



# Laparoscopic extraperitoneal approach for lateral lymph node dissection for patients with metachronous lateral pelvic lymph node metastases following surgery for rectal cancer: a case series and short-term outcomes

Shinsuke Masubuchi<sup>1,2</sup> · Junji Okuda<sup>3</sup> · Hiroki Hamamoto<sup>2</sup> · Hiroki Yokoyama<sup>1</sup> · Maiko Sanford<sup>1</sup> · Masaru Kawai<sup>1</sup> · Hitoshi Inoue<sup>1</sup> · Takashi Kinoshita<sup>1</sup> · Michihiro Hayashi<sup>1</sup> · Sang-Woong Lee<sup>2</sup>

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## Abstract

**Background** There have been few reports of a totally extraperitoneal approach for laparoscopic lateral lymph node dissection (LLND) for patients with metachronous lateral pelvic lymph node metastases following surgery for rectal cancer. Therefore, this study reports the short-term outcomes of LLND via an extraperitoneal approach.

**Methods** A total of 10 patients underwent LLND through a laparoscopic extraperitoneal approach in our hospital since October 2018. Patients with suspected resectable lateral lymph node recurrence after surgery for rectal cancer on computed tomography (CT), magnetic resonance imaging (MRI), or positron emission tomography CT (PET-CT) were selected for this procedure.

**Results** Nine of the 10 cases were completed using this procedure, but one case was converted to an intraperitoneal approach. The median operative time was 231 min, and the median estimated blood loss was 10 ml. There was one case of wound infection, but no other postoperative complications were seen. In one patient, no metastases were found in the retrieved lymph nodes.

**Conclusion** The short-term outcomes of LLND through a laparoscopic extraperitoneal approach were acceptable. Because this procedure can be performed without violating the peritoneum, it is less invasive than the conventional intraperitoneal approach and is useful for metachronous lateral pelvic lymph node metastases.

**Keywords** Extraperitoneal approach · Lateral lymph node dissection · Metachronous lateral pelvic lymph node metastasis · Case series

Lateral pelvic lymph node metastasis is one of the major causes of local recurrence after total mesorectal excision (TME) for rectal cancer [1, 2]. Since local recurrence limited to the pelvic lateral lymph nodes may be completely cured

by lateral lymph node dissection (LLND), resection should be considered. LLND is technically difficult due to adjacent anatomical structures. In particular, cases with lateral pelvic lymph node metastases after radical surgery are technically difficult due to problems resulting from the previous surgery, such as adhesions. The safety and feasibility of laparoscopic LLND with TME for primary rectal cancer have been reported, but only a few studies have assessed laparoscopic salvage LLND for recurrent lateral pelvic lymph node metastases [3–7]. We previously reported a new technique, modified totally extraperitoneal approach to laparoscopic LLND (M TEP LLND), for patients with metachronous lateral pelvic lymph node metastases after rectal cancer surgery [8]. We have performed this procedure in 10 cases so far and herein describe the short-term outcomes.

✉ Shinsuke Masubuchi  
shinsuke.masubuchi@ompu.ac.jp

<sup>1</sup> Department of Gastroenterological Surgery, Hirakata City Hospital, 14-1-2 Kinyahonmachi, Hirakata, Osaka 573-1013, Japan

<sup>2</sup> Department of General and Gastroenterological Surgery, Osaka Medical and Pharmaceutical University, Takatsuki 569-8686, Japan

<sup>3</sup> Department of Gastroenterological Surgery, Toyonaka Keijinkai Hospital, Toyonaka 560-0004, Japan

## Materials and methods

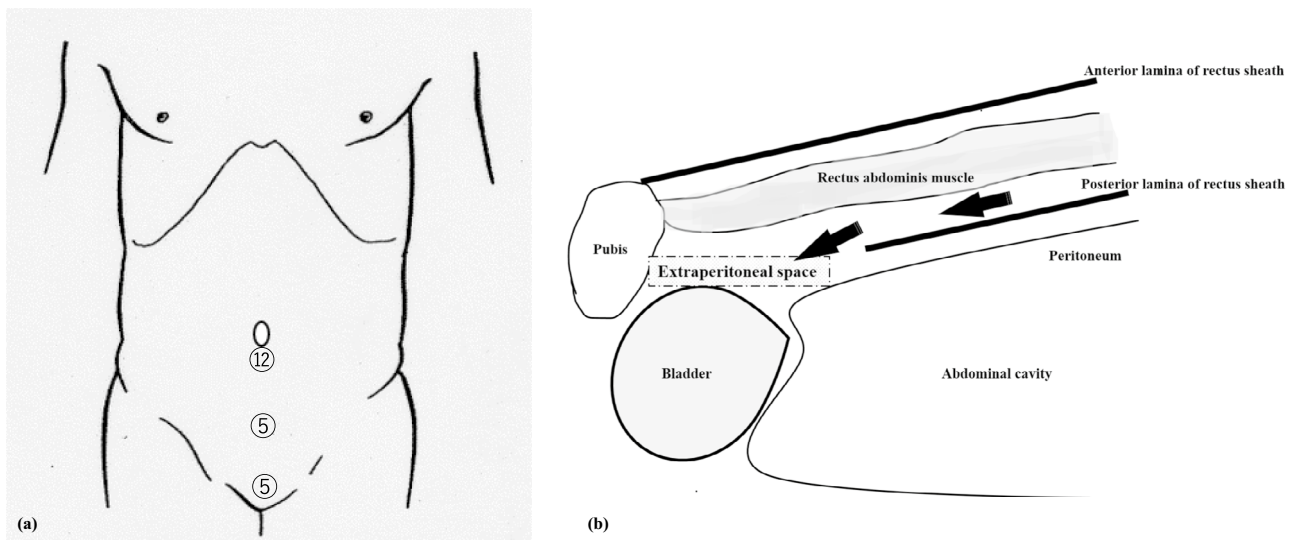
“Metachronous lateral lymph node metastasis” is defined as metastasis that was not present at the time of previous rectal cancer surgery. However, M TEP LLND is not indicated if the patient has previously undergone lateral lymph node dissection. Since October 2018, we have been performing M TEP LLND for patients with resectable metachronous lateral lymph node after rectal cancer surgery. By June 2023, 10 cases have been performed thus far.

Patients with local recurrence limited to lateral pelvic lymph nodes with R0 resection considered likely are candidates for M TEP LLND. All patients were evaluated by regular abdominal computed tomography (CT) follow-up after the initial surgery. The patients found to have enlarged lateral pelvic lymph nodes underwent further magnetic resonance imaging (MRI), and positron emission tomography CT (PET-CT), and treatment was determined at our board conference. The first author who had started career as a gastrointestinal surgeon in 2006, is the only surgeon performing M TEP LLND. There was no specialized team performing M TEP LLND, and a surgeon with less than 10 years of experience as a gastrointestinal surgeon participated in the surgery as a scopist. This study was approved by the Hirakata City Hospital Institutional Ethics Committee, R5-No.15. This case series has been reported in line with the PROCESS Guideline [9].

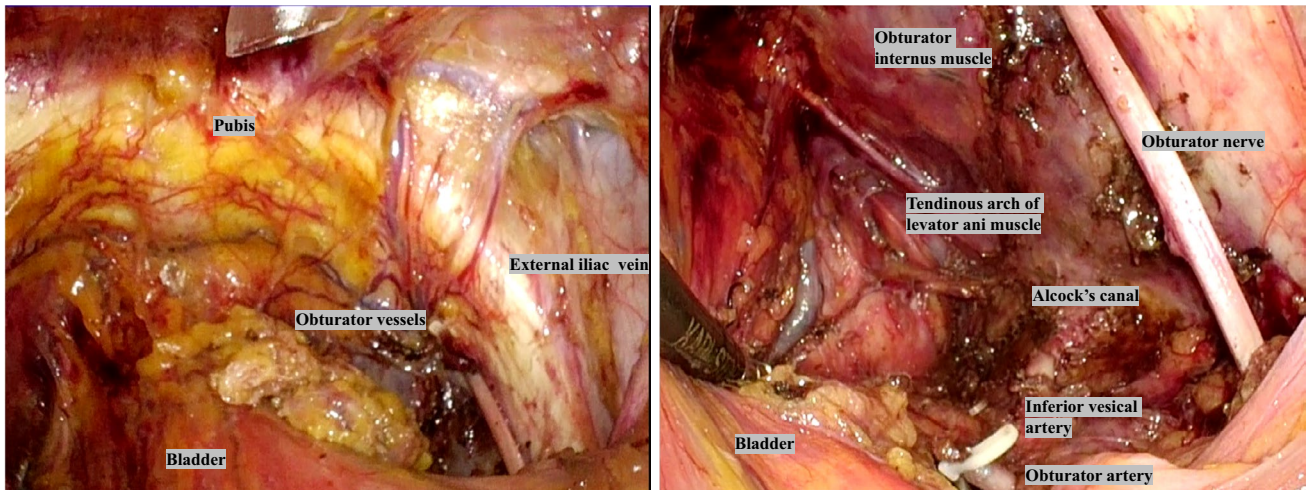
## Surgical technique

This procedure is based on totally extraperitoneal approach for inguinal hernia surgery. It begins with a small incision (about 15 mm) below the umbilicus. The incision of the anterior sheath of the rectus abdominis muscle is then made. Next, the rectus abdominis muscle is turned from the midline to the outside, and a 12-mm port is inserted in front of the posterior lamina of the rectus sheath. A camera is inserted through this port, and 5-mm ports are inserted in the midline between the umbilicus and the pubis. By peeling to the caudal direction in the dorsal layer of the rectus abdominis muscle, it reaches the extraperitoneal space, and 5-mm ports are inserted 1-cm superior to the median pubis (Fig. 1).

First, with the pubic bone and Cooper’s ligament as the landmarks, the external iliac vein is exposed. The obturator foramen is identified, and the obturator nerve is left intact if metastatic lymph nodes have not invaded the nerve, thereby preventing femoral adduction failure. The obturator vessels are removed in all cases. The lymph node dissection is performed along the obturator internus muscle at the outer edge and along the bladder at the inner edge. The distal side of the dissection line is at Alcock’s canal. The branches of the internal iliac artery are preserved as much as possible, but they are clipped and divided if necessary (superior vesical artery, inferior vesical artery, artery to the ductus deferens, or uterine artery). The branches of the internal iliac vein are treated similarly to the arteries. The dissected lymph node is placed in a bag and removed from the 12-mm port wound (Fig. 2). Then, the pneumoperitoneum was deflated,



**Fig. 1** **a** Port placement. **b** Approach to the extraperitoneal space. Peeling toward the caudal direction in the dorsal layer of the rectus abdominis muscle, the extraperitoneal space is reached



**Fig. 2** Laparoscopic view after lateral pelvic lymph node dissection

the puncture sites were sutured, and the operation was completed (as shown in Video).

## Results

A total of 10 patients underwent M TEP LLND during the study period (Table 1). The interval between initial surgery and M TEP LLND ranged from 6 to 62 months, with a median of 21.5 months. Preoperative chemotherapy was performed in one case. None of the patients received neoadjuvant radiotherapy before surgery, and none received postoperative chemotherapy or radiotherapy immediately after surgery. The perioperative data are summarized in Table 2.

There were two cases in which the lesions were bilateral; one of them could not be resected with M TEP LLND. In case 3, the metastatic lymph nodes were located on the dorsal side of the internal iliac artery and were firmly adherent, and could not be removed using this surgical method, so the procedure was converted to an intraperitoneal approach. The median operative time was 231 min, and estimated blood loss was 10 ml. Postoperative complications included wound infection in only one patient. In one case, there was no metastasis in the retrieved lymph nodes. Postoperative mid-to long-term outcomes (9 months to 5 years and 3 months after surgery) included one case with lateral lymph node recurrence, penile metastasis, and lung metastasis, one case with spinal metastasis, one case with liver metastasis and

**Table 1** Patients' characteristics (n = 10)

Case	Age (year)	Sex	BMI (kg/m <sup>2</sup> )	ASA	Primary operation	Histological type	Stage*	Pretreatment	Duration between primary surgery and salvage surgery (months)
1	69	Male	31.6	2	Lap. ISR	Mod	I	–	7
2	73	Female	21.5	2	Lap. LAR	wel	IIa	–	20
3	71	Male	24.0	2	Lap. ISR	wel	I	–	40
4	75	Male	23.4	2	Lap. ISR	NET G2	IV	–	35
5	37	Male	24.3	1	Lap. Total proctocolectomy	mod	IIa	–	6
6	56	Male	23.6	2	Lap. APR	wel	I	–	21
7	69	Male	23.3	2	Lap. LAR	mod	IIIb	Chemotherapy	62
8	76	Male	19.3	2	Lap. ISR	wel	I	–	22
9	64	Male	26.0	2	Lap. LAR	mod	I	–	32
10	70	Male	22.1	2	Lap. LAR	wel	IIIc	–	6

BMI, Body mass index; ASA, American Society of Anesthesiologists; Wel., well differentiated adenocarcinoma; Mod., moderately differentiated adenocarcinoma; NET, neuroendocrine tumor; Lap., laparoscopic; ISR, intersphincteric resection; LAR, low anterior resection

\*Stage is classified by UICC-8 staging

**Table 2** Operative results

Case	Location	Operation time (min)	Blood loss (ml)	Pathology (Rt/Lt)		Complication	Follow up	
				Retrieved lymph node	Positive lymph node		Duration (months)	Recurrence
1	Left-sided	231	10	7	1	–	62 (dead)	Lateral lymph node recurrence Penile metastasis Lung metastasis
2	Left-sided	243	10	9	1	–	63	–
3	Bilateral	321	50	7/9	1/1	–	40 (dead)	Spinal metastasis-
4	Right-sided	232	10	4	1	–	55	Liver metastasis Lung metastasis
5	Left-sided	174	10	5	1	–	38	Para-aortic lymph node metastasis Peritoneal dissemination
6	Right-sided	304	10	8	1	Wound infection	38	–
7	Right-sided	128	10	11	0	–	31	–
8	Bilateral	317	10	2/2/	1/1	–	28 months	–
9	Left-sided	220	10	5	1	–	27	–
10	Left-sided	148	5	8	2	–	9	–

lung metastasis, and one case with para-aortic lymph node metastasis and peritoneal dissemination. There was no recurrence or metastasis in the other six cases.

## Limitation

M TEP LLND is based on totally extraperitoneal approach for inguinal hernia surgery, so working space is limited and port placement is also limited. For these reasons, lymph node dissection on the central side is difficult, lymph nodes on the central side from the bifurcation of the internal and external iliac arteries cannot be dissected.

## Discussion

In Japan, LLND is commonly performed, and it has been reported that performing LLND can suppress local recurrence and increase the survival rate. Therefore, if there is no distant metastasis, a complete cure can be expected, and resection is considered in cases where it is possible. However, if radical surgery is difficult, such as when nerve invasion is suspected, radiation therapy is performed, and if the risk of distant metastasis is high, chemotherapy is performed [10–12]. The present study shows that laparoscopic LLND using an extraperitoneal approach is feasible. M TEP LLND was safely performed in 10 patients, and no serious complications occurred. Local recurrence was observed in the first patient, but there was no local recurrence in the other nine patients, and the procedure was oncologically acceptable.

This procedure is somewhat difficult for obese patients, as with other surgeries, but there is little difference in difficulty between male and female. M TEP LLND is indicated if the patient has not undergone LLND in the previous surgery. If LLND was performed in the previous surgery, the intraperitoneal approach is indicated. No patient was treated with an intraperitoneal approach within this study period in the same department.

Laparoscopic surgery provides a very detailed image and magnifying effect, resulting in great advantages for complicated surgery such as salvage LLND, which is done in a very deep narrow pelvic space. To the best of our knowledge, few studies have focused on salvage surgery for metachronous lateral pelvic lymph node metastases after rectal cancer surgery [6, 7]. Laparoscopic salvage LLND is more difficult due to adhesions of the small intestine and reconstructed colon into the pelvis from previous surgery. However, a totally extraperitoneal approach for laparoscopic LLND is unaffected by intraperitoneal adhesions, and since there is no peritoneal defect after LLND, intestinal obstruction does not occur. The extraperitoneal approach has been used as a repair procedure for inguinal hernias. We first reported this procedure, which we named M TEP LLND, in 2019; there are few reports of laparoscopic pelvic lymph node dissection via an extraperitoneal approach, so anatomical understanding is necessary to undertake this approach [8, 13]. Because M TEP LLND is performed in the extraperitoneal space, complications such as injury to the intestine or vascular structures due to adhesions can be reduced, and it is less invasive than the conventional intraperitoneal approach. M TEP LLND

appears to be particularly useful for metachronous lateral pelvic lymph node metastases. However, there are concerns that this procedure requires anatomical understanding and is technically difficult. Although we have performed this method in 10 cases so far, the number of cases is still small, and it is important to evaluate more cases and analyze the data in the future. There was only one case of local recurrence with M TEP LLND, and some cases were completely cured by performing this procedure; thus, it is considered effective as a local treatment.

Since patients with lateral pelvic lymph node metastases often develop other metastases, long-term outcomes are unwanted. Lateral lymph node metastasis itself is associated with a poor prognosis, and because the present study was small, there is no way to accurately describe long-term outcomes. However, if there is no distant metastasis, a complete cure can be expected; therefore, if possible, resection should be considered. Since doing so avoids chemotherapy and radiotherapy and has the advantage of improving quality of life.

## Conclusion

A laparoscopic extraperitoneal approach for lateral lymph node dissection (M TEP LLND) for patients with metachronous lateral pelvic lymph node metastases following surgery for rectal cancer is technically feasible and safe, with good short-term outcomes. Although this study is limited by its small size, and further research is needed to evaluate the long-term oncological outcomes of this technique, it is one of the techniques available, though it is still an experimental procedure.

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## Declarations

**Disclosures** Drs. Shinsuke Masubuchi, Junji Okuda, Hiroki Hamamoto, Hiroki Yokoyama, Maiko Sanford, Masaru Kawai, Hitoshi Inoue, Takashi Kinoshita, Michihiro Hayashi and Sang-Woong Lee have no conflicts of interest or financial ties to disclose.

**Ethical approval** All authors certify that they accept responsibility as an author and have contributed to the concept, data gathering, analysis, manuscript drafting, and give their final approval. This study was approved by the local ethics committee according to the specific requirements of the country.

**Informed consent** Informed consent was obtained from all participants and the data are available in institutional electronic repositories.

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