

Research Article

Factors Influencing Quality of Life in Patients After Rectal Cancer Anus-Preserving Surgery: A Cross-Sectional Study

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Abstract

Aims and Objectives: The purpose of this study was to investigate the symptoms and quality of life level in patients after rectal cancer anus-preserving surgery, and to explore the factors affecting the quality of life level. In addition, a correlation analysis was conducted between symptoms and quality of life level. **Background:** Patients after rectal cancer anus-preserving surgery may have related complications, and the quality of life is also affected by various factors. It is particularly important to pay attention to and improve the quality of life of patients, so it is necessary to clarify the influencing factors and better clinical nursing intervention. **Design:** A cross-sectional study. **Methods:** From June 2020 to May 2022, a convenience sample of 165 participants were recruited at two tertiary hospitals in Guangdong, China. Quality of life and postoperative symptoms were assessed using the Cancer Patient Quality of Life Measurement Scale (FACT-G) and the Chinese Cancer Anderson Symptom Assessment Scale (MDASI) face-to-face or by telephone. **Results:** The overall quality of life score of patients after rectal cancer anus-preserving surgery was 54.07 ± 14.58 points. The top three most severe symptoms were sleep, fatigue, and numbness or tingling in the limbs or face. The most severe gastrointestinal symptom was constipation. The severity of symptoms, gastrointestinal symptoms, and symptom interference were negatively moderately correlated with the total score of quality of life ($P < 0.01$). The severity of symptoms, the severity of gastrointestinal symptoms, and the degree of symptom interference were independent factors affecting the quality of life of patients after RCAPS, with statistical significance ($P < 0.05$). **Conclusion:** The quality of life of patients after rectal cancer anus-preserving surgery is at a medium level. The higher the severity of symptoms and symptom interference of patients after rectal cancer anus-preserving surgery, the lower the quality of life of patients. **Relevance to clinical practice:** To provide a theoretical basis for clinical nursing interventions for patients after rectal cancer anus-preserving surgery, so as to improve their quality of life.

Keywords

Rectal Cancer Sphincter-Preserving Surgery, Quality of Life, Symptoms, Influencing Factors

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1. Introduction

Colorectal cancer ranks fifth in the number of deaths from malignant tumors in China, ranking behind lung cancer, liver cancer, stomach cancer, and esophageal cancer. Among colorectal cancer, rectal cancer (RC) had the highest proportion, accounting for about 70% [1], and the incidence of RC was increasing year by year, tending to be younger [2]. Miles surgery was the preferred surgical method for low RC due to the anatomical position, physiological characteristics, and the infiltration and metastasis of rectal malignant tumors. However, this procedure may cause damage to the patient's normal bowel function, and therefore influence patient's quality of life and mental health after surgery at different levels because of the removal of anus. Besides a permanent abdominal stoma was then to maintain bowel function and the smoothness of the digestive tract. The long-term care and frequent replacement of the stoma bag stressed the patient physically and mentally, greatly affecting their work and daily life. In addition, this permanent difference from healthy individuals led to a great mental and psychological pressure, and some patients may experience depression or even suicidal tendencies. With the continuous advancement of surgical techniques and the emergence of the Dixon and total mesorectal excision (TME) aforementioned treatment methods, especially the introduction and acceptance of neoadjuvant therapy and TME, not only significantly extended patients survival time, but also enabled patients who were previously unable to undergo sphincter-preserving surgery to receive sphincter-preserving treatment [3]. The choice of treatment method was closely related to the prognosis and postoperative quality of life. Sphincter-preserving surgeries represented by Dixon and TME were preferred since they, not only preserved the anus but also avoided postoperative complications such as stomas [4], thus preventing RC patients from the inconvenience of carrying a stoma bag for life. However, the resection of the tumor inevitably caused anatomical changes and rectal functional impairment, such as damage to the sensory nerve function of the anal canal and perianal region, impairment of the defecation reflex pathway, and changes in the rectal angle. These changes resulted in decreased sensory function and compliance of the anastomosed rectum after surgery. Additionally, complications such as scar contracture after surgery may occur due to the anatomical characteristics of the rectum, referring to its lower position and its proneness to stenosis. Some patients might also suffer from the complications of preoperative and postoperative radiotherapy,

chemotherapy, targeted therapy, or immunotherapy. These factors together made 80% to 90% of patients experience low anterior resection syndrome (LARS) that resulted from varying degrees of bowel dysfunction after surgery [5]. Some common symptoms that could significantly jeopardize patients' quality of life included increased frequency of bowel movements, and urgency, lower abdominal bloating, fecal incontinence, and difficulty in defecation. These symptoms often occurred one month after surgery, became most pronounced within six months, and could persist for one to two years [6]. The purpose of this study was to explore the factors affecting the quality of life of rectal cancer after anus-preserving surgery, to provide a theoretical basis for clinical intervention to provide targeted care, and to improve the quality of life of rectal cancer.

2. Methods

2.1. Study Design and Participants

A convenience sample of patients after rectal cancer anus-preserving surgery were recruited from two tertiary hospitals in Guangdong in China, during June 2020 to May 2022. Eligible participants were adult (>18 years) rectal cancer patients with pathological diagnosis, receiving anus-preserving surgery within one year with or without temporary colostomy that has been reversed (allowing anus bowel movements) more than one month, without cognitive impairment and mental disorders, being able to effectively communicate and willing to participate after informed consent. Patients were excluded if they were diagnosed with other malignant tumours, with tumour recurrence or metastasis, with pre-existing intestinal-related functional disorders or other unrelated severe diseases. According to the relevant studies, most of the age values are 60, so this study refers to the relevant values and takes 60 years old as the dividing line. In the end, a total of 165 patients completed the questionnaire. Sociodemographic characteristics, household registration type, body mass index (BMI), and disease-related information including postoperative stages and comorbidities such as diabetes and hypertension of patients, were collected (table 1). Informed consent was given by all participants and their participation was kept anonymous.

Table 1. Basic information of study subjects (N=165).

	Number of people	Percentage
Gender		
Female	78	47.27%
Male	87	52.73%

	Number of people	Percentage
Age		
<60	90	54.55%
≥60	75	45.45%
Educational level		
Primary school and below	60	36.36%
Middle school or technical	68	41.21%
secondary school College or above	37	22.42%
Ethnicity		
Han ethnicity	150	90.91%
ethnic minorities	15	9.09%
Household registration type		
town	136	82.42%
countryside	29	17.58%
Marital Status		
Married	147	89.09%
Unmarried or divorced or widowed	18	10.91%
BMI		
Normal	128	77.58%
Overweight or obese	37	22.42%
Diabetes		
None	138	83.64%
Present	27	16.36%
Hypertension		
None	133	80.61%
Present	32	19.39%
Postoperative Stage		
3 months postoperative	58	35.15%
6 months postoperative	52	31.52%
9 months postoperative	35	21.21%
12 months postoperative	20	12.12%

2.2. Measurements

2.2.1. Intervention Methods

Telephone surveys were conducted every Friday afternoon, using the Functional Assessment of Cancer Therapy-General (FACT-G) and the MD Anderson Symptom Inventory (MDASI). The FACT-G [7] consists of 4 dimensions with a

total score of 108 points, and the higher its score, the higher the quality of life. There are a total of 24 items in MDASI-GI [8], 1~4 are mild, 5~6 are moderate, and 7~10 are severe, the higher the score, the more severe the symptoms. At the point of postoperative 3 months, 6 months, 9 months, and 12 months (allowing a time difference of 7 days before and after). For patients returned to the hospital for a check-up during the research time point, an on-site questionnaire survey was conducted. The completed questionnaire was collected

on the spot and converted into an electronic spreadsheet by another colleague.

2.2.2. Ethical Considerations

Ethical approval was granted by the Biomedical Ethics Committee of Fifth Affiliated Hospital of Jinan University (Approval Number: IRB (KY)2022-014-01) prior to commencing the study.

2.2.3. Statistical Methods

Excel was used to manage the data, and SPSS 26.0 and R language software were used for data description, graph drawing, and statistical analysis. Cronbach's α coefficient [9] was used to evaluate the reliability and validity. When the Cronbach's alpha coefficient was greater than 0.7, good reliability and validity were considered. For measurement data, conformed to or approximated a normal distribution, mean \pm standard deviation was used for description, independent sample t-tests were used for comparisons between two groups, one-way analysis of variance is used for comparisons among multiple groups, LSD method is used for post-hoc pairwise comparisons, and Pearson correlation analysis was used for correlation analysis. For data with extreme skewness, logarithmic transformation or square root transformation was used to satisfy normality, and then the above analysis was performed; this study belongs to normal distribution. Frequency (percentage) was used adopted for description for categorical data. With the total score of quality of life as the dependent variable, variables with statistical significance in the above single-factor analysis and variables with $P < 0.05$ in the correlation analysis were included in the multiple linear regression equation to explore the independent influencing factors of quality of life. The R language ggplot2 package was used for related graph drawing. All analyses in this study were two-sided tests, the difference is considered statistically significant with $P < 0.05$.

3. Results

3.1. Analysis of Overall Scores and Scores of Various Dimensions in the Quality of Life

The results of the total quality of life scores and dimensions for the 165 study participants showed that the physical status score was 17.15 ± 3.85 , the social and family status score was 14.38 ± 4.12 , the emotional status score was 11.86 ± 4.12 , and the functioning status score was 10.68 ± 4.73 , with a mean of 54.07 ± 14.58 points in total. The results were significantly lower compared to the full score of 108, indicating that the quality of life of patients after rectal cancer sphincter-preserving surgery is still at a medium level, and there was room for further improvement.

Table 2. Scores of Quality of Life Scale and Anderson Symptom Scale Scores for patients after rectal cancer sphincter-preserving surgery.

Scale and dimensions	Mean \pm Standard Deviation
Quality of life scale	
Physiological condition	17.15 ± 3.85
Social and family condition	14.38 ± 4.12
Emotional condition	11.86 ± 4.12
Functional condition	10.68 ± 4.73
Total score of quality of life	54.07 ± 14.58
Anderson Symptom Scale	
Severity of Symptoms	24.73 ± 9.57
Severity of Gastrointestinal Symptoms	12.58 ± 4.01
Degree of interference	14.98 ± 5.74

3.2. Analysis of the Severity of Symptoms in Patients

The top three symptoms with the highest average severity were sleep, fatigue, and numbness or tingling in the limbs or face. The top three symptoms with the highest severity in the gastrointestinal tract were constipation, diarrhea, and abdominal bloating. These symptoms had the greatest impact on the quality of life amongst patients after rectal cancer sphincter preservation surgery, followed by work. See Table 3 for details.

Table 3. Scores of individual items on the Anderson Symptom Scale in patients after rectal cancer sphincter-preserving surgery.

Items	Average scores
Symptom Items	
Disturbed sleep	3.99 ± 2.18
Fatigue	3.95 ± 2.09
Numbness/tingling	3.89 ± 2.28
Difficulty remembering	1.70 ± 1.61
Sadness	1.53 ± 1.66
Vomiting	1.37 ± 1.53
Dry mouth	1.29 ± 1.51
Drowsiness	1.27 ± 1.25
Lack of appetite	1.25 ± 1.34
Distress/feeling upset	1.23 ± 1.38
Nausea	1.19 ± 1.57
Pain	1.09 ± 1.29

Items	Average scores
Shortness of breath	1.04±1.39
Gastrointestinal Symptom Items	
constipation	4.42±1.62
diarrhea	2.69±1.37
feeling bloated	2.49±1.69
change in taste	1.55±1.21
difficulty swallowing	1.43±1.34
Interference Items	
Enjoyment of life	4.19±2.14
Working (including housework)	3.54±1.74
Mood	2.38±1.86
Activity	2.22±1.80
Relations with other people	1.38±1.19
Walking	1.27±1.15

3.3. Correlation Analysis Between Quality of Life Scale and Anderson Symptom Scale

For the Anderson Symptom Scale, there were positive correlations among the severity of symptoms, gastrointestinal symptoms, and symptom interference dimensions, all of which were statistically significant ($P < 0.001$). The correlation coefficients between the severity of symptoms, gastrointestinal symptoms, symptom interference dimensions, and the total score of the Quality of Life Scale were -0.47, -0.48, and -0.45, respectively. These coefficients indicated a moderate negative correlation, suggesting that the severity of symptoms, gastrointestinal symptoms, and symptom interference may reduce the patients' quality of life. See Figures 1-3.

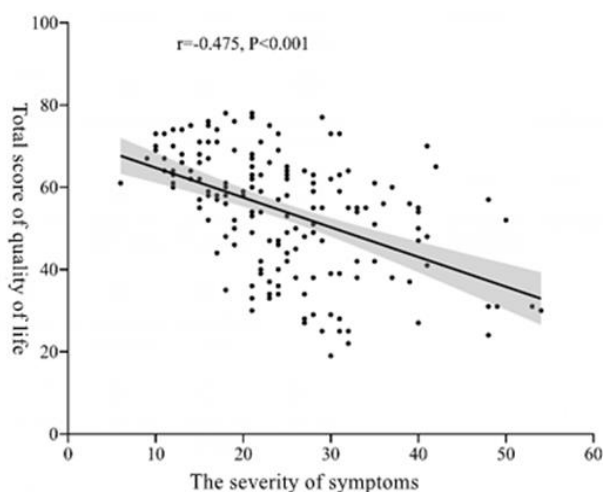


Figure 1. Scatter plot of the correlation analysis between the severity of symptoms and quality of life.

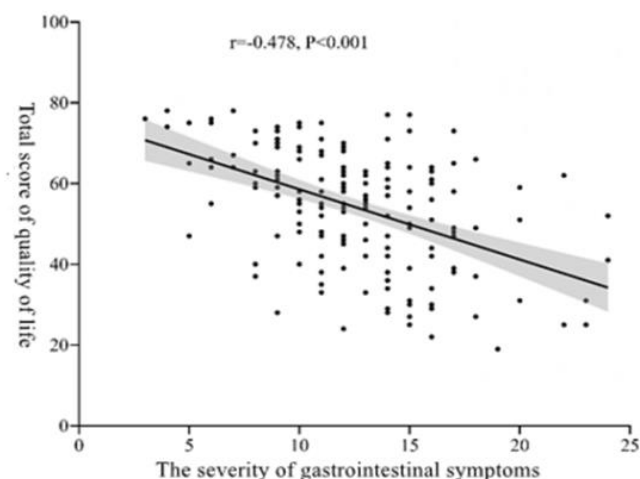


Figure 2. Scatter plot of the correlation analysis between the severity of gastrointestinal symptoms and quality of life.

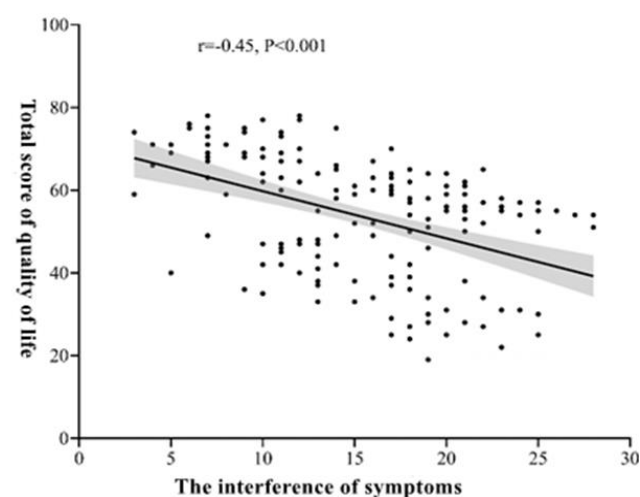


Figure 3. Scatter plot of the correlation analysis between the interference of symptoms and quality of life.

This study further confirmed the negative relationship between the severity of symptoms, severity of gastrointestinal symptoms, symptom interference, and the quality of life through Pearson correlation analysis ($r = -0.47$, $r = -0.48$, $r = -0.45$, $P < 0.01$). This suggested that as the severity of symptoms, severity of gastrointestinal symptoms, and symptom interferences increase, the patients' quality of life decreases. Long-term postoperative intestinal dysfunction, side effects of chemotherapy and radiation therapy, and poor sleep quality had a significant impact on patients' lives. Negative emotions such as pessimism, anxiety, and even depression may occur afterwards. Combined with the uncertainty about the degree and time of recovery in the future, as well as concerns about cancer recurrence and metastasis, these negative emotions had a negative impact on the patients' quality of life and their social functioning, creating a vicious cycle. This study also found that symptom occurrence had the biggest impact on life satisfaction in patients after rectal cancer-preserving surgery.

3.4. Factors Influencing the Quality of Life in Patients

To investigate the independent factors influencing patients' quality of life, multiple linear regression analysis was conducted with the total score of the Quality of Life Scale as the dependent variable. Variables with statistically significant

differences in the univariate and correlation analyses were included as independent variables. The final model included gender, age, education level, BMI, diabetes, marital status, postoperative stage, severity of symptoms, severity of gastrointestinal symptoms, and symptom interference. Attached to [Table 4](#).

Table 4. Variable Assignment Table.

Variable	Assignment
Y	Quality of Life Total Score
X1	Gender
X2	Age
X3	Educational Level
X4	BMI
X5	Diabetes
X6	Marital Status
X6	Postoperative Stage
X7	Severity of Symptoms
X8	Severity of Gastrointestinal Symptoms
X9	Interference of Symptoms

The results of the multiple linear regression analysis showed that the overall model had statistical significance ($F=20.75$, $P<0.001$, $R^2=64.11\%$, adjusted $R^2=61.02\%$), indicating a good model fit. The highest VIF value was 1.54, suggesting no collinearity issue. Gender, age, educational level, BMI, diabetes, marital status, postoperative stage, severity of symptoms, severity of gastrointestinal symptoms, and interference of symptoms were identified as independent factors influencing patients' quality of life. Males had a 4.09-point higher quality of life compared to females (95% CI: 1.19, 6.99). Patients aged 60 years or older had a 5.81-point lower quality of life compared to those who were younger than 60 years (95% CI: -9.03, -2.60). Patients with a college degree or above had a 6.79-point higher quality of life compared to those with primary education or

below (95% CI: 2.72, 10.87). Overweight or obese patients had a 5.41-point lower quality of life compared to those with normal-weight (95% CI: -8.95, -1.88). Patients with diabetes had an 8.3-point lower quality of life compared to patients without diabetes (95% CI: -12.37, -4.23). Unmarried patients had an 8.28-point lower quality of life compared to married ones (95% CI: -13.01, -3.55). In terms of postoperative stage, patients at 12 months post-surgery had a higher quality of life compared to patients at 3 months post-surgery, with statistical significance. The severity of symptoms, severity of gastrointestinal symptoms, and interference of symptoms were negatively associated with quality of life, with regression coefficients of -0.29, -0.52, and -0.39, respectively, all with P values less than 0.05. See [Table 5](#) for details.

Table 5. Results of multiple linear regression.

Variables	β	Standard Error	t	P	95%CI
Gender					
Female	0.00				reference
Male	4.09	1.48	2.767	0.006	1.19,6.99

Variables	β	Standard Error	<i>t</i>	<i>P</i>	95%CI
Age Group					
<60	0.00				reference
≥60	-5.81	1.64	-3.544	0.001	-9.03,-2.60
Education Level					
Elementary school or below	0.00				reference
Middle school or technical secondary school	3.00	1.69	1.777	0.078	-0.31,6.30
College or above	6.79	2.08	3.267	0.001	2.72,10.87
Marital Status					
Married	0.00				reference
Unmarried or divorced or widowed	-8.28	2.41	-3.431	0.001	-13.01,-3.55
BMI					
Normal	0.00				reference
Overweight or obese	-5.41	1.80	-3.001	0.003	-8.95,-1.88
Diabetes					
None	0.00				reference
Present	-8.30	2.08	-3.996	0.000	-12.37,-4.23
Postoperative Stage					
3 months postoperative	0.00				reference
6 months postoperative	1.05	1.76	0.594	0.554	-2.41,4.51
9 months postoperative	2.41	2.01	1.196	0.234	-1.54,6.35
12 months postoperative	6.31	2.47	2.552	0.012	1.46,11.15
Severity of Symptoms	-0.29	0.09	-3.123	0.002	-0.47,-0.11
Severity of gastrointestinal symptoms	-0.52	0.22	-2.391	0.018	-0.95,-0.09
Degree of interference caused by symptoms	-0.39	0.15	-2.644	0.009	-0.68,-0.10

β : Partial regression coefficient; 95% CI: 95% confidence interval of the regression coefficient

4. Discussion

In this study, the quality of life of patients was found to be moderate. It is similar to the results from Wang Ping [10]. In addition, functional status scores were the lowest among the dimensions assessed by the questionnaire. This is consistent with the results of other related studies [11, 12]. Zhang Hua et al [13] found that the functional status of patients had significant implications for clinical treatment and nursing interventions. The more severe the postoperative symptoms, the worse the functional status. It's also important to pay attention to the patient's emotional state and social and family status. Related research [14] showed that there was a mutual influence between human physiology and psychology. An optimistic and positive mood can enhance the body's immune and

metabolic capabilities, which was beneficial for recovery, otherwise, it may affect the body's endocrine or nervous system, thereby hindering patient recovery [15]. Therefore, medical staff need to help patients face cancer correctly, alleviate symptoms such as depression and anxiety, and intervene in their different psychological problems in a timely and reasonable manner, which may significantly improve the quality of life for cancer patients [16]. In clinical practice, nurses should focus on the patient's overall condition and develop appropriate care plans for individualised quality of life influences to improve the patient's quality of life level.

During symptom assessment of postoperative patients, the three most severe symptoms identified were sleep disturbance, fatigue and sensory abnormalities. Sleep disorders were one of the most common adverse symptoms in cancer patients [17]. Long-term sleep deprivation could lead to adverse outcomes such as compromised immune system, cognitive de-

cline, increased risk of cardiovascular diseases, and impact on daily activities [18]. In addition, 40%-60% of insomnia patients had negative emotions such as depression or anxiety [19], so it is necessary to use appropriate approaches and methods to provide psychological counseling for patients with anxiety and depression, relieve psychological stress, and improve mental health and quality of life [20]. Numerous studies had found that the sleep quality score was significantly lower than other items in terms of postoperative quality of life questionnaires for rectal cancer patients, indicating that most RC patients experienced varying degrees of sleep disorders after surgery. This study was consistent with these findings. To address the issue of postoperative sleep disorders in rectal cancer patients undergoing sphincter preservation surgery, it is possible to find the optimal solution among numerous nursing models or create a new nursing model by integrating multiple advantageous nursing models. This requires a large amount of practice and samples for validation.

Regarding fatigue, some studies have shown aerobic exercise, psychological interventions, nutritional support, and traditional Chinese medicine therapy were found helpful in alleviating fatigue symptoms among patients [21-23]. Besides, The results of this study indicated that postoperative RC patients experienced sensory abnormalities such as limb or facial tingling or numbness. This symptom occurrence was consistent with the findings of Bonhof et al [24]. This may be due to the fact that patients generally received chemotherapy after surgery, and chemotherapy drugs often accumulated in the dorsal root nerves [25], leading to dull limb sensation or abnormal distal limb sensation (tingling). Currently, the mechanism was not clear, but some scholars believed that this may be caused by the chelation of calcium ions in chemotherapy drugs affecting the voltage-gated sodium channels of neurons [26]. Limb or facial tingling or numbness can affect the quality of life of patients.

This study found that constipation was the most severe gastrointestinal symptom in rectal cancer patients after sphincter preservation surgery, which should be highly valued by nursing staff. Various factors could affect postoperative bowel function, such as tumor diameter, location, whether adjuvant radiotherapy or chemotherapy was performed before surgery, distance between anastomosis and anal margin, and damage to the anal sphincter muscle [27, 28]. For RC patients with postoperative difficulty in defecation, most studies suggested that bowel function training was an effective measure. For example, some researchers [29] found that individualized biofeedback training combined with early defecation function training helped patients recover gastrointestinal function quickly after surgery and improve postoperative defecation difficulties. Therefore, in clinical practice, attention should be paid to the constipation symptoms of rectal cancer patients after sphincter preservation surgery, and timely interventions, such as early defecation function training, dietary adjustment, and the use of laxatives, can be performed to alleviate patients' discomfort. Diarrhea is also one

of the common postoperative symptoms in patients. Rectal cancer sphincter preservation surgery can damage the nerves related to the control of the anal sphincter, leading to an increase in bowel movements or even fecal incontinence after surgery [30]. A related study [31] indicated that the incidence of diarrhea after colon cancer resection was as high as 47.78%. Therefore, it is important to correctly evaluate and selectively prevent, treat, and care for postoperative diarrhea based on the disease stage and intestinal microenvironment of RC patients.

This study concluded that RC patients after sphincter preservation surgery suffered from various symptoms, and healthcare professionals should pay attention to their symptom manifestations and develop effective interventions for the most severe symptoms to alleviate symptom burden and improve their quality of life. In the early postoperative period, life dissatisfaction may result from factors such as pain or gastrointestinal symptoms resulting from surgery, the conflicts between preoperative and postoperative lifestyles and the differences between expected and actual quality of life. As physical function recovered and symptoms alleviated, patients' expectations for life could be regained. Timely assessment and intervention for the main symptoms experienced by patients, while addressing their psychological health issues, using a biopsychosocial medical model, can improve the prognosis and enhance the quality of life.

The main treatments for RC include surgery, radiotherapy and chemotherapy. Among them, surgery is the most important treatment method for RC, and the choice of surgery mainly depends on the location of the tumor, pathological results and disease stage, and its postoperative effect [32]. In addition to those factors, the surgeon and advanced technology (minimally invasive surgery and robotic-assisted surgery) are also the factors affecting the postoperative quality of life of patients, but the shortcomings of this study did not include this factor in the study.

5. Conclusion

The quality of life of patients after rectal cancer sphincter-preserving surgery is at a moderate level. The severity of symptoms and the degree of symptom interference are negatively correlated with the quality of life. Factors such as gender, age ≥ 60 , overweight or obesity, coexistence of diabetes, unmarried, divorced, or widowed status, severity of symptoms, severity of gastrointestinal symptoms, and degree of symptom interference are contributing factors to the decreased quality of life of patients after rectal cancer sphincter-preserving surgery. On the other hand, factors such as having a college degree or above and being 12 months postoperatively are contributing factors to the increased quality of life of patients after rectal cancer sphincter-preserving surgery. In the later stage, the surgeon and advanced technology (minimally invasive surgery and robotic-assisted surgery) can be included in the influencing factors for further research.

Abbreviations

BMI	Body Mass Index
FACT-G	Functional Assessment of Cancer Therapy-Generic Scale
LARS	Low Anterior Resection Syndrome
MDASI-GI	M.D. Anderson Symptom Inventory-Gastrointestinal Cancer Module
QOL	Quality of Life
RC	Rectal Cancer
TME	Totalesorectalexcision

Author Contributions

Xiuli Wei: Investigation, Writing – original draft
Yue Zeng: Data curation, Formal Analysis
Zitao Zhang: Validation, Writing – review & editing
Minping Deng: Conceptualization, Supervision

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Data Availability Statement

The study data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

We confirm that this work is original and has not been published elsewhere nor is it currently under consideration for publication elsewhere.

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