RESEARCH ARTICLE

Advantages of Laparoscopic Abdominoperineal Resection for Anastomotic Recurrence of Rectal Cancer

Xing-Mao Zhang[1], Zheng Wang[1], Sheng-Hui Ma[2], Zhi-Xiang Zhou[1]*

Abstract

Background: Surgery offers the only potential for cure and long-term survival of recurrence of rectal cancer. Few studies about laparoscopic recurrent lesion resection have been reported. This study was designed to evaluate the safety and feasibility of laparoscopic abdomino-perineal resection for anastomotic recurrence of rectal cancer. Materials and Methods: Data for 42 patients with recurrence of rectal cancer were collected retrospectively. Of the 42 patients, 22 underwent laparoscopic surgery (LR group) and 20 received open surgery (OR group). Outcomes between the two groups were compared. Results: Operation time in LR group was shorter compared with the OR group (164.6±27.7min *vs* 203.0±45.3min); intra-operative blood loss was 119.7±44.4ml and 185.0±94.0ml in LR group and OR group, respectively ($p<0.001$); time to first flatus in LR group was shorter than in OR group, and the difference was statistically significant (2.6±0.8 days *vs* 3.1±0.8 days, $p=0.013$); hospital stay in the LR and OR groups was 8.6±1.3 days and 9.8±2.2 days; 3-year survival rates in the LR and OR groups were 44.4% and 42.8% ($p=0.915$) and the 3-year disease-free survival rates were 36.4% and 30.0%, respectively ($p=0.737$). Conclusions: Laparoscopic abdomino-perineal resection is safe and feasible for anastomotic recurrence of rectal cancer.

Keywords: laparoscopic surgery - anastomotic recurrence - rectal cancer - feasibility

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Introduction

Local recurrence is the major setback for patients with rectal cancer after surgery. Although the recurrent rate has reduced due to the application of TME and adjuvant therapy, between 2.6 and 32 percents of patients develop local recurrence after curative resection (Heriot et al., 2008). For local recurrence, the subsite is classified into presacral, postero-lateral, lateral, anterior, anastomotic or perineal (Kusters et al., 2009). Patients with anastomotic recurrence have a relatively better prognosis (Matsuda et al., 2010). Nowadays, treatment remains a difficult and challenging problem and no consensus exists as to an optimal treatment approach for local recurrence (Bedrosian et al., 2006). Complete surgical removal offers the only potential for cure and long-term survival (Bedrosian et al., 2006). Minimal invasive surgery which has been extensively accepted by both patients and surgeons represents the development tendency of surgical therapy for colorectal cancer. Till now, there are few reports on the feasibility of laparoscopic resection for patients with anastomotic recurrence of rectal cancer. This retrospective study was designed to evaluate the safety and feasibility of laparoscopic surgery compared with open surgery for anastomotic recurrence of rectal cancer.

Materials and Methods

Data of 42 patients with anastomotic recurrence of rectal cancer underwent curative abdomino-perineal resection in both cancer hospital, Chinese academy of medical sciences (hospital one) and Chengde central hospital (hospital two) between March 2009 and July 2011 was collected retrospectively. Of these 42 cases, 29 cases received treatment in hospital one and 13 cases in hospital two. No neoadjuvant therapy was applied for these patients before receiving previous operation and all patients underwent laparoscopic-assisted resection for previous rectal cancer between March 2007 and June 2010. Pathologic staging was confirmed as T2N0M0 in 3 patients, T3N0M0 in 14 patients, T2N1M0 in 7 patients, T2N2M0 in 6 patients, T3N1M0 in 8 patients and T3N2M0 in 4 patients. No adjuvant therapy was applied for patients with staging of T2N0M0; For T3N0M0, adjuvant therapy was applied for selected patients with high risk factors including poor differentiation, neural invasion and tumor thrombus. 6 patients with this staging received adjuvant therapy and 8 patients did not. Adjuvant chemoradiotherapy was applied for all the remaining patients. Postoperative radiotherapy was delivered to a total dose of 50Gy in 25 fractions treating daily for 31

*[1]Department of Gastrointestinal Surgery, Cancer Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, [2]Department of Oncology, Chengde Central Hospital, Chengde, China *For correspondence: zhouzx_01@163.com*

patients. Of the 31 patients, 5-FU+LV was recommended for 17 patients and FOLFOX was recommended for 14 patients. Anastomotic recurrence was confirmed by colonoscopy with biopsy between 13 and 52 months after pervious operation. Physical examination, abdominal ultrasound and barium enema were routinely used for evaluation. Abdominal computed tomography scan (CT), endo-luminal ultrasound and MRI were used to assess the resectability of recurrent rectal cancer. Distance metastasis was excluded from this study. No lateral pelvic wall invasion and sacrum invasion was detected by CT and MRI. cT2N0 was confirmed for rectal recurrent cancer in 16 patients, cT2N+ in 14 patients, cT3N0 in 5 patients and cT3N+ in 7 patients. All patients with cT3N+, 6 patients with cT2N+ and 3 patients with cT3N0 were given preoperative adjuvant therapy (Table 1). Choice of open or laparoscopic resection was strictly based on the patient's individual decision after providing informed consent concerning the methods and risks. The protocol was approved by the ethics committee of our hospital.

Surgical procedure

Of the 42 patients, 22 patients received laparoscopic surgery (LR group) and 20 patients underwent open surgery (OR group). All laparoscopic operations were performed by two experienced surgeons who had completed about 300 laparoscopic rectal operations. Open operations were performed by another two experienced surgeons. For no case with lateral pelvic wall invasion or sacrum invasion, no extended pelvic resection was performed in our study. For laparoscopic surgery, four trocars were used, a 12mm superumbilical port was created to introduce the laparoscope, the other three trocars were created in right lower quadrant (12-mm port), right upper quadrant (5-mm port) and left lower quadrant (5-mm port). Bowel mobilization and dissection of lymph nodes were performed laparoscopically, and the transection of sigmoid colon was performed by an Endoscopic Linear Cutter-Straight (YZB/USA 3859-2010; Ethicon Endo-surgery, LLC) under laparoscopy. Perineal operation was implemented after laparoscopic procedure by another two surgeons. Pelvic peritoneal was closed through a small incision which was done in the lower abdomen after perineal operation. An anus praeternaturalis was constructed in left lower quadrant. For open surgery, all abdominal operations were performed through a large incision.

Table 1. Comparisons of Two Groups for General Parameters of Patients with Primary Rectal Cancer

Parameters	LR group (n=22)	OR group (n=20)	*p* value
Gender			0.952
Male	13	12	
Female	9	8	
Age, year (mean±SD)	59.1±11.4	57.6±8.1	0.62
BMI, kg/m2(mean±SD)	25.4±4.3	23.1±3.2	0.057
ASA			0.981
I	2	2	
II	16	14	
III	4	4	
Concomitant diseases			0.845
Yes	6	6	
No	16	14	
Tumor size, cm(mean±SD)	3.7±1.4	3.8±1.5	0.836
Distance of tumor from anal verge, cm(mean±SD)	6.7±1.0	6.9±1.0	0.624
Pathologic staging			0.801
T2N0M0	2	1	
T2N1M0	3	4	
T2N2M0	2	4	
T3N0M0	8	6	
T3N1M0	4	4	
T3N2M0	3	1	
Differentiation			0.839
Well	3	3	
Moderate	15	12	
Poor	4	5	
Neural invasion (case)	2	0	0.167
Tumor thrombus (case)	1	2	0.493
Adjuvant therapy			0.463
Radiotherapy+chemotherapy (5-FU+LV)	7	10	
Radiotherapy+chemotherapy (FOLFOX)	8	6	
Without	7	4	

Follow up

All patients were followed up every three months with physical examination and laboratory tests including tumor markers (carcinoem-bryonic antigen, carbohydrate antigen, 19-9). Abdominal computed tomography scan was performed every half a year after operation, colonoscopy and barium enema were performed one year postoperatively. The follow-up time was from 8 to 55 months, and the last follow-up date was October 20th, 2013. Short-term outcomes including operation time, blood loss, status of circumferential resection margin (CRM), number of lymph nodes, time to recovery of intestinal function, complication rate and hospital stay and long-term outcomes including 3-year survival rate and 3-year disease-free survival rate (DFS) were compared between the two groups.

Statistical analysis

Statistical analyses were performed using statistical software package SPSS version 16.0. A p value less than 0.05 was considered to be statistically significant. Categorical variables were analyzed by Chi-square test, and continuous variables were analyzed by the Student's t-test. Survival curves were generated by the Kaplan-Meier method.

Results

No patients in LR group were converted to open surgery, and all patients in the two groups received R0 resection. Age, gender, concomitant diseases, BMI (Body Mass Index), ASA (American Society of Anesthesiologists), distance of recurrent lesion to anal verge, the depth of invasion and size of recurrent lesion were all matched between the two groups (Table 2). All patients in both groups received postoperative chemotherapy.

Short-term outcomes

The mean operative time was 164.6±27.7min in LR group and 203.0±45.3min in OR group (p<0.001), and the mean blood loss in these two groups was 119.7±44.4ml and 185.0±94.0ml, respectively (p<0.001). There was

Table 2. Comparisons of two Groups for General Parameters of Patients with Recurrent Cancer

Parameters	LR group (n=22)	OR group (n=20)	*p* value
Gender			0.952
Male	13	12	
Female	9	8	
Age, year (mean±SD)	61.5±9.2	59.1±7.7	0.377
BMI, kg/m2(mean±SD)	24.9±4.3	23.9±2.9	0.256
ASA			0.385
I	2	0	
II	14	14	
III	6	6	
Concomitant diseases			0.808
Yes	8	8	
No	14	12	
Tumor size, cm(mean±SD)	2.4±0.9	2.6±0.9	0.46
Distance of tumor from anal verge, cm(mean±SD)	3.9±0.6	4.0±0.5	0.464
Neoadjuvant therapy			0.694
Yes	9	7	
No	13	13	
Adjuvant therapy after surgery for recurrence			0.622
Radiotherapy+chemotherapy (5-FU+LV)	3	3	
Radiotherapy+chemotherapy (FOLFOX)	4	1	
Chemotherapy (5-FU+LV)	7	7	
Chemotherapy (FOLFOX)	8	9	
Pathologic staging			0.978
T1N0M0	5	5	
T2N0M0	5	4	
T2N1M0	4	3	
T3N0M0	5	6	
T3N1M0	3	2	

Table 3 Comparisons of Two Groups for Short-Term Outcomes

Outcomes	LR group	OR group	*p* value
Operative time, min (mean±SD)	164.6±27.7	203.0±45.3	<0.001
Blood loss, ml (mean±SD)	119.7±44.4	185.0±94.0	<0.001
Number of lymph node (mean±SD)	7.3±3.4	7.9±3.4	0.466
Time to first flatus, day (mean±SD)	2.6±0.8	3.1±0.8	0.013
Time to first defecation, day (mean±SD)	3.3±1.1	3.6±0.9	0.256
Hospital stay, day (mean±SD)	8.6±1.3	9.8±2.2	0.006
Peri-operative complication, case (%)	2(9.1%)	4(20.0%)	0.313

Table 4. Comparisons of Two Groups for Long-Term Outcomes

Outcomes	LR group	OR group	*p* value
3-year survival rate (%)	44.4	42.8	0.915
3-year DFS (%)	36.4	30	0.737

no significant difference for number of lymph nodes harvested between the two groups (7.3±3.4 *vs* 7.9±3.4, p=0.466). Time to first flatus in LR group was shorter than that in OR group, and the difference was statistically significant (2.6±0.8 days *vs* 3.1±0.8 days, p=0.013). Time to passing of first defecation in LR group was shorter, but no statistically significant difference (3.3±1.1 days *vs* 3.6±0.9 days, p=0.256) (Table 3). The hospital stay in LR group was 8.6±1.3 days and 9.8±2.2 days in OR group (p=0.006). No trocar-related injuries in LR group. 2 patients in LR group and 4 patients in OR group had incision complication; total complication rate in LR group was lower than in OR group in spite of no statistically significant difference (Table 3).

Long-term outcomes

No patients were lost to follow-up. The median survival was 36.0 months in LR group and 35.0 months in OR group. The 3-year survival rate was 44.4% and 42.8% in LR group and OR group (Table 4), there was no statistically significant difference (p=0.915) and the cumulative survival curve was shown in Figure 1. The 3-year DFS was 36.4% and 30.0% in LR group and OR group, respectively (Figure 2), and the difference was not statistically significant (p=0.737).

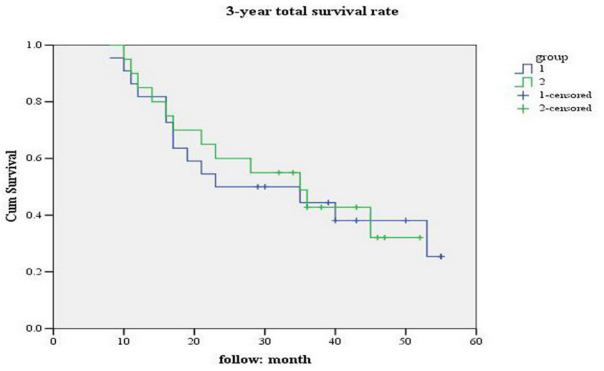

Figure 1. The 3-year Totally Survival Rate

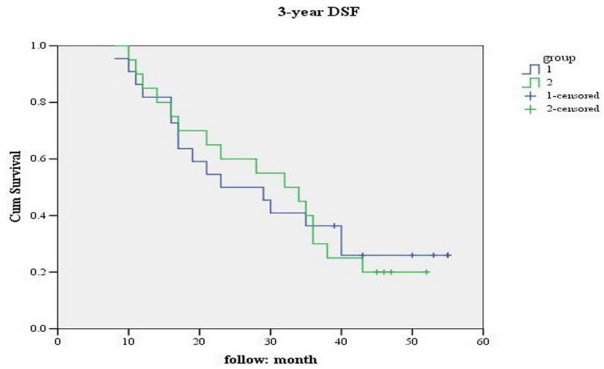

Figure 2. The 3-year Disease-Free Survival Rate

Discussion

Prognosis of rectal cancer is influenced by local recurrence seriously (Rashid et al., 2009; Zhou et al., 2013). For untreated local recurrence, the median survival ranges from 3.5 to 13 months and the 5-year survival is 0%-5% (Bergamaschi R et al., 1996). However, resection for locally recurrent rectal cancer results in an overall five-year survival of 36.6% and a cancer-specific survival of 41.5%, which is in line with more recent studies (Hahnloser et al., 2003; Moriya et al., 2004; Boyle et al., 2005). An increasing consensus on the fact that surgery should be the first choice if locally recurrent rectal cancer is resectable (Bergamaschi et al., 2001). Anastomotic recurrence has a relatively better prognosis comparing with other types of local recurrence, so aggressive surgical treatment is needed urgently.

So far, Laparoscopic colorectal cancer resection has been accepted extensively by most surgeons and patients. Laparoscopic surgery has been steadily established as a standard operative procedure for patients with colorectal cancer and advantages of this minimal invasive surgery have been confirmed by several studies (Zhou et al., 2004; Lujan et al., 2009). In comparison to open surgery, there is less postoperative pain, quicker recovery, less blood

loss and shorter hospital stay (King et al., 2006; Ng et al., 2008). There are few reports on the use of laparoscopic technique for the treatment of anastomotic recurrence of rectal cancer. Aimed at evaluating the feasibility and safety of laparoscopic resection for anastomotic recurrence, this study was designed.

Oncologic outcome is the focus of every surgeon's attention. Number of lymph nodes harvested (Gao et al., 2013) and status of CRM (Yu et al., 2012) were indexes used for evaluating the oncologic outcome of abdominoperineal resection for low rectal cancer. For rectal cancer, previous studies had shown that number of lymph nodes harvested and resection margins after laparoscopic surgery were equivalent to open surgery (Rezvani et al., 2007; Kang et al., 2010), and the same result could be found in our study. Patients had been implemented radical rectal surgery and postoperative adjuvant therapy in our study, so it is understandable that the number of lymph nodes in both groups was obviously less than what is recommended (Morcos et al., 2010).

Some studies proved that laparoscopic approach can shorten the operation time and reduce the intra-operative blood loss (Yang et al., 2013). For some procedures such as ligation of the inferior mesenteric vessels and dissociation of partial intestinal canal have been completed during the previous operation, operation for recurrent lesion may be simpler. In addition, amplification of laparoscopy and clear view played a very important role in hemostasis, dissociating abdominal cavity adhesion and distal rectum.

Advantages of laparoscopic surgery are reflected by rapider recovery and lower incidence of complication. Avoiding exposure of gastrointestinal tract to external environment may be related to rapider recovery of gastrointestinal function and slighter disturbance of internal environment and avoiding the procedure of pulling the gastrointestinal tract excessively is related to rapider recovery of energy metabolism and visceral protein (Zhang et al., 2008). Previous studies have confirmed that patients underwent laparoscopic surgery had faster recovery of intestinal function compared with who received conventional open surgery (Khoury et al., 2010; Singh et al., 2011). Incision complication reduced as the length of incision shortened, some other complications such as ileus and pulmonary infection had lower incidence resulted from less pain and earlier ambulation. A study designed by Kang et al. (2012) confirmed that laparoscopic colorectal surgery has lower postoperative complications, lower mortality, lower costs and shorter hospital stays. In our study, we found the same results for laparoscopic recurrent lesion resection.

Prognosis of recurrence of rectal cancer can be influenced by several factors. Radical operation or not is the most important one. R0 resection has an obviously better outcome comparing with R1 or R2 resection. Further tumor recurrence after resection of recurrent rectal cancer has been quoted to occur in approximately one-third of patients (Sagar et al., 1996). And several studies (Wiggers et al., 1996; Bozzetti et al., 1997; Bergamaschi et al., 2001) reported that 5-year survivors after resection represent 2%-13% of all patients with locally recurrent rectal cancer occurring either alone or in addition to distant metastases. Poor prognosis mainly resulted from R1 or R2 resection for some patients. Meanwhile, a study designed by Palmer et al. (2007) showed that locally recurrent patients who underwent curative resection had a 5-year survival rate of 57%. So R0 resection is the crucial reason for reducing re-recurrent rate and improving the survival rate. Patients in both groups received R0 resection in our study. Due to the limitation of follow-up time, we calculated the 3-year survival rate and 3- year DFS. No significant difference could be found for either 3-year survival rate or 3-year DFS between the two groups.

In conclusion, accurate judgment for resectability of anastomotic recurrence is crucial. For resectable recurrence of rectal cancer, laparoscopic abdomino-perineal resection had a better short-term outcome and a similar long-term outcome comparing with open resection. Laparoscopic abdomino-perineal resection is feasible and safe for low anastomotic recurrence of rectal cancer.

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References

Bedrosian I, Giacco G, Pederson L, et al (2006). Outcome after curative resection for locally recurrent rectal cancer. *Dis Colon Rectum*, **49**, 175-82.

Bergamaschi R, Arnaud JP (1996). Routine compared with non-scheduled follow-up of patients with curative surgery for colorectal cancer. *Ann Surg Oncol*, **3**, 464-9.

Bergamaschi R, Pessaux P, Burtin P, et al (2001). Abdominoperineal resection for locally recurrent rectal cancer. *Tech Coloproctol*, **5**, 97-102.

Boyle K, Sagar P, Chalmers A, et al (2005). Surgery for locally recurrent rectal cancer. *Dis Colon Rectum*, **48**, 929-37.

Bozzetti F, Bertario L, Rossetti C, et al (1997). Surgical treatment of locally recurrent rectal carcinoma. *Dis Colon Rectum*, **40**, 1421-4.

Gao C, Li JT, Fang L, et al (2013). Pre-operative predictive factors for intra-operative pathological lymph node metastasis in rectal cancers. *Asian Pac J Cancer Prev*, **14**, 6293-9.

Hahnloser D, Nelson H, Gunderson LL, et al (2003). Curative potential of multimodality therapy for locally recurrent rectal cancer. *Ann Surg*, **237**, 502-8.

Heriot AG, Byrne CM, Lee P, et al (2008). Extended radical resection: the choice for locally recurrent rectal cancer. *Dis Colon Rectum*, **51**, 284-91.

Kang CY, Chaudhry OO, Halabi WJ, et al (2012). Outcomes of laparoscopic colorectal surgery: data from the Nationwide Inpatient Sample 2009. *Am J Surg*, **204**, 952-7.

Kang SB, Park JW, Jeong SY, et al (2010). Open versus laparoscopic surgery for mid or low rectal cancer after neoadjuvant chemoradiotherapy (COREAN trial): short-term outcomes of an open-label randomised controlled trial. *Lancet Oncol*, **11**, 637-45.

Khoury W, Kiran RP, Jessie T, et al (2010). Is the laparoscopic approach to colectomy safe for the morbidly obese? *Surg Endosc*, **24**, 1336-40.

King PM, Blazeby JM, Ewings P, et al (2006). Randomized clinical trial comparing laparoscopic and open surgery for colorectal cancer within an enhanced recovery programme. *Br J Surg*, **93**, 300-8.

Kusters M, Holman FA, Martijn H, et al (2009). Patterns of local recurrence in locally advanced rectal cancer after intra-operative radiotherapy containing multimodality treatment. *Radiother Oncol*, **92**, 221-5.

Lujan J, Valero G, Hernandez Q, et al (2009). Randomized clinical trial comparing laparoscopic and open surgery in patients with rectal cancer. *Br J Surg*, **96**, 982-9.

Matsuda K, Hotta T, Takifuji K, et al (2010). Clinicopathological features of anastomotic recurrence after an anterior resection for rectal cancer. *Langenbecks Arch Surg*, **395**, 235-9.

Morcos B, Baker B, Al Masri M, et al (2010). Lymph node yield in rectal cancer surgery: effect of preoperative chemoradiotherapy. *Eur J Surg Oncol*, **36**, 345-9.

Moriya Y, Akasu T, Fujita S, et al (2004). Total pelvic exenteration with distal sacrectomy for fixed recurrent rectal cancer in the pelvis. *Dis Colon Rectum*, **47**, 2047-54.

Ng SS, Leung KL, Lee JF, et al (2008). Laparoscopic-assisted versus open abdominoperineal resection for low rectal cancer: a prospective randomized trial. *Ann Surg Oncol*, **15**, 2418-25.

Palmer G, Martling A, Cedermark B, et al (2007). A population-based study on the management and outcome in patients with locally recurrent rectal cancer. *Ann Surg Oncol*, **14**, 447-54.

Rashid MR, Aziz AF, Ahmad S, et al (2009). Colorectal cancer patients in a tertiary referral centre in Malaysia: a five year follow-up review. *Asian Pac J Cancer Prev*, **10**, 1163-6.

Rezvani M, Franko J, Fassler SA, et al (2007). Outcomes in patients treated by laparoscopic resection of rectal carcinoma after neoadjuvant therapy for rectal cancer. *JSLS*, **11**, 204-7.

Sagar PM, Pemberton JH (1996). Surgical management of locally recurrent rectal cancer. *Br J Surg*, **83**, 293-304.

Singh A, Muthukumarasamy G, Pawa N, et al (2011). Laparoscopic colorectal cancer surgery in obese patients. *Colorectal Dis*, **13**, 878-83.

Wiggers T, deVries MR, Veeze-Kuypers B (1996). Surgery for local recurrence of rectal carcinoma. *Dis Colon Rectum*, **39**, 323-8.

Yang Q, Xiu P, Qi X, et al (2013). Surgical margins and short-term results of laparoscopic total mesorectal excision for low rectal cancer. *JSLS*, **17**, 212-8.

Yu DS, Huang XE, Zhou JN (2012). Comparative study on the value of anal preserving surgery for aged people with low rectal carcinoma in Jiangsu, China. *Asian Pac J Cancer Prev*, **13**, 2339-40.

Zhang Y, Yang Z, Li X, et al (2008). Custom prosthetic reconstruction for proximal tibial osteosarcoma with proximal tibiofibular joint involved. *Surg Oncol*, **17**, 87-95.

Zhou C, Ren Y, Wang K, et al (2013). Intra-operative rectal washout with saline solution can effectively prevent anastomotic recurrence: a meta-analysis. *Asian Pac J Cancer Prev*, **14**, 7155-9.

Zhou ZG, Hu M, Li Y, et al (2004). Laparoscopic versus open total mesorectal excision with anal sphincter preservation for low rectal cancer. *Surg Endosc*, **18**, 2111-5.