ORIGINAL ARTICLE

Laparoscopic Intersphincteric Resection and Colon Shaping for Low Rectal Cancer Treatment

Truong Van Nguyen[1*], Minh Quang Dao[2*], Hoa Lam Nguyen[3], Quyet Van Ha[4], Thuong Van Pham[5], Phuoc Van Nguyen[6], Thang Quyet Tran[7], Anh Thuy Tran[8]

Abstract

Aim and objective: This paper was conducted to examine the results of laparoscopic intersphincteric resection and colon shaping for low rectal cancer treatment in adults.

Materials and methods: Data were collected, including general characteristics, preoperative and postoperative characteristics, and long-term treatment outcomes. The Kaplan–Meier survival analysis was performed to assess the survival rate of 48 months after surgery.

Results: Of 43 patients with low rectal cancer, subtotal intersphincteric resection was the primary surgical method at 37.2%. The colon was mainly shaped "J" at 51.2% of the patients. According to Kirwan classification, there were 83.7% of the patients at grade I; and this rate decreased to 62.9% after surgery (p <0.05). According to Wexner score, before surgery, 62.8% of the patients had a score <5, which reduced to 48.8% after surgery (p >0.05). The mean survival time was 41.53 ± 2.37 months, with a cumulative survival probability of 48 months of 78.8%. There was no difference in survival rate between patients with different stages of cancer and colon shaping.

Conclusion: Laparoscopic intersphincteric resection and colon shaping were effective in low rectal cancer treatment. Colon shaping was an effective method of improving bowel function in cases of subtotal or total intersphincteric resection.

Keywords: Colon shaping, Laparoscopic surgery, Low rectal cancer.

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Introduction

Low rectal cancer is malignancy, accounting for a high rate of about 40–45% of the colorectal cancer diseases. The common treatment is multimodal therapies that combine surgery and adjuvant therapy, with or without preoperative chemotherapy. In the early 20th century, Ernest Miles' surgical method was considered the standard approach for the treatment of low rectal cancer, with abdominoperineal resection.[1,2]

In the later stages, the treatment target for low rectal cancer has changed. In addition to the three primary goals of the treatment, including increasing survival, improving quality of life, and reducing recurrence rates, preserving the function of patients after treatment has been set as a priority to ensure rectal cancer patients' quality of life. In 1972, Park and Percy successfully performed sphincter-saving surgery. In 1982, Heald introduced a complete mesenterectomy and quickly became standard in rectal cancer surgery. Since then, the requirement to save sphincters has been prioritized in rectal cancer treatment.[3,4]

In 1984, based on the anatomical development of the anorectal region and the discovery of the layer between the two sphincter muscles and the structure of the sphincter muscles, Rudolf Schiessel introduced the intersphincteric resection and colo-anal anastomosis by hand stitching.[5–7] In 2005, Schiessel et al. reported long-term results, providing the foundation for intersphincteric resection in rectal cancer surgery. This study also mentioned sphincter regeneration or using an artificial anal sphincter.[1–7] In 2010, Bujko et al. published a study of 948 patients showing that a distance from 1 cm or more from the tumor to the anal margin is sufficient to guarantee surgical success in terms of oncology. In the group of patients with a distance of less than 1 cm or 5 mm, if the disease condition reaches R0, the rate of local recurrence was 1.7% or lower.[8] In addition, laparoscopic surgery has been shown to have many advantages over this period over open abdominal surgery, especially in abdominal/pelvic area surgery. Laparoscopic intersphincteric resection has become the standard surgical method.[9]

However, after surgery for rectal tumors, bowel function often has disorders due to surgical intervention in the sphincter. Schiessel proposed a method of rectal shaping by the colon to reduce the number of bowel movements while assessing factors influencing the indications for colon shaping and factors affecting the frequency of defecation after surgery.[7] This study was conducted to evaluate the effectiveness of laparoscopic

[1,2]Department of General Surgery, Thanh Nhan Hospital, Hanoi, Vietnam

[3]Hai Phong Oncology Centre, Hai Phong University Medicine and Pharmacy, Hanoi, Vietnam

[4,5]Department of Surgery, Hai Phong University of Medicine and Pharmacy, Hanoi, Vietnam

[6]Thanh Nhan Hospital, Hanoi, Vietnam

[7]Department of Obstetrics and Gynecology, Thanh Nhan Hospital, Hanoi, Vietnam

[8]Department of Functional Test, National Hospital of Traditional Medical, Hanoi, Vietnam

*Equally contributed to this manuscript

Corresponding Author: Truong Van Nguyen, Department of General Surgery, Thanh Nhan Hospital, Hanoi, Vietnam, e-mail: dr.truongnv@gmail.com

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intersphincteric resection and colon shaping for low rectal cancer treatment in adults.

Materials and Methods

Study Design and Patients

A case series was conducted on 43 patients diagnosed with low rectal cancer and underwent laparoscopic intersphincteric resection at Thanh Nhan Hospital, Hanoi, Vietnam. Criteria for selection included: (1) primary low rectal cancer diagnosed by biopsy; (2) tumor-anal margin distance ≤6 cm; (3) cancer stage from T3 or less as classified by Union for International Cancer Control (UICC); (4) having laparoscopic intersphincteric resection; (5) with or without colon shaping, and (6) accepting to participate in the study. Exclusion criteria included: (1) tumor-anal margin distance more than 6 cm; (2) tumor-anal margin distance less than 6 cm but switching from laparoscopic surgery to open surgery; (3) tumor-anal margin distance less than 6 cm but the tumor recurs. The research was approved by the Institutional Review Board at Thanh Nhan Hospital, Hanoi (Code: 02/BVTN-HDDD).

Surgical Technique

The patient was placed in a supine position. The patient's head was set low and tilted to the right. A 10-mm trocar was placed above or below the navel; then, gas was pumped into the peritoneal cavity. A 5-mm trocar was placed in the left pelvic fossa, a 10–12-mm trocar was placed in the right pelvic fossa and 2–3 cm from the upper anterior pelvic spine, and finally, a 5-mm trocar was placed on the outer margin of the abdominal straight muscle on the right, with a distance of about 10 cm to the first trocar.

First, we dissected the lateral and medial surface area of the sigmoid colon and rectum, along with the left colonic adhesion. We continued to identify the sigmoid artery, and the lower mesenteric artery, from which we dissected with forceps to reveal the lower mesenteric artery. After that, we used clips, Hemolock, or sutures to control and cut this artery. At the cut site of the blood vessel, we cut the mesenteric sigmoid and descending colon to the left to free this part of the colon. The rectum was dissected that the organs from the rectum to the lifting muscles moved completely according to the principle of total mesorectal excision. In the posterior side of the rectum, we dissected the nonvascular area in front of the sacrum and behind the rectum, closely following the curvature of the mesorectum, to avoid tearing the mesorectum, when also not damaging the anterior sacrum. On both sides of the lower rectum, we used a harmonic scalpel or a LigaSure knife to stop bleeding and avoid damage to the pelvic plexus located outside of the lateral ligament. In the anterior rectum, we dissected the surface between the mesorectum and genital organs, helping to release the entire rectum.

Next, we performed surgery to reveal the entire anus and episiotomy. We used the Lone Star Valve (Lone Star Medical Products Inc., Houston, Texas) to expose the anal area and dissect the anal canal 5 mm under the dentate line. We removed the entire internal sphincter or the deep muscle bundle of the external sphincter with the entire mesorectum, going upward until we met the laparoscopic dissection plane. Through the anus, we pull out the sigmoid colon and rectum with the mesorectum and then cut and connect these bowel segments. We shaped the colon into the ileal pouch and performed one layer of end-to-end anastomosis. We put a surgical drain that connects the rectum to the anus and ends in the epis. Then, we pumped gas into the peritoneum, rechecked, and then put 01 18F surgical drain in the abdominal/pelvic area through the 5-mm hole in the left side. Then, we removed the gas and closed the trocar hole.

Variables and Data Collection

Patients were examined for functional symptoms, physical symptoms, and some subclinical indicators and imaging diagnoses (e.g., ultrasound, chest X-ray, and computed tomography). Patients underwent a colonoscopy of the entire colon and rectum to evaluate the tumor location, the shape of the tumor, degree of invasion, circumference of the rectum, number of tumors, tumor in the colon, polyp status, and biopsy. Endoscopic ultrasound was performed to assess the degree of invasiveness, degree of serosal invasion, and degree of sphincter invasion and lymph node metastasis. The postoperative disease stage was divided according to tumor-node-metastasis (TNM) standards of the UICC. Functional assessment was performed according to Kirwan classification with five grades:[10]

- Grade I: Perfect
- Grade II: Incontinent to gas
- Grade III: Occasional minor leak
- Grade IV: frequent major soiling
- Grade V: colostomy

Wexner score was used to evaluate three components of fecal incontinence (solid, liquid stools, and flatus).[11]

After surgery, patients were scheduled to reexamine periodically 6, 12, 18, 24, 36, and 48 months or any time if the patient had abnormal symptoms. For patients who did not go to the hospital, information was obtained through short, easy-to-understand questionnaires that were sent to patients and families, or calling to patients and their families. We also monitored patients by phone and regularly inquired to note any abnormal signs (if any). Low rectal cancer-related fatalities were recorded.

Data Analysis

Research indicators were directly recorded through examination, monitoring, and evaluation of treatment results. Data were recorded in medical records. Information from medical records was coded, cleaned, and verified. The SPSS 20.0 (Statistical Package for Social Science) software was used to analyze data. Kaplan–Meier estimates were conducted to measure the overall and disease-free survival rates. A log-rank test was used to compare the characteristics of fatal and nonfatal patients. $p < 0.05$ was statistically significant.

Results

In 43 patients with low rectal cancer, the mean age was 68.7 ± 13.3 years. The proportion of male patients was 62.8%. Most patients had an anal margin of 4 to less than 5 cm (53.5%). The invasion degree was mainly at T2 (60.5%). According to the TNM classification, the cancer was mainly in stage III (39.5%) and II (37.2%). Subtotal intersphincteric resection was the primary surgical method at 37.2%. The colon was mainly J-shaped with 51.2% of the patients (Table 1).

Table 2 shows that, according to Kirwan classification, there were 83.7% of the patients at grade I. This rate decreased to 62.9% after surgery. There were 13.9% of the postoperative patients reaching grade III. The difference was statistically significant. According to Wexner score, before surgery, 62.8% of the patients had a score <5. This rate after surgery was 48.8%. There were four patients with Wexner scores between 10 and 20 points. The

Table 1: Clinical and surgical characteristics

Characteristics	*Frequency*	*Percentage*
Age (year), mean (SD)	68.7 ± 13.3	
Gender, male	27	62.8
Tumor-anal margin distance		
5–6 cm—(N1)	16	37.2
4–<5 cm—(N2)	23	53.5
<4 cm—(N3)	4	9.3
Invasiveness		
T1	6	14.0
T2	26	60.5
T3	11	25.5
TNM classification		
I	10	23.3
II	16	37.2
III	17	39.5
IV	0	0.0
Surgical method		
Partial intersphincteric resection	13	30.2
Subtotal intersphincteric resection	16	37.2
Total intersphincteric resection	14	32.6
Colon shaping		
None	13	30.2
J-shape	22	51.2
Side-to-end	8	18.6

Table 2: Functional results according to Kirwan classification and Wexner score before and after surgery

	Preoperative		*Postoperative*		
Characteristics	*n*	*%*	*n*	*%*	*p value*
Kirwan classification					
I. Perfect	36	83.7	27	62.9	0.02
II. Incontinence to gas	7	16.3	10	23.2	
III. Occasional minor leak	0	0.0	6	13.9	
Wexner score					
<5	27	62.8	21	48.8	0.09
5–10	16	37.2	18	41.9	
10–20	0	0.0	4	9.3	

difference in the Wexner score between before and after surgery was not statistically significant ($p > 0.05$).

Figure 1 shows that the mean survival time of the patient was 41.53 ± 2.37 months, the cumulative probability of survival at 48 months was 78.8%.

The mean survival time of patients in stages I, II, and III was 43.4 ± 4.2, 41.9 ± 3.8, and 41.2 ± 3.4 months, respectively. The probability of survival at 48 months according to stages I, II, and III was 85.7, 80.0, and 77.9%, respectively. The log-rank test showed no difference in disease stage and duration of survival (Fig. 2).

Comparing between groups with colon shaping (value = 1) and without colon shaping (value = 0), the log-rank test showed no difference in survival time between the two groups ($p > 0.05$) (Fig. 3).

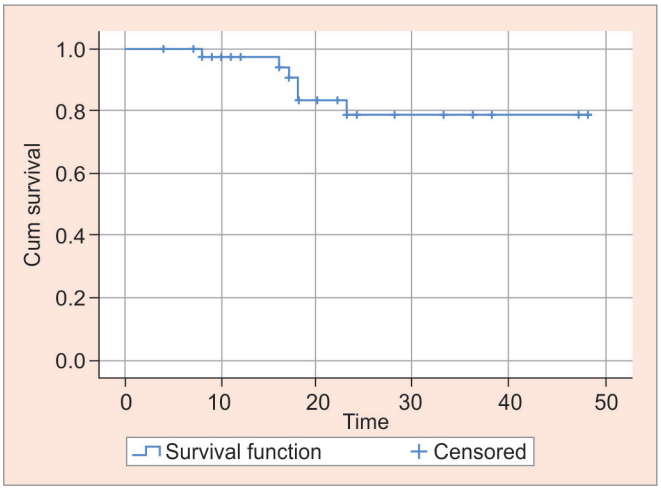

Fig. 1: Survival probability of low rectal cancer patients after surgery

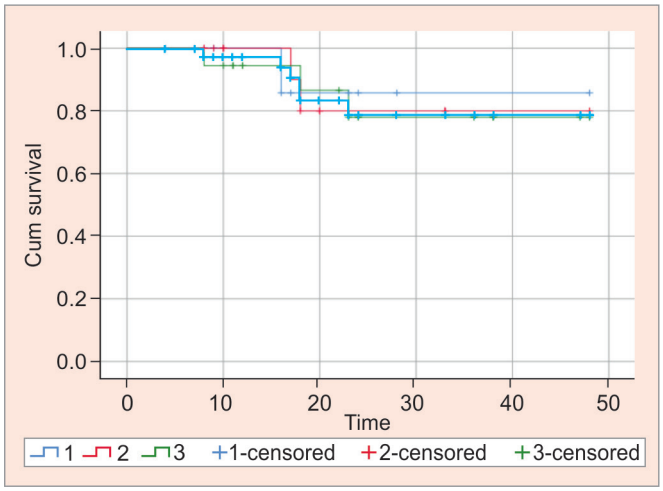

Fig. 2: Survival probability of low rectal cancer patients by TNM stages

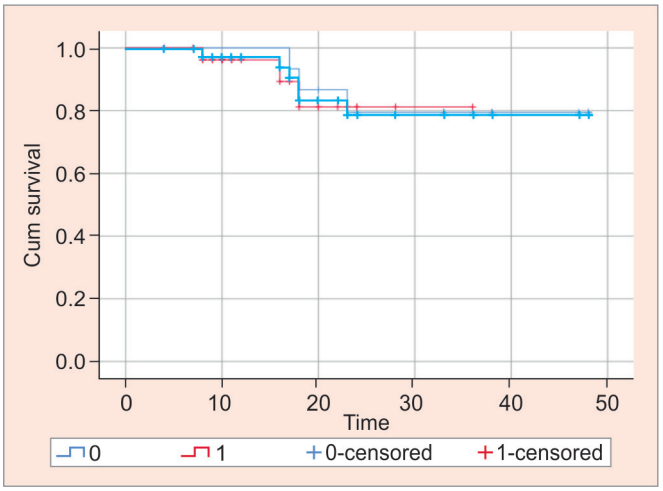

Fig. 3: Survival probability of low rectal cancer patients after surgery according to colon shaping characteristics

Discussion

Selecting surgical methods for low rectal cancer depends on the degree of tumor invasion in the sphincter, the stage of invasion, and the distance from the tumor to the margin of the anus. The distance can be determined by using magnetic resonance imaging of the abdominal/pelvic area. In our study, there were 16 cases (37.2%) having tumors located 5–6 cm away from the anal margin, 23 cases (53.5%) having tumors located 4–5 cm from the anal margin, and 4 cases (9.3%) having tumors located less than 4 cm from the anal margin. Recent studies show that tumors with a distance of less than 2 cm to the anal margin can reach R0 and rectal tumors often spread across the mesorectum and up the abdominal/pelvic area along with the lymph node. The lower the distance indicated, the better chance of sphincter-saving.[8]

In this study, 16 cases had to perform surgery to remove the entire inner sphincter and perform colon shaping. For cases under 60 years old, and the frequency of bowel movements was less than two times a day, we did not perform colon shaping but anastomosis. Results showed that the frequency of bowel movements after surgery was relatively good, including the ability to control fluid and gas. Cases with colon shaping were divided into two groups, including J-shape and side-to-end shape, which were based on colon length after rectal resection, mesenteric thickness, and pelvic diameter. For patients with colons longer than 5 cm after cutting, we could choose J-shape and side-to-end shape depending on the experience of the surgeon. Whereas for groups with colon lengths less than 5 cm, we could only perform side-to-end shape or no shaping. In most cases, we found that the colon diameter dilated to more than 5 cm; therefore, colon diameter had little effect on the selection of shaping method in our study.[7–9,12]

Regarding postoperative treatment for sphincter-saving, we followed a recovery procedure on the 7th day after surgery, including eating normal meals, limiting water intake, and defecating more than three times per day. The patient received loperamide and rehabilitated pelvic floor muscle function. We also met two cases with urinary disorders after surgery. They were rehabilitated and recovered after 10 days of training. In this study, before surgery, 100% of the patients had Wexner score below 10 (mean = 5.7 ± 2.2). There were 62.8% of the patients had a score below 5 points and 37.2% had a score of 5 points or above. This was because the low rectal tumor affected the anal canal, and in addition to causing the patient to defecate many times, the tumor also affected the anal pressure. At 1 month after the surgery, patients had a mean score of 9.3 ± 4.5, and four cases with a Wexner score above 10 points. After 3 months of rehabilitation, patients' scores improved significantly. Using Kirwan classification before surgery, results showed that all patients had grades I and II, or in other words, patients were difficult to control gas. However, after surgery, 13.9% of the patients were classified in-group grade III. This group corresponded to a group with a Wexner score of more than 10 points, which was similar to the previous study.[13]

In our study, the maximum follow-up time was 48 months, and the cumulative survival rate at the 48th month was 78.8%. The mean survival time according to disease stages I, II, and III were 43.4 ± 4.2, 41.9 ± 3.8, and 41.2 ± 3.4 months, respectively, with the corresponding survival probability of being 85.7, 80.0, and 77.9%. Morino. M studied 70 low rectal cancer cases undergoing laparoscopic surgery, with a 5-year overall survival rate of 80.7%, and the survival rates for stages I, II, and III were 92, 79, and 73%, respectively.[14] Thus, the survival rate after 4 years in our study was equivalent to other studies.

Conclusion

This study showed that laparoscopic intersphincteric resection and colon shaping were effective in low rectal cancer treatment. Colon shaping was an effective method of improving bowel function in cases of subtotal or total intersphincteric resection.

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