European Review for Medical and Pharmacological Sciences 2023; 27: 5677-5683

Assessment of bowel movement dysfunction following laparoscopic low anterior resection for rectal cancer: a single-center study from Vietnam

H.-A. HO[1], T.-D. TRIEU[1], V.-T. NGUYEN[1], V.-Q. LE[1], N.-S. VU[1], T.-T. NGUYEN-THI[2], M.-D. NGUYEN[3]

[1]Department of Colon and Rectal Surgery, Institute of Digestive Surgery, 108 Military Central Hospital, Hanoi, Vietnam
[2]College of Health Sciences, Vin University, Hanoi, Vietnam
[3]Department of Radiology, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

Abstract. – OBJECTIVE: Postoperative bowel movement dysfunction is a challenging problem greatly affecting patients' quality of life after low anterior resection. We aimed to evaluate the bowel movement function of patients undergoing laparoscopic low anterior resection for rectal cancer.

PATIENTS AND METHODS: This retrospective study recruited 82 rectal cancer patients undergoing laparoscopic low anterior resection from July 2018 to July 2020 at 108 Military Central Hospital, Hanoi, Vietnam.

RESULTS: The patients' mean age was 62.3±11.6 (28-84) years, 54 (65.9%) were males, and 28 (34.1%) were females. Bowel movement function changed significantly after one year: the average score for low anterior resection syndrome (LARS) after three months, six months, and one year was 17.6, 14.0, and 10.6, respectively. The rate of patients with major LARS decreased from 26.8% after three months to 14.6% after one year. The Wexner score also decreased from 5.9 after three months to 3.4 after one year. The rate of patients with normal bowel movement increased from 28.0% after three months to 46.3% after one year. The rate of patients with complete fecal incontinence decreased from 11.0% after three months to 7.3% after one year. Preoperative chemoradiotherapy (p=0.017), tumor location (p=0.02), method of anastomosis (p=0.01), and anastomosis location (p=0.000) were risk factors associated with major LARS after surgery.

CONCLUSIONS: Bowel movement dysfunction in rectal cancer patients undergoing laparoscopic low anterior resection is a common and persistent problem after surgery. However, bowel function gradually recovers over time. Therefore, patients should be monitored and supported for a better quality of life.

Key Words:
Rectal cancer, Low anterior resection syndrome, Laparoscopic low anterior resection, Wexner score.

Introduction

Rectal cancer is a fairly common malignancy of the gastrointestinal tract. According to GLOBOCAN 2018, approximately 704,000 new cases of rectal cancer were diagnosed in 2018, and it is a leading cause of death, accounting for 3.2% of all cancer deaths globally[1]. Rectal cancer treatment has advanced in recent decades, ensuring optimal oncology results and improving patients' quality of life after treatment.

Advances in adjuvant therapy (preoperative chemoradiotherapy), equipment, surgical technique, and a comprehensive understanding of rectal cancer have helped patients to maximize the preservation of the anus. However, up to 80% of rectal cancer patients have postsurgical bowel dysfunction, such as fecal incontinence, fecal urgency, and stool frequency, also known as low anterior resection syndrome (LARS)[2,3].

The LARS score, with its advantages of ease of use and high accuracy, was introduced to assess bowel function after rectal cancer surgery[4-6]. The LARS score has a high correlation with high sensitivity (72.54%), and specificity (82.52%) for major LARS[7]. In addition, the Wexner score is used to assess anal sphincter function[8]. According to recent studies[9,10], 46.4-89.7% of patients develop LARS after low anterior resection.

Although there is a large amount of literature worldwide on this problem, a complete assessment of bowel dysfunction following low anterior resection is rare in Vietnam. Therefore, in this study, we aimed to evaluate the bowel function of rectal cancer patients undergoing laparoscopic low anterior resection in

Corresponding Author: Nguyen Minh Duc, MD; e-mail: bsnguyenminhduc@pnt.edu.vn

Vietnam. Our evaluation was based on LARS scores and Wexner scores.

Patients and Methods

Study Design and Participants

This was a retrospective study. The patients with rectal cancer selected for this study underwent laparoscopic low anterior rectal resection between July 2018 and July 2020 at 108 Military Central Hospital, Hanoi, Vietnam. This study was approved by the Scientific Committee on Biomedical Research, 108 Military Central Hospital (Ref: 4468/QĐ-BV 108; dated September 25, 2020). All patients were explained and agreed to participate in the study. Patients were monitored and assessed for bowel function using LARS scores and Wexner scores at three months, six months, and one-year post-operation (Figure 1). Patients with an ileostomy protecting the anastomosis were evaluated from the time of ileostomy closure.

The patients selected for this study were those undergoing laparoscopic low anterior resection for rectal cancer without distant metastases. The following patients were excluded: those undergoing Hartmann's procedure; those undergoing abdominoperineal resection; those who died during follow-up; those with complications of anastomosis requiring colostomy; and those whose contact information was lost.

Between July 2018 and July 2020, a total of 152 patients with rectal cancer underwent laparoscopic low anterior resection. Seventy patients were excluded according to exclusion criteria. Eighty- two patients were followed up and assessed. The preoperative staging was evaluated

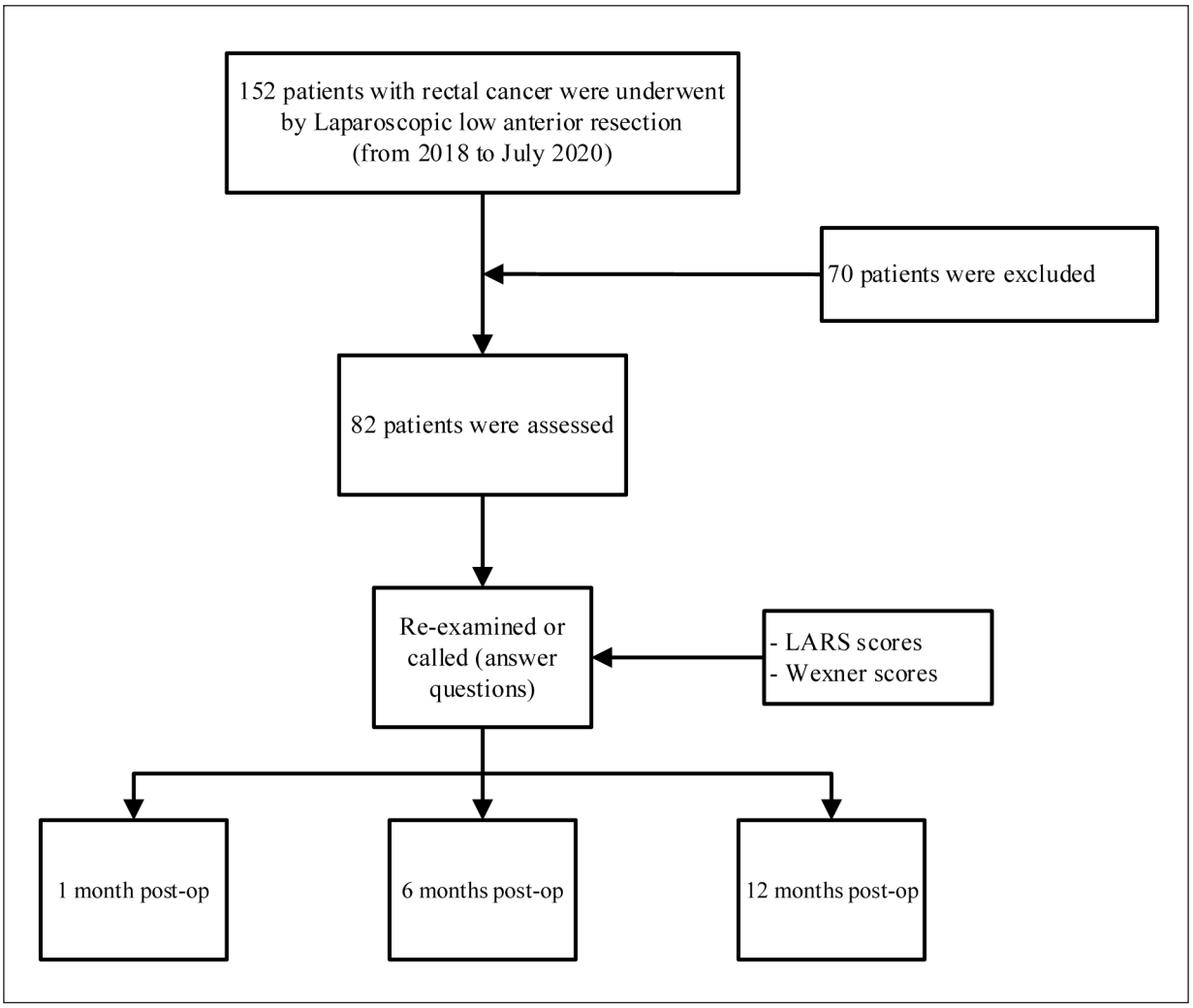

Figure 1. The flow diagram of the study.

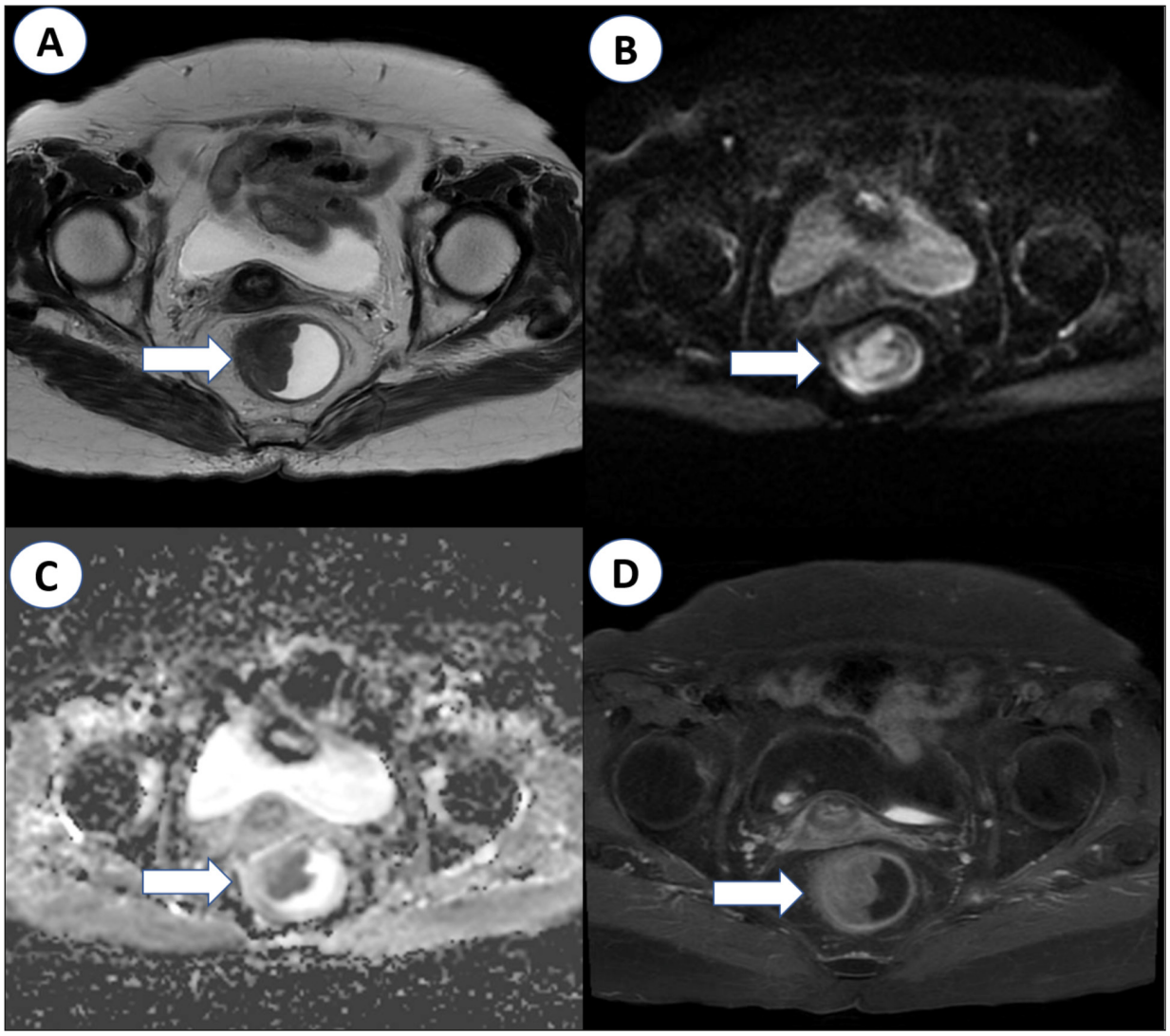

Figure 2. Pelvic magnetic resonance imaging to assess tumor (arrow) staging before treatment. **A**, Axial T2-weighted image. **B**, Axial diffusion-weighted image. **C**, Axial apparent diffusion coefficient map. **D**, Axial T1-weighted image with contrast agent.

by pelvic magnetic resonance imaging (MRI) (3.0 Tesla Philips Achieva MRI Scanner; Amsterdam, The Netherlands) (Figure 2), chest and abdominal computed tomography (CT) (Somatom Definition As 64, Siemens Healthineers; Erlangen, Germany). For patients with stage T3-4 and/or N(+) tumors, long-term preoperative chemoradiotherapy [50.4 Gy divided into 28 doses for 5 weeks, accompanied by oral Xeloda (capecitabine) 5 days/week for 5 weeks] was indicated. Patients receiving preoperative chemoradiotherapy underwent surgery 6-8 weeks after completion of the treatment.

All patients underwent laparoscopic low anterior resection. For tumors in the upper 1/3 of the rectum (10-15 cm from the anal verge), laparoscopic partial mesorectal excision was performed. For tumors in the middle-lower 1/3 of the rectum (<10 cm from the anal verge), total mesorectal resection (TME) and intersphincteric resection were performed. The distal rectum was cut with a tri-staple (Endo GIA 45 mm, Covidien; Dublin, Ireland), and end-to-end colorectal anastomosis was performed with a circular stapler (EEA™ Circular Stapler with Tri-Staple™ Technology, Covidien; Dublin, Ireland). Coloanal anastomoses were hand sewn. TME combined with lateral pelvic lymph node dissection was performed for patients with lower rectal cancer on MRI whose lateral pelvic lymph nodes were ≥7 mm in diameter before chemoradiotherapy and/or ≥5 mm in diameter after

chemoradiotherapy. An anastomosis-protective ileostomy was performed for patients with a high risk of anastomotic leak. Adjuvant therapy was based on pathology.

Assessment Tools

The LARS score is an assessment tool that includes five items: fecal incontinence with flatus (range 0-7 points), fecal incontinence with liquid stools (range 0-3 points), frequency of bowel movement (range 0-5 points), clustering (range 0-11 points); and urgency (range 0-16 points). The overall score is classified into severity levels: 0-20 (no LARS), 21-29 (minor LARS), and 30-42 (major LARS).

The Wexner score also includes five items: fecal incontinence with solid stools (range 0-4 points), fecal incontinence with liquid stools (range 0-4 points), fecal incontinence with gas (range 0-4 points), pad use (range 0-4 points), and lifestyle alteration (range 0-4 points). Severity is classified into normal (0 points), minor fecal incontinence (1-8 points), average fecal incontinence (9-14 points), and complete fecal incontinence (15-20 points).

Statistical Analysis

Data were analyzed using SPSS 23.0 statistical software (IBM Corp., Armonk, NY, USA). For the descriptive analysis, we expressed the measures of central tendency and dispersion as means and standard deviation (mean±SD) for continuous variables of normal distribution and medians and interquartile ranges for those of non-normal distribution. We expressed categorical and ordinal values as absolute and relative frequencies. In the univariate data analysis, we used the Student's t-tests for normal continuous dependent variables and the Mann-Whitney test for non-normal continuous dependent variables. In order to examine age as a risk factor, patients were divided into two groups: group 1 (≤60 years), consisting of 26 patients, and group 2 (>60 years) consisting of 56 patients. We applied the Chi-square and Fisher tests for binary or categorical dependent variables. Significant differences were defined at $p<0.05$.

Results

Between July 2018 and July 2020, 82 patients were followed up and evaluated. Their mean age was 62.3±11.6 (28-84) years and 54 (65.9%) were male, and 28 (34.1%) were female. The average BMI was 21.9±2.9 (16.4-32.4). The tumor location was in the upper 1/3, middle 1/3, and lower 1/3 of the rectum in 28.0%, 50.0%, and 22.0% of patients, respectively (Table I). The monitoring of bowel movement function after surgery was at three months, six months, and one year. The average LARS score was 17.6 (56.1% no LARS, 17.1% minor LARS, and 26.8% major LARS) at three months, 14.0 (64.6% no LARS, 17.1% minor LARS, and 18.3% major LARS) at six months, and 10.6 (75.6% no LARS, 9.8% minor LARS, and 14.6% major LARS) at one year.

The average Wexner score was 5.9 (28.0% normal, 43.9% minor, 17.1% average, and 11.0% complete fecal incontinence) at three months, 4.6 (34.1% normal, 46.3% minor, 9.8% average, and 9.8% complete fecal incontinence) at six months, and 3.4 (46.3% normal, 40.2% minor, 6.1% average, and 7.3% complete fecal incontinence) at one year (Table II). The bowel movement function improved significantly within 12 months after surgery.

Univariate analysis showed that preoperative chemoradiotherapy ($p=0.017$), tumor location ($p=0.02$), method of anastomosis ($p=0.01$), and anastomosis location ($p=0.000$) were risk factors significantly associated with major LARS after surgery (Table III).

Discussion

Bowel dysfunction after low anterior resection is a challenging problem that greatly affects patients' quality of life[11]. Symptoms of LARS are usually caused by a combination of colonic dysmotility, neorectal reservoir dysfunction, and anal sphincter dysfunction[12]. Our study found that the patient's bowel function improved gradually over time at the evaluation time points 1 month, 2 months, and 12 months after surgery. The average score for LARS after three months, six months, and one year was 17.6, 14.0, and 10.6. Of the patients in this study, 56.1% did not have LARS after three months, and this percentage increased to 75.6% after one year. The proportion of patients with major LARS after three months was 26.8%, which decreased to 14.6% after one year.

Evaluation using the Wexner scale also provided similar results: the average Wexner score decreased from 5.9 after three months to 3.4 after one year. The rate of patients with normal bowel movements after three months was 28.0%, increasing to 46.3% after one year. The percentage of patients with complete fecal incontinence decreased from 11.0% after three months to 7.3% after one year (Table II). In

Chen et al's study[13], the rate of major LARS was 46% (56% chemoradiotherapy plus TME and 35% TME alone), with a follow-up time of 14.6 years and a mean patient age of 75 years.

In the study of Dulskas et al[10], 46.4% (58/125) of patients had LARS: 26.4% with minor LARS and 20% with major LARS. The Wexner scores indicated a normal state in 34.4%, minor fecal incontinence in 44%, average fecal incontinence in 14.4%, and complete fecal incontinence in 7.2%, with a mean follow-up time of 7.5 years. In addition, in the study of Ekkarat et al[14] of 129 patients (67 men and 62 women), 65.2% (84/129) had no LARS, 17.8% (23/129) had minor LARS, and only 17.8% (23/129) had major LARS[14]. Similarly, Miacci et al[15], in a study of 64 patients with a mean age of 60.1±11.4 years, 67.7% (42/64) did not have LARS and 32.3% had LARS. In our study, after one year of evaluation, 14.6% of patients had major LARS, which was more common in the middle and lower rectal cancer groups. Most patients, especially those with lower-third rectal cancer, underwent intersphincteric resection with a part of the internal sphincter removed, which affected anal sphincter function after surgery.

Studies[10,15,16] also showed that age, adjuvant chemotherapy, anastomosis distance, and tumor location are associated with major LARS after surgery. Liu et al[16] found associations between major LARS and the following factors: chemotherapy and radiotherapy (RR=5.608; 95% CI: 1.457-21.584; p=0.006), tumor distance to the anal verge (RR=0.125; 95% CI: 0.042-0.372; p=0.004), anastomosis to the anal verge (RR=0.255; 95% CI: 0.098-0.665; p=0.004), and protective ileostomy (RR=0.125; 95% CI: 0.098-0.665; p=0.004) (RR=3.643; 95% CI: 1.058-12.548; p=0.032). Similarly, Miacci et al[15] showed that factors such as neoadjuvant therapy (p=0.0014), distance from the anastomosis to the anal verge (p<0.001), tumor location, and ileostomy are factors associated with postoperative major LARS.

In our study, univariate analysis of related factors using Fisher's exact test showed that at 12 months after surgery, preoperative chemoradiotherapy, tumor location, anastomosis location (above the dentate line, at the dentate line, or below the dentate line), and the method of anastomosis were related to major LARS after surgery (p<0.05; Table III). Low tumor location, preoperative chemoradiotherapy, and the anastomosis position close to the anal verge are factors associated with major LARS. All patien-

Table I. Characteristics of the patients.

Variable	Number, n (%) (n=82)
Age, years [mean±SD (range)]	62.8±11.6 (28-84)
Gender (male/female)	54/28
BMI[mean±SD (range)]	21.9±2.9 (16.4-32.4)
ASA n (%)	
I	57 (69.5)
II	25 (30.5)
Tumor location, n (%)	
1/3 upper rectum	23 (28.0)
1/3 middle rectum	41 (50.0)
1/3 lower rectum	18 (22.0)
Pathological T stage, n (%)	
pT0	10 (12.2)
pT1	4 (4.9)
pT2	22 (26.8)
pT3	39 (47.6)
pT4	7 (8.5)
Pathological N stage, n (%)	
N0	56 (68.3)
N1	19 (23.2)
N2	7 (8.5)
N3	0 (0)

BMI: Body mass index.

Table II. Bowel movement function after surgery.

	Follow-up time 3 months	6 months	1 year
Wexner score (mean)	5.9	4.6	3.4
Normal, % (n)	28.0 (23)	34.1 (28)	46.3 (38)
Minor fecal incontinence, % (n)	43.9 (36)	46.3 (38)	40.2 (33)
Average fecal incontinence, % (n)	17.1 (14)	9.8 (8)	6.1 (5)
Complete fecal incontinence, % (n)	11 (9)	9.8 (8)	7.3 (6)
LARS score (mean)	17.6	14.0	10.6
No LARS, % (n)	56.1 (46)	64.6 (53)	75.6 (62)
Minor LARS, % (n)	17.1 (14)	17.1 (14)	9.8 (8)
Major LARS, % (n)	26.8 (22)	18.3 (15)	14.6 (12)

LARS: Low anterior resection syndrome.

Table III. Risk factors related to major low anterior resection syndrome (LARS).

	Major LARS		
	No	Yes	*p*
Age, years (n)			0.092
	≤60	25	1
	>60	45	11
Male/female	44/26	10/2	0.205
ASA (n)			1.000
	I	49	8
	II	21	4
Preoperative chemoradiotherapy (n)			0.017*
	No	23	0
	Yes	47	12
Tumor location (n)			0.020*
	1/3 upper rectum	23	0
	1/3 middle rectum	34	7
	1/3 lower rectum	13	5
Anastomotic method (n)			0.01*
	Circular staple	56	5
	Hand sewn	14	7
Anastomosis location			0.000*
	Above dentate line	52	3
	At dentate line	14	4
	Below dentate line	4	5
Ileostomy (n)			0.320
	Yes	25	2
	No	45	10
Pathological T stage (n)			0.960
	pT0	8	2
	pT1	4	0
	pT2	19	3
	pT3	33	6
	pT4	6	1

LARS: Low anterior resection syndrome. *$p<0.05$ (Fisher's exact test).

ts after surgery were examined by us and given supportive drugs (2 mg of loperamide) depending on the patient's bowel status.

The strength of our study is that we used a combination of two tools that are widely applied to evaluate patients' bowel movement function after surgery. The patients were evaluated from time to time to compare and assess their degree of recovery of bowel function.

The study also has some limitations. First, although the number of patients undergoing surgery was large, the number satisfying the research criteria was small. Second, our study has yet to evaluate long-term outcomes after surgery. We intend to further follow up with the patients in future research for a more comprehensive evaluation of results.

Conclusions

Bowel movement dysfunction in rectal cancer patients undergoing laparoscopic low anterior resection is a common and persistent problem after surgery. However, bowel movement function gradually recovers over time. Therefore, it is necessary to monitor, advise, and support patients, especially those with major LARS or complete fecal incontinence, for a better quality of life. Further studies are needed to investigate measures to improve LARS prevention and treatment and better support for patients with LARS after surgery.

Ethics Approval

Institutional Review Board number is 4468/QĐ-BV108 by the Ethics Committee of 108 Military Central Hospital on 25 Sep 2020.

Informed Consent

Informed consent was waived for the study's retrospective nature, and the analysis used anonymous clinical data.

Availability of Data and Materials

The datasets generated and/or analyzed during the current study are not publicly available due to privacy concerns but are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare no conflict of interest.

Funding

This research received no external funding.

Authors' Contributions

H.-A. Ho and M.-D. Nguyen prepared, drafted, and revised the manuscript critically, for important intellectual content. H.-A. Ho and M.-D. Nguyen contributed substantially to the acquisition, analysis, and interpretation of data. Each author gave final approval to the version of the manuscript submitted for publication and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

ORCID ID

Nguyen Minh Duc: 0000-0001-5411-1492

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