

Application of Local Excision for Early Cancer of the Colon and Rectum

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ABSTRACT. To confirm whether or not local excision for early cancer of the colorectum is sufficient to prevent recurrence, we attempted retrospectively to clarify the characteristics of such lesions and the criteria for additional resection following local excision. During a 22-year period (1974-1995), 184 (16.7%) of 1,103 patients (Dukes A : 286, B : 322, C : 290, D : 205) developed early colorectal cancer (m : 85, sm₁ : 46, sm₂ : 29, sm₃ : 24). The number of patients who underwent resection was 114 (m : 47, sm₁ : 32, sm₂ : 16, sm₃ : 19). Twenty-five (m : 3, sm₁ : 7, sm₂ : 10, sm₃ : 5) underwent additional resection following local excision, and local excision was performed on 45 (m : 35, sm₁ : 7, sm₂ : 3, sm₃ : 0). Pathological findings revealed lymph node involvement in 11 cases, corresponding to 6.0% of the 184 early colorectal cancers and 7.9% of the 139 resected cases. Our results indicated that massive invasion of sm₂ or sm₃ (82%), the broad-based type of Is (64%), tumors greater than 20 mm in diameter (55%), and venous or lymphatic invasion (36%) including poorly differentiated adenocarcinoma (0%) were risk factors for lymph node metastasis. Therefore, additional resection following local excision is strongly recommended in the presence of any of these factors and a positive surgical margin. The rates of recurrence after resection, local excision and additional resection following local excision were 2 (1.8%) of 114 cases (cancer death : 2), 2 (4.4%) of 45 cases (cancer death : 1), and 0 (0%) of 25 cases, respectively.

Key words : early cancer of colorectum — local excision — recurrence

Local excision including endoscopic mucosal resection (EMR) and polypectomy has been applied to preserve anal function and/or to offer minimally invasive treatment when colorectal lesions are suspected to be in the early stage. To determine whether or not local excision of such lesions is sufficient to prevent recurrence, resected specimens have been investigated by many surgeons and pathologists.¹⁻⁶⁾ However, the choice of surgical treatment for early colorectal cancer is still controversial, because improved methods of detection have resulted in an increase in the number of these cases. In this report, we attempted retrospectively to clarify the characteristics of early colorectal cancer by analyzing our large number of resected cases and the criteria for additional surgery following local excision.

MATERIALS AND METHODS

During the 22-year period between January 1974 and December 1995, a total of 1,103 patients (Dukes A : 286, B : 322, C : 290, D : 205) underwent colorectal surgery in the Department of Surgery at Kawasaki Medical School Hospital. Of these, 184 (16.7%) subsequently developed early cancer, by mucosal invasion (m) in 85 (7.7%) and by submucosal invasion (sm) in 99 (9.0%). These 184 cases were analyzed according to whether they were treated by a primary resection, by local excision, or by additional surgery following local excision, which included endoscopic polypectomy and EMR (Table 1).

In the present study, the cancers were classified into two macroscopic shapes, protruding and superficial, which were both subclassified. They were classified according to the depth of invasion into mucosal invasion (m) and three degrees of submucosal invasion (sm₁ : superficial, sm₂ : middle, sm₃ : deep) (Table 2).

TABLE 1. Number of Patients with Colorectal Cancer

Site	Dukes		Classification		Total
	A	B	C	D	
Cecum	7(5)	12	13	14	46(5)
Ascending colon	24(12)	41	36(3)	19	120(15)
Transverse colon	9(6)	31	15(1)	14	69(7)
Descending colon	14(9)	22	4	11	51(9)
Sigmoid colon	72(42)	68	44(2)	48	232(44)
Upper rectum	19(13)	33	23	22	97(13)
Middle rectum	55(38)	60	84(4)	39	238(42)
Lower rectum	86(48)	55	71(1)	38	250(49)
Total	286(173)	322	290(11)	205	1,103(184)

1974-1995
() : Early cancer

TABLE 2. Abbreviations for Early Colorectal Cancer with Regard to Macroscopic Type and Depth of Invasion

Macroscopic type	
Protruding	Ip : pedunculated Isp : semipedunculated Is : sessile
Superficial	Ila : elevated Ilc : depressed
Depth of invasion	
	m : mucosa sm ₁ : superficial submucosa sm ₂ : middle submucosa sm ₃ : deep submucosa

RESULTS

The rates of early colorectal cancer at each site ranged from 10.1% (transverse colon) to 19.6% (lower rectum). However, those for the entire colon and whole rectum were 15.4% (80 of 518 cases) and 17.8% (104 of 585 cases), respectively (Table 1). One hundred fourteen patients underwent resection (m : 47, sm₁ : 32, sm₂ : 16, sm₃ : 19), 25 underwent additional resection following local excision (m : 3, sm₁ : 7, sm₂ : 10, sm₃ : 5), and 45 underwent local excision (m : 35, sm₁ : 7, sm₂ : 3, sm₃ : 0). Local excision was the first therapy for 70 (38.0%) of 184 cases. Two patients (1.8%) who developed recurrence after resection died of colorectal cancer. One (2.2%, of 45 cases) of two patients who needed further resection for recurrence after local excision died of carcinoma (Table 3).⁷⁾

Regarding the depth of invasion and tumor size, the rates for m and sm₁ of less than 20 mm in diameter were 64.7% (55 of 85 cases) and 71.7% (33 of 46 cases), respectively. Although each depth group had some patients with a tumor greater than 30 mm, the small lesions of less than 10 mm in diameter showed a decreasing correlation with increasing depth of invasion (Table 4).

TABLE 3. Surgical Treatment for Early Colorectal Cancer According to Depth of Invasion

Site	Resection (N=114)				Local excision + Additional resection (N=25)				Local excision (N=45)				Total
	m	sm ₁	sm ₂	sm ₃	m	sm ₁	sm ₂	sm ₃	m	sm ₁	sm ₂	sm ₃	
Cecum	1	1			1	1			1				5
Ascending colon	3	2	2	2	1	1			3	1			15
Transverse colon	2	2	1						2				7
Descending colon	2	2	1	2				1	1				9
Sigmoid colon	15	7	4	7(1)*	3	3			5				44(1)
Upper rectum	3	5	2	1					2				13
Middle rectum	14	10	2	4	1	1	2	1	5(1)*	2			42(1)
Lower rectum	7	3	4(1)*	3	2	1	3	3	16	4(1)	3		49(2)
Total	47	32	16(1)	19(1)	3	7	10	5	35(1)	7(1)	3		184(4)

() Recurrence

*Cancer death

TABLE 4. Characteristics of Relationship between Depth of Invasion and Tumor Size

Depth of invasion	~10	~20	~30	~40	~50	>50 (mm)	Total
m	12	43	18	7	2	3	85
sm ₁	6	27	8	5			46
sm ₂	3	13	11		1		28
sm ₃	1	10	7	5	1	1	25
Total	22	93	44	17	4	4	184

Regarding the relation of macroscopic type to the depth of invasion, it was found that in 18 (75%) cases of pedunculated (Ip) protruding cancers and 11 (85%) elevated (IIa) superficial cancers, invasion remained mucosal. On the other hand, most patients with middle or deep submucosal (sm_2 or sm_3) invasion were of the protruding semipedunculated (Isp) macroscopic type or the sessile (Is) type, including the mixed type of Is+IIc (depressed superficial type). Only two cases (15.4%) of 13 superficial IIa cancers and half of the IIc cancers showed massive invasion to the submucosa (Table 5). Most of the cancers of the superficial type were less than 20 mm in diameter excluding two cases with large IIa. Many lesions (79%) of the protruding type were 10 to 30 mm in diameter (Table 6). Pathological findings revealed lymph node involvement in 11 cases, corresponding to 6.0% of the 184 early colorectal cancers and 7.9% of the 139 resected cases (114 with resection and 25 with additional resection following local excision). These results indicated that massive invasion of sm_2 or sm_3 (82%, 9 of 11 cases), the broad-based type of Is (64%, 7 of 11 cases), a tumor of greater than 20 mm in diameter (55%, 6 of 11 cases), and venous or lymphatic invasion (36%, 4 of 11 cases) are important risk factors of lymph node involvement (Table 7). Although 45 of 70 cases treated with local excision were followed up without further operation, additional resection was immediately performed for 25 cases following local excision. Massive invasion of sm_2 or sm_3 (60%, 15 of 25 cases), venous or lymphatic invasion (24%, 6 of 25 cases), and a positive surgical margin (36%, 9 of 25 cases) led to reoperation, which disclosed two cases (8%) with lymph node involvement and three cases

TABLE 5. Characteristics of Relationship between Depth of Invasion and Macroscopic Type

Depth of invasion	Protruding type				Superficial type			Total
	Ip	Isp	Is	Is+IIc	IIa	IIc	IIa+IIc	
m	18	34	19		11	1	2	85
sm_1	5	24	14			1	2	46
sm_2	1	11	12	2	1	1		28
sm_3		5	12	5	1	1	1	25
Total	24	74	57	7	13	4	5	184

TABLE 6. Characteristics of Relationship between Tumor Size and Macroscopic Type

Size	Protruding type				Superficial type			Total
	Ip	Isp	Is	Is+IIc	IIa	IIc	IIa+IIc	
~10 (mm)	1	9	1		7	2	2	22
~20	15	42	25	2	4	2	3	93
~30	4	17	19	4				44
~40	3	4	9	1				17
~50	1	2	1					4
>50			2		2			4
Total	24	74	57	7	13	4	5	184

TABLE 7. Characteristics of Patients with Lymph Node Involvement

Prognostic factors	Resection (N=9)			Local excision + Additional resection (N=2)		
	sm ₁	sm ₂	sm ₃	sm ₁	sm ₂	sm ₃
Macroscopic type						
Is		1	4			
Isp	1	1		1		1
Is+Iic			2			
Size of tumor						
≤20 mm	1		2	1		1
>20 mm		2	4			
Differentiation						
well		1	4			1
moderate	1	1	2	1		
Venous or lymphatic invasion						
positive		1	2	1		
negative	1	1	4			1

TABLE 8. Comparison of Patients with and without Additional Resection Following Local Excision

Prognostic factors	Local excision + Additional resection (N=25)				Local excision (N=45)			
	m	sm ₁	sm ₂	sm ₃	m	sm ₁	sm ₂	sm ₃
Differentiation								
well	2	6	8	4	31	5	1	
moderate	1	1	2	1	4	2	2	
Venous or lymphatic invasion								
positive		5	1					
negative	3	2	9	5	35	7	3	
Surgical margin								
positive	1	3	2	3				
negative	2	4	8	2	35	7	3	
Lymph node involvement*								
positive		1		1				
negative	3	6	10	4				
Residual cancer*								
positive		1	1	1				
negative	3	6	9	4				

*After additional resection

(12%) with residual cancer (Table 8).

Among the patients with early colorectal cancer, the rates of recurrence after resection, local excision, and additional resection following local excision were 2 (1.8%) of 114 cases (cancer death : 2), 2 (4.4%) of 45 cases (cancer death : 1), and 0 (0%) of 25 cases, respectively. Three patients died of carcinoma one year and four months, six years, and seven years after initial surgery, respectively (Table 3).

DISCUSSION

As minimally invasive treatment and sphincter preservation, local excision has been used with selected patients with early colon or rectal cancer.^{5,6)} The rates of our Dukes A and early colorectal cancer cases were 25.9% and 16.7%, respectively, as compared with 21.2% reported by Grigg *et al*⁸⁾ and 4% by Lock *et al*.³⁾ It is likely that improved techniques of investigation have produced these higher rates of early cancers. Although the rates of these cases at each site ranged from 10.1% (transverse colon, 7 of 69 cases) to 19.6% (lower rectum, 49 of 250 cases), the incidence of early cancer in the entire colon (15.4%, 80 of 518 cases) was almost the same as that in the whole rectum (17.8%, 104 of 585 cases) (Table 1).

The number of patients who underwent resection at initial surgery was 114 (62.0%) out of 184 patients with early colorectal cancer. Local excision was attempted in the other 70 (38.0%) cases, and 32 (65.3%) of 49 patients with lower rectal cancer underwent transanal resection. Regarding the relation between the depth of invasion and tumor size or macroscopic type, more than half of m and sm₁ were less than 20 mm in diameter, and massive submucosal invasion (sm₂, sm₃) was frequently of the broad-based type (Is, Isp) or involved depressed lesions (IIc, Is+IIc).

The findings of Morson,⁹⁾ who found the risk of lymph node involvement of early cancer in his cases to be 10.8% and who also noted that there is less chance of lymphatic invasion in exophytic tumors than in ulcerating lesions, supports our incidence (7.9%) of lymph node involvement and findings regarding the characteristics of early colorectal cancer. As also emphasized in some other reports,¹⁰⁻¹²⁾ our results indicated that massive invasion (sm₂, sm₃, 82%), a broad-based type (Is, Isp, 64%), large tumor size (> 20 mm, 55%), and venous or lymphatic invasion (36%) including poorly differentiated adenocarcinoma¹³⁾ (0%) are applicable as risk factors of lymph node involvement. One of these factors plus a positive surgical margin or a combination of these factors led to additional resection for 25 patients, at which time two cases of lymphatic invasion and three cases of residual tumor were disclosed.

Among 184 patients with early colorectal cancer, the rates of recurrence (2.2%, 4 cases) were similar to those of Morson *et al*¹⁾ (3.3%) and Lock *et al*³⁾ (4.5%). Furthermore, Hager *et al*⁴⁾ reported an 8% recurrence rate after local excision. However, the risk of recurrence among the 45 patients who underwent local excision existed in three cases with sm₂ invasion since this factor has been one of the criteria of additional resection in our series. Other factors, such as tumor budding¹⁴⁾ and p53 nuclear overexpression,¹⁵⁾ should be discussed to clarify the criteria exactly. In the near future, local excision will

be deemed applicable to about half of patients with early colorectal cancer as a result of improved techniques of endoscopic ultrasonography.

REFERENCES

- 1) Morson BC, Bussey HJR, Samoorian S: Policy of local excision for early cancer of the colorectum. *Gut* **18**: 1045-1050, 1977
- 2) Cuthbertson AM, Kaye AH: Local excision of carcinomas of the rectum, anus, and anal canal. *Aust NZ J Surg* **48**: 412-415, 1978
- 3) Lock MR, Cairns DW, Ritchie JK, Lockhart-Mummery HE: The treatment of early colorectal cancer by local excision. *Br J Surg* **65**: 346-349, 1978
- 4) Hager Th, Gall FP, Hermanek P: Local excision of cancer of the rectum. *Dis Colon Rectum* **26**: 149-151, 1983
- 5) Whiteway J, Nicholls RJ, Morson BC: The role of surgical local excision in the treatment of rectal cancer. *Br J Surg* **72**: 694-697, 1985
- 6) Gyorffy EJ, Amontree JS, Fenoglio-Preiser CM, Gogel HK, Blessing LD: Large colorectal polyps: Colonoscopy, pathology, and management. *Am J Gastroenterol* **84**: 898-905, 1989
- 7) Yamamoto Y, Mure T, Iwamoto S, Sano K: Local recurrence after local excision of early rectal cancer. *In* Recent advances in management of digestive cancers, ed by Takahashi T. Tokyo, Springer-Verlag, 1993, pp 541-543
- 8) Grigg M, McDermott FT, Pihl EA, Hughes ESR: Curative local excision in the treatment of carcinoma of the rectum. *Dis Colon Rectum* **27**: 81-83, 1984
- 9) Morson BC: Factors influencing the prognosis of early cancer of the rectum. *Proceedings of the Royal Society of Medicine* **59**: 607-608, 1966
- 10) Stearns MW, Sternberg SS, DeCosse JJ: Treatment alternatives-Localized rectal cancer. *Cancer* **54**: 2691-2694, 1984
- 11) Killingback MJ: Indications for local excision of rectal cancer. *Br J Surg* **72**: S54-S56, 1985
- 12) Michelassi F, Vannucci L, Ayala JJ, Chappel R, Goldberg R, Block GE: Local recurrence after curative resection of colorectal adenocarcinoma. *Surgery* **108**: 787-793, 1990
- 13) Muto T, Sawada T, Sugihara K: Treatment of carcinoma in adenomas. *World J Surg* **15**: 35-40, 1991
- 14) Hase K, Shatney CH, Mochizuki H, Johnson DL, Tamakuma S, Vierra M, Trollope M: Long-term results of curative resection of "minimally invasive" colorectal cancer. *Dis Colon Rectum* **38**: 19-26, 1995
- 15) Grewal H, Guillem JG, Klimstra DS, Cohen AM: p53 nuclear overexpression may not be an independent prognostic marker in early colorectal cancer. *Dis Colon Rectum* **38**: 1176-1181, 1995