

ORIGINAL ARTICLE

SHORT-TERM OUTCOMES OF LAPAROSCOPIC LATERAL DISSECTION FOR LOWER RECTAL CANCER

Hajime Morohashi¹⁾, Yoshiyuki Sakamoto¹⁾, Daichi Ichinohe²⁾, Hiroyuki Jin³⁾,
Kentarō Sato¹⁾, Tatsuya Yoshida¹⁾, Takuya Miura¹⁾, Harue Akasaka⁴⁾,
Hayato Nagase⁵⁾, Kensuke Okano⁶⁾, Eri Yoshida⁷⁾, Kazunori Aoki⁸⁾,
Nobukazu Watanabe⁴⁾, Seiji Takahashi⁷⁾, and Kenichi Hakamada¹⁾

Abstract Background: In Japan, the recommended standard surgical procedure for advanced lower rectal cancer includes total mesorectal excision (TME) plus central D3 lymph node dissection and bilateral lateral lymph node dissection (LLND). Laparoscopic LLND is performed in the pelvis, which is an anatomically complex and small operative field and thus, requires an extremely high level of skill. Laparoscopic LLND has been introduced following the recent expansion in the application of laparoscopic surgery for advanced lower rectal cancer.

Patients and methods: The subject sample comprised 79 patients who underwent lateral dissection, including 61 patients who underwent laparotomic lateral dissection and 18 patients who underwent laparoscopic lateral dissection. Clinical characteristics and the oncological outcome were compared between groups.

Results: The mean surgical duration in the laparoscopy group was 285 min, which was significantly longer than the 165 min in the laparotomy group ($p < 0.001$). The mean blood loss amount was 131 g in the laparoscopy group, which was significantly less than the mean amount of 407 g in the laparotomy group ($p < 0.001$). There was no significant difference in complications.

Conclusion: The short-term outcomes of laparoscopic LLND were good, indicating that the procedure can be performed safely and is likely to be useful.

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Key words: Rectal Cancer; Laparoscopy; Lateral lymph node dissection.

Introduction

Compared with colon cancer, lower rectal cancer has a poorer prognosis and in particular, is often associated with the development of local recurrence¹⁾. In the rectum, the lymphatic pathway is broadly divided into ascending, lateral, and descending components²⁾. Therefore, appropriate lymph node dissection for lower rectal cancer requires para-intestinal lymph node

dissection and regional dissection in accordance with lateral lymph flow toward the internal iliac artery, as well as dissection of central lymph nodes along the inferior mesenteric artery. According to a study conducted by the Japanese Society for Cancer of the Colon and Rectum, the rate of lateral lymph node metastasis among 2916 patients with rectal cancer was 20.1%, the risk of intra-pelvic recurrence had decreased by 50%, and the 5-year survival rate was expected

¹⁾ Department of Gastroenterological surgery, Hirosaki University

²⁾ Department of Surgery, Mutsu general hospital

³⁾ Department of Surgery, Ajigasawa hospital

⁴⁾ Department of Surgery, Aomori kousei hospital

⁵⁾ Department of Surgery, Hakodate Municipal hospital

⁶⁾ Department of Surgery, Aomori Prefectural central hospital

⁷⁾ Department of Surgery, Kuroishi general hospital

⁸⁾ Department of Surgery, Aomori city hospital

Correspondence: H. Morohashi

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Table 1. Patients characteristics

		laparotomy (N = 61)	laparoscopy (N = 18)	p
Gender	Male	39	14	N.S.
	Female	22	4	N.S.
Age, years	Median (year)	62 [35-80]	65 [49-81]	N.S.
Body mass index	Median (kg/m ²)	22.1	22.4	N.S.
Depth of primary tumor invasion	cT1/cT2/cT3/cT4	4/6/47/4	0/0/2/15/1	N.S.
LN metastasis	pN0/pN1/pN2/pN3	36/8/6/11	7/4/3/1	N.S.
pStage	0-II/IIIa/IIIb/IV	34/7/14/6	8/6/3/1	N.S.

to improve by 8%–9%³⁾. Therefore, in Japan, the recommended standard surgical procedure for advanced lower rectal cancer includes total mesorectal excision (TME) plus central D3 lymph node dissection and bilateral lateral lymph node dissection (LLND)⁴⁾. To date, our department has performed bilateral lateral dissection via laparoscopy for “patients with the lower tumor margin on the anal side below the peritoneal reflection and invasion exceeding the muscularis propria.” On the other hand, the recent popularization of laparoscopic colon resection has been remarkable, and according to the Japanese Society for Endoscopic Surgery, approximately 50% of medical institutions perform laparoscopic colon resection for colon cancer. Similarly, in our department, laparoscopic surgery was introduced in 2011 for the surgical treatment of early stage colon cancer; with the accumulation of experience, we have gradually expanded the applications of this procedure to include advanced cancer. The primary benefit of laparoscopic colon resection is that its magnification effect facilitates precise manipulation, which is considered extremely useful for nerve preservation and bleeding control during surgery for rectal cancer. However, as mentioned earlier, with regard to suitable magnification during laparoscopic colon resection for advanced rectal cancer, laparoscopic lymph node dissection cannot be

avoided. Laparoscopic LLND is performed in the pelvis, which is an anatomically complex and small operative field and thus, requires an extremely high level of skill. Therefore, this procedure can be difficult to achieve in facilities without sufficient experience and technique. Laparoscopic LLND has been introduced following the recent expansion in the application of laparoscopic surgery for advanced lower rectal cancer. We will present the short-term outcomes of this procedure and discuss future challenges.

Patients and Methods

The subject sample comprised 61 patients who underwent lateral dissection at the Department of Gastrointestinal Surgery, Hirosaki University from April 2011 to December 2015, including 61 patients who underwent laparotomic lateral dissection and 18 patients who underwent laparoscopic lateral dissection (Table 1). We retrospectively examined the clinicopathological patient background information [e.g., age, body mass index (BMI), stage, and surgical procedure], surgical duration, amount of blood loss, number of lymph nodes dissected, length (number of days) of postoperative hospital stay, and complications. Clinical characteristics and the oncological outcome were compared between groups.

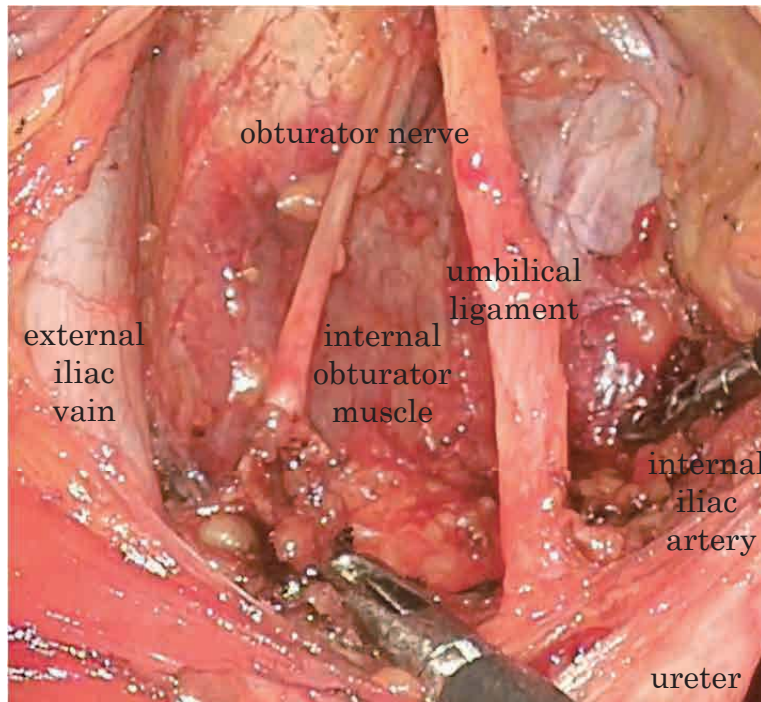


Figure 1 The final view after laparoscopic LLND

Surgical procedure

The surgical procedure for laparoscopic LLND was as follows: after completing laparoscopic TME, LLND was performed via five ports. (1) First, the ureter was detached up to the bladder inflow site and then taped and pulled medially. (2) Next, the layer preserving the pelvic nerve from the hypogastric nerve, the medial dissection margin, was separated. (3) Separation was then performed from the internal-external iliac artery bifurcation, the lateral dissection margin, up to the site where the dorsal side of the psoas was exposed along the external iliac artery and vein. (4) Thereafter, the obturator nerve, artery, and vein were identified and preserved, and the lymph node #283 was dissected. (5) After determining the left- and right-side dissection lines, separation was performed in a caudal direction along the artery from the center of the internal iliac artery after which the lymph

node #263 was dissected. The final view after laparoscopic LLND is shown in figure 1.

Results

The laparoscopy group comprised fourteen men and four women, with a mean age of 65 years and a mean BMI of 22.4. The surgical procedures were low anterior resection in eight patients, intersphincteric resection in three patients, Hartmann's operation in two patients and abdominoperineal resection of the rectum in five patients. No shifts to laparotomy or severe intraoperative complications occurred. Of the clinicopathological background factors, no significant differences were observed with respect to gender, age, BMI, staging, or surgical procedure. The mean surgical duration in the laparoscopy group was 302 min, which was significantly longer than the 174 min in the laparotomy group ($p < 0.01$). The mean blood loss amount was 99 g in the laparoscopy group,

Table 2. Operative data

	laparotomy (N = 61)	laparoscopy (N = 18)	p
Operation			N.S.
Low anterior resection	15	8	
Abdominoperitoneal resection	19	5	
Intersphincteric resection	23	3	
Hartmann's operation	4	2	
Duration of operation median [range] (minutes)	174 [86-330]	302 [210-483]	< 0.01
Blood loss median [range] (g)	418 [50-2685]	99 [1-380]	< 0.01
Dissected lymph nodes			
Total lymph node median [range]	26 [10-64]	21 [8-43]	N.S.
Lateral lymph node median [range]	5.8 [0-19]	9.1 [1-18]	N.S.
Post operative day median [range] (day)	28 [10-419]	16.7 [8-41]	0.04
Complication			
Anastomotic leakage	11	3	N.S.
Intestinal obstruction	3	0	N.S.
Surgical site infection	7	1	N.S.
Urinary disorder	7	1	N.S.

which was significantly less than the mean amount of 418 g in the laparotomy group ($p < 0.01$). Although there was no significant difference in the number of dissected lymph nodes, postoperative complications, anastomotic leakage, intestinal obstruction and surgical site infection. There was also a significant difference in the length of postoperative hospitalization (Table 2).

Discussion

LLND has been reported to reduce the rate of local recurrence and improve the 5-year survival rate among patients diagnosed with rectal cancer^{5, 6}. On the other hand, an earlier meta-analysis of 20 patients found that LLND did not improve prognosis, instead increased complications associated with the reproductive and urinary systems⁷. To improve therapeutic outcomes, we believe that it is important to perform adequate

dissection and provide balanced treatment, thus minimizing complications as far as possible. For cases without lateral lymph node metastasis according to preoperative diagnostic imaging, the rate of lateral lymph node metastasis is reported to be 7.4%⁸. Because the number of patients who would benefit from LLND is not very high, there are an increasing number of patients without clear lateral metastasis on imaging for whom LLND is avoided by administering preoperative chemoradiation therapy (CRT)⁹.

However, although preoperative CRT can effectively control local recurrences, reports state that this therapy does not affect the prognosis^{10, 11}; and therefore, due attention should be paid to the high rate of complications, including postoperative reproductive and urinary system dysfunction^{12, 13} as well as reported radiation-induced impairments, such as venous thrombosis, intestinal obstruction, fistula, femoral neck fracture, and reduced

anal function. Another report described that after performing tumor-specific mesorectal excision and lateral dissection following CRT for patients who exhibited lateral lymph node metastasis on preoperative tests, 66% of patients were pathologically diagnosed as positive for metastasis, despite undergoing CRT¹⁴). Therefore, we believe that from the perspective of local control, LLND is essential for patients with lateral lymph node metastasis and swelling on preoperative diagnostic imaging.

Because various problems associated with LLND can be overcome using laparoscopic surgery, we introduced laparoscopic LLND. Although lateral lymph node metastases were not identified in all of our patients using preoperative diagnostic imaging, the same number of lymph nodes was dissected using laparoscopy and laparotomy and radical curability was ensured. Furthermore, no reproductive and urinary system complications were observed. Excluding one patient who developed an anastomotic leak, no Clavien-Dindo III or higher complications were observed. Although the longer duration required for completing the procedure, which has a high level of difficulty, poses a problem, we believe that the duration of the procedure will gradually decrease as the experience of the surgical team increases.

Laparoscopic LLND enables reliable visual verification and preservation of the nerve plexus in the pelvis, and is expected to reduce neurological complications of the reproductive and urinary systems. Furthermore, the magnified field of vision enables combined resection of the internal iliac blood vessels and pelvic plexus with a good visual field, which we expect will facilitate safer and more reliable dissection. In future, we plan to examine the safety and radical curability of this procedure, including the local recurrence rate and long-term prognosis as well as the expansion of its application for therapeutic

dissection.

Conclusions

The short-term outcomes of laparoscopic LLND were good, indicating that the procedure can be performed safely and is likely to be useful.

Reference

- 1) Kobayashi H, Mochizuki H, Sugihara K, Morita T, Kotake K, Teramoto T, Kameoka S, et al. Characteristics of recurrence and surveillance tools after curative resection for colorectal cancer: a multicenter study. *Surgery*. 2007;141:67-75.
- 2) Grinnell RS. The Lymphatic and Venous Spread of Carcinoma of the Rectum. *Ann Surg*. 1942;116:200-16.
- 3) Sugihara K, Kobayashi H, Kato T, Mori T, Mochizuki H, Kameoka S, Shirouzu K, et al. Indication and benefit of pelvic sidewall dissection for rectal cancer. *Dis Colon Rectum*. 2006;49:1663-72.
- 4) Ueno M, Oya M, Azekura K, Yamaguchi T, Muto T. Incidence and prognostic significance of lateral lymph node metastasis in patients with advanced low rectal cancer. *Br J Surg*. 2005;92:756-63.
- 5) Koyama Y, Moriya Y, Hojo K. Effects of extended systematic lymphadenectomy for adenocarcinoma of the rectum—significant improvement of survival rate and decrease of local recurrence. *Jpn J Clin Oncol*. 1984;14:623-32.
- 6) Kobayashi H, Mochizuki H, Kato T, Mori T, Kameoka S, Shirouzu K, Sugihara K. Outcomes of surgery alone for lower rectal cancer with and without pelvic sidewall dissection. *Dis Colon Rectum*. 2009;52:567-76.
- 7) Nagawa H, Muto T, Sunouchi K, Higuchi Y, Tsurita G, Watanabe T, Sawada T. Randomized, controlled trial of lateral node dissection vs. nerve-preserving resection in patients with rectal cancer after preoperative radiotherapy. *Dis Colon Rectum*. 2001;44:1274-80.
- 8) Fujita S, Akasu T, Mizusawa J, Saito N, Kinugasa

- Y, Kanemitsu Y, Ohue M, et al. Postoperative morbidity and mortality after mesorectal excision with and without lateral lymph node dissection for clinical stage II or stage III lower rectal cancer (JCOG0212): results from a multicentre, randomised controlled, non-inferiority trial. *Lancet Oncol.* 2012;13:616-21.
- 9) Watanabe T, Tsurita G, Muto T, Sawada T, Sunouchi K, Higuchi Y, Komuro Y, et al. Extended lymphadenectomy and preoperative radiotherapy for lower rectal cancers. *Surgery.* 2002;132:27-33.
- 10) Randomised trial of surgery alone versus surgery followed by radiotherapy for mobile cancer of the rectum. Medical Research Council Rectal Cancer Working Party. *Lancet.* 1996;348:1610-4.
- 11) Kapiteijn E, Marijnen CA, Nagtegaal ID, Putter H, Steup WH, Wiggers T, Rutten HJ, et al. Preoperative radiotherapy combined with total mesorectal excision for resectable rectal cancer. *N Engl J Med.* 2001;345:638-46.
- 12) Lange MM, Marijnen CA, Maas CP, Putter H, Rutten HJ, Stiggelbout AM, Meershoek-Klein Kranenbarg E, et al. Risk factors for sexual dysfunction after rectal cancer treatment. *Eur J Cancer.* 2009;45:1578-88.
- 13) Tekkis PP, Cornish JA, Remzi FH, Tilney HS, Strong SA, Church JM, Lavery IC, et al. Measuring sexual and urinary outcomes in women after rectal cancer excision. *Dis Colon Rectum.* 2009;52:46-54.
- 14) Akiyoshi T, Ueno M, Matsueda K, Konishi T, Fujimoto Y, Nagayama S, Fukunaga Y, et al. Selective lateral pelvic lymph node dissection in patients with advanced low rectal cancer treated with preoperative chemoradiotherapy based on pretreatment imaging. *Ann Surg Oncol.* 2014; 21:189-96.