





6 L4-L5 L5-S1 가  
 , 4  
 , 1  
 가 L4-L5 , 1  
 T4 2 ~  
 5 cm  
 L5-S1 L5  
 23 (70%)  
 2.  
 (Abdominoperineal resection; APR)  
 1  
 1 cm 가 10  
 (30.3%), 1.5 ~ 3 cm 가 22  
 (66.7%) (Low anterior  
 resection; LAR) (obturator foramen)  
 가 13 (39.4%), 가  
 가 13 (39.4%), 가  
 (15.2%), 가 5  
 가 1 (3.0%),  
 가 1 (3.0%)  
 (2 ~ 3 cm)  
 13 가  
 가  
 N- 가  
 가 14 (42.4%), N- 가  
 10 (30.3%), N- 가  
 9 (27.3%) 가 27 (82%), 6  
 가 18%

Table 2. Considering Factors for Determining Anterior Margin of Radiation Fields

| Factors for anterior margin     | Number | (%)   |
|---------------------------------|--------|-------|
| Bony landmarks                  |        |       |
| Symphysis pubis posterior tip   | 15     | (45)  |
| Symphysis pubis mid             | 2      | (6)   |
| Symphysis pubis anterior tip    | -      | -     |
| L-spine anterior surface+margin | 2      | (6)   |
| Tumor extent                    |        |       |
| Tumor anterior extent+margin    | 13     | (39)  |
| No reply                        | 1      | (3)   |
| Total                           | 33     | (100) |

3. ( 1)  
 10  
 (30%), 22 (67%)  
 CT- (sacral canal)  
 4. ( 1)(Table 2)  
 (symphysis pubis) 15 (45%) 가  
 , 13 1/2  
 50%가  
 5. (external iliac node)  
 가 32 (97%)  
 (hypogastric node)  
 가 27 (82%), 6  
 가 18%

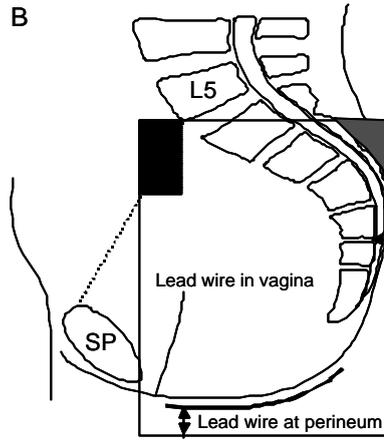
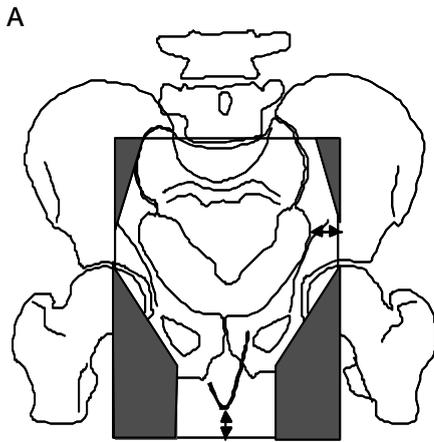


Fig. 1. Radiation fields after an abdominopelvic resection (APR). Superior margin, L5 low, mid, or upper SI joint: Inferior margin, about 2~3cm below perineal scar: Anterior margin, posterior tip of symphysis pubis: Posterior margin, some distance from Ant/Post surface of sacrum: Lateral margin, 1.5~2cm lateral to pelvic brim.

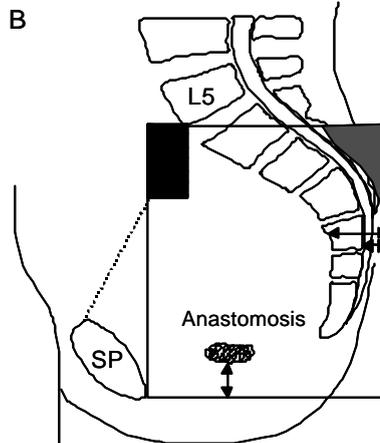
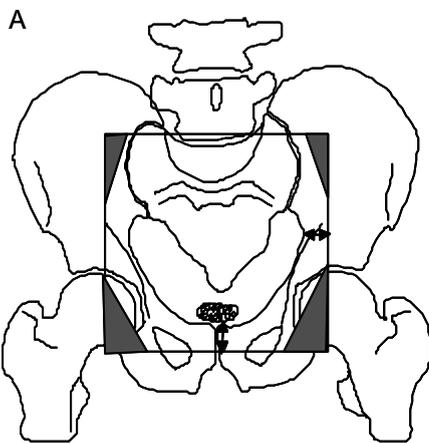


Fig. 2. Radiation fields after a low anterior resection (LAR). Superior margin, L5 low, mid, or upper SI joint: Inferior margin, about 2~3 cm below anastomosis: Anterior margin, posterior tip of symphysis pubis: Posterior margin, some distance from Ant/Post surface of sacrum: Lateral margin, 1.5~2 cm lateral to pelvic brim.

가

1.

6~8)

L5-S1

가

가 가

가

(Fig. 1B, 2B).

가

(pelvic inlet line)

가 가 (serosa)

가

가

가

가

9)

가

L5-S1



5

3.

가

가

가

1.5 cm

<sup>3)</sup>

4,10)

가

2.

1)

가

2 cm  
<sup>2)</sup> 2 cm  
2 cm

가  
(Fig. 1B, 2B).

가

4.

(Fig. 2).<sup>11-18)</sup> <sup>20)</sup>

72

2 cm 3 cm

가

2)

(anal canal)

가

가

가

가 가

(Fig.

1).

가 가

10 :

<sup>3)</sup> 가

가

가

(Fig. 1B,

가

2B).

가 , , , ,

. Sanfilippo

T4 가 45

<sup>19)</sup>

<sup>21)</sup>

307

6

6.

T4

(Fig. 1B, 2B).

(29 , 97%)

(anal canal)

가

(hypogastric node)

가

<sup>3,10)</sup>

가

1 ~

2 cm 가

(Tepper, personal communication)(Fig. 1, 2).

2 ~ 3 cm,

가

5. (antero-superior/  
inferior block)

(antero-superior/  
inferior block)

가

1.5 cm,

1.5 cm

1. Martenson JA, Gunderson LL. Colon and Rectum. In: Perez CA, Brady LW, eds. Principles and Practice of Radiation Oncology. 3rd ed. Philadelphia PA: Lippincott Williams & Wilkins. 1997:1495-1497
2. Skibber JM, Hoff PM, Minsky BD. Cancer of the Rectum. In: Devita VT, Hellman S, Rosenberg SA, eds. Cancer: Principles & Practice of Oncology. 6th ed. Philadelphia PA: Lippincott Williams & Wilkins. 2001:1271-1319
3. Enker WE, Martz J, Tepper JE, Ryan DP, Mayer R. Rectal cancer:

- Management of locoregional disease. In: Kelsen DP, Daly JM, Kern SE, Levin B, Tepper JE, eds. Gastrointestinal oncology: Principles and practice. Philadelphia PA: Lippincott Williams & Wilkins. 2002:815
4. Minsky BD. Pelvic radiation therapy in rectal cancer: Technical considerations. *Semin Radiat Oncol* 1993;3:42-47
  5. Kim JH, Kim DY, Kim YH, et al. Survey on radiotherapy protocols for the rectal cancers among the Korean radiation oncologists in 2002 for the development of the Patterns of Care Study of radiation therapy. *J Korean Soc Ther Radiol* 2003; 21(1):44-53
  6. Gunderson LL, Sosin H. Areas of failure found at reoperation (second or symptomatic look) following "curative surgery" for adenocarcinoma of the rectum. Clinicopathologic correlation and implications for adjuvant therapy. *Cancer* 1974;34(4):1278-1292
  7. Pilipshen SJ, Heilweil M, Quan SH, Sternberg SS, Enker WE. Patterns of pelvic recurrence following definitive resections of rectal cancer. *Cancer* 1984;53(6):1354-1362
  8. Mendenhall WM, Million RR, Pfaff WW. Patterns of recurrence in adenocarcinoma of the rectum and rectosigmoid treated with surgery alone: implications in treatment planning with adjuvant radiation therapy. *Int J Radiat Oncol Biol Phys* 1983;9(7):977-985
  9. Wibe A, Moller B, Norstein J, et al. A national strategic change in treatment policy for rectal cancer - implementation of total mesorectal excision as routine treatment in Norway. A national audit. *Dis Colon Rectum* 2002;45:857-866
  10. Myerson RJ, Mohiuddin M, Rich TA. Rectal Cancer. In: Gunderson LL, Tepper JE, eds. *Clinical Radiation Oncology*. Philadelphia PA: Churchill Livingstone. 2000:740-743
  11. Gastrointestinal Tumor Study Group. Prolongation of the disease-free interval in surgically treated rectal carcinoma. *N Engl J Med* 1985;312(23):1465-1472
  12. Fisher B, Wolmark M, Rockette H, et al. Postoperative adjuvant chemotherapy or radiation therapy for rectal cancer: results from NSABP protocol R-01. *J Natl Cancer Inst* 1988; 80(1):21-29
  13. Krook JE, Moertel CG, Gunderson LL, et al. Effective surgical adjuvant therapy for high-risk rectal carcinoma. *N Engl J Med* 1991;324(11):709-715
  14. Gastrointestinal Tumor Study Group. Radiation therapy and fluorouracil with or without semustine for the treatment of patients with surgical adjuvant adenocarcinoma of the rectum. *J Clin Oncol* 1992;10(4):549-557
  15. O'Connell MJ, Martenson JA, Wieand HS, et al. Improving adjuvant therapy for rectal cancer by combining protracted-infusion fluorouracil with radiation therapy after curative surgery. *N Engl J Med* 1994;331(8):502-507
  16. Tepper JE, O'Connell MJ, Petroni GR, et al. Adjuvant postoperative fluorouracil-modulated chemotherapy combined with pelvic radiation therapy for rectal cancer: initial results of intergroup 0114. *J Clin Oncol* 1997;15(5):2030-2039
  17. Tepper JE, O'Connell MJ, Niedzwiecki D, et al. Adjuvant therapy in rectal cancer: analysis of stage, sex, and local control - final report of intergroup 0114. *J Clin Oncol* 2002;20(7):1744-1750
  18. Womark N, Wieand HS, Hyams DM, et al. Randomized trial of postoperative adjuvant chemotherapy with or without radiotherapy for carcinoma of the rectum: National Surgical Adjuvant Breast and Bowel Project Protocol R-02. *J Natl Cancer Inst* 2000;92(5):388-396
  19. Sanfilippo NJ, Crane CH, Skibber J, et al. T4 rectal cancer treated with preoperative chemoradiation to the posterior pelvis followed by multivisceral resection: patterns of failure and limitations of treatment. *Int J Radiat Oncol Biol Phys* 2001;51(1):176-183
  20. Park SW, Ahn YC, Huh SJ, et al. Individualized determination of lower margin in pelvic radiation field after low anterior resection for rectal cancer resulted in equivalent local control and radiation volume reduction compared with traditional method. *J Korean Soc Ther Radiol Oncol* 2000;18(3):194-199
  21. Kim YS, Kim JH, Choi EK, et al. Optimal scheme of postoperative chemoradiotherapy in rectal cancer: phase III prospective randomized trial. *J Korean Soc Ther Radiol Oncol* 2002;20:53-61

---

 Abstract
 

---

## Suggestion of Optimal Radiation Fields in Rectal Cancer Patients after Surgical Resection for the Development of the Patterns of Care Study

Jong Hoon Kim, M.D.\*, Jin Hong Park, M.D.\*, Dae Yong Kim, M.D.<sup>†</sup>, Woo Cheol Kim, M.D.<sup>‡</sup>,  
 Jinsil Seong, M.D.<sup>§</sup>, Yong Chan Ahn, M.D.<sup>¶</sup>, Mi Ryeong Ryu, M.D. , Mison Chun, M.D.<sup>\*\*</sup>,  
 Seong Eon Hong, M.D.<sup>††</sup>, Do Hoon Oh, M.D.<sup>‡‡</sup> and Il Han Kim, M.D.<sup>§§</sup>

\*University of Ulsan Medical College, <sup>†</sup>National Cancer Center,  
<sup>‡</sup>Inha University Medical College, <sup>§</sup>Yonsei University Medical College,  
<sup>¶</sup>Seong Kyun Kwan University Medical College, <sup>¶</sup>Catholic University Medical College,  
<sup>\*\*</sup>Ajou University Medical College, <sup>\*\*</sup>Kyung Hee University Medical College,  
<sup>‡‡</sup>Hallym University Medical College, <sup>§§</sup>Seoul National University Medical College

**Purpose:** To suggest the optimal radiation fields after a surgical resection based on a nationwide survey on the principles of radiotherapy for rectal cancer in the Korean Patterns of Care Study.

**Materials and methods:** A consensus committee, composed of radiation oncologists from 18 hospitals in Seoul Metropolitan area, developed a survey format to analyze radiation oncologist's treatment principles for rectal cancer after a surgical resection. The survey format included 19 questions on the principles of defining field margins, and was sent to the radiation oncologists in charge of gastrointestinal malignancies in all Korean hospitals (48 hospitals). Thirty three (69%) oncologists replied. On the basis of the replies and literature review, the committee developed guidelines for the optimal radiation fields for rectal cancer.

**Results:** The following guidelines were developed: superior border between the lower tip of the L5 vertebral body and upper sacroiliac joint; inferior border 2 ~3 cm distal to the anastomosis in patient whose sphincter was saved, and 2 ~3 cm distal to the perineal scar in patients whose anal sphincter was sacrificed; anterior margin at the posterior tip of the symphysis pubis or 2 ~3 cm anterior to the vertebral body, to include the internal iliac lymph node and posterior margin 1.5 ~2 cm posterior to the anterior surface of the sacrum, to include the presacral space with enough margin. Comparison with the guidelines, the replies on the superior margin coincided in 23 cases (70%), the inferior margin after sphincter saving surgery in 13 (39%), the inferior margin after abdominoperineal resection in 32 (97%), the lateral margin in 32 (97%), the posterior margins in 32 (97%) and the anterior margin in 16 (45%).

**Conclusion:** These recommendations should be tailored to each patient according to the clinical characteristics such as tumor location, pathological and operative findings, for the optimal treatment. The adequacy of these guidelines should be proved by following the Korean Patterns of Care Study.

---

**Key Words:** Rectal cancer, Radiotherapy, Radiation field