ORIGINAL ARTICLE

Retrospective Cohort Study

Effect of low anterior resection syndrome on quality of life in colorectal cancer patients: A retrospective observational study

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Abstract

BACKGROUND
Low anterior resection syndrome (LARS) is a common complication of anus-preserving surgery in patients with colorectal cancer, which significantly affects patients' quality of life.

AIM
To determine the relationship between the incidence of LARS and patient quality of life after colorectal cancer surgery and to establish a LARS prediction model to allow perioperative precision nursing.

METHODS
We reviewed the data from patients who underwent elective radical resection for colorectal cancer at our institution from April 2013 to June 2020 and completed the LARS score questionnaire and the European Organization for Research and Treatment of Cancer Core Quality of Life and Colorectal Cancer Module questionnaires. According to the LARS score results, the patients were divided into no LARS, mild LARS, and severe LARS groups. The incidence of LARS and the effects of this condition on patient quality of life were determined. Univariate and multivariate analyses were performed to identify independent risk factors for the occurrence of LARS. Based on these factors, we established a risk prediction model for LARS and evaluated its performance.

RESULTS
Among the 223 patients included, 51 did not develop LARS and 171 had mild or severe LARS. The following quality of life indicators showed significant differences between patients without LARS and those with mild or severe LARS: Physical, role, emotional, and cognitive function, total health status, fatigue, pain,

shortness of breath, insomnia, constipation, and diarrhea. Tumor size, partial/total mesorectal excision, colostomy, preoperative radiotherapy, and neoadjuvant chemotherapy were identified to be independent risk factors for LARS. A LARS prediction model was successfully established, which demonstrated an accuracy of 0.808 for predicting the occurrence of LARS.

CONCLUSION
The quality of life of patients with LARS after colorectal cancer surgery is significantly reduced.

Key Words: Colorectal cancer; Low anterior resection syndrome; Precision nursing; Quality of life; Prediction model; Risk factors

Core Tip: Low anterior resection syndrome (LARS) is a common complication of anus-preserving surgery in patients with colorectal cancer. In this study, we found that LARS significantly affected patients' quality of life after colorectal cancer surgery, and that perioperative precision nursing could significantly reduce the incidence of LARS and improve patients' quality of life. Furthermore, we established a LARS prediction model, which showed excellent performance in predicting the occurrence of LARS after colorectal cancer surgery. This prediction model can enable implementation of perioperative precision nursing to improve the quality of life of patients with LARS.

INTRODUCTION

Colorectal cancer is the third most common cancer worldwide[1], with a global incidence of 7.7 per 100000 population[2] and more than 1 million affected patients in the United States[3]. According to the National Cancer Institute's Surveillance, Epidemiology, and End Results program, improvements in living standards and changes in dietary habits correspond with an increase in the incidence of colorectal cancer in individuals aged 20-49 age by 51% since 1994[4,5]. In China, colorectal cancer is the fifth most common cancer, but its incidence is gradually increasing, with a significant increase observed in large cities in recent years[6,7].

Colorectal cancer treatment is based on a comprehensive multidisciplinary approach, and includes a variety of treatment methods, such as surgery, radiotherapy, chemotherapy, immunotherapy, and traditional Chinese medicine[8-11]. With the vigorous development of scientific research and the continuous exploration of approaches in clinical practice, the surgery-based multidisciplinary treatment strategy has played a significant role in improving the prognosis of patients with colorectal cancer[12,13].

With the continuous improvement of surgical techniques and equipment, the survival rates of patients with colorectal cancer have significantly improved[13,14]. According to the latest data from the American Cancer Society, the 5-year overall survival rate is 65%, with patients in local areas and hospitals having a better prognosis, with rates of up to 90% and 71%, respectively[15]. However, in patients with advanced colorectal cancer, the effect of surgical treatment is far from ideal. For these patients, current guidelines recommend the use of chemotherapy drugs, including 5-fluorouracil, oxaliplatin, and irinotecan[15].

Advancement in treatment methods has allowed colorectal cancer surgery to effectively improve patient symptoms in addition to providing good disease control and prolonging patient survival[16]. Retention of the anal canal, urinary function, and sexual function while ensuring radical resection has become the surgical objective. However, some patients develop low anterior resection syndrome (LARS) after anus-preserving surgery[17,18].

LARS is a subjective discomfort syndrome with common symptoms including incontinence, increased frequency and urgency of defecation, difficulty in emptying, and other symptoms, which brings great inconvenience to patients[9,19]. The incidence of LARS has been reported to range from 17.8% to 80.0%. Nonetheless, to date, there have been no population-based cohort studies to determine the incidence of LARS and its relationship with patient quality of life[20, 21].

The accelerated development of rehabilitation surgery has shortened the overall length of hospital stay of patients with colorectal cancer[22]. However, a shorter hospitalization stay reduces the time for patients to acquire anal rehabilitation skills prior to being discharged from the hospital, which may lead to an increase in the incidence of LARS[23].

MATERIALS AND METHODS

Study design

This was a longitudinal observational retrospective cohort study with a hospital-based survey that included patients surgically treated for colorectal cancer. Postoperatively, patients were provided with the LARS score questionnaire, the third edition of the European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC QLQ-C30), and the Colorectal Cancer Module (EORTC QLQ-CR29) questionnaire[24]. To ensure patient compliance, each hospital assigned a responsible person to supervise and inspect the completion of the questionnaires. Researchers from the three hospitals met once a week to discuss the content of the study and the completion of the questionnaires.

Perioperative clinicopathological characteristics of patients and tumors were extracted from the medical records. Data were analyzed to determine the incidence of LARS and its effects on patient quality of life and to identify independent risk factors for the occurrence of LARS. Based on these factors, we established a risk prediction model for LARS and evaluated its performance.

Instrument with validity and reliability

LARS score: The LARS score questionnaire evaluates defecation frequency, occasional uncontrollable exhaust (flatulence), occasional anal leakage, stool properties, and urgency. Based on the findings of this questionnaire, patients were divided into three groups as follows: No LARS (0-20 points), mild LARS (21-29 points), and severe LARS (30-42 points).

EORTC QLQ-C30: The EORTC QLQ-C30 contains the following domains: Physical, role, emotional, and cognitive function, total health status, fatigue, nausea and vomiting, pain, shortness of breath, insomnia, loss of appetite, constipation, diarrhea, and economic difficulties. Body function was scored based on the ability of the patient to engage in strenuous activities and long- or short-distance walks outdoors, the necessity to stay in bed or a chair during the day, and the ability to eat, dress, bathe, or go to the toilet. Role function was scored based on restrictions in work and daily activities and hobby or leisure activities (physical strength). Emotional function was scored based on feelings of nervousness, worry, irritability, and depression. Cognitive function was scored based on the ability to concentrate and remember. Total health status was scored based on general health status and life quality, as assessed over one week. Fatigue was scored based on the requirement for rest and the presence of weakness and tiredness. The total QLQ-C30 score was obtained by summing the total percentile scores of each domain.

EORTC QLQ-CR29: The EORTC QLQ-CR29 contains the following domains: Urinary frequency, stool blood/mucus, body image, ostomy, male sexual function, impotence, female sexual function, pain, incontinence, urinary pain, abdominal pain, hip pain, abdominal distension, dry mouth, hair loss, taste abnormalities, anxiety, and obesity. The total QLQ-CR29 score was obtained by summing the total percentile scores of each domain.

Population

The study population included patients who underwent elective radical resection for colorectal cancer at our institution from April 2013 to June 2020 and completed the LARS score and the EORTC QLQ-C30 questionnaires.

The perioperative management and treatment of patients were in full compliance with current guidelines. All surgeries were performed by surgeons with more than 5 years of experience in performing primary surgery. Histopathological analysis was performed by the pathologists of our hospital.

Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) Completed preoperative colonoscopy and postoperative pathological confirmation of colorectal cancer; (2) elective colorectal cancer surgery with definite indications and without contraindications; (3) age ≥ 18 years; and (4) ability to complete the questionnaires.

The exclusion criteria were as follows: (1) Palliative colorectal resection; (2) history of immune system disorders, uremia, or severe preoperative renal impairment; (3) concurrent other primary malignant tumors, except for gastric cancer; (4) emergency surgery due to ileus; and (5) incomplete or otherwise disqualified questionnaire data.

Data sources and collection

Relevant clinical, surgical, and pathological data were extracted from the patient medical records, which included age, sex, preoperative radiotherapy, neoadjuvant chemotherapy, tumor size, length, resection margin (cm), tumor-node-metastasis (TNM) stage, degree of differentiation (01/23), total/partial mesorectal excision (TME/PME), anal distance (cm), presence of stoma, lymphatic dissection, and surgery type (open or endoscopic).

Data analysis

For analyses, patients were divided into no-LARS and LARS groups based on the LARS score results. The LARS group included patients with mild and severe LARS. The above clinicopathological factors were compared between the groups. Continuous variables are expressed as the mean with standard deviation or median with interquartile range and were compared using Student's *t*-test or Mann-Whitney's *U* test, as appropriate. Categorical variables are expressed as frequencies with percentages and were compared using the Chi-square test.

Table 1 Association between low anterior resection syndrome symptoms and patient quality of life

	No LARS (*n* = 51)	LARS (*n* = 171)	*P* value
Physical function: High/low	36 (70.6%)/15 (29.4%)	87 (50.6%)/85 (49.4%)	0.008[1]
Role function: High/low	33 (64.7%)/18 (35.3%)	88 (51.5%)/84 (48.5%)	0.06
Emotional function: High/low	38 (74.5%)/13 (25.5%)	98 (56.9%)/74 (43.1%0	0.017[2]
Cognitive function: High/low	36 (70.6%)/15 (29.4%)	75 (43.8%)/97 (56.2%)	0.001[1]
Total health status: High/low	29 (56.9%)/22 (43.1%)	69 (40.3%)/103 (59.7%)	0.026[2]
Fatigue: High/low	33 (64.7%)/18 (35.3%)	86 (50%)/86 (50%)	0.045[2]
Nausea and vomiting: High/low	45 (88.2%)/6 (11.8%)	146 (84.9%)/26 (15.1%)	0.365
Pain: High/low	44 (86.3%)/7 (13.7%)	109 (63.4%)/63 (36.6%)	0.001[1]
Polypnea: High/low	46 (90.2%)/5 (9.8%)	129 (75.0%)/43 (25%)	0.013[2]
Sleeplessness: High/low	40 (78.4%)/11 (21.6%)	93 (54.1%)/79 (45.9%)	0.001[1]
Appetite loss: High/low	42 (82.3%)/9 (17.6%)	126 (73.3%)/46 (26.7%)	0.126
Constipation: High/low	35 (68.6%)/16 (31.4%)	71 (41.3%)/101 (58.7%)	0.001[1]
Diarrhea: High/low	41 (80.4%)/10 (19.6%)	77 (44.8%)/95 (57.2%)	0.001[1]
Financial difficulty: High/low	46 (90.2%)/5 (9.8%)	142 (82.5%)/30 (17.5%)	0.135

[1]$P \leq 0.001$.

[2]$P \leq 0.05$, statistically significant.

LARS: Low anterior resection syndrome.

The Chi-square and Fisher's exact tests were used for univariate analysis to identify factors associated with LARS. Multivariate logistic regression analysis was performed based on the univariate analysis results, and odds ratios and 95% confidence intervals were calculated. Least absolute shrinkage and selection operator (LASSO) regression was employed to select significant clinicopathological factors associated with LARS. Based on the selected independent risk factors, a visual prediction model of LARS risk and survival line chart were constructed.

IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY, United States) was used for statistical analyses. Statistical significance was set at $P < 0.05$. All *P* values were two-tailed.

Ethical considerations

The study was approved by the Ethics Committee of our institution.

RESULTS

Patient characteristics

Of the 312 patients who underwent colorectal surgery during the study period, 19 were excluded for the following reasons: Seven due to preoperative metastasis to other sites and palliative surgical treatment, three due to preoperative diagnosis of severe renal failure, and nine due to discrepancy between the pre- and postoperative diagnosis. Therefore, a total of 293 patients received questionnaires, of whom 265 (90.4%) returned completed questionnaires. Among them, 42 patients who completed the questionnaires in less than 300 s were excluded. Finally, 223 (84.15%) patients with qualified questionnaires were included in the analysis.

There were 65 women (25.12%) and 158 men (74.88%), with an average age of 59.21 (range, 52-68) years. According to the LARS score results, 51 (22.86%) patients did not have LARS, 47 (121.07%) had mild LARS, and 125 (56.05%) had severe LARS.

Relationship between LARS and quality of life

Compared with those without LARS, patients with LARS had significantly lower scores for physical, emotional, and cognitive function and total health status and higher scores for fatigue, nausea and vomiting, pain, shortness of breath, insomnia, constipation, and diarrhea. The relationship between LARS and quality of life assessed using the EORTC QLQ-C30 and EORTC QLQ-CR29 questionnaires is shown in Tables 1 and 2, respectively. The scatterplot correlation analysis showed good consistency between the two quality of life assessment methods (Figure 1).

### Clinicopathological factors associated with LARS

According to the findings of the LARS score assessment, 99 patients received low LARS scores and 124 received high

Table 2 Association between low anterior resection syndrome symptoms and quality of life in patients with colorectal cancer

	Without LARS (*n* = 51)	With LARS (*n* = 171)	*P* value
Frequent micturition: With/without	27 (52.3%)/24 (47.9%)	74 (43.0%)/98 (56.9%)	0.138
Blood in stool: With/without	41 (80/4%)/10 (19.6%)	106 (61.6%)/66 (38.4%)	0.009[1]
Body image: With/without	41 (80/4%)/10 (19.6%)	88 (51.2%)/84 (48.8%)	0.001[1]
Male sexual function: With/without	16 (44.4%)/20 (55.6%)	60 (53.6%)/52 (46.4%)	0.223
Impotence: With/without	21 (61.7%)/13 (38.3%)	52 (50%)/52 (50%)	0.160
Female sexual function: With/without	9 (81.8%)/2 (18.2%)	37 (80.4%)/9 (19.6%)	0.644
Pain: With/without	8 (88.8%)/1 (11.1%)	33 (78.6%)/9 (21.4%)	0.429
Uroclepsia: With/without	49 (96.1%)/2 (3.9%)	149 (86.6%)/23 (13.3%)	0.061
Odynuria: With/without	47 (92.1%)/4 (7.8%)	157 (91.3%)/15 (8.7%)	0.816
Stomachache: With/without	44 (86.3%)/7 (13.7%)	129 (75.0%)/43 (25.0%)	0.062
Pygalgia: With/without	48 (94.1%)/3 (5.9%)	128 (74.4%)/44 (25.6%)	0.001[1]
Ventosity: With/without	44 (86.3%)/7 (13.7%)	110 (63.9%)/62 (36.1%)	0.001[1]
Thirst: With/without	32 (19.6%)/19 (37.2%)	83 (48.3%)/89 (51.2%)	0.048[1]
Alopecia: With/without	47 (92.2%)/4 (7.8%)	118 (68.6%)/54 (31.4%)	0.001[1]
Allotriogeustia: With/without	46 (90.2%)/5 (9.8%)	114 (66.3%)/28 (33.8%)	0.180
Anxiety: With/without	29 (56.9%)/22 (43.1%)	54 (31.3%)/118 (68.6%)	0.001[1]
Obesity: With/without	35 (68.6%)/16 (31.3%)	97 (56.4%)/75 (43.6%)	0.08[1]

[1]$P \le 0.001$, statistically significant difference.
LARS: Low anterior resection syndrome.
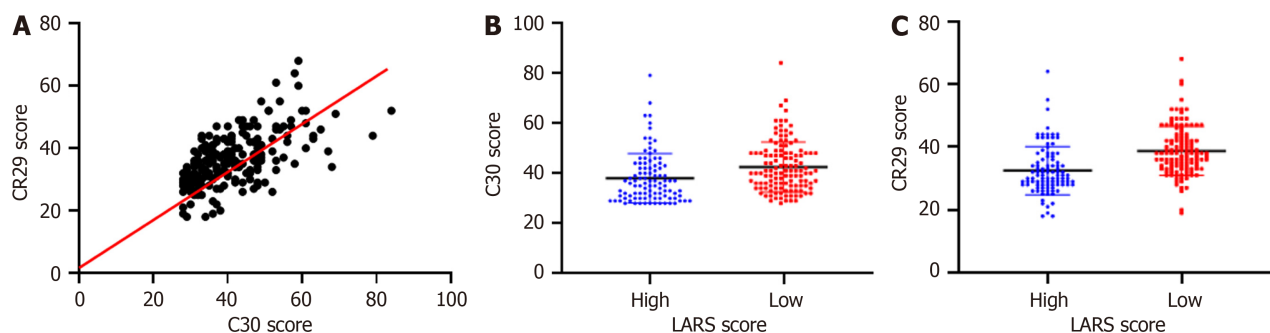
Figure 1 Relationship between low anterior resection syndrome scores and postoperative quality of life. A: Scatterplot showing good consistency between the Quality of Life Questionnaire (QLQ)-C30 and QLQ-CR29 quality of life scores; B: Patients in the low low anterior resection syndrome (LARS) score group had lower QLQ-C30 scores, fewer symptoms affecting quality of life, and better quality of life (*P* < 0.05); C: Patients in the low LARS score group had lower QLQ-CR29 scores, fewer symptoms affecting quality of life, and better quality of life (*P* < 0.05). LARS: Low anterior resection syndrome.

scores. A comparison of clinicopathological factors between the groups showed that TME/PME, ostomy, preoperative radiotherapy, and neoadjuvant chemotherapy were significantly correlated with LARS scores (*P* < 0.05, Table 3).

Impact of perioperative precision nursing on postoperative quality of life
According to the perioperative nursing method and patient clinical course, patients were divided into precision and routine nursing groups. The two groups were compared based on the LARS, QLQ-C30, and QLQ-CR29 scores (Figure 2). Perioperative precision nursing was associated with lower LARS scores and higher QLQ-C30 and QLQ-CR29 scores (*P* < 0.05). These results indicate that perioperative precision nursing is of great significance for reducing the incidence of LARS and improving patient quality of life.

LARS prediction model
LASSO regression analysis showed that TME/PME, ostomy, preoperative radiotherapy, and neoadjuvant chemotherapy

Table 3 Low anterior resection syndrome is correlated with clinicopathological features of colorectal cancer patients

	Low LARS score (*n* = 99)	High LARS score (*n* = 124)	*P* value
Age (yr): < 59/≥ 60	49 (49.5%)/50 (50.5%)	62 (50.0%)/62 (50.0%)	0.524
Sex: Male/female	73 (73.4%)/26 (26.3%)	81 (65.3%)/43 (34.6%)	0.114
Tumor size (cm): < 4/≥ 4	44 (44.4%)/52 (55.6%)	69 (55.6%)/49 (44.4%)	0.044
Length (cm): < 12/≥ 12	25 (25.3%)/63 (74.7%)	25 (23.1%)/83 (76.8%)	0.249
Length of distal margin (cm): < 3/≥ 3	43 (52.4%)/39 (47.6%)	52 (57.1%)/39 (42.8%)	0.32
T: 0, 1/2, 3	10 (15.1%)/56 (84.8%)	13 (17.6%)61 (82.4%)	0.439
N: < 17/≥ 17	60 (61.8%)/37 (38.1%)	77 (63.1%)/45 (36.9%0	0.479
M: No/yes	86 (92.5%)/7 (7.5%)	86 (89.6%)/10 (10.4%)	0.331
Differentiated degree: 0, 1/2, 3	31 (31.9%)/66 (68.1%0	45 (37.8%)/74 (62.2%)	0.264
TME/PME	59 (62.1%)/39 (37.9%)	58 (47.5%)/64 (52.4%)	0.041
Anal distance: < 9/≥ 9(cm)	41 (41.8%)/57 (58.2%)	62 (51%)/60 (49%)	0.117
Fistulation: No/yes	53 (53.5%)/46 (46.5%)	50 (41.3%)/71 (58.7%)	0.005
Preoperation radiotherapy: No/yes	79 (81.4%)/18 (18.6%)	79 (64.7%)/43 (35.1%)	0.021[1]
Neoadjuvant chemotherapy: No/yes	84 (85.7%)/14 (24.3%)	84 (68.3%)/39 (31.7%)	0.007[2]

[1]$P \leq 0.05$.

[2]$P \leq 0.001$, statistically significant difference.

T: Tumor; N: Node; M: Metastasis; TME/PME: Total/partial mesorectal excision.
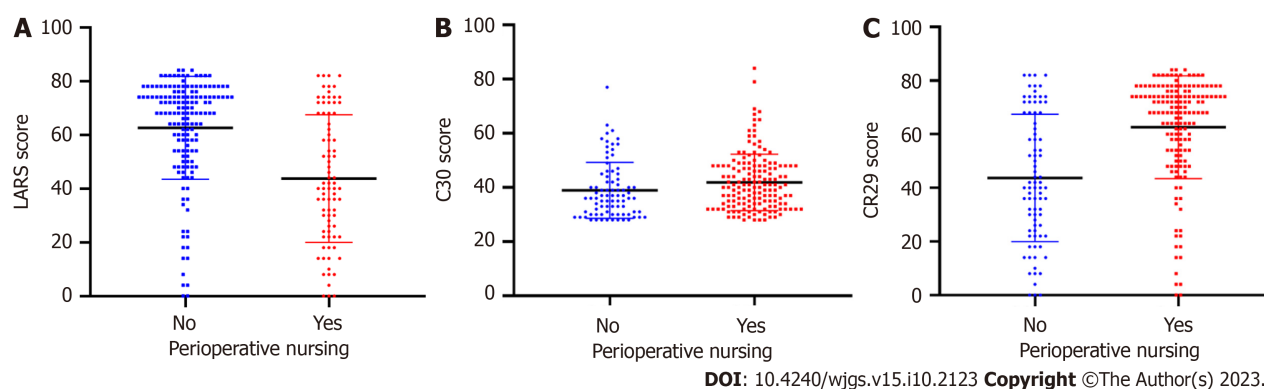
Figure 2 Relationship between perioperative precision nursing and postoperative quality of life. A-C: Patients provided with perioperative precision nursing had (A) significantly lower low anterior resection syndrome scores (LARS) after surgery and a reduced probability of developing LARS (*P* < 0.05), (B) higher postoperative Quality of Life Questionnaire (QLQ)-C30 scores (*P* < 0.05), and (C) higher postoperative QLQ-CR29 scores (*P* < 0.05). LARS: Low anterior resection syndrome.

were independent risk factors for the occurrence of LARS after colorectal surgery (*P* < 0.05). These factors were used to establish a prediction model, which had an area under the receiver operating characteristic curve of 0.808 for predicting LARS (Figure 3).

DISCUSSION

Before the LARS score questionnaire was developed in 2012, most studies on postoperative long-term quality of life focused on the incontinence symptom of defecation dysfunction[25]. This research method formed the misunderstanding that "intestinal dysfunction recovers within 1 year after surgery and the function of long-term survival patients is acceptable"[11]. In this study, we found that LARS significantly affected patient quality of life after colorectal cancer surgery and that perioperative precision nursing has the potential to significantly reduce the incidence of LARS and improve patient quality of life. Furthermore, TME/PME, ostomy, preoperative radiotherapy, and neoadjuvant chemotherapy were identified as independent risk factors for LARS. Based on these clinicopathological factors, we
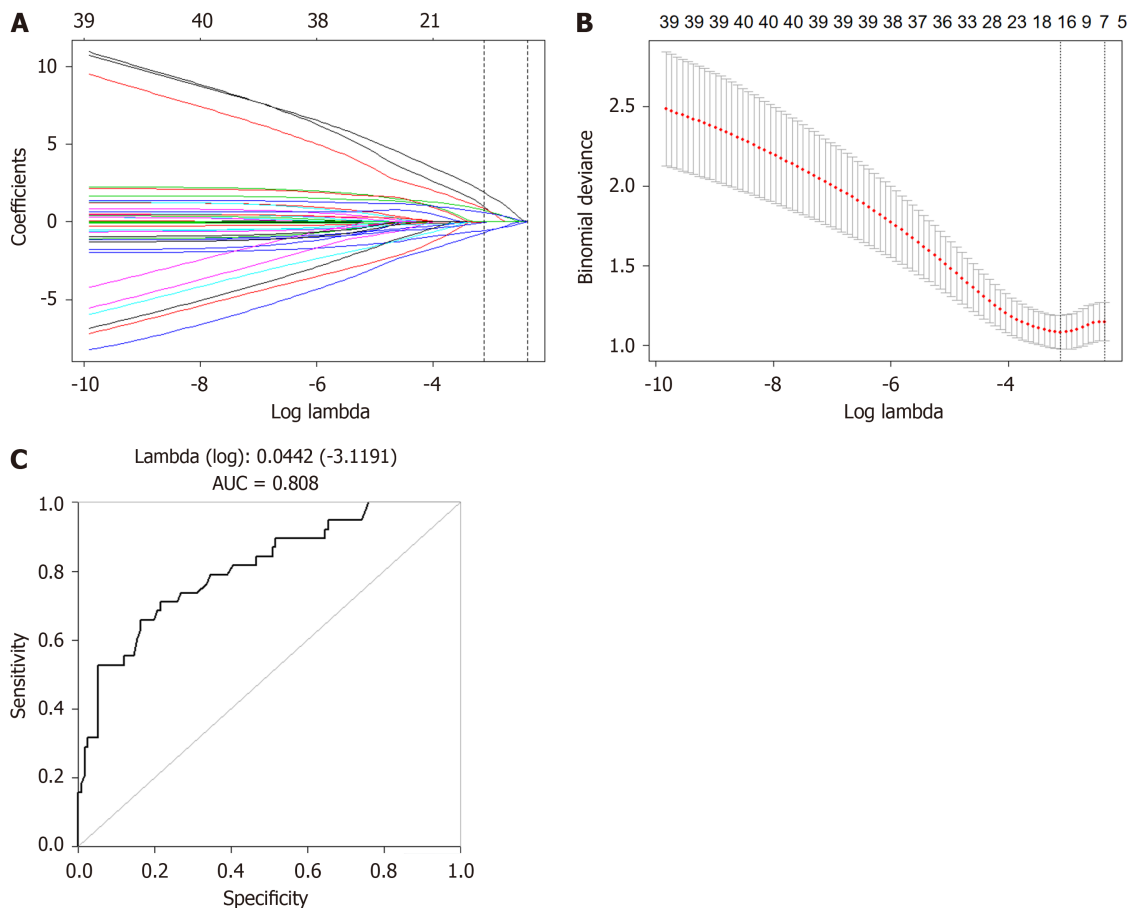
Figure 3 Low anterior resection syndrome prediction model established by least absolute shrinkage and selection operator regression. A and B: Total/partial mesorectal excision, ostomy, preoperative radiotherapy, and neoadjuvant chemotherapy were identified as risk factors for low anterior resection syndrome (LARS) and were used to establish an LARS prediction model; C: The accuracy of the LARS prediction model reached over 80%. AUC: Area Under Curve.

established a LARS prediction model that showed excellent performance in predicting the occurrence of LARS after colorectal cancer surgery.

Surgical resection is the main method for treating colorectal cancer[26]. With the continuous updating of surgical techniques and equipment and the expanding knowledge on neoadjuvant chemoradiotherapy and colorectal cancer pathology and molecular pathology, postoperative survival rates continue to increase[27]. LARS is a common complication of anus-preserving surgery, for which a targeted and effective treatment is not available[25]. Currently, LARS treatment includes rehabilitation therapy and diet adjustment[18]. With the application of laparoscopic minimally invasive technology and the double-anastomosis technique[28], LARS has gradually become the most important treatment challenge in patients with middle and low rectal cancer[29]. LARS is more likely to occur in older patients than in other age groups due to their reduced pelvic floor bearing capacity[9].

Although most LARS symptoms disappear within 1 year after surgery, the occurrence greatly inconveniences patients. In this study, patients with LARS had a significantly poorer quality of life than those without, and the quality of life decreased with the aggravation of LARS symptoms. To assess patient quality of life, we used the EORTC QLQ-C30 and EORTC QLQ-CR29 questionnaires. Our analysis showed good consistency between the scores of these two question-naires, confirming that both reflect the quality of life of patients well[30].

In the present study, we found that TME/PME, ostomy, preoperative radiotherapy, and neoadjuvant chemotherapy were independent risk factors for LARS. This is consistent with the results of a prior study that identified the anastomotic site-anal edge distance, anastomotic leakage, radiotherapy, neoadjuvant chemotherapy, TNM stage, and sex as risk factors for LARS after surgery for low rectal cancer[31]. Furthermore, we established a LARS risk prediction model, which had an accuracy of over 80%.

Most prior studies on LARS have focused on the causes and risk factors for LARS without exploring factors that may help reduce LARS incidence and severity[32]. In the current study, we found that personalized precision nursing during the perioperative period could help reduce LARS scores and improve patient quality of life. Therefore, perioperative precision nursing is an important protective factor for LARS. As personalized precision nursing is labor-intensive and requires substantial material resources, patients should undergo LARS risk assessment before surgery, and precision nursing should be applied according to the results, which can improve patient quality of life[33].

The findings of this study are of great significance for predicting the long-term functional prognosis of patients after anal preservation. If the patient has not received radiation and the anastomotic height is high, it is unlikely that severe

LARS will occur from a long-term survival perspective. If these patients have more severe LARS symptoms early after surgery, active treatment may result in a good functional prognosis[33].

There are still some limitations in this study. All patients included in this study retrospectively. According to the LARS risk prediction model established in this study, prospective perioperative nursing studies can be conducted, which will be the plan of further research[34].

CONCLUSION

The LARS risk prediction model established in this study can enable the implementation of perioperative precision nursing for high-risk patients after colorectal cancer surgery. This may result in reduced LARS incidence and severity, which is of great value for improving the quality of life and happiness index of patients undergoing colorectal cancer surgery.

ARTICLE HIGHLIGHTS

Research background
Low anterior resection syndrome (LARS) is a common complication of anus-preserving surgery for colorectal cancer, which seriously affects the daily life of patients.

Research motivation
In order to reduce the incidence and severity of LARS, while improving the quality of life of patients undergoing colorectal cancer surgery.

Research objectives
The purpose of this study was to investigate the relationship between LARS and patient quality of life in a large cohort of patients and to identify perioperative clinicopathological factors that can predict the occurrence of LARS.

Research methods
This was a longitudinal retrospective cohort study using a hospital-based survey. In this study, the LARS score questionnaire and the European Organization for Research and Treatment of Cancer Core Quality of Life and Colorectal Cancer module questionnaires were completed.

Research results
Multiple independent risk factors for LARS were identified in the study. The accuracy of the LARS prediction model established was 0.808.

Research conclusions
The LARS prediction model in this study can implement perioperative precision nursing and improve the quality of life of LARS patients.

Research perspectives
The LARS prediction model would enable the implementation of perioperative precision nursing interventions to improve patient quality of life.

FOOTNOTES

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