The THAI Journal of SURGERY 2007; 28:51-56.
Official Publication of the Royal College of Surgeons of Thailand

Adequacy of Lymph Node Harvested by Curative Intent Resection for Colorectal Cancer: Ramathibodi Experience

Suthat Apaikulchorn, MD
Weerapat Suwanthanma, MD
Chakrapan Euanorasetr, MD
Division of General Surgery, Unit B, Faculty of Medicine Ramathibodi Hospital, Bangkok, Thailand

Abstract

Objective: **Number of lymph node reported is main predictor of outcome in colorectal cancer. We review the adequacy of lymph node harvested by curative intent resection of our colorectal cancer patients in one year period.**

Materials and Methods: **From January-December 2005, 138 colorectal cancer patients underwent curative intent operations. Thirty-seven patients were excluded. Patient demographic data, type of operation, number of lymph node harvested and tumor staging were obtained from chart reviewed. All tumors were staged by TNM staging system.**

Results: **From 101 patients, 52 colon and 49 rectal cancer cases were reviewed. Average number of lymph node harvested was 18.57. Left-sided resection and rectal operation had high percentage of lymph node inadequacy. In node-negative cases, 25% of colon and 46% of rectal cancer had inadequate lymph node harvested resulted in overall 36% in this group were potentially understaged.**

Conclusion: **Right-sided colon resection is the only operation that has excellent result in terms of adequacy of lymph node harvest. Improvement of lymph node retrieved in left-sided colon resection and rectal resection will result in upstaging and improved patient outcome.**

Keywords: Lymph node, Curative intent, Colorectal cancer

Introduction

Colorectal cancer is among the most common cancers in Thai population in both men and women. The prognosis of colorectal cancer is strongly influenced by the stage of the disease at the time of diagnosis. However, even with favourable prognostic factor and complete clinical care, up to 20-30% of patients still develop recurrent disease.[1] One of the factors that may explain this treatment failure is the pathologic understaging of the tumor.

The accurate report of lymph node metastasis in colorectal resection specimens is critical for tumour staging. The number of lymph node retrieved has been found to be a crucial predictor of treatment outcome, particularly in stage II disease. Recent guidelines from panel discussion, AJCC, NCCN 2006 recommend that surgeons should perform oncologic

Correspondence address : *Weerapat Suwanthanma, MD, Division of General Surgery, Unit B, Faculty of Medicine, Ramathibodi Hospital, Bangkok 10400, Thailand. E-mail: tewsw@mahidol.ac.th*

resection with at least 12 lymph nodes harvested for accurate staging.[2-4]

Two factors that strongly influence the number of lymph node harvesting in colorectal resection specimens include surgical technique and pathologic evaluation. Surgical resections for colon and rectal cancer are different and depend on the site of tumors. Standard surgical resections for colon and rectal cancer are oncologic resection, which include removal of regional lymph nodes as a component of the resection. Extent of lymph node dissection has been established.[5] Pathological identification, evaluation and reporting of these specimens are also well established, particularly with new technique such as fat clearance method to assist in recovering of lymph nodes.[6,7]

The purpose of this study was to review the adequacy of lymph node harvested by curative intent resection for colorectal cancer patients at Ramathibodi Hospital in one-year period from January 2005 to December 2005.

Materials and Methods

From January 2005 to December 2005, 138 patients with colon and rectal cancer underwent operation at Ramathibodi Hospital. All operations were performed by general surgical staff and chief general surgical residents of our institution. Pathologic evaluation was performed in rotation by pathologists in the department. Patients who did not undergo oncological resection, patients who were treated with palliative intent resection (21), patients who underwent pre-operative chemoradiation (2), patients whose operations were performed laparoscopically (3), patients whose diagnosis were not adenocarcinoma (3, CA appendix, CA anal canal and lymphoma) and patients whose clinical records were not completed (8) were excluded from this study. As a result, 101 patients were included in this study. Patient demographic data, types of operation, number of harvested and positive lymph nodes, and pathological staging were obtained from medical records and pathological reports. All tumors were staged according to the TNM system.

Results

A total of 138 specimens were eligible for review. Twenty-one patients who underwent palliative intent surgery, two patients who underwent preoperative chemoradiation therapy, eight patients whose record files were lost, three patients diagnosed with other cancers and three patients operated with laparoscopic technique were all excluded. There were 101 patients remaining in this study, out of which 50 were male. The average age at diagnosis was 62.4 years in male and 62.3 years in female. The age of the patients in this study ranged from 30-70 years (Table 1). Most were symptomatic at the time of diagnosis, only 10% of patients were diagnosed at screening (Table 2). The incidence of colon cancer was comparable to rectal cancer (52 vs 49). Sigmoid cancer was the most common, slightly more frequent than right-sided colon cancer (44% vs 34%). There were 52 cases diagnosed with colon cancer, with 18 in right-sided colon, 2 in transverse colon, 9 in left-sided colon, and 23 in sigmoid colon. Forty-nine patients had rectal cancer (Table 3). Most of the colon cancer patients (48%) presented with stage II as compared to 38% of rectal cancer presented with stage III (Table 4). The operations for colon cancer included right hemicolectomy/extended right hemicolectomy in 18, left hemicolectomy in 6, sigmoid colectomy in 21, subtotal colectomy in 5 and

Table 1 Demographic distribution of patients

Age group (years)	Male (N = 50)	Female (N = 51)	Total (N = 101)
≤30	1	2	3
31-39	0	3	3
40-49	5	1	6
50-59	12	13	25
60-69	13	19	32
≥70	19	13	32
Total	**50**	**51**	**101**

Table 2 Presenting symptoms

Presenting symptoms	Number of patients (%) (Colon) (N = 52)	Number of patients (%) (Rectum) (N = 49)
Bleeding	20 (38.5)	39 (79.6)
Mass	7 (13.4)	0
Pain	20 (38.5)	5 (10.2)
Screening	5 (9.6)	5 (10.2)

Table 3 Sites of primary tumors

Site of primary tumors	Number of patients (%)
Colon	52
- Right-sided	18 (34.6)
- Transverse	2 (3.9)
- Left-sided	9 (17.3)
- Sigmoid	23 (44.2)
Rectum	49

Table 4 Pathological staging

Pathological staging	Number of patients (%) (Colon) (N = 52)	Number of patients (%) (Rectum) (N = 49)
Stage I	11 (21.1)	8 (16.3)
Stage IIA	23 (44.2)	15 (30.6)
Stage IIB	2 (3.9)	3 (6.1)
Stage IIIA	-	1 (2.1)
Stage IIIB	10 (19.2)	13 (26.5)
Stage IIIC	3 (5.8)	5 (10.2)
Stage IV	3 (5.8)	4 (8.2)

Table 5 Operations performed for colon and rectal cancer

Operations	Number of patients (%)
Colon	52
- Right /extended right hemicolectomy	18 (34.6)
- Left hemicolectomy	6 (11.5)
- Sigmoidectomy	21 (40.4)
- Hartmann's operation	2 (3.9)
- Subtotal colectomy	5 (9.6)
Rectum	49
- Low anterior resection	34 (69.4)
- Ultralow anterior resection	2 (4.1)
- Abdominoperineal resection	9 (18.4)
- Hartmann's operation	4 (8.1)

Hartmann's operation in 2. The operations for rectal cancer included low anterior resection in 34, ultralow anterior resection in 2, Hartmann's operation in 4 and abdominoperineal resection in 9 patients (Table 5). There were 86 anastomoses created and 27 anastomoses were performed by hand-sewn. The rest of the anastomoses were completed with circular stapler using double-stapling technique. Surgical procedures were performed mainly by surgical staff, with two surgeons performing more than half of the operations.

Table 6 Number of lymph nodes harvested

Number of lymph node harvested	Number of patients (%)
Colon specimens	
0-4	3 (5.8)
5-8	5 (9.6)
9-11	3 (5.8)
12-15	9 (17.3)
>16	32 (61.5)
Rectum specimens	
0-4	4 (8.2)
5-8	8 (16.3)
9-11	4 (8.2)
12-15	8 (16.3)
>16	25 (51)

Table 7 Number of lymph nodes harvested according to operations

Operations	Average number of lymph node harvested
Colon	
- Right /extended right hemicolectomy	28
- Left hemicolectomy	15
- Sigmoidectomy	16.5
- Hartmann's operation	6
- Subtotal colectomy	25.8
Rectum	
- Low anterior resection	17.7
- Ultralow anterior resection	6.5
- Abdominoperineal resection	13.8
- Hartmann's operation	13.8

Adequacy of lymph node harvested

Among the 101 specimens, the average number of lymph node harvested was 18.57 nodes. Thirty-six patients had positive lymph nodes. As for colon specimens, 61% contained more than 16 lymph nodes whereas only 6% contained less than 4 lymph nodes. For rectal specimens, half of them had more than 16 lymph nodes compared to 8% with less than 4 lymph nodes (Table 6). The average numbers of lymph nodes retrieved from colectomy specimens were 28 for right or extended right hemicolectomy, 25.8 for subtotal colectomy, 16.5 for sigmoidectomy, 15 for left hemicolectomy and 6 for Hartmann's operation. The average numbers of lymph nodes retrieved from rectal

Table 8 Adequacy of lymph node harvested according to operations

Operations	Number of patients with LN <12 (%)	Number of patients with LN ≥12
Colon (N = 52)		
- Right /extended right hemicolectomy	-	18 (34.6)
- Left hemicolectomy	3 (5.8)	3 (5.8)
- Sigmoidectomy	6 (11.5)	15 (28.9)
- Hartmann's operation	1 (1.9)	1 (1.9)
- Subtotal colectomy	1 (1.9)	4 (7.7)
Rectum (N = 49)		
- Low anterior resection	9 (18.4)	25 (51)
- Ultralow anterior resection	2 (4.1)	-
- Abdominoperineal resection	4 (8.2)	5 (10.2)
- Hartmann's operation	1 (2)	3 (6.1)

Table 9 Number of lymph nodes harvested according to pathological staging

Pathological staging	Number of patients with lymph node harvested <12 (Colon)	Number of patients with lymph node harvested ≥12 (Colon)	Number of patients with lymph node harvested <12 (Rectum)	Number of patients with lymph node harvested ≥12 (Rectum)
Stage I	6	5	6	2
Stage IIA	2	21	5	10
Stage IIB	1	1	1	2
Stage IIIA	-	-	-	1
Stage IIIB	1	9	3	10
Stage IIIC	-	3	-	5

specimens were 17.7 for low anterior resection, 13.8 for both Hartmann's operation and abdominoperineal resection, and 6.5 for ultralow anterior resection (Table 7). Thirty-two percent of rectal specimens contained lymph node less than 12, which was higher than that of colon specimens (21%). For colon cancer, the two operations with the highest percent of inadequate lymph node retrieval were sigmoidectomy (11.5%) and left hemicolectomy (5.8%). For rectal cancer, low anterior resection and abdominoperineal resection had the highest percent of inadequate harvested lymph node, 18.4% and 8.2% respectively (Table 8).

Discussion

The single most important prognostic determinant in patients with colorectal cancer is lymph node involvement. The 5-year survival rate in patients with stage I or II disease is usually greater than 75% but decreases to 45% in node-positive patients.[8,9] The presence of positive lymph nodes determines the need for adjuvant chemotherapy for patients with colon cancer[5] and served as criteria for considering adjuvant radiation and chemotherapy for patients with rectal cancer.[10] In this study, the overall rate of nodal metastases (36%) was comparable to that reported in the literature.[11] Inadequate lymph node evaluation is correlated with poor outcome, particularly in stage II disease.[9,11-13] This likely reflects inaccurate staging and results in lacking of adjuvant treatment. To properly stage and treat colorectal cancer patients, we must accurately identify patients with lymph node involvement.

According to survival of colon cancer from AJCC, the 5-year survival of stage IIB patients is lower than that of stage IIIA.[8,9] The only explanation of this discrepancy is that some patients of stage IIB are understaged from various factors. Among factors causing understaging is inadequacy of lymph node harvested for pathological examination.

In this study, nine of thirty-six colon cancer patients (25%) and twelve out of twenty-six rectal cancer patients (46%) with less than 12 lymph nodes were in stage I or II disease, resulting in overall 21/62 (36%) of node-negative patients potentially understaged (Table 9). This means if we could evaluate more lymph nodes in these groups of patients, some patients would be upstaging to stage III disease and should have received adjuvant treatment.

The number of lymph nodes examined depends on the extent of the dissection by surgeons, the extent of the examination of the tissue by pathologists and also on the number of lymph nodes contained in mesocolon and mesorectum.

One factor that might explain the inadequacy of lymph node retrieval for left-sided resection is the anatomical site of lymph node normally contained in the mesocolon and mesorectum. For the left-sided colectomy and rectal specimen, the normal number of lymph node in these areas is usually lower than that of right-sided,[14] as we found in 32.5% of our study. Resection in patients with right-sided colon cancer seems to be excellent because all of the specimens contain more than 12 lymph nodes. Moreover, this group of patients had, on average, more lymph nodes evaluated, as in previous studies.[13,15]

Regardless of pathological methods for lymph node evaluation, surgeons and surgical techniques are the most important factors in decreasing the mortality number of patients with understaged disease. Surgeons must perform an oncologic resection, including the main lymphovascular drainage of the bowel, to provide pathologists with enough lymph nodes to dissect and guarantee the clearance of tumor. From our study, surgeons should be aware of the mesocolonic margin when performing left-sided colectomy and should routinely perform TME (total mesorectal excision) and adequate mesorectal excision in appropriate rectal cancer patients.

Conclusions

In conclusion, we have reported the adequacy of lymph node harvested by curative intent resection from our colorectal cancer patients during the last one-year period. Overall, we demonstrated that some patients with colorectal cancer did not receive adequate lymph node evaluation. Right-sided colonic resection is the only operation that has excellent result in terms of adequacy of lymph node harvesting. We have to improve the adequacy of lymph node harvesting in some particular operations of left-sided colon and rectum. Recognition of this problem by surgeons and pathologists is essential. Standardization of surgical technique and pathological examination and report may also improve outcomes. These data will be the baseline for quality control, both for surgeons and pathologists who are responsible for care of colon and rectal cancer patients.

REFERENCES

1. Cohen AM, Kelsen D, Saltz L, et al. Adjuvant therapy for colorectal cancer. Curr Probl Cancer 1998; 22: 5-65.
2. Nelson H, Petrelli N, Carlin A, et al. Guidelines 2000 for colon and rectal cancer surgery. J Natl Cancer Inst 2001; 93: 583-96.
3. Sobin LH, Greene FL. TNM classification: clarification of number of regional lymph nodes for pNo. Cancer 2001; 92: 452.
4. Fielding LP, Arsenault PA, Chapuis PH, et al. Clinicopathologic staging for colorectal cancer: an international documentation system (IDS) and an international comprehensive anatomical terminology (ICAT). J Gastroenterol Hepatol 1991; 6: 325-44.
5. Otchy D, Hyman NH, Simmang C, et al. Practice parameters for colon cancer. Dis Colon Rectum 2004; 47: 1269-84.
6. Compton CC, Fielding LP, Burgardt LJ, et al. Prognostic factors in colorectal cancer. College of American pathologists consensus statement. Arch Pathol Lab Med 2000; 124: 979-94.
7. Martinez SR, Bilchik AJ. Quality control issues in the management of colon cancer patients. Eur J Surg Oncol 2005; 31: 616-29.
8. Caplin S, Cerottini JP, Bosman FT, et al. For patients with Dukes' B (TNM stage II) colorectal carcinoma, examination of six or fewer lymph nodes is related to poor prognosis. Cancer 1998; 83: 666-72.
9. Le Voyer TE, Sigurdson ER, Hanlon AL, et al. Colon cancer survival is associated with increasing number of lymph nodes analyzed: a secondary survey of intergroup trial INT-0089. J Clin Oncol 2003; 21: 2912-9.
10. Wolmark N, Wieand HS, Hyams DM, et al. Randomized trial of post-operative chemotherapy with or without radiotherapy for carcinoma of the rectum: National surgical breast and bowel project protocol R-02. J Natl Cancer Inst 2000; 92: 388-96.
11. Tepper JE, O'Connell MJ, Niedzwiecki D, et al. Impact of number of nodes retrieved on outcome in patients with rectal cancer. J Clin Oncol 2001; 19: 157-63.

12. Swanson RS, Compton CC, Stewart AK, Bland KI. The prognosis of T3N0 colon cancer is dependent on the number of lymph nodes examined. Ann Surg Oncol 2003; 10: 65-71.
13. Prandi M, Lionetto R, Bini A, et al. Prognostic evaluation of stage B colon cancer patients is improved by an adequate lymphadenectomy: results of a secondary analysis of a large scale adjuvant trial. Ann Surg 2002; 235: 458-63.
14. Schofield JB, Mounter NA, Mallett R, Haboubi NY. The importance of accurate pathological assessment of lymph node involvement in colorectal cancer. Colorectal Dis 2006; 8: 460-70.
15. Johnson PM, Malatjalian D, Porter GA. Adequacy of nodal harvest in colorecal cancer: A consecutive cohort study. J Gastrointest Surg 2002; 6: 883-90.