Original Article

Short-term Surgical Outcome of Pelvic Lymph Node Dissection for Rectal Cancer in a Single Institute

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Key Words
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Purpose. Colorectal tumor with distant metastasis has long been a critical issue in colon cancer treatment. The lymphatic drainage system is thought to be an important route to tumor cell metastasis or recurrence. The different principle between Western countries and the Japanese Society for Cancer of the Colon and Rectum (JSCCR) not only causes the different treatment strategy but also raises the question of whether or not pelvic lymph nodes dissection (PLND) should be performed. We present 19 patients who received pelvic lymph nodes dissection in a single institute and analysis the short-term surgical outcome and related complication.
Methods. We retrospectively collected the data of patients (n = 19) from a single medical center between the period of June 2018 to December 2019. Data was collected with regards to pre-treatment pelvic lymph node image, surgery time, blood loss during operation, pathological tumor staging, lymph node dissection amount, and complications from the surgery.
Results. There were 19 patients who received lateral pelvic lymph nodes dissection (PLND). Additionally, most of the patients (73.7%, n = 14) received neo-adjuvant concurrent chemoradiotherapy (nCCRT) or short course radiation therapy (SCRT). The median image size of the pre-treatment pelvic lymph node was 7 mm (2.8-22). The types of surgery performed included open abdominoperineal resection (15.8%, n = 3), laparoscopic low anterior resection (15.8%, n = 3), transanal total mesorectal excision (63.2%, n = 12), and only pelvic lymph nodes dissection (5.3%, n = 1). The median surgery time was 475 minutes (range 265-865 minutes). The average blood loss volume was 250 ml (150-600). The median number of lateral pelvic LN harvested was 5 lymph nodes (range 1-13) per pelvic side wall. Positive lateral pelvic LN metastasis was identified in 3 patients (15.8%), with the size being 17.7 mm (13.2-20.1 mm) in those positive pelvic lymph nodes metastasis. The median size of negative finding pelvic lymph nodes was 5.65 mm (2.8-11.2 mm). The median number of admission days was 11 (range 7-72 days). The median follow up period was 14 months (5-25). Major complications, included bladder injury (5.3%, n = 1), ureter leakage (10.5%, n = 2), lymphocele (15.8%, n = 3), lower leg edema (5.3%, n = 1), leg numbness (21.4%, n = 4), and pelvic abscess (5.3%, n = 1). There was no pelvic local recurrence found in the post-OP follow up (median follow up 14 months, range from 5-25 months).
Conclusions. It is safe and feasible to perform selective PLND in a patient diagnosed with rectum tumor, with pelvic lymph node enlargement found in the pre-treatment image study. Though this challenging technique may accompany with longer operation time, more blood loss and complications, PLND can providing a benefit in disease local control. Complication rates could be reduced through refined surgical skills.
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Colorectal tumor with distant metastasis has long been a critical issue in colon cancer treatment. The lymphatic drainage system is thought to be an important route to tumor cell metastasis or recurrence. In rectal cancers, the rate of pelvic lymph node (PLN) involvement has been reported at 10 to 25%.[1-6] The local recurrence rate has also been reported as 6.6%-8.7% in a pelvic lymph node positive patient group who received neo-adjuvant concurrent chemoradiotherapy (nCCRT) followed by total mesorectal excision (TME).[7,8]

As to lymphatic drainage, the mid/lower rectum follows two different pathways according to human anatomy. The lymphatic system flows superiorly towards the superior rectal artery along the inferior mesenteric artery and para-aortic lymph nodes. Inferiorly, the lymphatic flows through the middle and lower rectal arteries and drains to the obturator, internal iliac, external iliac and common iliac lymph nodes.[9] In these pelvic drainage regions, lymph node involvement is commonly found in the internal pudendal artery region, the internaliliac artery and obturator region. This region is also known as the "vulnerable field" in lower rectal cancers.[10] The Japanese Society for Cancer of the Colon and Rectum (JSCCR) has shown that the prognosis of low rectal cancer with lateral pelvic nodes involvement is similar to N2a/N2b mesorectal lymph nodes.[11,13]

This caused the treating principle regarding lateral pelvic lymph node of low rectal cancers to be different between Western countries and Japan. In Western countries, lateral pelvic lymph node metastasis is generally considered as a metastatic disease,[12] whereas lateral pelvic lymph node metastasis is considered as regional lymph nodes in Japan.[13]

In this study, we present 19 patients who received pelvic lymph nodes dissection in a single institute and analysis the short-term surgical outcome and related complication.

Material and Method

We retrospectively collected the data of patients in Taichung Veterans General Hospital between the period of June 2018 to December 2019. The inclusion criteria were i) Patient diagnosed with rectum cancer who received the laparoscopic method with a radiological positive finding of PLN. Radiological positive pelvic lymph nodes were defined as lymph nodes larger than 7 mm in the long axis or with abnormal morphology on imaging studies. ii) Patient diagnosed with rectum cancer who received the laparoscopic method without a radiological positive finding of PLN (< 7 mm). iii) Strong image evidence (computer tomography/positron emission tomography) of PLN recurrence during the post-OP follow up period. In our study, we routinely performed MRI and PET scans prior to surgery as a pre-operation clinic-radiologically tumor stage. If patients did not received pre-operative MRI, pre-operative CT and/or PET scan will performed instead.

We excluded patients having double cancer, poor ECOG status, and severe co-morbidities such as heart failure, ESRD, and respiratory failure.

Radiation therapy

There were two types of radiation therapy performed after each patient had discussed with the radiation oncologist. The nCCRT group received between 40-50 Gy in 25# for 5 weeks, along with oral 5-FU chemotherapy. Surgery was performed 4-6 weeks after completion of the nCCRT treatment course. The SCRT patient group received 25 Gy in 5# for 5 days, with oral capecitabine treatment and underwent surgery right after completion of radiation therapy. For some stage 4 patients (n = 4), FOLFOX was applied during the radiation therapy course. Those patients suspected of LPN recurrence didn't receive radiation therapy prior to surgery.

Surgical procedures for PLN dissection

The pelvic lymph node dissection was performed as outlined below. After completing tumor resection and complete reconstruction through anastomosis, the ureter was isolated and pulled with a vessel loop. After exposing the external iliac artery and vein, dissection was performed along the iliopsoas and internal obturator muscles. The obturator nerve was identified

and preserved, as well as the internal iliac artery. When bilateral dissection of the PLNs was required, the bilateral superior and inferior vesical arteries were preserved so as to ensure blood flow to the bladder. The internal iliac vein and inferior vesical vein were then exposed and divided. The sacral plexus was exposed as the dorsal landmark of the PLN dissection, and the distal side of the internal iliac artery (internal pudendal artery) was divided at the level of the pudendal canal. The inferior vesical artery and vein were divided at their entrance into the bladder. The lymph node tissue was en bloc removed.[14]

The primary end-point of this study was to analyze the result of the operation, with the second endpoint being analysis of any short-term complications.

Statistical analysis

Descriptive analyses were performed for all variables at baseline. The relationships between each of the variables and PLND were analyzed using the Mann-Whitney U test.

Results

Patient characteristics

Table 1 summarizes the characteristics of the patients. Male (78.9%, n = 15) prevalence was higher than female (21.1%, n = 4). The median age was 59 years (IQR [interquartile range], 51-71 years). The median distance of tumor location was 6 cm (1-8) from the anal verge. In 47.4% (n = 9) of the patients the tumor was located more than 5 cm from the anal verge, and in 31.6% (n = 6) was located within 5 cm from the anal verge. The clinical stage was based upon an image study finding, with 12 (63.2%) patients categorized as clinical stage III, and 7 (36.8%) patients experiencing distance metastasis when upon diagnosis. There were 9 patients (47.4%) who received nCCRT, and 5 patients (26.3%) who received SCRT.

There were 15 patients (78.9%, 15/19) receive MRI before operation, and 12 patients (80%, 12/15) has positive finding of pelvic lymph nodes on the image study. The median image size of the pre-treatment pelvic lymph node was 5.9 mm (2.8-20.1). There were 9 patients (47.4/%) with a pre-treatment image lymph node finding ≥ 7 mm, and 10 patients (52.6%) with a finding < 7 mm.

Surgery profile

There were 19 patients in total who received pelvic lymph node dissection (PLND). The types of surgery perform (Table 2) included open abdominoperineal resection (15.8%, n = 3), laparoscopic low anterior resection (15.8%, n = 3), transanal total meso-

Table 1. Characteristics of the patients

Characteristics of the patients (n = 19)	
Gender	
Female	4 (21.1%)
Male	15 (78.9%)
Age	59 (51.0-71.0)
Median distance of tumor location (cm)	6 (1-8)
< 5 cm FAV	6 (31.6%)
≥ 5 cm FAV	11 (57.9%)
Clinical T stage	
cT2	3 (15.8%)
cT3	13 (68.4%)
cT4	3 (15.8%)
Clinical N stage	
cN1	10 (52.6%)
cN2	9 (47.4%)
Clinical M stage	
cM0	12 (63.2%)
cM1	7 (36.8%)
Clinical stage	
Stage III	12 (63.2%)
Stage IV	7 (36.8%)
Pr-OP radiation therapy	
Nil	5 (26.3%)
SCRT	5 (26.3%)
CCRT	9 (47.4%)
Plevis PET scan	
Positive (Grade 3, Grade 4)	5 (26.3%)
Equivocal (Grade 2)	7 (36.8%)
Negative (Grade 0, Grade 1)	3 (15.8%)
N/A	4 (21.1%)
Median size of LN (mm)	7 (2.8-22)
≥ 7 mm	9 (47.4%)
< 7 mm	10 (52.6%)

FAV, from anal verge; SCRT, short course radiation therapy; CCRT, concurrent chemoradiotherapy.

Table 2. Operation profile

Operation profile	
Operation method	
Open APR	3 (15.8%)
Laparoscopic LAR	3 (15.8%)
TaTME	12 (63.2%)
Lymphnectomy	1 (5.3%)
Median operation time	475 mins (420.0-535.0)
Median blood loss volume	250 ml (150.0-600.0)
PLND method	
Conventional	4 (21.1%)
Laparoscopic	15 (78.9%)
Diverting stoma	
Colostomy before	4 (21.4%)
Simultaneous ileostomy	9 (47.4%)
End colostomy	4 (21.1%)

APR, abdominoperineal resection; LAR, low anterior resection; TaTME, transanal total mesorectal excision.

rectal excision (63.2%, n = 12), and only pelvic lymph nodes dissection (5.3%, n = 1). Only one patient received lateral pelvic lymph node dissection in an open method due to robust image evidence of tumor/lymph node recurrence after undergoing a laparoscopic anterior resection. The median operation time was 475 minutes (range 265-865 minutes). The average blood loss volume was 250 ml (150-600). A diverting ileostomy was performed together during the surgery (47.4%, n = 9), a diverting loop colostomy due to obstruction (21.1%, n = 4), and patients with an end colostomy who received an abdominoperineal resection or Hartmann's procedure (21.1%, n = 4).

Results and pathological findings

Table 3 demonstrates the result of PLND. Positive lateral pelvic lymph nodes metastasis was identified in 3 patients (15.8%). The median number of lateral pelvic lymph nodes harvested per side was 5 lymph nodes (range 1-13) per pelvic side wall. In these patients, there was no perirectal lymph nodes metastasis nor lateral pelvic lymph nodes metastasis (26.3%, n = 5). Perirectal lymph nodes metastasis without lateral pelvic lymph nodes metastasis had occurred (42.1%, n = 8), while positive lateral pelvic lymph nodes metastasis was identified in 3 patients (15.8%).

The pathology diagnosis of these patients was as follows: stage 0-I (21.1%, n = 4), stage II (10.5%, n = 2), stage III (42.1%, n = 8), and stage IV (26.3%, n = 5). Regarding the pelvic lymph nodes we harvested, the median size (long axis) found during the pre-nCCRT image study was 17.7 mm (13.2-20.1 mm) in those positive pelvic lymph nodes metastasis, with the median size of those negative finding pelvic lymph nodes being 5.65 mm (2.8-11.2 mm) (Table 3-1). Pathological complete response (CR) was achieved in 2 patients, with near complete response occurring (21.1%, n = 4), partial response (31.6%, n = 6), and poor/no response (15.8%, n = 3). All the patients' histology grading were grade 2, moderated differentiated. The circumferential resection margin (CRM) was free from tumor in 13 patients (68.4%), while 3 patients' (15.8%)

Table 3. Result of PLND

Result of PLND	
Median number of LN harvested per side	5 (3-13)
Pathological finding	
ypT0-T1	4 (21.1%)
ypT2	4 (21.1%)
ypT3	8 (42.1%)
ypT4	3 (15.8%)
ypN0	6 (31.6%)
ypN1a	5 (26.3%)
ypN1b	4 (21.1%)
ypN2	4 (21.1%)
Pathological PLN metastasis	3 (15.8%)
Pathological 1TMN stage	
Stage 0-I	4 (21.1%)
Stage II	2 (10.5%)
Stage III	8 (42.1%)
Stage IV	5 (26.3%)
Histological grading	
Grade I	0
Grade II	19 (100%)
Grade III	0
Tumor regression grade	
Complete response, score 0	2 (10.5%)
Near complete response, score 1	4 (21.1%)
Partial response, score 2	6 (31.6%)
Poor or no response, score 3	3 (15.8%)
N/A	4 (21.1%)
Circumferential resection margin	
Free	13 (68.4%)
Involved	3 (15.8%)
N/A	3 (15.8%)

PLND, pelvic lymph node dissection.

Table 3-1. Pathological result of PLND (N = 18)

	Negative finding of PLND (n = 15)	Positive finding of PLND (n = 3)	Total (n = 18)	*p* value
Median LN size	5.65 (2.8-11.2)	17.7 (13.2-20.1)	5.9 (2.8-20.1)	0.028*
Mean ± SD	6.14 ± 2.27	17 ± 3.5	7.44 ± 4.30	

Mann-Whitney U test, Median (IQR). * $p < 0.05$, ** $p < 0.01$.

circumferential resection margin was involved.

Post-operative outcomes

The median number of admission days was 11 (range 7-72 days) (Table 4). The median follow up of period was 14 months (5-25). Major complications were define as grade 3 according to the Clavien-Dindo classification. Post operation complications included ureter leakage (10.5%, n = 2), lymphocele (15.8%, n = 3), lower leg edema (5.3%, n = 1), leg numbness (21.4%, n = 4), and pelvic abscess (5.3%, n = 1). There was no pelvic local recurrence found in the post-operation follow up.

Table 4. Post operative outcome

Post operative outcome	
Admission day	11 (9-13)
Median follow up (month)	14 (5-25)
Type of complication	
Ureter injury	2 (10.5%)
Lymphocele	3 (15.8%)
Leg edema	1 (5.3%)
Leg numbness	4 (21.4%)
Pelvic abscess	1 (5.3%)
Bladder injury	1 (5.3%)

Discussion

As a concept of total mesorectal excision (TME) introduced in 1990. It has successfully reduced local recurrence and improved survival rate in rectal cancer patients. With the incorporation of neoadjuvant therapy, the prognosis has improved with a 5-year overall survival rate in excess of 60%.[15,16] However, it has been reported that the rate of lateral pelvic lymph node metastasis is 10 to 25%. The effort of multimodal treatments has lowered the rate of local recurrence but has still not achieved a satisfactory result.

In a series of 366 patients who received nCCRT followed by TME for T3/N+ rectal cancer, local recurrence of pelvic tumor still occurred in 8% of the patients.[8] Kusters et al. also reported on patients who had lateral nodes larger than 1 cm despite having received radiotherapy, with the lateral local recurrence rate still reaching up to 33.3%.[17] These studies have implied that there were still inefficiencies with CCRT in avoiding lateral pelvic metastasis in locally advanced rectum cancer.

In those patients with locally advanced low rectal cancer, there was still 7% lateral pelvic local recurrence for the TME-only group, a large portion of whom could possibly have been treated with pre-op CRT as reported by the JOCG 0212.[18] This then, raises the issue of how to determine LPLN and selecting those patients for PLND. There is still no consensus regarding the cut off size for suspicious PLN on a preoperative image. It ranges from 5 to 10 mm in the short axis, morphological of irregularities and signal intensity between various studies.[19,20] A short-axis cut-off value of 7 mm prior to neo-adjuvant chemotherapy was used to predict lymph node metastasis.[19] A small trial conducted by Ishihara S et al. involved 18 rectal cancer patients with enlarged (≥ 8 mm) PLNs who were treated with nCCRT followed by TME with LPN dissection and showed that a PET scan after nCCRT can predict the presence of metastatic LPN with a high degree of accuracy (92.9%) when PLNs were ≥ 12 mm in size and/or had standard uptake values (SUV) ≥ 1.6.[21]

Most patients in our study were selected based upon the positive finding of a pre-nCCRT image. We claimed 7 mm of the lymph node as the cut off value. However, due to heterogeneous pre-operative work up between different surgeons and the limitations of Taiwan's National Health Insurance regulations, patients in our study did not receive a follow-up PET scan or MRI after receiving the nCCRT treatment

course prior to surgery. The PET scan can detect possible metastatic lesions and provide surgeons with the ability to notice any undetected sites found in an MRI,[21] but it can also cause a false positive detection in the pre-operative surgical plan. In our study, the positive (Grade 3, Grade 4) pelvic PET scan result was found in 26.3% of the patients (n = 5). Amongst these five patients, metastatic pelvic lymph node involvement was detected in two of the them.

In our study, a positive pelvic lymph node size was found to be bigger in the pre-treatment image (13.2 mm, 17.7 mm, and 20.1 mm) (Table 3-1) than in the negative pelvic lymph nodes.

Although a short axis 5 mm or larger on MRI was considered as the criterion for diagnosing lateral lymph node metastasis in patients with rectal carcinoma,[22] but the size of is not the only factor for predict, the specifically the margin (spiculated, indistinct) and signal intensity (mottled or heterogeneous), may affect the sensitivity and specificity. In order to identify more pelvic lymph nodes during the surgery, we chose long axis as the selection criteria.

Akasu et al.[23] evaluated the accuracy of an MRI in pre-operative staging and found it to be highly predictive of lateral pelvic node involvement. They found that size criteria were the most accurate in diagnosing metastatic lymph nodes, and this concurs with our findings as well in that a large PLN is associated with a higher rate of positive lymph node involvement.

According to Ogura A, et al. approximately about 29.2% of the PLND can be saved in those patients with shrinkage of the lateral nodes from a short axis node size of 7 mm or greater on a primary MRI to a node size of 4 mm or less on restaging MRI.[24] Based upon the study conducted by Ogura A, et al., we are looking forward to analyzing our patients follow-up data and in turn modified our pre-operative workup.

In our study, the median number of pelvic lymph nodes we harvested was 5 lymph nodes per pelvic side (range from 3-13), with positive lateral pelvic lymph nodes metastasis being identified in 3 of the patients (15.8%). Literature review of the number of pelvic lymph nodes harvested indicated approximately 10-27 lymph nodes per pelvic side, with the positive rate of pelvic lymph nodes being around 21.1%-65.8%.[14,21,25,26] This result may be contributed to lymph node shrinkage after nCCRT/SCRT. Since we did not perform a post-nCCRT/SCRT image study, we could not accurately evaluate the response of the pelvic lymph nodes after the nCCRT which may have reduced the number of pelvic lymph nodes we harvested. More aggressive lymph nodes dissection and adipose tissue removal may increase the number of pelvic lymph nodes harvested, but it would also increase the risk of vessel and nerve injury, causing post-operative complications. The surgical risk of PLND and greater numbers of pelvic lymph nodes harvested should be taken into consideration.

A longer operating time, more blood loss, and post-operative morbidity such as urinary dysfunction and lymphocele are the major concerns in a routine PLND performance. A meta-analysis disclosed that operating time was significantly greater in the PLND group by 76 minutes, which is also associated with increased urinary and sexual dysfunction.[27] Similarly, in a multi-center randomized controlled non-inferiority JCOG0212 trial, there was a slightly longer operating time and more blood loss in the TME plus PLND group. There was no significant difference in post-operative complications, anastomotic leak or urinary dysfunction.[28]

According to a pilot study conducted by Yuki Aisu et al. there was an average operating time of 626 minutes (537-892), and blood loss volume of 101 ml (5-890).[14] The average operating time in our study was 475 minutes, about 60 minutes more than the patients who had received TaTME only, as compared to our surgeons' routine practice. In our study, more blood loss was found amongst those patients experienced post-OP complications. Accidental injury of arteries (external iliac artery injury, n = 1, and inferior vesical arteries injury, n = 1) was found in two patients (10.5%), therefore causing more blood loss and longer operation time. Much more blood loss may be due to either locally advanced tumor invasion, too aggressive lymph node and adipose tissue dissection, or surgical skill immaturity. Using a rubber vessel loop to identify and protect the vessel, we diminished blood loss in the remainder of the patients.

Ureter injury was observed in 2 of the 19 (10.5%)

patients, and they received ureter double-J insertion after the TaTME+PLND surgery. One of these two patients received open APR due to advanced tumor invasion, as well as ureter repair during the operation. These kinds of complications may contribute to locally advanced tumor invasion. Pre-operation ureter double-J insertion may provide better anatomical recognition and ureter protection, so that ureter injury can be avoided.

Lymphocele (15.8%, n = 3) was found through the post-operation follow up CT study, and no significant symptoms were complained of by the patients. We modified our surgical technique by securing a large lymphatic channel with clips rather than using only electricoautery. The complications of lower leg edema (5.3%, n = 1), and leg numbness (21.4%, n = 4) maybe due to the nerve being stretched during the PLND. After we adjusted the surgical maneuver by looping the nerve using a rubber vessel loop and avoiding aggressive adipose tissue dissection, no additional patients encountered leg numbness in the subsequent cases. There was no urinary dysfunction requiring a delayed urinary catheter removal or long-term urinary catheter indwelling. This was our preliminary attempt at developing PLND, and further surgical techniques will be refined.

Achieving a lower local recurrent rate has long been a serious issue regarding disease control, and lymph node metastasis is thought to be a poor prognostic factor.[7,8,13,16] Though having different treatment principles, studies performed in both the west and east have all concluded that a lymph node size greater than 10 mm in short axis in pre-treatment imaging represents a higher risk of PLN recurrence rate after nCCRT.[17,27] Akiyoshi et al. illustrated in those patients with lateral pelvic lymph nodes seen on pre-treatment image, that the local recurrence rate was 3.4% (3/89) in the TME only group, and zero (0%, 0/38) in the TME+PLND group.[26] Although the median follow up period remained relative short (14 months, range 5-25 months) in our study, there was no pelvic local recurrence found in the post-operation follow up.

There is still debate as to whether lateral pelvic lymph node metastasis is of regional involvement or is of a systemic metastasis status. But certainly pelvic lymph nodes act as a poor prognostic factor and are associated with a high local recurrence and decreased survival rate. The larger nodal size found in the pre-treatment image study offers a higher prediction rate for pelvic lateral lymph node metastasis. But the cut-off value should be well determined after more evidence is revealed. Re-stage imaging after nCCRT will increase the accuracy of predicting pelvic lateral lymph node metastasis. In our study, we found that the complications in patients who received PLND were acceptable. Additionally, the larger the size of the pelvic lymph nodes found in the pre-treatment image, the higher the possibility of that the pelvic lymph nodes were found to be involved. PLND can be performed as a safe and feasible technique providing a benefit in local control or even survival outcome.

The main limitation of our study was our small sample size using only a single center's data, and that a longer follow-up is necessary in order to evaluate the actual rates of local recurrence, and disease-free survival.

Conclusion

It is safe and feasible to perform selective PLND in a patient diagnosed with rectum tumor, with pelvic lymph node enlargement found in the pre-treatment image study. Though this challenging technique may accompany with longer operation time, more blood loss and complications, PLND can providing a benefit in disease local control. Complication rates could be reduced through refined surgical skills.

Conflict of Interest Statement

The authors declare no conflicts of interest in the study.

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References

1. Takahashi T, Ueno M, Azekura K, Ohta H. Lateral node dissection and total mesorectal excision for rectal cancer. *Dis Colon Rectum* 2000;43:59-68.
2. Ueno M, Oya M, Azekura K, Yamaquchi 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.
3. Hojo K, Koyama Y, Moriya Y. Lymphatic spread and its prognostic value in patients with rectal cancer. *Am J Surg* 1982;144:350-4.
4. Sugihara K, Kobayashi H, Kato T, Mori T, Mochizuki H, et al. Indication and benefit of pelvic sidewall dissection for rectal cancer. *Dis Colon Rectum* 2006;49:1663-72.
5. Wu ZY, Wan J, Li JH, Zhao G, Yao Y, et al. Prognostic value of lateral lymph node metastasis for advanced low rectal cancer. *World J Gastroenterol* 2007;13:6048-52.
6. Min BS, Kim JS, Kim NK. Extended lymph node dissection for rectal cancer with radiologically diagnosed extramesenteric lymph node metastasis. *Ann Surg Oncol* 2009;16:3271-8.
7. Van Lingen CP, Zeebregts CJ, Gerritsen JJ, Mulder HJ, Mastboom WJ, et al. Local recurrence of rectal cancer after total mesorectal excision without preoperative radiotherapy. *Int J Gastrointest Cancer* 2003;34:129-34.
8. Kim TH, Jeong SY, Choi DH, Kim DY, Jung KH, et al. Lateral lymph node metastasis is a major cause of locoregional recurrence in rectal cancer treated with preoperative chemoradiotherapy and curative resection. *Ann Surg Oncol* 2008;15:729-37.
9. Bell S, Sasaki J, Sinclair G, Chapuis PH, Bokey EL. Understanding the anatomy of lymphatic drainage and the use of blue-dye mapping to determine the extent of lymph adenectomy in rectal cancer surgery: unresolved issues. *Colorectal Dis* 2009;11:443-9.
10. Canessa C, Miegge L, Bado J, Silveri C, Labendara D, et al. Anatomic study of lateral pelvic lymph nodes: implications in the treatment of rectal cancer. *Dis Colon Rectum* 2004;47: 297-303.
11. Akiyoshi T, Watanabe T, Miyata S, Kotake K, Muto T, et al. Results of a Japanese nationwide multi-institutional study on lateral pelvic lymph node metastasis in low rectal cancer: is it regional or distant disease? *Ann Surg* 2012;255:1129-34.
12. Benson AB, Venook AP, Al-Hawary MM, et al. Rectal cancer, version 2.2018, NCCN clinical practice guidelines in oncology. *J Natl Compr Canc Netw* 2018;16(7):874-901. doi: 10.6004/jnccn.2018.0061.
13. Hashiguchi Y, Muro K, Saito Y, et al. Japanese Society for Cancer of the Colon and Rectum (JSCCR) guidelines 2019 for the treatment of colorectal cancer. *Int J Clin Oncol* 2020; 25:1. https://doi.org/10.1007/s10147-019-01485-z
14. Aisu Y, Kato S, Kadokawa Y, et al. Feasibility of extended dissection of lateral pelvic lymph nodes during laparoscopic total mesorectal excision in patients with locally advanced lower rectal cancer: a single-center pilot study after neoadjuvant chemotherapy. *Med Sci Monit* 2018;24:3966-77. Published 2018 Jun 11. doi: 10.12659/MSM.909163.
15. Martin ST, Heneghan HM, Winter DC. Systematic review of outcomes after intersphincteric resection for low rectal cancer. *Br J Surg* 2012;99:60312.
16. Sauer R, Becker H, Hohenberger W, Rödel C, Wittekind C, et al. Preoperative versus postoperative chemoradiotherapy for rectal cancer. *N Engl J Med* 2004;17:1731-40.
17. Kusters M, Slater A, Muirhead R, et al. What to do with lateral nodal disease in low locally advanced rectal cancer? A call for further reflection and research. *Dis Colon Rectum* 2017;60:577-85.
18. Fujita S, Akasu T, Mizusawa J, Saito N, Kinugasa Y, 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, randomized controlled, non-inferiority trial. *Lancet Oncol* 13:616-21.
19. Sekido Y, Nishimura J, Fujino S, et al. Predicting lateral pelvic lymph node metastasis based on magnetic resonance imaging before and after neoadjuvant chemotherapy for patients with locally advanced lower rectal cancer. *Surg Today* 2020; 50(3):292-7. doi: 10.1007/s00595-019-01886-7
20. Atef Y, Koedam TW, van Oostendorp SE, et al. Lateral pelvic lymph node metastases in rectal cancer: a systematic review. *World J Surg* 2019;43:3198-206.
21. Ishihara S, Kawai K, Tanaka T, et al. Diagnostic value of FDG-PET/CT for lateral pelvic lymph node metastasis in rectal cancer treated with preoperative chemoradiotherapy. *Tech Coloproctol* 2018;22:347-54.
22. Matsuoka H, Nakamura A, Masaki T, et al. Optimal diagnostic criteria for lateral pelvic lymph node metastasis in rectal carcinoma. *Anticancer Res* 2007;27(5B):3529-33.
23. Akasu T, Sugihara K, Moriya Y. Male urinary and sexual functions after mesorectal excision alone or incombination with extended lateral pelvic lymph node dissection for rectal cancer. *Ann Surg Oncol* 2009;16:2779-86.
24. Ogura A, Konishi T, Beets GL, et al. Lateral nodal features on restaging magnetic resonance imaging associated with lateral local recurrence in low rectal cancer after neoadjuvant chemoradiotherapy or radiotherapy. *JAMA Surg* 2019;154(9): e192172. doi: 10.1001/jamasurg.2019.2172
25. Wong KY, Tan AMN. Short term outcomes of minimally invasive selective lateral pelvic lymph node dissection for low rectal cancer. *World J Gastrointest Surg* 2020; 12(4):178-89.
26. Akiyoshi T, Ueno M, Matsueda K, Konishi T, Fujimoto 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.
27. Georgiou P, Tan E, Gouvas N, Antoniou A, Brown G, et al. Extended lymphadenectomy versus conventional surgery for

rectal cancer: a meta-analysis. *Lancet Oncol* 2009;10:1053-62.

28. Fujita S, Mizusawa J, Kanemitsu Y, Ito M, Kinugasa Y, Komori K, Ohue M, Ota M, kazai Y, Shiozawa M, Yamaguchi T, Bandou H, Katsumata K, Murata K, Akagi Y, Takiguchi N, Saida Y, Nakamura K, Fukuda H, Akasu T, Moriya Y; Colorectal Cancer Study Group of Japan Clinical Oncology Group. Mesorectal excision with or without lateral lymph node dissection for clinical stage II/III lower rectal cancer (JCOG0212): a multicenter, randomized controlled, noninferiority trial. *Ann Surg* 2017;266:201-7.
29. Kim MJ, Kim TH, Kim DY, et al. Can chemoradiation allow for omission of lateral pelvic node dissection for locally advanced rectal cancer? *J Surg Oncol* 2015;111:459-64.

原　著

直腸癌手術合併骨盆腔淋巴結清除術在單一醫學中心之手術短期結果

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目的　大腸直腸癌遠端轉移向來是治療上的一大挑戰，其中淋巴迴流系統常是造成遠端轉移或者復發的重要途徑。以歐美為首的國家認為骨盆腔的淋巴侵犯應該視為遠端轉移的第四期疾病來治療，但日本大腸直腸癌症醫學社群則提出研究報告指出骨盆腔淋巴侵犯的預後與 N2a/N2b 相近。以致學界目前對是否需要進行骨盆腔淋巴結清除術仍然沒有共識。

方法　我們蒐集了台中榮民總醫院 2018 年 6 月至 2019 年 12 月中接受直腸癌切除手術合併淋巴結清除術的病人共 19 位。資料來源根據病歷紀載，蒐集了關於術前淋巴結影像大小，手術時間，出血量，病理分期報告，淋巴結清除數量，以及手術併發症等資料進行分析。

結果　總共 19 位病人接受骨盆腔淋巴結清除術，其中 14 名 (73.7%) 病患在術前接受了合併化學藥物及放射線治療 (含短期放射線治療)。術前淋巴中位數大小為 7 mm (2.8-22)。直腸腫瘤手術切除方式包括經腹部會陰切除術 (15.8%, n = 3)，腹腔鏡前低位切除手術 (15.8%, n = 3)，經肛門直腸全繫膜切除手術 (63.2%, n = 12)，以及單純骨盆腔淋巴清除術 (5.3%, n = 1)。手術時間中位數為 475 分鐘 (265-865 分鐘)。平均出血量為 250 毫升 (150-600 毫升)。每側邊淋巴清除中位數為 5 顆 (1-13). 共有 3 名 (15.8%) 病人的病理診斷確定骨盆腔淋巴結侵犯。骨盆腔淋巴結侵犯的淋巴結大小為 17.7 mm (13.2-20.1 mm)，對比沒有被侵犯的淋巴結大小為 5.65 mm (2.8-11.2 mm)。中位住院天數為 11 天 (7-72 天)。追蹤中位數為 14 個月 (5-25 月)。骨盆腔淋巴清除術後的主要併發症有膀胱損傷 (5.3%, n = 1)，輸尿管滲漏 (10.5%, n = 2)，淋巴囊腫 (15.8%, n = 3)，下肢水腫 (5.3%, n = 1)，下肢感覺異常 (21.4%, n = 4)以及骨盆腔膿瘍 (5.3%, n = 1)。病人術後追蹤至今沒有發現骨盆腔復發。

結論　對於術前發現有骨盆腔淋巴腫大的直腸癌患者，直腸腫瘤切除合併骨盆腔淋巴清除術是一項安全且可行的手術。淋巴結的大小可能可以用來增進淋巴結侵犯的準確度。藉由更細緻的手術技巧，手術併發症發生率應可以再下降。我們會繼續追蹤病人是否復發以及更長的追蹤時間來評估骨盆腔淋巴結清除手術的長期結果。

關鍵詞　大腸直腸癌、局部復發、骨盆腔淋巴結清除術、手術併發症。