

# ORIGINAL ARTICLE

## Short-term Outcome of Laparoscopic Surgery for Rectal Cancer

Nobuyoshi Miyajima

*Gastroenterological and General Surgery, School of Medicine,  
St. Marianna University, Toyoko Hospital, Kawasaki, Japan*

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**Abstract:** Although laparoscopic surgery for colorectal cancer improves post operative recovery, its use for curative treatment especially for rectal cancer is still controversial. The present study is an attempt to analyze the results of the safety and feasibility of laparoscopic surgery including short-term results for rectal cancer.

**Methods:** This study accumulated 109 patients with rectal cancer retrospectively who underwent laparoscopic surgery. Patients with rectosigmoid colon cancer were excluded from this study. Patients' data, perioperative data including morbidity and mortality, surgical data were analyzed, and the 3-year disease-free survival data were calculated by Kaplan-Meier method, according to the location of the tumor and the UICC stage.

**Results:** There were 71 males and 38 females who underwent laparoscopic surgery for rectal cancer. Mean age of them was  $63.7 \pm 12.5$  years. The mean BMI was  $22.6 \pm 2.8$  kg/m<sup>2</sup>. The operative procedure was low anterior resection (LAR) in 80 cases, abdominoperineal resection (APR) in 14 cases, intersphincteric resection (ISR) in 14 cases, and Hartmann's procedure in one case. The operation time was  $237.0 \pm 71.6$  minutes. Blood loss was  $165.0 \pm 163.8$ . The postoperative morbidity was 22.9%. The postoperative mortality within 30 days after surgery was not experienced. The 3-year disease-free survival rate was 94.2% after curative surgery. According to the UICC stage, the 3-year disease survival rate was 100% in stage 0/I, 89.1% in stage II, and 84.6% in stage III.

**Conclusions:** Laparoscopic surgery for rectal cancer was safe and feasible including postoperative morbidity, mortality and postoperative short-term results. Further study is necessary to clarify the quality of laparoscopic surgery including the postoperative long-term results. (Keio J Med 57 (3) : 150–154, September 2008)

**Key words:** rectal cancer, laparoscopic surgery, short-term outcome, disease-free survival

### Introduction

Colorectal cancer is one of the commonest malignant diseases in our country, and laparoscopic surgery for colorectal cancer has been reported since 1991.<sup>1</sup> Laparoscopic surgery for colon and rectal diseases has been performed increasingly in many institutions with the advances in techniques and instruments, and many studies have reported the usefulness of laparoscopic surgery for colorectal malignancy.<sup>2-7</sup> Lacy *et al.* reported that laparoscopic colectomy is superior to open surgery in terms of cancer-related survival.<sup>8</sup> However, cases with rectal

cancer were excluded in their study. In Japan, laparoscopic surgery for colorectal cancer was introduced in 1992. Individual institutions have reported the satisfactory short-term results, but there have been few studies focused on rectal cancer.<sup>9-11</sup>

This present article analyzes the perioperative course, oncologic radicality and the short-term outcomes of laparoscopic surgery for rectal cancer.

### Materials and Methods

From May, 1994 to February, 2006, cases which were

**Table 1** Data of patients

Patients	109
Male/Female	71/38
Mean Age	63.7±12.5
Mean BMI (kg/m <sup>2</sup> )	22.6±2.8
Tumor location	
upper rectum	54
lower rectum	55
Distance from anal verge (cm)	7.5±2.9
upper rectum	9.1±1.3
lower rectum	5.1±1.9
Preoperative chemotherapy	1

BMI: Body mass index

diagnosed as rectal cancer and underwent laparoscopic surgery were accumulated. Operation was performed at my institute or several related hospitals where the author attended and performed the operation. The location of the tumor was determined by means of pelvic CT scan, colonoscopy, and/or barium enema before surgery and confirmed during surgery. We excluded the following cases; (1) those with tumor larger than 7 cm, (2) those with tumor infiltration to the adjacent organs in upper rectal cancer, (3) those with tumor penetrated the adventitia in lower rectal cancer, (4) those with intestinal obstruction or perforation.

Patients took a standard mechanical bowel preparation before surgery. The extent of lymphadenectomy and was decided according to the General Rules for Clinical and Pathological Studies on Cancer of the Colon, Rectum and Anus edited by the Japanese Society for Cancer of the Colon and Rectum.<sup>12</sup> Total mesorectal excision (TME) or tumor specific mesorectal excision (TSME) was performed by keeping proper plane. Adequate distal margin was secured according to the extent of the clinical stage of the tumor. Surgery was defined as conversion when the skin incision was longer than 8 cm. In the low anterior resection (LAR), rectum was transected laparoscopically or through a small laparotomy, and the decision depended on the situation of the operation.

The data including demographic data, operation time, blood loss, passage of the first flatus, time until resumption of oral intake, morbidity, and 30-day mortality were accumulated and analyzed.

In the case of curative resection, additional detailed data including histopathology, International Union Against Cancer (UICC) TNM stage, and the number of lymph nodes harvested were obtained.

Cancer follow-up consisted of measurement of the serum carcinoembryonic antigen level 3-6 months during the first year, every 6 months during the next 2 years,

**Table 2** Surgical data

Surgical procedures (%)		
LAR		80(73.4)
APR		14(12.8)
ISR		14(12.8)
Hartmann		1(0.9)
Conversion (%)		3(2.8)
Mean operation time (minutes)		237.0±71.6
LAR		217.5±61.4
APR		302.5±72.3*
ISR		278.8±41.7**
Mean blood loss (ml)		165.0±163.8
LAR		117.6±156.0
APR		275.7±167.1***
ISR		232±148.2****
Diverting stoma (%)		20(21.3 of AR+ISR)
stage		
0		10
I		41
II		31
III		16
IV		11

LAR: Low anterior resection

APR: Abdominoperineal resection

ISR: Intersphincteric resection

\*: p<0.01 vs LAR

\*\* : p=0.01 vs LAR

\*\*\*: p<0.01 vs LAR

\*\*\*\*: p=0.01 vs LAR

and annually during the next 5 years, and abdominal and pelvic computed tomography scanning, chest x-ray were taken at least every 6 months.

Statistical differences in categorical variables were analyzed by the chi-square test, and differences in continuous variables were analyzed by the Student's t-test. The Kaplan-Meier method was used to calculate survival rates.

## Results

Between May 1994 and February 2006, 109 patients with rectal cancer underwent laparoscopic surgery at my institute and several related hospitals. The majority of the interventions were completed with curative intent to treat a lower rectal cancer, whereas in 11 patients the procedure was palliative.

The data of the patients who underwent laparoscopic surgery for rectal cancer are summarized in Table 1. There were 71 males and 38 females. Mean age was 63.7 ±12.5 years. The mean BMI was 22.6±2.8 kg/m<sup>2</sup>. All the operations were performed for adenocarcinoma of the rectum. Tumor was located at the upper rectum in 54 patients and at the lower rectum in 55 patients. The mean distance from anal verge to the lower edge of the tumor was 7.5±2.9 cm, 9.1±1.3 cm in the upper rectal cancer,

**Table 3** Postoperative course

Oral intake (days)	5.4±6.8
Complication (+)	12.0±14.2
Complication (-)	4.1±2.5
First stool (days)	4.3±2.2
Postoperative hospital stay (days)	30.6±20.5
Complication (+)	59.4±25.8
Complication (-)	24.9±13.3

**Table 4** Morbidity and mortality

Morbidity (%)	25 (22.9)
Anastomotic leakage (%)	8 (8.5 of AR+ISR)
Wound infection (%)	8 (8.5)
Abscess (%)	2 (1.8)
Ileus (%)	2 (1.8)
Pulmonary (%)	2 (1.8)
Urinary tract infection (%)	1 (0.9)
Others (%)	2 (1.8)
Mortality	0

and 5.1±1.9 cm in the lower rectal cancer. One patient received preoperative chemotherapy. Laparoscopic cholecystectomy was performed in 2 cases at the same time.

The surgical data are shown in Table 2. Low anterior resection (LAR) was the most common procedure for rectal cancer and was performed in 80 cases. Abdominoperineal resection (APR) was performed in 14 cases, intersphincteric resection (ISR) in 14 cases and Hartmann's procedure in one case. Conversion to open surgery was necessary in 3 cases of all patients (2.8%). The cause of conversion was the invasion of the tumor to the urinary bladder in one case, the invasion of the tumor to the uterus in one case, and massive adhesion because of the previous gastrectomy. Diverting stoma was created in 20 cases.

Mean operation time was 237.0±71.6 minutes. Operation time was shorter in LAR than in APR ( $p<0.001$ ) and ISR ( $p=0.01$ ). Mean blood loss was 165.0±163.8 ml. Blood loss was smaller in LAR than in APR ( $p<0.001$ ) and ISR ( $p=0.01$ ).

According to UICC stage, 10 cases were stage 0, 41 cases stage I, 31 cases stage II, 16 cases stage III, and 11 cases stage IV.

**Table 5** Three-year disease-free survival rate

Curative resection (%)	94.2
upper rectum (%)	91.2
lower rectum (%)	97.4
stage 0/I (%)	100
stage II (%)	89.1*
stage III (%)	84.6*

\*:  $p<0.05$  vs stage 0/I

The postoperative course is shown in Table 3. Oral intake started on day 5.4±6.8 after surgery. However, the day of oral intake prolonged in patients with complications. First stool appeared on 4.3±2.2 days after surgery. Postoperative hospital stay was 30.6±20.5 days after surgery. Postoperative hospital stay prolonged markedly in patients with complications.

Morbidity was shown in Table 4. Intraoperatively, bleeding, injury of other organ and anastomotic trouble occurred in each case. Postoperative complications were seen in 25 cases of 18 patients. Anastomotic leakage rate was 8.5%. Wound infection occurred in 8 cases. Intraabdominal abscess developed in 2 cases, ileus in 2 cases, pulmonary disorder in 2 cases, urinary tract infection in 1 case, and others in 2 cases.

The mean number of lymph nodes harvested was 16.1±7.2. There was no significant difference between upper rectal cancer and lower rectal cancer in terms of the number of the lymph nodes harvested ( $p=0.09$ ). Curative surgery was performed in 98 patients (90.0%). Other 11 cases underwent palliative surgery because of liver metastasis in 8 cases, lung metastasis in 2 cases, and peritoneal dissemination in one case.

Mean follow up period is 1020±917.5 days. Recurrence developed in 5 cases. The first recurrent site was liver in 2 cases, lung in one case, peritoneum in one case and ovary in one case. The 3-year disease-free survival rate was 94.2% after curative resection. According to the location of the tumor, the 3-year disease-free survival rate was 91.2% in upper rectal cancer patients and 97.4% in lower rectal cancer patients. There was no significant difference between upper rectal cancer and lower rectal cancer patients. The 3-year disease-free survival rate was 100% in stage 0/I, 89.1% in stage II, and 84.6% in stage III. The 3-year disease-free survival rate in stage 0/I was significantly higher than that in stage II and stage III. The difference between stage II and stage III was not significant (Table 5).

## Discussion

This study analyzes the safety and feasibility of laparoscopic surgery for rectal cancer including the short-term

results. Numerous studies have demonstrated that laparoscopic techniques have many advantages in colorectal surgery compared with open surgery.<sup>13–15</sup> However, it is still controversial to perform laparoscopic surgery for rectal cancer because of the difficulty in understanding the accurate anatomy of the small pelvic cavity, in dissecting the TME or TSME plane, and in transecting the lower rectum safely. This study demonstrated that laparoscopic surgery for rectal cancer was safe and feasible, and the 3-year disease-free survival rate was acceptable. Laparoscopic surgery did not jeopardize the perioperative outcomes and the short-term results compared with the results reported in the literature. A series reported by Lacy and colleagues showed that the laparoscopic approach had survival advantages over the conventional approach,<sup>8</sup> but they excluded the rectal cancer. This study analyzed only rectal cancer.

Conversion from laparoscopic surgery to open surgery occurred because of technical difficulties, the presence of associated conditions such as obesity and unexpected adhesion, or findings of locally advanced disease. Conversion to open surgery should not be hesitated for the patients' safety. In our series, conversion rate was very low.

The reported morbidity rates for laparoscopic colorectal surgery vary between 6 and 39 percent.<sup>16–26</sup> The postoperative morbidity in this study was mainly due to anastomotic leakage and wound infection, which was the same as reported in open surgery. The mortality rate within 30 days after surgery, which is one of the most important factors to analyze the safety of laparoscopic surgery, was not experienced in this study.

Low conversion rate and the acceptable morbidity and mortality rate shows that laparoscopic surgery itself was performed safely and feasibly

The postoperative hospital stay was not short in this study especially in cases with complications. Owing to the specifics of the health insurance system in our country, the duration of postoperative hospital stay can not be compared with the data in the international literature. Adequate tumor resection and lymphadenectomy are major problems of cancer surgery. The number of lymph nodes harvested in this study was comparable with the studies so far published on laparoscopic resection.<sup>26–30</sup>

The 3-year disease free survival rate was 100% in stage 0/I patients, 89.1% in stage II and 84.6% in stage III. This result was acceptable and extremely favorable compared with that reported in the literature.<sup>31–34</sup>

This study concentrated on the lesions at the rectum because rectum was one of the commonest sites of colorectal cancer which we encountered and we had many experiences in open surgery. Laparoscopic surgery has been reported to have a magnified view and get better visual fields than open surgery. However, in cases of lower rectal cancer it is sometimes difficult to grasp the

correct dissecting plane and dissect the rectum in the pelvic cavity because of obesity, narrow pelvic space, and the tumor extension. This study clarified that the morbidity rate was acceptable, the mortality was not experienced, and short-term outcome was quite acceptable compared with open surgery.

This study analyzed only small number of laparoscopic surgery retrospectively. Large number of cases with rectal cancer operated laparoscopically should be accumulated by multi-center study, and safety and feasibility of laparoscopic surgery for lower rectal cancer should be made sure. Based on the results of multi-center study, randomized control study is essential.

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