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A 10-year Experience of Laparoscopic Colorectal Cancer Surgery : Ensuring Patient Safety and Acceptable Outcomes

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ABSTRACT

Aim : To review the outcomes of laparoscopic surgery for colorectal cancer at Kashiwa hospital since its introduction in 2001.

Patients and methods : Between January 2001 and December 2010, 302 patients who underwent laparoscopic surgery for colorectal cancer at Kashiwa hospital were included in this study. The medical records of all patients were retrospectively reviewed.

Results : The patients comprised 199 and 103 with colon and rectal cancer patients, respectively. The tumor were, classified as stages 0 or I, II, IIIa, IIIb, and IV in 166 (55%), 84 (28%), 33 (11%), 8 (2%), and 11 (4%) patients, respectively. No conversion to open surgery was encountered. The 5-year survival rates were 100%, 93.4%, 91.0%, 85.7%, and 27.2% for stages 0 or I, II, IIIa, IIIb, and IV, respectively. No postoperative local recurrences have been encountered more than three years after surgery.

Conclusion : Laparoscopic surgery for colorectal cancer is feasible and oncologically acceptable for patients with colorectal cancer, excluding for those with extraserosal invasion.

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Key words : laparoscopic surgery, colorectal surgery, colorectal cancer

INTRODUCTION

In 1991, Jacobs et al.[1] first reported their experiences with laparoscopic-assisted colectomy for benign as well as malignant diseases. Due to the immense improvements in the surgical techniques since then, laparoscopic surgery for colorectal cancer is slowly becoming the gold standard treatment, both in Japan and in other developed counties[2-4]. However, its long-term oncological results for advanced colorectal cancer have not been well-documented.

Laparoscopic colorectal surgery at Kashiwa Hospital, the Jikei University School of Medicine, was first introduced in 2001 by one of the authors (H.K.)[5-9]. Since then, the number of patients undergoing this procedure has steadily increased. The aim of this study was to evaluate the surgical and oncological outcomes of laparoscopic surgery for colorectal cancer at Kashiwa hospital since 2001.

PATIENTS AND METHODS

During the 10-year period between 2001 and 2010, 302 patients with colorectal cancer underwent laparoscopic surgery at Kashiwa hospital. These patients comprised 191 males and 111 females with a mean age of 64.0 ± 9.4

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Table 1. Charactaristics of the patients

Variable	Surgical profile
Gender	
Male	191 (63)
Female	111 (37)
Age (years)	64.0±9.4
Tumor diameter (mm)	29.0±16.7
Tumor invasion	
Tis*	51 (17)
T1	85 (28)
T2	44 (14)
T3	122 (41)
Histological type of adenocarcinoma	
Well differentiated adenocarcinoma	181 (60)
Moderately differentiated adenocarcinoma	106 (35)
Other**	15 (5)
Lymph node involvement	
Yes	48 (16)
No	254 (84)
Tumor location	
Colon cancer	199 (66)
Rectal cancer	103 (34)

The data are presened as mean±SD or as *n* (%).
* Carcinoma in mucoal layer
** Poorly differentiated adenocarcinoma, mucinous carcinoma

years (Table1). The data were prospectively collected from the patient's medical records and pathological reports. In this study, colorectal cancer stage was classified according to the Japanese classification of colorectal carcinoma[10]. Early-stage cancer patients accounted for 45% of all patients, whereas 41% of the patients had T3 disease. Only 48 (16%) patients had lymph node involvement. The numbers of patients with colon and rectal cancer were 199 (66%) and 103 (34%), respectively (Table 1).

Indication of laparoscopic surgery

Laparoscopic surgery was conducted in patients with colorectal cancer without peritoneal dissemination. Laparoscopic surgery was not applied for patients with local invasive cancer including cancer infiltrating to other organs ; patients with a history of serious surgical and non-surgical complications ; and patients whose body mass index was ≧ 30 kg/m^2.

Follow-up after surgery and postoperative adjuvant chemotherapy

All patients were followed up every 6 months for 5 years with tumor marker monitoring by measurement of serum carcinoembryonic antigen, and by computed tomography. Additionally, they were also followed up with annually colonoscopy for 5 years.

While patients classified as stages 0, I, and II did not received adjuvant chemotherapy, patients classified as stage III and IV received adequate chemotherapy. Stage III patients were administered oral S-1 (Taiho Pharmaceuticals Co. Ltd., Tokyo, Japan) or capecitabine (Xeloda ; Hoffmann-La Roche, Basel, Switzerland), for six months after surgery. Patients classified as stage IV received first, second, and third-line sequential chemotherapy, according to the Japanese Society for Cancer of the Colon and Rectum Guidelines 2010[11].

Statistical Analysis

All data were analyzed using the Statistical Package for Social Sciences (SPSS) 22.0, (IBM SPSS, Tokyo, Japan). The survival rates were examined using the Kaplan-Meier method with log-rank analysis. Only deaths from recurrent carcinoma were counted as events, and non-cancer deaths were censored at the date of the last follow-

up. A p-value of less than 0.05 was considered to indicate significance.

Results

Number of operations (Fig. 1)

During 2001, the number of laparoscopic surgeries was only 10 (five colon and rectal cancer cases each). Following years, the numbers increased each year. In 2010, 10 years after starting laparoscopic surgery for colorectal cancer, 47 patients underwent laparoscopic surgery ; however the ratio of laparoscopic surgery to total colorectal surgery was still < 40%.

Early postoperative outcomes (Table 2)

The mean duration of surgery was within 160 minutes for both colon and rectal surgery. The mean blood loss of colon surgery was significantly lower than that of rectal surgery, and the mean hospital stay was significantly shorter for colon surgery patients compared to for those undergoing rectal surgery. No conversion to open surgery was encountered. As for the post-operative complications, five patients (1.7%) developed anastomotic leakage (colon surgery, $n=1$; rectal surgery, $n=4$), but none of these patients required reoperation. A limitation of this study is that data on minor postoperative complications such as surgical site infections were not prospectively collected, thus likely leading to the very low postoperative complication rate.

Pathological staging (Fig. 2)

Since it was first introduced, all patients with advanced cancer received laparoscopic surgery. Between 2001 and 2010, the number of patients with stage 0 or I disease undergoing laparoscopic surgery was 136, whereas the corresponding number was 166 stage II, IIIa, IIIb, or IV patients (55%). In 2009 and 2010, a tendency of an increasing number of patients with stage I undergoing laparoscopic surgery was found.

Location of the tumors (Fig. 3)

The number of patients with colon and rectal cancer were 199 (66%) and 103 (34%), respectively. Sigmoid colon cancer was the most common type of cancer, followed by ascending colon and upper rectal cancer. Upon laparoscopic surgery, both transverse colectomy and low anterior resection, which are considered highly difficult surgical procedures, were performed for more than 30 patients each.

Oncological outcome (Fig. 4)

The 5-year survival rates were 100% (136/136), 93.4% (79/84), 91.0% (30/33), 85.7% (7/8), and 27.2% (3/11) for patients classified as stage 0 or I, II, IIIa, IIIb, and IV re-

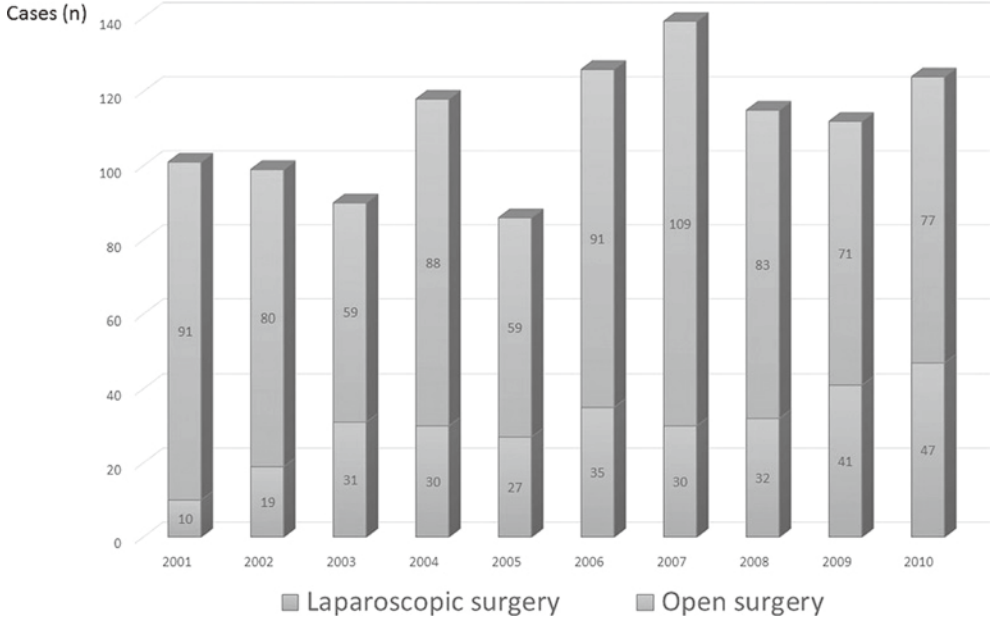

Fig. 1. Laparoscopic surgery trends for colorectal cancer between 2001 and 2010 at our institution.

Table 2. Early and late postoperative outcomes

Variable	Our surgical profile	*p*-value
Duration (minutes)	158.2±54.6	
Colon cancer	145.4±44.6	< 0.01
Rectal cancer	183.1±63.0	
Bleeding (ml)	33.1±107.0	
Colon cancer	20.5±43.9	< 0.01
Rectal cancer	57.7±170.0	
Postoperative hospital stay (days)	10.5±2.6	
Colon cancer	10.1±1.7	< 0.01
Rectal cancer	11.1±3.8	
Postoperative complication	6(2.0)	
Leakage	5(1.7)	
Ileus	1(0.3)	
5-year survival rates		
stage 0, I (*n*=166)	100.0%	
stage II (*n*=84)	93.4%	
stage IIIa (*n*=33)	91.0%	
stage IIIb (*n*=8)	85.7%	
stage IV (*n*=11)	27.2%	

The data are presened as mean±SD or as *n* (%).

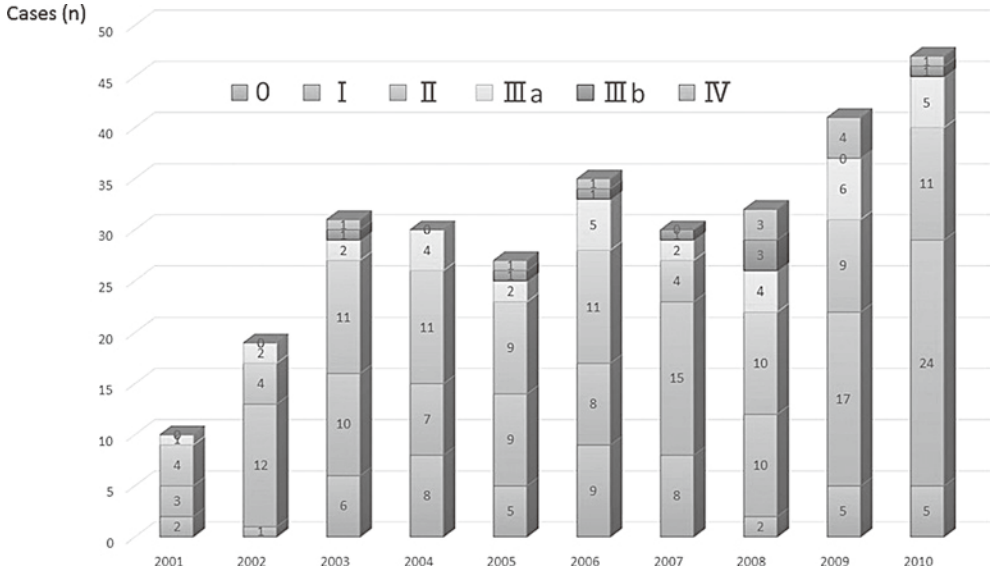

Fig. 2. Laparoscopic surgery trends for colorectal cancer between 2001 and 2010 according to the tumor stage.

spectively. There were no significant differences in the 5-year survival rates among stage 0 or I, II, IIIa, and IIIb patients. On the other hand, the 5-year survival rate of stage IV patients was significantly worse compared with that of the other four groups. Postoperative local recurrence was not encountered more than four years after surgery.

DISCUSSION

Initially, laparoscopic surgery for colorectal disease was considered as an intermediate procedure between colonoscopic resection and open bowel resection[12]. Although a laparoscopic simple segmental resection for early-stage cancer is considered feasible, it is not known whether an

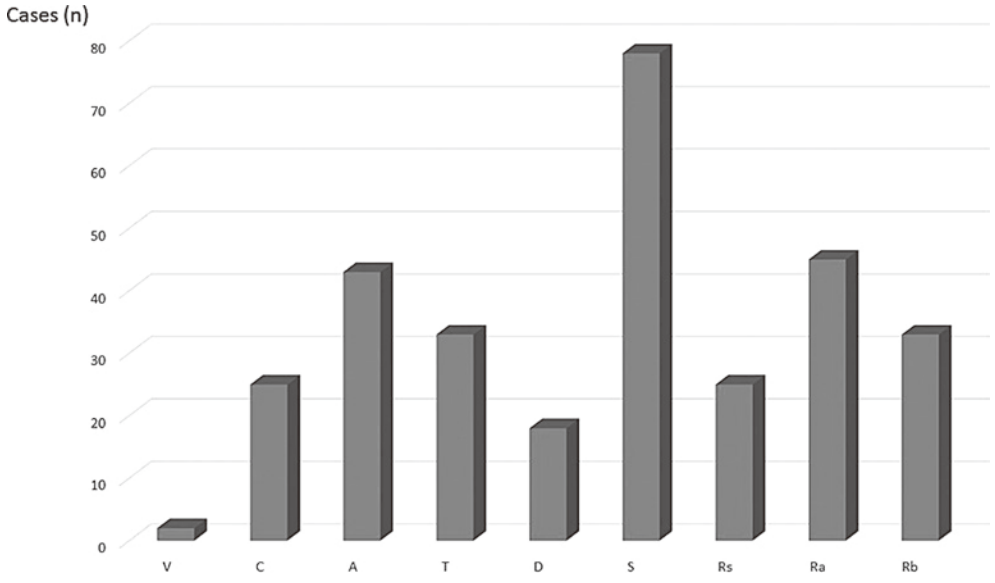

Fig. 3. Laparoscopic surgery trends for colorectal cancer between 2001 and 2010 according to the tumor location.

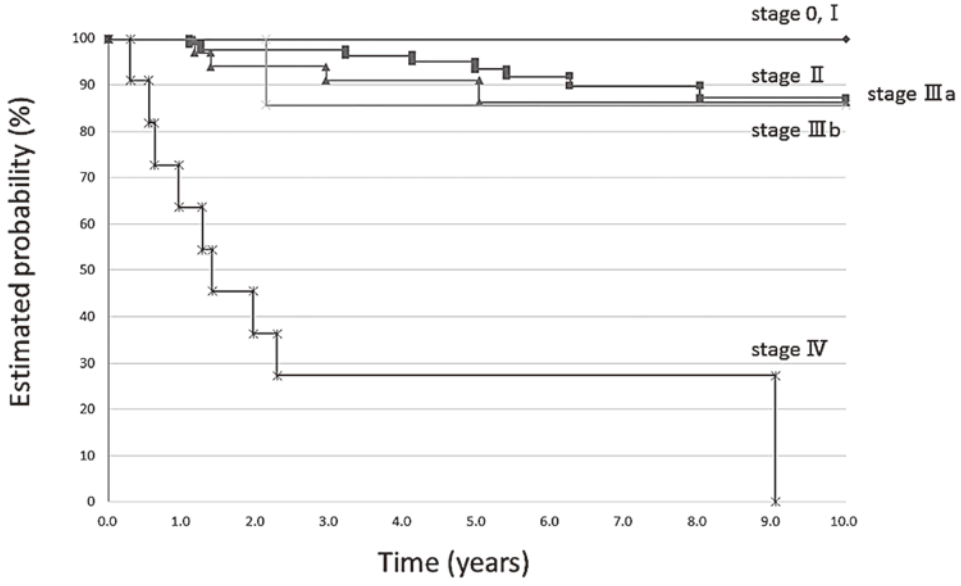

Fig. 4. Kaplan–Meier survival curves of colorectal cancer patients undergoing laparoscopic surgery according to tumor stage.

adequate extent of lymph node dissection for more advanced cases can be achieved by laparoscopic procedures[13]. Furthermore, the feasibility of laparoscopic surgery for rectal cancer has not yet been established. In the Japanese Society for Cancer of the Colon and Rectum Guidelines 2010[11], laparoscopic surgery is indicated only for stage 0 or I colon cancer. However, according to the national survey conducted by the Japanese Society of Endoscopic Surgery[14], the percentage of more advanced cancers (T2 or higher) accounting for the procedure has increased to over 50% of the total cases. In our institution, we have been aggressively performing laparoscopic surgery for advanced colorectal cancer since 2001.

As for the operative duration, two laparoscopic surgeries can be scheduled in a day, with the mean operative time being 158.2 minutes. Generally, it is considered that the duration of laparoscopic surgery is longer than that of open surgery, which is considered to be one of the major disad-

vantages of laparoscopic surgery. In this regard, our surgical procedure was judged to be acceptable. With regard to the oncological outcome, the 5 year overall survival rates of curatively operated cases according to a Japanese multicenter study were 98.9%, 98.5%, 94.5%, 85.9%, and 74.6% for stages 0, I, II, IIIa, and IIIb, respectively[15]. Although there were no differences between our outcomes and the multicenter data for stage 0, I, and II patients, our outcomes were better than the multicenter data for stage III patients. Hence, our surgical outcomes were judged to be acceptable.

As for local invasive cancer, including cancer infiltrating to other organs, the curability and safety of laparoscopic surgery have not yet been established ; for this reason, we have not applied laparoscopic surgery for such advanced cancers.

In conclusion, our 10-year experience suggests that laparoscopic surgery is feasible and oncologically acceptable for patients with colorectal cancer, excluding for those with extraserosal invasion.

Authors have no conflict of interest.

REFERENCES

1. Jacobs M, Verdeja JC, Goldstein HS. Minimally invasive colon resection (laparoscopic colectomy). Surg Laparosco Endosc. 1991 ; 1 : 144-50.
2. Yamamoto S, Watanabe M, Hasegawa H, Kitajima M. Oncologic outcome of laparoscopic versus open surgery for advanced colorectal cancer. Hepatogastroenterology. 2001 ; 48 : 1248-51.
3. Kojima M, Konishi F, Okada M, Nagai H. Laparoscopic colectomy versus open colectomy for colorectal carcinoma : A retrospective analysis of patients followed up for at least 4 years. Surg Today. 2004 ; 34 : 1020-4.
4. Naitoh T, Tsuchiya T, Honda H, Oikawa M, Saito Y, Hasegawa Y. Clinical outcome of the laparoscopic surgery for stageII and III colorectal cancer. Surg Endosc. 2008 ; 22 : 950-4.
5. Kawahara H, Hirai K, Watanabe K, Kashiwagi H, Yamazaki Y, Yanaga K. New approach for laparoscopic surgery of the right colon. Dig Surg. 2005 ; 22 : 50-2.
6. Kawahara H, Yanagisawa S, Kashiwagi H, Hirai K, Yamazaki Y, Yanaga K. Implementation of Clinical pathway for laparoscopic colorectal surgery. Int Surg. 2005 ; 90 : 144-7.
7. Kawahara H, Watanabe K, Ushigome T, Noaki R, Kobayashi S, Yanaga K. Umbilical incision laparoscopic surgery with one assist port for anterior resection. Dig Surg. 2010 ; 27 : 364-6.
8. Kawahara H, Watanabe K, Ushigome T, Noaki R, Kobayashi S, Yanaga K. Laparoscopy-assisted lateral pelvic lymph node dissection for advanced rectal cancer. Hepatogastroenterology. 2010 ; 57 : 1136-8.
9. Kawahara H, Watanabe K, Ushigome T, Yanagisawa S, Kabayashi S, Yanaga K. Lateral Pelvic Lymph Node Dissection using Latero-Vesical Approach with Aspiration Procedure for Advanced Lower Rectal Cancer. Hepatogastroenterology. 2012 ; 59 : 116-9.
10. Japanese Society for Cancer of the Colon and Rectum. Japanese classification of colorectal carcinoma. 2nd English ed. Tokyo : Kanehara Co Ltd ; 2009.
11. Japanese Society for Cancer of the Colon and Rectum Guideline 2010 (in Japanese). Tokyo : Kanehara Co Ltd ; 2010.
12. Konishi F, Kawamura Y, Kitano S, Kimura T, Watanabe M. Laparoscopic colorectal cancer surgery : Japanese experience. Asian J Endosc Surg. 2009 ; 2 : 36-42.
13. Konishi F, Nagai H, Kashiwagi H, Yasuda T, Okada M, Kanazawa K. Laparoscopy assisted colectomy with extracorporeal anastomosis. Dig Endosc. 1994 ; 6 : 52-8.
14. Kitano S. Nation wide survey of laparoscopic surgical procedures in Japan. J Jpn Soc Endosc Surg. 2007 ; 32 : 499-503.
15. Miyajima N, Fukunaga M, Hasegawa H, Tanaka J, Okuda J, Watanabe M. Results of a multicenter study of 1057 cases of rectal cancer treated by laparoscopic surgery. Surg Endosc. 2009 ; 23 : 113-8.