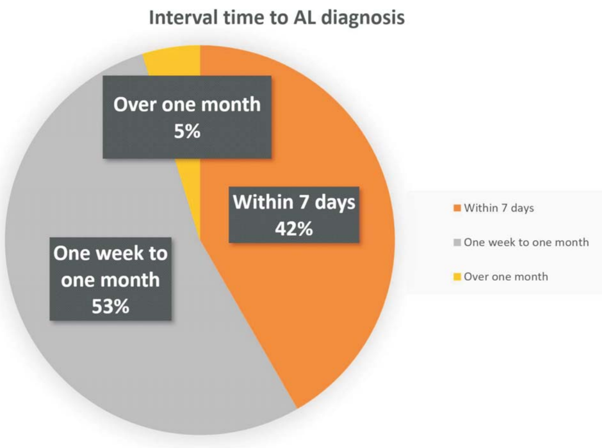

Fig. 2. Postoperative day of diagnosis of symptomatic anastomotic leakage in 84 patients.

Long-term postoperative outcomes

The median follow-up time was 35.65 months (IQR: 8.5-50.5). The 5-year OS rate was 63.0% (95% confidence interval [CI]: 56.0%-70.0%), with an average survival duration of 81.04 ± 7.68 months. Stratification by disease stage revealed mean survival times of 98.12 ± 4.86 months for stage I, 74.72 ± 13.30 months for stage II, 68.75 ± 8.86 months for stage III, and 24.27 ± 6.59 months for stage IV. Correspondingly, the 5-year OS for stages I, II, III, and IV were 94.1% (95% CI: 88.4%-99.8%), 55.8% (95% CI: 41.7%-69.9%), 62.5% (95% CI: 43.2%-81.8%), and 19.2% (95% CI: 7.5%-30.9%), respectively (Fig. 3a). Furthermore, the post-AL 5-year DFS investigation indicated a rate of 46.5% (95% CI: 39.5%-53.5%). Upon stratification by cancer stage, the five-year DFS rates were stage I: 84.4% (95% CI: 73.5%-95.3%), stage II: 50.8% (95% CI: 35.6%-66.0%), stage III: 23.6% (95% CI: 11.2%-36.0%), and stage IV: 14.3% (95% CI: 4.9%-23.7%), respectively (Fig. 3b).

We analyzed comparisons between the diverting

Table 1. Patients' characteristics

Demographic data	Total AL after MIS (N = 84)	Diverting stoma group (N = 44)	No-stoma group (N = 40)	*p*
	Number (percentage)/Mean ± SD			
Age (year)	63.1 ± 13.9	63.7 ± 12.8	62.5 ± 15.2	0.705
≥ 60 years. n (%)	50 (59.5%)			
Gender (Male/Female)	61.9%/38.1%	65.9%/34.1%	57.5%/42.5%	0.428
CCI[a]	5 ± 2	5 ± 2	5 ± 2	0.773
Diabetes mellitus	16 (19%)	9 (20.5%)	7 (17.5%)	0.731
Hypertension	35 (41.6%)	22 (50.0%)	13 (32.5%)	0.104
Previous abdominal surgery	30 (35.7%)	9 (20.5%)	21 (52.5%)	0.002
Operation time (min)	331.8 ± 92.4	323.2 ± 90.2	341.0 ± 94.9	0.389
Estimated blood loss (mL)	270.8 ± 333.3	281.1 ± 340.9	259.4 ± 328.6	0.767
Tumor location				0.005
Colon	33 (39.3%)	11 (25.0%)	22 (55.0%)	
Rectum	51 (60.7%)	33 (75.0%)	18 (45.0%)	
Neoadjuvant chemotherapy therapy, n (%)	9 (10.7%)	5 (11.4%)	4 (10.0%)	0.84
Neoadjuvant radiation therapy, n (%)	8 (9.5%)	5 (11.4%)	3 (7.5%)	0.547
Surgical procedure				0.03
Right hemicolectomy	10 (11.9%)	1 (2.3%)	9 (22.5%)	
Left hemicolectomy	3 (3.6%)	2 (4.5%)	1 (2.5%)	
Anterior resection	10 (11.9%)	4 (9.1%)	6 (15.0%)	
Low anterior resection	58 (69.0%)	36 (81.8%)	22 (55.0%)	
Subtotal colectomy	3 (3.6%)	1 (2.3%)	2 (5.0%)	
Abdominal approach				0.165
Laparoscopic	48 (57.1%)	22 (50%)	26 (65.0%)	
Robotic	36 (42.9%)	22 (50%)	14 (35.0%)	
Anastomotic configurations				0.005
End-to-end	49 (58.3%)	25 (56.8%)	24 (60.0%)	
Side-to-end	23 (27.4%)	17 (38.6%)	6 (15.0%)	
Side-to-side	12 (14.3%)	2 (4.5%)	10 (25.0%)	
Pathology T stage[b]				0.484
T1	15 (17.9%)	6 (13.6%)	9 (22.5%)	
T2	13 (15.5%)	9 (20.5%)	4 (10.0%)	
T3	45 (53.6%)	23 (52.3%)	22 (55.0%)	
T4	11 (13.1%)	6 (13.6%)	5 (12.5%)	
Pathology N stage[b]				0.996
N0	48 (57.1%)	25 (56.8%)	23 (57.5%)	
N1	15 (17.9%)	8 (18.2%)	7 (17.5%)	
N2	21 (25.0%)	11 (25.0%)	10 (25.0%)	
TNM stage[b]				0.995
I	25 (29.8%)	13 (29.5%)	12 (30.0%)	
II	22 (26.2%)	12 (27.3%)	10 (25.0%)	
III	23 (27.4%)	12 (27.3%)	11 (27.5%)	
IV	14 (16.7%)	7 (15.9%)	7 (17.5%)	
LVSI[c]	31 (36.9%)	17 (38.6%)	14 (35.0%)	0.730
PNI[d]	23 (27.4%)	14 (31.8%)	9 (22.5%)	0.339
Adjuvant chemotherapy regimen	56 (66.7%)	28 (67.6%)	28 (70.0%)	0.537
Flurouracil, folinic acid	25 (29.8%)	15 (34.1%)	10 (25.0%)	
Oxaliplatin based	14 (16.7%)	8 (18.2%)	6 (15.0%)	
Irinotecan based	13 (15.5%)	5 (11.4%)	8 (20.0%)	
Capecitabine	4 (4.8%)	0 (0%)	4 (10.0%)	

[a] Charlson Comorbidity Index, [b] AJCC 8th edition, [c] Lymphovascular space invasion, [d] Perineural invasion.

and no-stoma groups regarding DFS and OS. There was no significant difference between the two groups in 5-year OS (58.1% vs. 67.2%, $p = 0.632$; Fig. 3c), 5-year DFS (42.3% vs. 50.4%, $p = 0.799$; Fig. 3d), 5-year local recurrence-free survival (80.6% vs. 75.2%, $p = 0.587$; Fig. 3e). In patients with stage II disease, the 5-year local recurrence-free survival rates were similar between the diverting and no-stoma groups

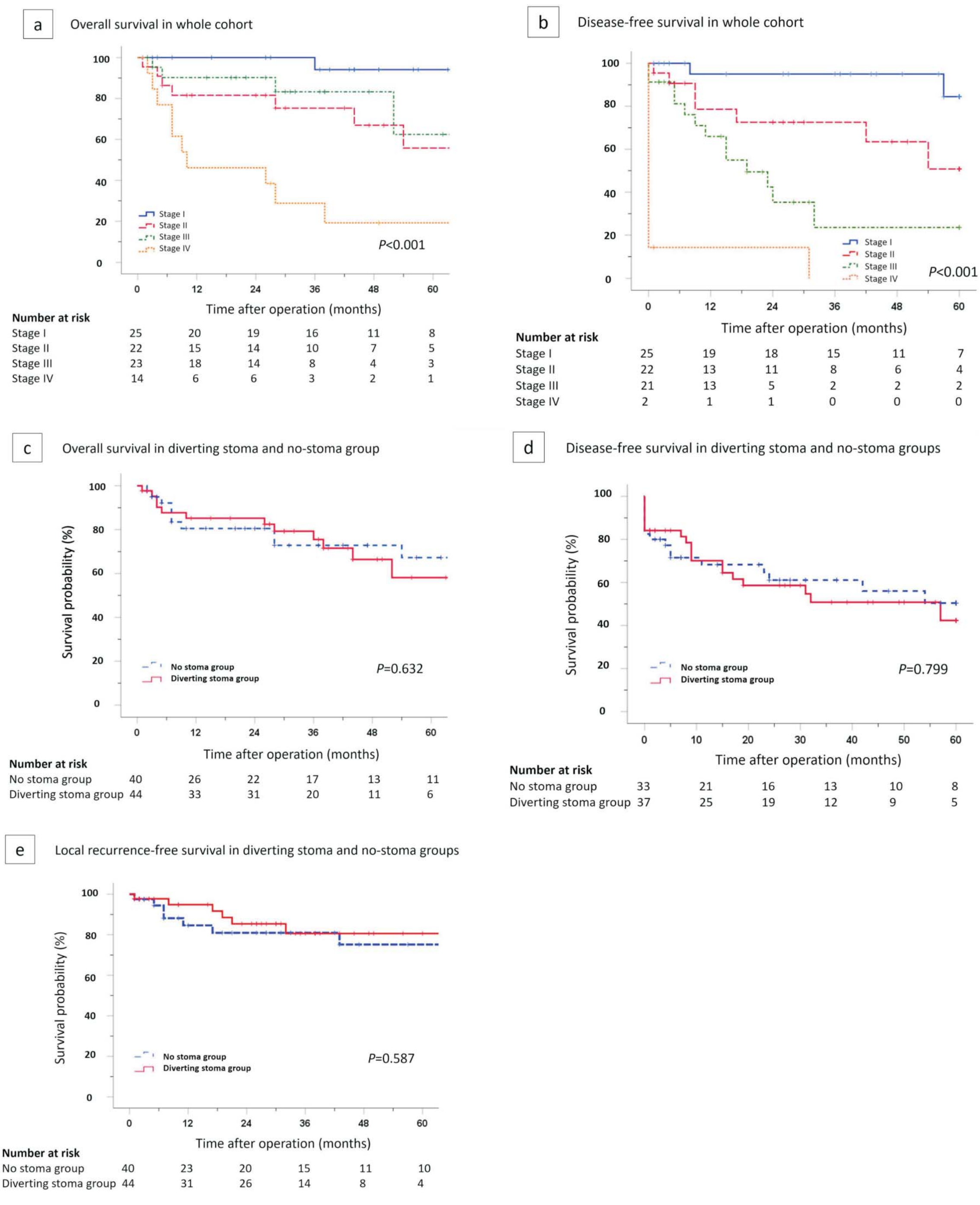

Fig. 3. Kaplan-Meier survival curves of AL patients. (a) Overall survival in whole cohort with AL; (b) Disease-free survival in whole cohort with AL; (c) Overall survival in diverting stoma and no-stoma groups; (d) Disease-free survival in diverting stoma and no-stoma groups; (e) Local recurrence-free survival in diverting stoma and no-stoma groups.

(80.2% vs. 90.0%, $p = 0.69$). The proportion of patients receiving adjuvant chemotherapy was comparable (75.0% vs. 80.0%, $p = 0.781$), and the mean time to initiation of chemotherapy was longer in the diverting group (133 days vs. 95 days), though this difference was not statistically significant ($p = 0.726$). In patients with stage III disease, the 5-year local recurrence-free survival was better in the diverting group compared to the no-stoma group (60.0% vs. 45.7%, $p = 0.67$), but this difference was not statistically significant. The receipt of adjuvant therapy was similar between the diverting and no-stoma groups (83.3% vs. 81.8%, $p = 0.924$). The mean time to initiation of chemotherapy was longer in the diverting group (111 days vs. 79 days), but this did not reach statistical significance ($p = 0.163$).

Multivariate analysis employing the Cox proportional hazards model revealed that advanced TNM classification (HR = 2.09) was an independent prognostic factor for poor overall survival. Furthermore, advanced TNM classification (HR = 2.95) emerged as the sole independent predictor for disease-free survival (Table 2).

In the 44 patients assigned to the diverting stoma group, 14 underwent colostomy, while 30 received ileostomy. Within this group, stoma reversal was achieved in 24 patients during a postoperative period ranging from 3 to 6 months, resulting in a stoma reversal rate of 54.5%. The median duration to stoma reversal was recorded at 146 days, with an IQR of 119-199 days. In the remaining cohort of 20 patients with non-reversed stomas, the following characteristics were observed: (1) Six patients were of advanced age, being over 80 years old; (2) Twelve patients presented with advanced cancer at stages III and IV, exhibiting progressive disease deterioration despite chemotherapy treatment; (3) Six patients required recurrent hospital admissions due to intra-abdominal infections; (4) One patient developed a complication of a rectovaginal fistula during follow-up. Furthermore, most patients exhibited limited physical capacity, capable of only restricted self-care, and were confined to a bed or chair for more than 50% of their waking hours. Additionally, a subset of these individuals required long-term care in a nursing home setting.

Discussion

This study retrospectively analyzed the prevalence and oncologic long-term outcome of AL following resection of CRC in MIS. Consistent with prior research indicating an AL incidence ranging from 1%-21%,[7,16] our study observed that 5.7% of the population, comprising 84 patients, developed AL.

In a study by Lee et al.,[17] an analysis of 869 CRC patients from the Taiwan Cancer Database at the Medical Center Hospital in Northern Taiwan (2007-2013) revealed a mean survival time of 71.27 ± 1.27 months. The 5-year survival rates by disease stage were as follows: stage I at 91.20%, stage II at 82.20%, stage III at 63.20%, and stage IV at 21.70%. Data from the U.S. SEER Databases[18] revealed distinct 5-year CRC survival rates by stage: 92% for stage I, 87% for IIA, 65% for IIB, 90% for IIIA, 72% for IIIB, 53% for IIIC, and 12% for metastatic stage IV. Compared to prior research, OS trends across different stages in this manuscript are highly consistent. However, the absence of notable survival distinctions in our study between stages II and III may be attributed to constrained sample size and the lack of subdivisions into stages IIA, IIB, IIC, IIIA, IIIB, and IIIC, underscoring the es-

Table 2. Prognostic factors for survival by Cox proportional hazard model

	Overall survival		Disease-free survival	
	HR (95% CI)	*p*	HR (95% CI)	*p*
Age (years)	1.01 (0.96-1.06)	0.686	0.98 (0.95-1.02)	0.390
CCI[a]	1.28 (0.99-1.67)	0.062	1.18 (0.91-1.53)	0.215
TNM stage[b]	2.09 (1.12-3.89)	0.02	2.95 (1.73-5.04)	< 0.001
Diverting stoma	0.70 (0.29-1.68)	0.429	0.89 (0.44-1.79)	0.744

[a] Charlson Comorbidity Index; [b] AJCC 8th edition; HR, hazard ratio.

sential importance of precise staging in the prognosis of CRC. Additionally, this study did not examine mechanistic molecular prognostic factors such as KRAS and BRAF mutations. Although these mutations are linked with poorer survival outcomes in metastatic settings, their implications in the early stages of colorectal cancer remain not definitively established. Furthermore, this analysis refrained from hypothesizing about the predictive significance of these genetic markers in guiding the duration of adjuvant chemotherapy, a factor that could significantly affect long-term postoperative outcomes.[19]

In a recent study by Hong et al.,[20] 1,126 colorectal adenocarcinoma patients who underwent radical surgery in Korea from 2009 to 2018 were analyzed, with findings indicating DFS rates of 91% for stage I, 79.8% for II, 63.3% for III, and 18.9% for IV. Conversely, our investigation revealed reduced DFS rates across stages II to IV, a discrepancy potentially linked to the incidence of AL. Prior studies have demonstrated a significant association between AL and elevated local recurrence rates, reduced DFS, and increased overall mortality. Ishizuka et al.[21] conducted a meta-analysis on the impact of AL on the survival of CRC patients, revealing that 69.7% of 234 patients with AL survived 5 years post-surgery versus 81.3% of 1,422 patients without AL. This indicates a significantly lower 5-year OS rate in CRC patients with AL. Ramphala et al.[22] found that out of 1,984 patients receiving primary anastomosis post-surgery, those with AL had a significantly lower 5-year DFS rate of 48.0% versus 64.1% in patients without AL ($p < 0.01$). Yang et al.[23] analyzed 21,883 patients across 28 studies, demonstrating that AL significantly raises the risk of local recurrence, with an odds ratio (OR) of 1.69 (95% CI: 1.45-1.96; $p < 0.00001$), yet it had no significant impact on the distant recurrence of the tumor. AL may increase local recurrence rates due to cancer cell implantation at inflamed sites and is linked to heightened systemic inflammation, as indicated by elevated C-reactive protein levels, potentially exacerbating malignancy progression.[24,25] Furthermore, AL allows intestinal tumor cells to spread into the pelvic cavity, enhancing local recurrence risks.[26,27] Emerging evidence also indicates that gut microbiota may influence the effectiveness of cancer treatments, including chemotherapy and immunotherapy.[28] Jung et al. observed that patients with stage II and III diseases who developed anastomotic leakage were less likely to undergo chemotherapy than those without leakage.[29] Furthermore, in patients with stage III disease, anastomotic leakage significantly reduced the likelihood of receiving adjuvant chemotherapy.[30]

Following AL, the approach to management encompasses a spectrum of interventional and surgical strategies, contingent upon the surgeon's understanding, the availability of requisite hospital infrastructure, and intensive care facilities.[31,32] Blumetti et al.[33] elucidated that the predominant course for AL does not necessitate surgical intervention, with nonoperative management being feasible for 73% of patients.

Studies indicate that, despite not reducing the incidence of AL, a bypass stoma can alleviate its severity, leading to a short-term reduction in all-cause mortality and lower reoperation rates.[34,35] Nonetheless, research on the long-term effects of managing AL with either ostomy or conservative strategies remains limited. Aker et al.[36] investigated 3,391 elective resections, finding 201 (5.9%) patients with AL. Of these, 50.7% received conservative treatment, 9.5% underwent radiological procedures, and 39.8% needed initial surgical intervention. The study revealed no significant mortality or long-term survival differences based on treatment modalities or AL location, with a cohort OS of 56.6 months (95% CI: 52.9-60.7). Herein, we examined treatment strategies for AL, comparing the no-stoma group, which encompassed conservative and radiological treatments, to the diverting stoma approach. Moreover, our findings showed no significant differences in long-term survival across these treatments, consistent with results from prior studies.

Upon extended observation periods, creating a stoma may adversely influence the patient's quality of life. In a study by Ponholzer et al.,[37] 39 of 71 patients (54.9%) with AL developed a persistent presacral sinus. The stoma reversal group had a significantly longer mean survival of 98.4 months compared to 56.7 months in the non-reversal group, indicating improved 10-year survival (log-rank: $p = 0.089$; Breslow: $p = 0.004$). Diverting ostomies are associated with complications, including stomal prolapse, stenosis, necrosis, parastomal hernia, skin excoriation, and surgical site infections.[38,39] Significantly, stoma reversal correlates with reduced post-therapeutic pain, highlighting increased pain risk in patients without reversal. In our research, the no-stoma group exhibited a trend towards enhanced prognoses beyond 3 years compared to the stoma group, although no statistically significant difference was observed. Across all colorectal surgeries in our study, failure to reverse a stoma occurred in 1.36% of cases (20 out of 1,474). Concurrently, it was found that distal anastomoses are linked with an increased probability of requiring a permanent stoma.

This investigation was performed in a retrospective, non-randomized manner, featuring a small cohort, especially within the subgroup analysis concerning stoma reversal. Consequently, the adjustment for confounding variables was not executed owing to the specific and restricted nature of the sample size. The study is subject to several limitations. Firstly, it lacks an analysis of long-term outcomes for patients without leaks, thereby rendering it challenging to directly demonstrate the impact of leaks on survival and prognosis within this paper. Secondly, it remains ambiguous how adverse events related to subsequent adjuvant chemoradiotherapy impact its discontinuation and the timing of stoma closure. Lastly, functional outcomes and quality of life metrics were not recorded or compared between the two groups following AL, underscoring a deficiency in the comprehensive evaluation of post-AL recovery.

Conclusion

In conclusion, this study presents the incidence, 5-year survival rates, and DFS for patients with AL following MIS for CRC. Similar long-term oncological outcomes were observed in subgroup analyses comparing patients with AL who underwent stoma creation to those who did not. Nonetheless, the potential permanence of stoma due to AL emphasizes the necessity of minimizing AL as a critical priority.

Financial Disclosure

None.

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原　著

大腸直腸癌微創手術後吻合處滲漏預後分析

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目的　本研究旨在評估吻合處滲漏對接受根治性微創大腸癌手術患者的存活率與無病存活率，並檢視以腸造口治療滲漏對於預後之影響。

方法　回溯性統計本院於涵蓋了 2013 年 1 月至 2023 年 6 月間接受腹腔鏡或機器人輔助微創大腸癌手術的患者。根據留置引流管與臨床症狀的改變用以診斷吻合處滲漏，並通過影像或再次手術確認。收集了患者的基本資料、臨床病理特徵及術後結果，分析術後滲漏比率與治療策略，追蹤其 5 年存活率、無病存活率與造口關閉之情況。

結果　在 1523 名患者中，納入符合研究條件的 1474 名微創大腸癌手術患者。84 名患者 (5.7%) 發生吻合處滲漏，術後出現症狀中位數時間為 8 天。平均追蹤 35.65 個月，其五年整體存活率 (Overall Survival) 跨越 I 至 IV 期分別為 94.1%、55.8%、62.5% 和 19.2%。五年無病存活率 (Disease-Free Survival) 對於 I 至 IV 期分別為 84.4%、50.8%、23.6%和 14.3%。比較進行分流造口治療的 44 名患者與未進行造口的 40 名患者，五年長期存活率及無遠端轉移存活率無顯著差異。造口成功關閉率為 54.5%，造口從實施手術到關閉的中位數時間約達 146 天。

結論　大腸癌微創手術後的吻合處滲漏具有一定的發生率，無論是進行分流造口還是保守治療，其對長期存活率與遠端轉移存活率均無明顯差異，應著重於減少吻合處滲漏以降低永久造口的風險。

關鍵詞　大腸直腸癌、大腸癌微創手術、吻合處滲漏。