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Incidence and Outcomes of Low Anterior Resection Syndrome in Patients Undergoing Preventive Ostomy for Laparoscopic Rectal Cancer Surgery

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AIM: This study aimed to explore the incidence and risk factors of low anterior resection syndrome (LARS) in patients undergoing preventive colostomy following laparoscopic rectal cancer surgery. Additionally, the outcomes of LARS were analyzed to provide evidence for effective prevention and treatment strategies.

METHODS: The medical records of 143 patients with laparoscopic rectal cancer who underwent preventive ostomy at the Zhujiang Hospital of Southern Medical University between January 2020 and October 2022 were retrospectively reviewed. All patients underwent ostomy reversal within 2 to 6 months post-surgery. The LARS score scale was used to evaluate the occurrence of LARS at 3, 6, and 12months post-surgery. Based on LARS scores, patients were divided into LARS and non-LARS groups. Clinical characteristics, including gender, TNM stage, and other related data, were compared between the two groups. Multivariate logistic regression analysis was conducted to identify risk factors for LARS, and the predictive performance of the regression model was evaluated using the receiver operating characteristic (ROC) curve.

RESULTS: The LARS score demonstrated a significant decrease over time after surgery ($p < 0.05$). LARS was identified in 80 patients (55.94%) at 3 months post-surgery, with no new cases reported after this period. Statistically significant differences between the LARS and non-LARS groups were observed in body mass index (BMI), tumor distance from the anal margin, postoperative anastomotic fistula, and the timing of ostomy reversal ($p < 0.05$). The ROC curve analysis revealed that the logistic regression model predicting LARS had an area under the curve (AUC) of 0.809 (95% CI: 0.735–0.870), with a sensitivity of 76.25% and a specificity of 79.37%. Among the LARS patients 3 months post-surgery, 73.75% (59/80) showed improvement by 12 months. The improvement rate in patients with mild LARS (87.93%) was significantly higher than in those with severe LARS (36.36%) ($p < 0.05$).

CONCLUSIONS: The incidence of LARS is relatively high in patients undergoing preventive ostomy after laparoscopic rectal cancer surgery. Key factors associated with LARS include BMI, tumor distance from the anal margin, postoperative anastomotic fistula, and the timing of ostomy reversal. Over time, the incidence of LARS decreases, and outcomes improve, especially in patients with mild LARS.

Keywords: laparoscopic rectal cancer; preventive ostomy; low anterior resection syndrome; risk factors; outcomes

Introduction

Colorectal cancer ranks third in incidence among the 2.3 million new cancer cases reported globally in 2020 and is second only to lung cancer in cancer-related mortality [1]. Although the overall incidence of colorectal cancer has stabilized or declined, it continues to rise among individuals aged 50 years or younger [2]. Surgical resection remains the cornerstone of rectal cancer treatment, and there is a growing demand for anal-preserving procedures driven by the increasing prevalence of the disease in younger populations [3]. However, anal preservation does not guarantee normal bowel function post-surgery. Many patients experience symptoms such as gas or stool incontinence, diarrhea, and defecation urgency, collectively termed low anterior resection syndrome (LARS). These symptoms significantly impair the postoperative quality of life in patients with colorectal cancer [4,5].

A meta-analysis reported that the prevalence of LARS after colorectal cancer surgery is 49.7%, with contributing factors including low tumor and anastomotic height, radiotherapy, postoperative anastomotic fistula, and stoma insufficiency [6]. Similarly, Muttillo *et al*. [7] reported an overall prevalence of LARS of 31% and identified tumor distance from the anal verge and tumor expansion as independent predictors of LARS. While numerous studies have explored the prevalence and risk factors of LARS, limited attention has been given to its occurrence in patients undergoing intraoperative prophylactic stoma creation.

Given that anastomotic fistula is a risk factor for LARS, prophylactic stomas are primarily recommended during surgery to prevent anastomotic fistula or mitigate its symptoms. However, the impact of prophylactic stomas on LARS remains inconclusive, with debates surrounding

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whether they effectively reduce or alleviate LARS and whether the psychological and emotional burden of a stoma outweighs its balance [8,9].

This study aimed to analyze the incidence and risk factors of LARS in patients undergoing prophylactic stoma after laparoscopic rectal cancer surgery. Additionally, it assessed the progression and regression of LARS symptoms over time to provide valuable insights into the prevention and management of LARS.

Information and Methodology

General Information

This study was a retrospective case-control analysis. Patients were included in the study if they met the following criteria: (1) Postoperative pathological confirmation of low rectal cancer; (2) Age >18 years and first-time diagnosis; (3) Underwent laparoscopic rectal cancer resection, following the principles of total mesorectal excision, with prophylactic stoma intervention during surgery; (4) Completed ileostomy reversal within 2–6 months postoperatively; (5) Predicted survival time >12 months post-surgery, with follow-up completed for at least 12 months; (6) Availability of complete clinical data.

Patients were excluded from the study based on the following conditions: (1) Presence of acute or chronic infections or other malignant tumors before surgery; (2) History of medical conditions affecting rectal or anal function, such as pelvic injuries or chronic constipation; (3) Severe preoperative events, such as intestinal perforation due to tumors; (4) Recurrence or distant metastasis after surgery; (5) Psychiatric illnesses or other factors impairing effective communication; and (6) Inability or refusal to participate in follow-up or loss to follow-up during the study period.

The study retrospectively included rectal cancer patients admitted to the Zhujiang Hospital of Southern Medical University between January 2020 and October 2022. The sample size was calculated using the multifactor analysis sample estimation method [10]. The recommended sample size was 5–10 times the number of independent variables, with an additional 10%–15% included to account for potential invalid responses. Based on this calculation, the required sample size was estimated to be between 82 and 156 cases. After applying the inclusion and exclusion criteria, 143 patients were enrolled. This study was conducted in compliance with the principles outlined in the Declaration of Helsinki and was approved by the Medical Ethics Committee of Zhujiang Hospital of Southern Medical University (approval number: 2024-KY-094-03). All participants provided informed consent.

Surgical Methods

(1) Laparoscopic Rectal Cancer Resection

All patients underwent laparoscopic rectal cancer resection under general anesthesia combined with epidural anesthesia. After successful anesthesia induction, patients were positioned in a modified lithotomy position, and a five-port laparoscopic technique was applied. The surgical area was exposed, and the middle approach to Toldt's left fascia plane was used. Blood vessels at the origin of the mesenteric arteries and veins were carefully dissected, and the sigmoid colon and mesentery were mobilized. The splenic flexure of the colon was freed as needed. The sacrorectal ligament was incised to create a plane down to the anorectal muscle.

Dissection proceeded along the pelvic wall, freeing the rectal mesenteric space while carefully protecting the adjacent nerves and the ureters. The peritoneum was incised at the rectovesical pouch and freed along the mesenteric space. In female patients, the posterior vaginal wall was protected, while in male patients, the prostate and seminal vesicle were protected. Dunn's fascia was incised and separated to expose the rectal wall. Dissection extended approximately 3 cm from the distal tumor and rectum margins to ensure oncologic safety. The sigmoid colon and mesentery were resected after mobilization, and the tumor lesion was excised. The proximal intestinal lumen was cleaned, and intestinal anastomosis was performed. Bleeding at the anastomotic site was assessed and managed. For the proximal bowel, clean management is performed, followed by bowel anastomosis, ensuring the anastomosis site is hemostatic and secure. The pelvic cavity is washed, defects in the mesentery are sutured intermittently, and a drainage tube is placed.

(2) Prophylactic Stoma

A circular incision (3–4 cm) was made at the McBurney's point. The central skin was excised, and the subcutaneous tissues were incised layer by layer to reach the peritoneum. The peritoneum was incised, and intestinal forceps were introduced into the abdominal cavity through the stoma. The ileum was clamped 20–30 cm proximal to the ileocecal valve and pulled approximately 4 cm outside the abdominal cavity. The intestinal wall was then fixed to create a double-lumen stoma. Stoma reversal was performed 2–6 months postoperatively.

Follow-up and LARS Assessment

Postoperative follow-up was conducted via telephone interviews or outpatient clinic visits. LARS was assessed at 3, 6, and 12 months following stoma reversal using the validated LARS scoring scale [11]. The scale evaluates five domains, including urgency of defecation and gas incontinence, with a total score ranging from 0 to 42 points and a critical value of 20 points. Scores of 0–20, 21–29, and 30–42 points correspond to no, mild, and severe LARS, respectively [12]. The reliability and validity of the LARS scoring scale in assessing rectal cancer outcomes have been well-documented. Based on the scores, patients were divided into LARS and non-LARS groups for further analysis.

Table 1. Postoperative LARS scores and incidence [$\bar{x} \pm$ s].

Post operative time (months)	Urgency of defecation (0–16)	Flatus incontinence (0–7)	Diarrhea (0–3)	Fecal aggregation (0–11)	Frequency of defecation (0–5)	Total score (0–42)	LARS occurrence cases (%)
3	7.36 ± 1.00	4.90 ± 0.98	1.93 ± 0.27	7.02 ± 0.40	3.50 ± 0.96	24.71 ± 5.13	80 (55.94, 80/143)
6	6.45 ± 0.64	4.50 ± 0.38	1.30 ± 0.17	5.01 ± 1.14	2.85 ± 0.58	20.11 ± 3.50*	55 (38.46, 55/143)*
12	6.00 ± 0.32	4.16 ± 0.23	1.40 ± 0.20	4.68 ± 1.06	2.70 ± 0.24	18.94 ± 2.98*#	28 (19.58, 28/143)*#
F or χ^2	/	/	/	/	/	84.120	40.151
p-value	/	/	/	/	/	<0.001	<0.001

Note: LARS, low anterior resection syndrome; Comparing 3 months postoperatively, $^*p < 0.05$; comparing 6 months postoperatively, $^\#p < 0.05$.

Data Collection and Observation Indices

Data from patients in the LARS and non-LARS groups were collected through electronic medical records and face-to-face interviews. The collected variables include demographic and clinical characteristics (gender, age, and body mass index (BMI)), comorbidities (presence of diabetes mellitus or hypertension), tumor-related factors (tumor diameter, TNM classification, degree of differentiation, preoperative radiotherapy, and distance of the tumor from the anal margin), and surgical and postoperative factors (duration of the operation, timing of urethral removal post-surgery, presence of postoperative anastomotic fistula, and the timing of prophylactic stoma reversal).

Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics 24.0 Simple Chinese Version (SPSS Inc., Armonk, NY, USA). The language version did not affect the results or methods. Categorical data were expressed as frequencies and percentages (%), and comparisons between groups were performed using the chi-square (χ^2) test. Continuous data were expressed as mean ± standard deviation ($\bar{x} \pm$ s) if they met normal distribution, and comparisons were conducted using the independent t-test. LARS scores at multiple time points were analyzed using repeated-measures Analysis of Variance (ANOVA). Logistic regression analysis was employed to identify factors associated with the occurrence of LARS, with variables showing statistical significance ($p < 0.05$) in univariate analyses included as independent variables in the model.

To assess the predictive accuracy of the model for LARS, the likelihood ratio of the χ^2 test, goodness-of-fit test, and receiver operating characteristic (ROC) curve analysis were performed. Statistical significance was set at $\alpha = 0.05$, with $p < 0.05$ considered as a significant difference.

Results

Patient Demographics and Incidence of LARS

A total of 143 patients were included in the study, comprising 81 males and 62 females, with ages ranging from 30 to 86 (mean: 54.24 ± 10.42 years). The BMI was 24.14 ± 3.10 kg/m^2 (17–30 kg/m^2). Tumor diameters were ≥5 cm in 65 cases and <5 cm in 78 cases. TNM classification was as follows: stage I (33 cases), stage II (72 cases), and stage III (38 cases). Tumor differentiation was categorized as low (42 cases), medium (81 cases), and high (20 cases). 3 months after the ileostomy reversal surgery, 80 cases (55.94%) of LARS occurred, with no new cases reported after this period. Both the total LARS score and the incidence of LARS decreased over time post-surgery ($p < 0.05$) (Table 1).

Unifactorial Analysis of LARS Incidence

Patients were divided into the LARS and non-LARS groups based on the presence or absence of LARS 3 months after stoma reversal. Univariate analysis revealed that BMI, tumor distance from the anal margin, postoperative anastomotic fistula, and time to prophylactic stoma reversal were statistically significant ($p < 0.05$). However, no significant differences were observed in gender, age, comorbid diabetes mellitus or hypertension, tumor diameter, TNM classification, tumor differentiation, preoperative radiotherapy, surgical duration, or timing of postoperative urinary catheter removal ($p > 0.05$) (Table 2).

Multivariate Logistic Regression Analysis of LARS Incidence

Multivariate regression analysis included dependent variables which $p < 0.05$ from the univariate analysis. The independent variables were the presence of LARS (1 = occurrence, 0 = no occurrence). BMI, tumor distance from the anal margin, postoperative anastomotic fistula, and time to prophylactic of stoma reversal were identified as independent predictors for LARS ($p < 0.05$) (Table 3,4).

LARS Prediction Model and ROC Curve Analysis

A predictive model for LARS was constructed based on the logistic regression analysis: Logit (P) = –5.394 + 0.210 × BMI – 1.130 × tumor distance from the anal margin – 1.568 × postoperative anastomotic fistula + 0. 659 × prophylactic stoma reversal. The likelihood ratio of χ^2 was 152.485 (degrees of freedom (DF) = 8, $p < 0.001$), suggesting the model was statistically significant. The area under the curve (AUC) for predicting the occurrence of LARS was 0.809 (95% CI: 0.735–0.870), with a sensitivity of 76.25% and specificity of 79.37% (Fig. 1).

Table 2. Univariate analysis of postoperative LARS incidence in patients with prophylactic stoma.

Variable	LARS group (n = 80)	Non-LARS group (n = 63)	χ^2 or t	p-value
Sex [cases (%)]	/	/	2.151	0.142
Male	41 (51.25)	40 (63.49)	/	/
Women	39 (48.75)	23 (36.51)	/	/
Age (years)	55.24 ± 10.36	53.00 ± 9.68	1.321	0.189
BMI (kg/m^2)	25.05 ± 3.28	22.97 ± 2.43	4.202	<0.001
Diabetes mellitus [cases (%)]	22 (27.50)	15 (23.81)	0.250	0.617
Hypertension [cases (%)]	16 (20.00)	13 (20.63)	0.009	0.925
Tumor diameter [cases (%)]	/	/	1.513	0.219
≥5 cm	40 (50.00)	25 (39.68)	/	/
<5 cm	40 (50.00)	38 (60.32)	/	/
TNM stage [cases (%)]	/	/	1.341	0.511
Stage I	21 (26.25)	12 (19.05)	/	/
Stage II	40 (50.00)	32 (50.79)	/	/
Stage III	19 (23.75)	19 (30.16)	/	/
Tumor differentiation [cases (%)]	/	/	0.055	0.973
Low	23 (28.75)	19 (30.16)	/	/
Medium	46 (57.50)	35 (55.56)	/	/
High	11 (13.75)	9 (14.28)	/	/
Preoperative radiotherapy [cases (%)]	/	/	0.510	0.475
Yes	26 (32.50)	17 (26.98)		
No	54 (67.50)	46 (73.02)	/	/
Tumor distance o from anal margin [cases (%)]	/	/	21.443	<0.001
≥5 cm	20 (25.00)	40 (63.49)	/	/
<5 cm	60 (75.00)	23 (36.51)	/	/
Surgery duration (minutes)	241.16 ± 23.28	236.89 ± 22.14	1.113	0.268
Postoperative urinary catheter removal time (hours)	40.20 ± 9.57	37.34 ± 9.25	1.800	0.074
Postoperative anastomotic fistula [cases (%)]	/	/	12.520	<0.001
Yes	24 (30.00)	4 (6.35)	/	/
No	56 (70.00)	59 (93.65)	/	/
Time to prevent stoma reversal (months)	3.83 ± 0.71	3.54 ± 0.50	2.727	0.007

Note: LARS, low anterior resection syndrome; BMI, body mass index.

Table 3. Dependent variable assignments.

Variable	Value assignment
BMI	Original value entry
Tumor distance from anal margin	<5 cm = 1, ≥5 cm = 0
Postoperative anastomotic fistula	Yes = 1, No = 0
Time to prevention stoma retraction	Original value entry

Note: BMI, body mass index.

LARS Regression

Among the 80 patients with LARS 3 months post-stoma reversal, 59 patients (73.75%, 59/80) improved within 12 months after surgery, while 21 patients (26.25%, 21/80) showed no significant change. The overall regression rate (i.e., improvement to no LARS) was significantly higher in patients with mild LARS than in those with severe LARS (improvement to mild LARS) ($p < 0.001$) (Table 5).

Discussion

LARS is a common complication following laparoscopic rectal cancer resection, characterized by variable and unpredictable symptoms. These symptoms typically stabilize into a long-term functional state by 12 months postoperatively [13]. However, persistent symptoms beyond 12 months may indicate permanent changes or chronic disease progression [14]. This study analyzed the occurrence of LARS within a 12-month follow-up period, focusing on patients with prophylactic stomas.

Previous studies have explored the relationship between prophylactic stoma and LARS. Vogel *et al*. [15] reported that ileostomy increases the risk of severe LARS (OR = 2.84) and that closure timing significantly influences severity. In contrast, other studies suggest that perioperative factors such as the choice of surgical approach, anastomosis reconstruction, and prophylactic stoma may significantly affect postoperative bowel function. These factors are potentially within the control of the surgeon, and theoretically, they could reduce the impact of factors like prophylactic stoma on LARS [16]. Liang *et al*. [17] showed that although the overall incidence of LARS was similar between patients with and without prophylactic stoma after laparoscopic rectal cancer, the incidence of severe LARS was sig-

Table 4. Multivariate logistic regression analysis of postoperative LARS in patients with prophylactic ostomy.

Variable	β	SE	Wald χ^2	p-value	OR	95% CI
BMI	0.210	0.073	8.340	0.004	1.233	1.070–1.422
Tumor $\geq$5 cm from anal margin	–1.130	0.407	7.704	0.006	0.323	0.145–0.717
No postoperative anastomotic fistula	–1.568	0.614	6.525	0.011	0.208	0.063–0.694
Time to prevention stoma retraction	0.659	0.333	3.911	0.048	1.933	1.006–3.714
Constant	–5.394	2.177	6.139	0.013	0.005	—

Note: BMI, body mass index; OR, odds ratio; CI, confidence interval.

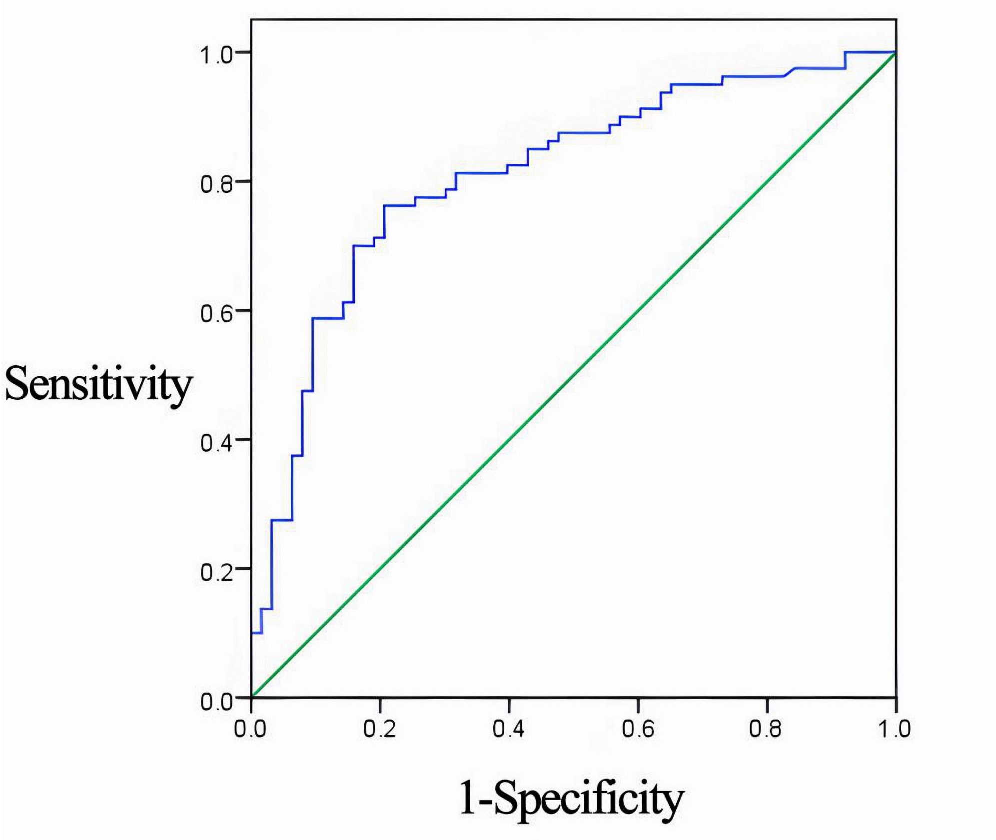

Fig. 1. ROC curves for predictive factors of LARS. ROC, receiver operating characteristic.

nificantly lower in stoma patients (22.06% vs. 40.38%). Additionally, the quality of life scores at 1 month postoperatively were significantly higher in patients with stoma compared to those without. These findings suggest that prophylactic stoma does not significantly increase the overall incidence of postoperative LARS in patients undergoing laparoscopic rectal cancer surgery. Furthermore, it appears to reduce the incidence of severe LARS. Prophylactic stomas may play a protective role in preventing postoperative LARS, likely by reducing anastomotic contamination with fecal matter, preventing local tissue infection, and minimizing inflammatory responses. Timely stoma reversal based on patient-specific conditions can further decrease the severity of LARS [17]. The stoma can also be reduced to mitigate the severity of LARS.

The present study aimed to investigate the occurrence of postoperative LARS in patients with prophylactic stomas. Patients with low rectal cancer who underwent prophylactic stomas were analyzed to identify factors associated with LARS occurrence. At 3 months postoperatively, the incidence of LARS in patients with prophylactic stomas was 55.94% and higher than the 27.2% and 40.7% reported by Benli *et al*. [18] and Yan *et al*. [19], respectively. However, it was lower than the 79.41% reported by Liang *et al*. [17] and the 87–91% reported by Rubinkiewicz *et al*. [20] in patients undergoing total mesenteric resection or conventional laparoscopic surgery. Variations in reported incidence may reflect differences in sample size, geographic regions, or surgical methods.

The pathogenesis of clinical LARS remains unclear, and while many studies have explored its risk factors, few have specifically focused on patients with prophylactic stomas. In this study, logistic regression analysis identified several independent risk factors for the occurrence of LARS in pa-

Table 5. Comparison of improvement in LARS severity over 12 months.

Severity level	Patients (n)	6 Months after surgery (cases)		12 Months after surgery (cases)		Overall improvement rate within 12 months after surgery (%)
		improvement	minimal change	improvement	minimal change	
Severe	22	3	19	5	14	36.36
Mild	58	24	34	27	7	87.93
χ^2		5.490		14.364		21.909
p-value		0.019		<0.001		<0.001

tients with prophylactic stomas three months after stoma reversal: (1) BMI: Previous research has shown that BMI is associated with LARS occurrence following radical anus-preserving surgery, with up to 76% of cases reported in patients with a BMI >20 kg/m^2 [21]. Consistent with these findings, the present study identified BMI as an independent risk factor for LARS (OR = 1.233). A higher BMI may increase the likelihood of obesity and associated comorbidities such as hyperlipidemia. Additionally, elevated BMI can increase pelvic pressure, complicating surgical dissection and intestinal reconstruction. These factors hinder postoperative recovery of bowel function, increasing susceptibility to LARS. (2) Tumor distance from the anal margin: Tumor proximity to the anal margin was another significant risk factor. Literature suggests that patients with tumors <8 cm from the anal margin have a threefold higher risk of developing LARS compared to those with tumors ≥8 cm [22]. Similarly, Miacci *et al*. [23] identified the anastomosis-to-anal margin distance as a predictor of LARS occurrence. This study corroborates these findings, showing that a tumor distance of ≥5 cm from the anal margin acts as a protective factor (OR = 0.323). Tumors closer to the anal margin necessitate lower anastomotic positions, which may increase the need for extensive tissue dissection and inadvertently damage the anal canal or sphincter, increasing the risk and severity of LARS. (3) Anastomotic fistula: The absence of postoperative anastomotic fistulas was found to be a protective factor against LARS (OR = 0.208), which was consistent with the results of related studies [19]. Anastomotic fistulas can lead to localized abscesses, trigger inflammation, increase rectal fibrin content, reduce anorectal compliance, and exacerbate LARS. While prophylactic stomas can mitigate the risk of anastomotic fistulas to some extent, the necessity of two surgeries may result in additional trauma to the rectum and adjacent tissues, increasing LARS incidence. (4) Prophylactic stoma reversal duration: The timing of stoma reversal significantly affected LARS occurrence. Xia *et al*. [24] found a relationship between stoma reversal time and LARS occurrence (OR = 2.298); the later the stoma reversal, the more it hinders bowel function recovery [25]. (5) Stoma closure timing: Closing a stoma within 10 weeks has been associated with a reduced risk of severe LARS [7]. In this study, the timing of stoma retraction was associated with LARS occurrence (OR = 1.933). Delayed stoma reversal may prolong the period during which the pelvic floor sphincter remains inactive, leading to muscle atrophy and diminished strength. This lack of pelvic muscle engagement can impair bowel function, increasing the risk of LARS. To mitigate this risk, it is recommended that patients undergoing prophylactic stoma intervention be closely observed for symptoms such as changes in defecation patterns. Pelvic floor function should be assessed regularly, and comprehensive interventions, including pelvic floor muscle exercises, dietary adjustments, and guided physical activities, should be implemented. Early stoma reversal should be prioritized when clinically feasible, based on the overall condition and recovery process of the patient. Additionally, this study constructed a predictive model based on Logistic regression analysis, and ROC curve analysis showed the area under the curve to be 0.809, indicating that the model has some value in predicting the occurrence of LARS after prophylactic stoma in rectal cancer patients.

A longitudinal analysis of LARS scores in this study revealed that the total LARS score was significantly lower at 6 and 12 months postoperatively compared to 3 months. Correspondingly, the incidence of LARS was significantly reduced at these later time points. These findings indicate that patients with prophylactic stomas experience a gradual improvement in LARS within 12 months postoperatively. Notably, among patients with mild LARS at 3 months postoperatively, 24 and 27 patients transitioned to no LARS at 6 and 12 months, respectively. In contrast, among patients with severe LARS, only 3 and 5 transitioned to mild LARS at these time points. These findings highlight that patients with severe LARS have persistent clinical symptoms, warranting focused clinical attention. Furthermore, the overall improvement rate within 12 months after surgery was significantly higher for mild LARS patients compared to those with severe LARS (87.93% vs. 36.36%). These findings suggest that mild LARS patients can resolve their symptoms through targeted interventions. Therefore, it is recommended that clinical staff tailor treatment and rehabilitation interventions to the severity of LARS symptoms observed in individual patients.

While many tools are available for the clinical assessment of LARS, the LARS scale remains widely used due to its simplicity and reliability. However, its inherent subjectivity and limitations may introduce potential biases. Future research should explore the integration of the LARS scale with additional tools or complementary methods to improve the accuracy and comprehensiveness of LARS assessment.

Additionally, this study did not evaluate permanent changes in gastrointestinal function beyond 12 months postoperatively. Prospective studies with extended follow-up periods are needed to better understand the long-term outcomes of LARS and further validate the findings of this study.

Conclusions

BMI, tumor distance from the anal margin, postoperative anastomotic fistula, and timing of prophylactic stoma retraction are identified as independent risk factors influencing the development of LARS in patients with prophylactic stomas after laparoscopic rectal cancer surgery. Additionally, the incidence of LARS decreases over time, with significant improvement noted within the first 12 months postoperatively.

Availability of Data and Materials

All data generated or analyzed during this study are included in this published article.

Author Contributions

GL: Project design, full implementation, wrote the manuscript. JL: Data summary check and statistical analysis. YY: Data collection, clinical observation. HM: Project implementation guidance and quality control. All authors contributed to editorial important changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was conducted in compliance with the principles outlined in the Declaration of Helsinki and was approved by the Medical Ethics Committee of Zhujiang Hospital of Southern Medical University (approval number: 2024-KY-094-03). All participants provided informed consent.

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Conflict of Interest

The authors declare no conflict of interest.

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