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Prevention of Local Recurrence by Extended Lymphadenectomy for Rectal Cancer

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Abstract: This study was undertaken to determine if the degree of lymphadenectomy correlates with the prevention of local recurrence. The authors retrospectively reviewed the clinical data of 269 patients who underwent curative surgery for rectal cancer. The study was divided into three periods based on the method of lymphadenectomy as follows: period I (1963–1979) when extended lymphadenectomy was not performed; period II (1980–1985) when this was partially done with no attempt to dissect the obturator and proximal middle rectal lymph nodes; and period III (1986–1990) when this was completely performed for patients with appropriate indications. The local recurrence rates were 21%, 10%, and 8% for Periods I, II, and III, respectively ($P < 0.05$). The incidence of local recurrence tended to be greater in period I versus periods II and III according to type of operation, location, and stage of the primary tumors. The local recurrence rates arising from lateral node metastases were 11%, 4%, and 2% for periods I, II, and III, respectively ($P < 0.05$), while the incidence related to an insufficient surgical margin was approximately 5% throughout the three periods. We thus conclude that the degree of lymphadenectomy is a major determinant of local recurrence following a curative operation for rectal cancer.

Key Words: rectal cancer, local recurrence, extended lymphadenectomy, local recurrence rate, lateral node metastasis

Introduction

For many years it has been one of the goals of both surgeons and pathologists to determine the true incidence of local recurrence following curative resection for rectal cancer and factors responsible for local recurrence.[1–5] Numerous reports have confirmed the fact that the mechanism of local recurrence is frequently some form of incomplete removal of the primary tumor and lymph node metastases, and have thus emphasized the need for additional modalities of therapy including adjuvant radiation therapy and extended lymphadenectomy.[6–10] The technique of extended lymphadenectomy has been developed in an attempt to reduce local recurrence and improve the prognosis in high-risk patients; however, the extent of improvement in local control using this technique has yet not been clearly demonstrated.[10–13]

The present study focuses on the influence of an extended lymphadenectomy on the incidence of local recurrence in three periods: period I when extended lymphadenectomy was not performed; period II when this was partially done with no attempt to dissect the obturator and proximal middle rectal lymph nodes; and period III when this was completely performed for patients with the appropriate indications. In addition, an attempt was also made to determine whether or not the presence of lateral node metastases influenced local recurrence in individual patients in terms of the degree of extended lymphadenectomy.

Materials and Methods

A total of 401 patients with a diagnosis of primary rectal invasive carcinoma were operated on at Tokyo University Hospital between January 1963 and June 1990. Ninety-one of those who had palliative surgery and 38 with adjuvant preoperative radiation therapy initiated since 1988 were excluded, as were 2 with chronic ulcerative colitis and 1 with familial polyposis coli. The remaining 269 patients form the basis of this retrospective study. To describe the sites of the primary tumors, the rectum was divided into two sections: the lower rectum in which the distal edge was

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less than 7 cm above the anal verge, and the upper rectum in which it was less than 12 cm. Patients with so-called rectosigmoid cancers (12 cm or more) were excluded from this analysis. The tumors were staged according to the Astler-Coller criteria.[14]

Extended lymphadenectomy has been employed either completely or partially by one surgical team (that of T.M.) since 1980. This procedure was defined as a lymphadenectomy, including pararectal, middle rectal, obturator, internal, and common iliac lymph nodes. The proximal middle rectal lymph nodes were defined as those found along the planes lateral to the autonomic nerve plexuses which were crossed by the middle rectal vessels. In practice, no systematic extended lymphadenectomy was performed before 1979 (period I), although an attempt was made with curative intent to dissect any lateral node metastases that were confirmed by the surgical and pathological tissue findings. An extended lymphadenectomy was partially done during the years 1980–1985 (period II) when no attempt was made to dissect the obturator lymph nodes or proximal middle rectal lymph nodes. Since 1986 (period III), an extended lymphadenectomy, which includes either unilateral or bilateral clearance of obturator and proximal middle rectal lymph nodes, has been performed on those considered to have tumors of Astler-Coller Stage B2 or C. For the remaining patients, no dissection of either the obturator or proximal middle rectal lymph nodes was performed.

Table 1 shows comparisons among the patients in the three periods for age, gender, type of operation, location, grade, and stage of the primary tumors. There was no significant difference in age, gender, location, or grade among the groups. However, the frequency of patients with low anterior resection as well as those with stages A and B1 significantly increased in periods II and III together compared with period I ($P < 0.0001$ for operation and $P < 0.005$ for stage; Table 1).

Local recurrence was defined as the presence of recurrent cancer anywhere in the pelvis. Sites of local recurrence were analyzed by the operative findings and/or radiologic evidence of local recurrence. The criteria for lateral node metastases included proximal middle rectal, obturator, internal, and common iliac lymph node metastases, and this excluded pararectal lymph node metastases. Local recurrence was considered to be due to surgical margins when the sites of recurrence were adjacent to the locations at which operative difficulties in removing the primary tumors were recorded. Local recurrence was considered to be due to lateral node metastases when the sites of recurrence were determined to be along the lymph node basins in the pelvis either with operative or radiologic evidence (lateral node recurrence). This diagnosis was established by the operative findings in 7 of the 18 patients (39%) with evidence of lateral node recurrence, and by radiographic studies in the remaining 11 patients.

Three of the 269 patients (1.1%) were lost to follow-up. Among the 139 patients alive as of this writing, the median follow-up after surgery for primary tumor was 68 months (range 2 months to 24 years). This was 35

Table 1. Clinical and pathological details of primary tumors in periods I, II, and III

	Period I (1963–1979)	Period II (1980–1985)	Period III (1986–1990)	*P*-value
No. of patients	132	77	60	
Mean age (range) (years)	57 (21–85)	59 (32–83)	61 (27–86)	N.S.
Male/female	87/45	39/38	37/23	N.S.
Location				N.S.
Lower rectum	88 (67%)	48 (62%)	36 (60%)	
Upper rectum	44 (33%)	29 (38%)	24 (40%)	
Operation				$P < 0.0001$
LAR	21 (16%)	43 (56%)	37 (62%)	
APR	100 (76%)	21 (27%)	11 (18%)	
Others	11 (8%)	13 (17%)	12 (20%)	
Grade				N.S.
Well	107 (82%)	69 (95%)	49 (83%)	
Moderate	20 (15%)	4 (5%)	9 (15%)	
Poor	3 (2%)	0 (0%)	1 (2%)	
Stage[a]				$P < 0.005$
A, B1	32 (24%)	29 (39%)	28 (47%)	
B2	57 (43%)	17 (23%)	20 (33%)	
C	43 (33%)	28 (38%)	12 (20%)	

LAR, low anterior resection; APR, abdominoperineal resection; N.S., not significant
[a] Astler-Coller criteria

months (range 2–83 months) for the 50 patients in period III. Statistical analysis was done using the chi-square test for variables grouped into categories. Calculations of overall survival were obtained using the method of Kaplan and Meier. Comparisons of survival for discrete variables were made using the log-rank test.

Results

Five of the 269 patients died within 30 days of the operation for the primary tumors (postoperative mortality 1.9%). The postoperative mortality rates were 3% (4/132), 1% (1/77), and 0% (0/60) for periods I, II, and III, respectively. The complication rates for patients in periods I, II, and III were 14% (19/132), 23% (18/77), and 15% (9/60), respectively. The major complications in periods II and III together were pelvic abscess in 11 of the 137 patients (8%), bowel obstructure in 7 (5%), and ureteral obstruction in 5 (4%). In period I, these occurred in 5 (4%), 6 (5%), and 0 (0%) patients, respectively.

The 5-year overall survival after the operation for the primary tumors was 56%, 65%, and 73%, for periods I, II, and III, respectively (Table 2). The overall survival rate was significantly higher for periods II and III together versus period I ($P < 0.05$).

Local recurrence was found in 41 of the 269 patients (15%). Of these, ten patients (24%) had evidence of distant metastasis at the time of diagnosis of local recurrence. Local recurrence was confirmed histopathologically in 28 of the 41 patients (68%), and the remaining 13 patients had radiologic evidence of local recurrence. The time from the operation until local recurrence ranged from 3 to 105 months, with a median of 18 months. The local recurrence rates were 21% (28/132) for patients in period I, 10% (8/77) for those in period II, and 8% (5/60) for those in period III, respectively. This difference was also statistically significant ($P < 0.05$, Table 2).

In Tables 3, 4, and 5, the local recurrence rates in the three periods for patients with stage B2 or C are presented. Although the incidence of local recurrence did not vary significantly among the periods, the recurrence rate tended to be greater in period I than in periods II or III (Table 3). Similar trends were seen for primary tumor sites (Table 4) and for the type of operation (Table 5).

Twelve of the 269 patients (4.5%) had lateral node metastases at the initial operation (Table 6). Of these 12, 11 (92%) had primary tumors in the lower rectum, and 10 (83%) had stage C2 tumors. The incidence of local recurrence was higher in period I (80%, 4/5) than in periods II and III together (29%, 2/7). However, this difference was not statically significant.

Table 7 summarizes the 18 patients with lateral node recurrence. Lateral node metastases were not docu-

Table 2. Local recurrence rate and 5-year survival in periods I, II, and III

Period	Local recurrence rate	5-year survival
I	21% (28/132)*	56%
II	10% (8/77)*	65%
III	8% (5/60)*	73%

* $P < 0.05$ between periods I, II, and III

Table 3. Local recurrence rate and 5-year survival in periods I, II, and III for cases with stage B2 or C tumors[a]

Period	Local recurrence rate	5-year survival
I	24% (24/100)	50%
II	15% (7/47)	50%
III	9% (3/32)	67%

[a] Astler-Coller criteria

Table 4. Local recurrence rates based on the primary tumor sites in periods I, II, and III (stage B2 or C[a])

Period	Local recurrence rate
Lower rectum	
I	28% (18/65)
II	14% (4/29)
III	13% (2/16)
Upper rectum	
I	17% (6/35)
II	17% (3/18)
III	6% (1/16)

[a] Astler-Coller criteria

Table 5. Local recurrence rates based on the type of operation for primary tumor in periods I, II, and III (stage B2 or C[a])

Period	Local recurrence rates
Low anterior resection	
I	25% (4/16)
II	19% (5/27)
III	9% (2/22)
Abdominoperineal resection	
I	24% (19/80)
II	13% (2/16)
III	14% (1/7)
Other operations[b]	
I	25% (1/4)
II	0% (0/4)
III	0% (0/3)

[a] Astler-Coller criteria
[b] Of the 11 patients with other operations, 8 were treated by the Hartmann procedure, 1 by total pelvic exenteration, 1 by left hemicolectomy, and 1 by a pull-through operation

Table 6. Summary of patients with lateral node metastases at primary tumor operations

Patient no.	Primary tumor		Sites of LNM	Local recurrence	LR rates
	Location	Stage[a]			
Period I					80% (4/5)
1	L	C2	MR	+	
2	L	C1	MR	+	
3	L	C2	MR	+	
4	L	C2	MR, II, CI, OB	+	
5	L	C2	MR	−	
Period II					40% (2/5)
6	L	C2	II	+	
7	L	C2	MS	+	
8	L	C2	MS, II	−	
9	L	C2	MR, II, OB	−	
10	L	C1	MR, OB	−	
Period III					0% (0/2)
11	L	C2	CI	−	
12	U	C2	MR	−	

LNM, lateral node metastasis; LR, local recurrence; L, lower rectum; U, upper rectum; MR, proximal middle rectal; II, internal iliac; CI, common iliac; OB, obturator; MS, median sacral
[a] Astler-Coller criteria

Table 7. Summary of patients with lateral node recurrence after curative operation for rectal cancer

Patient no.	LNM at primary operation	Sites of local recurrence	Interval to LR diagnosis	Survival from LR diagnosis	LR rates
Period I					11% (14/132)
1	+	perineum	25 mo	1 mo	
2	+	perineum	56 mo	16 mo	
3	+	perineum	47 mo	24 mo	
4	+	pelvic	21 mo	4 mo	
13	−	perineum	24 mo	8 mo	
14	−	pelvic	6 mo	6 mo	
15	−	anastomotic	17 mo	18 mo	
16	−	OB	75 mo	29 mo	
17	−	pelvic	6 mo	37 mo	
18	−	OB	22 mo	2 mo	
19	−	pelvic	22 mo	5 mo	
20	−	II, EI	25 mo	57 mo	
21	−	retroperitoneum	45 mo	5 mo	
22	−	retroperitoneum	37 mo	12 mo	
Period II					4% (3/77)
6	+	pelvic	17 mo	9 mo	
23	−	OB	17 mo	34 mo	
24	−	II	19 mo	5 mo	
Period III					2% (1/60)
25	−	OB	17 mo	22 mo	

LNM, lateral node metastasis; LR, local recurrence; OB, obturator; II, internal iliac; EI, external iliac; mo, months

mented at the initial operation in 13 of the 18 patients (72%) with lateral node recurrence. The incidence of lateral node recurrence was 11%, 4%, and 2% for periods I, II, and III, respectively. This difference was statistically significant ($P < 0.05$, Tables 7 and 8).

Of the 41 patients (37%) with local recurrence, 15 appeared to have recurrences at the surgical margin due to some form of incomplete removal of the pri-

Table 8. Comparisons of local recurrence patterns: lateral node versus surgical margin recurrence

	Patterns of local recurrence		
	Lateral nodes	Surgical margin	Others
No. of patients	18 (44%)	15 (37%)	8 (20%)
Local recurrence rate			
Period I	11% (14/132)*	6% (8/132)	5% (6/132)
Period II	4% (3/77)*	6% (5/77)	0% (0/77)
Period III	2% (1/60)*	3% (2/60)	3% (2/60)
Interval to diagnosis			
Median	22 mo	10 mo	18 mo
Range	6–75 mo	3–63 mo	9–105 mo
Survival from diagnosis			
Median	11 mo	9 mo	13 mo
Range	1–57 mo	2–55 mo	1–29 mo

mo, months
* $P < 0.05$ between periods I, II, and III

mary tumor (Table 8). The local recurrence rates of this pattern were 6%, 6%, and 3%, for periods I, II, and III, respectively. Of the remaining eight recurrent tumors, two were related to surgical implantation, one which lacked a distal margin, two with invasion of the lymphatic vessels, and three due to unknown causes. The time interval from primary surgery to recurrence diagnosis was longer for patients with lateral node recurrence compared with surgical margin recurrence, although survival after the diagnosis of local recurrence was similar for these groups.

Discussion

This study further confirms, the reports of others who have indicated that the use of extended lymphadenectomy reduces the incidence of local recurrence after resection for rectal cancer.[10,11] The local recurrence rates of 10% and 8% observed in periods II and III are in the range of the incidence (4%–13%) for those undergoing extended lymphadenectomy in the literature.[10–12] The local recurrence rate of 21% observed in period I is also comparable with reported rates for those who did not have an extended lymphadenectomy which ranges from 10%–38% with wide variation in the literature.[1–6,13,15–21]

However, it is difficult to compare the results from different series in order to recognize the true therapeutic improvement.[22] This study was undertaken to compare the local recurrence rates for three periods at one institution with regard to therapeutic changes during the years. Both the local control as well as the overall survival after the operation for primary tumors were significantly higher in the last two periods when extended lymphadenectomy was either partially or almost completely performed as compared to the first period when this technqiue was not employed ($P < 0.05$).

However, it might be argued that the three periods are not comparable, as they represent possible changes in the type of operation and stage of primary tumors (Table 1). We thus compared the results regarding the different types of operation and sites of primary tumors for patients with stage B2 or C because extended lymphadenectomy has been mainly performed for this subset of patients (Tables 3–5). None of these factors, however, appears to influence the local recurrence rate because a higher recurrence rate was still observed in the earlier periods regardless of the factors in question. The local recurrence rate after abdominoperineal resection was high in period III, but only a small number of patients underwent this procedure. This might be explained by our exclusion of those undergoing this procedure in combination with radiation therapy in this period.

In this study, the use of extended lymphadenectomy is supported by the analysis of individual patients who were at risk for local recurrence. As shown in Table 6, the local recurrence rate for those documented lateral node metastases at the initial operation was 80% in period I versus 29% in periods II and III. These results suggest that 71% of the patients with lateral node metastases achieved local control following additional extended lymphadenectomy.

It is important to realize that the dissection has been intended to encompass the internal and common iliac as well as mesorectal pathways of spread of rectal cancer in periods II and III. In this regard, a total mesorectal excision may be thus associated with improved local control as reported by other authors.[10,23] However, as indicated in Table 6, most of the lateral

node metastases which include proximal middle rectal metastases could not be dissected by the technique of total mesorectal excision, even though the incidence of lateral node metastases was not so high (4.5%).

Opinions vary on the exact causes of local recurrence in the individual patients.[1,3,4,7,10,20] We have, however, retrospectively attempted to evaluate the possible causes of local recurrence for occasional cases based on the operative and radiological findings of both primary and recurrent tumors (Table 7). In this experience, the majority of local recurrences have been related either to lateral node metastases or the lack of a surgical margin.[1,7,10,24] The incidence of local recurrence related to the surgical margin was approximately 5% throughout the three periods (Table 8). In contrast, the local recurrence rates arising from the lateral node metastases were 11%, 4%, and 2% for periods I, II, and III, respectively ($P < 0.05$). These data suggest that the wider extended lymphadenectomy could reduce the incidence of lateral node recurrence.[10,11,13]

The time interval from the initial operation to the diagnosis of local recurrence was longer for patients with lateral node recurrence than for those with an insufficient clear surgical margin. These results suggest that the lateral node recurrences are more difficult to detect than so-called suture line recurrences.[6,17,25–27]

A further criticism is that there is a difference in the follow-up periods between the three series which might also affect local recurrence rates. The median follow-up of 35 months for the patients in period III is still too short compared with the median time to lateral node recurrences of 22 months, although the majority of local recurrences usually developed within 2 years.[6,13,23,25,28]

The fairly low local recurrence rates and the acceptable morbidity rates in periods II and III suggest that the long-term benefits of extended lymphadenectomy outweigh its operative risk. Furthermore, the adjuvant radiotherapy now conducted by this institution as well as by various centers is expected to improve local control and reduce the morbidity from this operation.

In conclusion, the present study shows that the degree of lymphadenectomy appears to be a major determinant of local recurrence after a curative operation for rectal cancer. In view of the poor survival of patients with local recurrence, the prevention of these recurrences by extended lymphadenectomy should thus be considered in the operative management of this disease.

References

1. Morson BC, Vaughan EG, Bussey HJR (1963) Pelvic recurrence after excision of rectum for carcinoma. Br Med J 2:13–18
2. Secco GB, Fardelli R, Campora E, Rovida S, Bertoglio S (1989) Factors influencing local recurrence after curative surgery for rectal cancer. Oncology 46:10–13
3. Phillips RKS, Hittinger R, Blesovsky L, Fry JS, Fielding LP (1984) Local recurrence following "curative" surgery for large bowel cancer: I. The overall picture. Br J Surg 71:12–16
4. Quirke P, Durdey P, Dixon MF, Williams NS (1986) Local recurrence of rectal adenocarcinoma due to inadequate surgical resection: Histopathological study of lateral tumour spread and surgical excision. Lancet i:996–999
5. Michelassi F, Block GE, Vannucci L, Montag A, Chappell R (1988) A 5- to 21-year follow-up and analysis of 250 patients with rectal adenocarcinoma. Ann Surg 208:379–389
6. Welch JP, Donaldson GA (1978) Detection and treatment of recurrent cancer of the colon and rectum. Am J Surg 135: 505–511
7. Williams NS (1984) The rationale for preservation of the anal sphincter in patients with low rectal cancer. Br J Surg 71: 575–581
8. Enker WE, Heilweil ML, Hertz REL, Pilipshen SJ, Stearns MW, Sternberg SS, Janov AJ (1986) En bloc pelvic lymphadenectomy and sphincter preservation in the surgical management of rectal cancer. Ann Surg 203:426–433
9. Gunderson LL, Sosin H (1974) Areas of failure found at reoperation (second or symptomatic look) following "curative surgery" for adenocarcinoma of the rectum. Cancer 34: 1278–1292
10. Heald RJ, Ryall RDH (1986) Recurrence and survival after total mesorectal excision for rectal cancer. Lancet 1:1479–1482
11. Moriya Y, Hojo K, Sawada T, Koyama Y (1989) Significance of lateral node dissection for advanced rectal carcinoma at or below the peritoneal reflection. Dis Colon Rectum 32:307–315
12. Glass RE, Ritchie JK, Thompson HR, Mann CV (1985) The results of surgical treatment of cancer of the rectum by radical resection and extended abdomino-iliac lymphadenectomy. Br J Surg 72:599–601
13. Heimann TM, Szporn A, Bolnick K, Aufses AH (1986) Local recurrence following surgical treatment of rectal cancer: Comparison of anterior and abdominoperineal resection. Dis Colon Rectum 29:862–864
14. Astler VB, Coller FA (1954) The prognostic signifcance of direct extension of carcinoma of the colon and rectum. Ann Surg 139:846–851
15. Påhlman L, Glimelius B (1984) Local recurrences after surgical treatment for rectal carcinoma. Acta Chir Scand 150:331–335
16. Malcolm AW, Perencevich NP, Olson RM, Hanley JA, Chaffey JT, Wilson RE (1981) Analysis of recurrence patterns following curative resection for carcinoma of the colon and rectum. Surg Gynecol Obstet 152:131–136
17. Schiessel R, Wunderlich M, Herbst F (1986) Local recurrence of colorectal cancer: effect of early detection and aggressive surgery. Br J Surg 73:342–344
18. Welch JP, Donaldson GA (1979) The clinical correlation of an autopsy study of recurrent colorectal cancer. Ann Surg 189: 496–502
19. Berge T, Ekelund G, Mellner C, Pihl B, Wenekert A (1973) Carcinoma of the colon and rectum in a defined population. Acta Chir Scand 438[Suppl]:1–84
20. Olson RM, Perencevich NP, Malcolm AW, Chaffey JT, Wilson RE (1980) Patterns of recurrence following curative resection of adenocarcinoma of the colon and rectum. Cancer 45:2969–2974
21. Benotti PN, Bothe A, Eyre RC, Cady B, McDermott WV, Steele G (1987) Management of recurrent pelvic tumors. Arch Surg 122:457–460
22. Carlsson U, Lasson A, Ekelund G (1987) Recurrence rates after curative surgery for rectal carcinoma, with special reference to their accuracy. Dis Colon Rectum 30:431–434

23. Feil W, Wunderlich M, Kovats E, Neuhold N, Schemper M, Wenzl E, Schiessel R (1988) Rectal cancer: factors influencing the development of local recurrence after radical anterior resection. Int J Colorect Dis 3:195–200
24. Rich T, Gunderson LL, Lew R, Galdibini JJ, Cohen AM, Donaldson G (1983) Patterns of recurrence of rectal cancer after potentially curative surgery. Cancer 52:1317–1329
25. Törnquist A, Ekelund G, Leandoer L (1982) The value of intensive follow-up after curative resection for colorectal carcinoma. Br J Surg 69:725–728
26. Pheils MT, Chapuis PH, Newland RC, Colquhoun K (1983) Local recurrence following curative resection for carcinoma of the rectum. Dis Colon Rectum 26:98–102
27. Pilipshen SJ, Heilweil M, Quan SHQ, Sternberg SS, Enker WE (1984) Patterns of pelvic recurrence following definitive resections of rectal cancer. Cancer 53:1354–1362
28. Moossa AR, Ree PC, Marks JE, Levin B, Platz CE, Skinner DB (1975) Factors influencing local recurrence after abdominoperineal resection for cancer of the rectum and rectosigmoid. Br J Surg 62:727–730