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Retrospective Evaluation of the Operative Methods for Cancer of the Rectum

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Introduction

In the surgical treatment of carcinoma of the rectum, abdominoperineal resection has been widely used because of safety and technically simple operation[7]. On the other hand, sphincter preserving operations, such as anterior resection or pull through method, have been advocated in cases in which the cancer is located in the upper or middle portion of the rectum. However, problems relating to recurrence of cancer, anastomotic leakage and anal function after pull through operation have been reported[1,5].

Improvements in operative techniques and pre- and post-operative managements have drawn a renewed attention to sphincter preserving operations.

The purpose of this paper is to report a retrospective evaluation of the following operative methods for the cancer of the rectum: abdominoperineal resection, anterior resection and pull through method.

Patients and methods

Between January 1955 and December 1976, 244 patients with carcinoma of the rectum were treated in our department. Of these, 205 (84%) underwent resection. The operative methods employed were abdominoperineal resection, anterior resection (high or low) and pull through method. The location of the tumors and the operative method selected by various surgeons are shown in Table 1. All operated cases were compared, based on the following parameters: Location of the tumor and its gross pathologic type, Dukes classification and curative resectability, and the grading of cancer invasion into the rectal wall. In addition, the five year survival rate and incidence of local recurrence were reviewed.

Curative resection, as used in this paper, means radical resections of the tumor and regional lymph nodes.

Key words: Rectal Cancer, Surgical Treatment, Sphincter Preserving Operation.
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Table 1. Tumor Location, Gross Pathologic Type, Dukes Classification, and Operative Methods Used

	Abdominoperineal Resection	Anterior Resection High	Anterior Resection Low	Pull Through Method	Totals
TUMOR LOCATION					
Rectosigmoid Junction	9	21	—	—	30
Upper Rectum	23	—	15	9	47
Lower Rectum	94	—	2	13	109
Anal Canal	19	—	—	—	19
Totals	145(70.7%)	21(10.3%)	-17(8.3%)	22(10.7%)	205(100%)
TUMOR TYPE					
Elevated	2	3		2	7
Tumorous	45	18		10	73
Localized Ulcer	78	14		8	100
Infiltrating Ulcer	20	3		2	25
Totals	145	38		22	205
DUKES CLASSIFICATION					
A	29	6		8	43
B	73	13		7	93
C	43	19		7	69
Totals	145	38		22	205

Results

As shown in Table 1, abdominoperineal resection was the method of choice in the majority of the operated cases (70.7%). In 65% of the cases which were treated by this method, the tumor was located in the lower rectum. High anterior resection was chosen only in cases with tumors in the rectosigmoid junction; low anterior resection was performed primarily in cases with tumors located in the upper rectum; and pull through method primarily in tumors of the lower rectum.

Based on gross pathologic type, the tumors were divided into the elevated-, the tumorous-, the localized ulcer-, and the infiltrating ulcer type. Abdominoperineal resection was performed for the tumorous- and the infiltrating ulcer type; anterior resection or pull through method was used most frequently in the tumorous type (Table 1).

When Dukes classification was applied, 50.3% of the patients who were treated by abdominoperineal resection had Dukes B lesions; anterior resection was performed primarily in Dukes C lesion and pull through method was applied in about the same number of A, B and C lesions (Table 1).

The curative resectability in terms of tumor location and Dukes classification is shown in Table 2. A curative resectability rate of 100% was obtained, irrespective of the operative method employed, in cases in which cancer invasion was confined to the mucosa or submucosa (Table 3). In cases with infiltration confined to the muscle layer, a 100% resectability rate was obtained by pull through method, followed by abdominoperineal resection and anterior resection. If the cancer invasion extended the serosa, pull through method was most effective, followed by abdo-

Table 2. Tumor Location, Dukes Classification and Curative Resectability

	Total Patients*	Curative Resections
TUMOR LOCATION		
Rectosigmoid Junction	30	15 (50.0%)
Upper Rectum	47	34 (72.3%)
Lower Rectum	109	84 (77.0%)
Anal Canal	19	12 (63.1%)
Totals	205	145 (70.7%)
DUKES CLASSIFICATION		
A	43	100(100.0%)
B	93	71 (76.3%)
C	69	31 (44.9%)
Totals	205	145 (70.7%)

* Including palliative resections

minoperineal resection and anterior resection. No cases with invasion to adjacent structures were treated by the pull through method; of the other two, abdominoperineal resection was somewhat more effective than anterior resection.

The relationship between tumor location and grading of cancer invasion into the rectal wall was studied in cases operated by pull through method or low anterior resection (Fig. 1). In 16 of 22 (72.7%) patients treated by the pull through method, the tumors were located between 10 and 15 cm from the anal verge. In 7 of these 22 cases (31.3%), cancer invasion was confined to the mucosa or submucosa; in 8 (36.4%) it was confined to the muscle layer. The tumor diameter was within 3 cm in 9 or 22 (40.9%) cases.

In 13 of 17 (76.5%) patients operated by low anterior resection, the tumors were located between 7 and 15 cm from anal verge. In none of these 17 cases was tumor invasion limited to the mucosa; in one (5.9%) it was restricted to the submucosa, in 4 (23.5%) to the muscle layer

Table 3. Cancer Invasion and Curative Resectability

Cancer Invasion	Abdominoperineal Resection		Anterior Resection		Pull Through Method	
	Total Patients*	Curative Resections	Total Patients*	Curative Resections	Total Patients*	Curative Resections
m	4	4 (100.0%)	4	4 (100.0%)	3	3 (100.0%)
sm	6	6 (100.0%)	2	2 (100.0%)	5	5 (100.0%)
pm	18	16 (88.8%)	14	8 (57.1%)	9	9 (100.0%)
s(a)	78	60 (76.9%)	13	5 (38.4%)	5	4 (80.0%)
si(ai)	39	17 (43.5%)	5	2 (40.0%)	—	— —
Totals	145	103 (71.0%)	38	23 (55.2%)	22	21 (95.4%)

m: mucosa
sm: submucosa
pm: muscle layer
s: serosal membrane; (a)-invasion through pm in tumors located in the lower rectum or anal canal
si: contiguous structures; (ai)-tumors located in the lower rectum or anal canal
* Including palliative resections

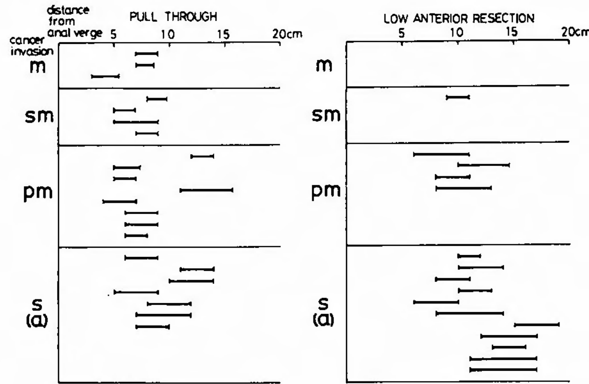

Fig. 1. Tumor location and degree of cancer cell invasion into the rectal wall
For symbol designation, see Table 3
The length of the bars indicates the long diameter of the tumor

and in 12 (70.6%) to the serosa (Fig. 1).

In patients treated by abdominoperineal resection, the five year survival rate was 54%; it was 52% for anterior resection cases and 53% in patients operated by pull through method.

Local recurrence was noted in 9 of 145 (6.2%) abdominoperineal resection, in 2 of 38 (5.3%) anterior resection, and in 2 of 22 (9.1%) patients treated by pull through method. In 6 of the 13 cases with local recurrence, the site of the recurrence was in the lower rectum and the incidence of recurrence was from one to two years postoperatively. The distance of the recurrent tumor from the anal verge, the tumor size, the extent of cancer invasion and lymph node metastasis, as well as the operative methods that had been used, are shown in Table 4.

Discussion

While abdominoperineal resection is the oldelst method in the surgical treatment of cancer of the rectum, sphincter-preserving operations, i.e. anterior resection and pull through- and invagination method, are recently widely performed.

Table 4. Cases of Local Recurrence

Case	Age	Tumor Location	Distance From Anal Verge	Tumor Size	Cancer Invasion	Lymph Node Metastasis	Operative Method	Postoperative Interval
1	54	lower rectum	9 cm	5.0×5.0 cm	pm*	n_1	Abdominoperineal resection	2 years
2	55	lower rectum	5 cm	5.0×3.0 cm	pm	n_2	Abdominoperineal resection	1 year
3	69	lower rectum	6 cm	4.0×5.0 cm	s(a)	n_1	Abdominoperineal resection	1 year
4	70	lower rectum	10 cm	5.0×7.0 cm	s	n_1	Anterior resection	2 years
5	51	lower rectum	9 cm	5.0×5.0 cm	pm	n_1	Pull through	1 year
6	63	lower rectum	8 cm	3.5×4.2 cm	s	n_2	Pull through	2 years

* For abbreviations, see Table 3
n_1: metastasis to lymph nodes of group 1
n_2: metastasis to lymph nodes of group 2

Anterior resection can be carried out in terms of high or low anterior resection. The former method is indicated in tumors which are located at the upper rectum; the latter for tumors located at the lower rectum. If the tumor is located between 6 and 8 cm from the anal verge, the pull through method or invagination method is more appropriate for anterior resection has difficulties in anastomosis of the colon.

Lockhart-Mummery et al.[6], who evaluated the surgical results in cancer of the rectum operated during a 24-year period, reported that the number of sphincter preserving operations had increased from 17% in the early period, to 41% in the last five years. A similar tendency has been reported by Japanese workers[3,4,12].

Regarding the choice of operative methods in the treatment of carcinoma of the rectum, sphincter preserving operations are indicated for tumors which are located at 5–6 distance cm from the anal verge and in tumors without lymph node metastasis or cancer invasion to adjacent structures. However, while Williams et al.[11] advocated that tumors should be resected at a point 6 cm distant from the anal verge, Lockhart-Mummery et al.[6] stressed the resection of tumors between 8 and 10 cm from the anal verge. Factors such as tumor size, gross pathologic appearance and extent of cancer invasion into rectal wall, affect the indication for sphincter preserving operations. Hojo et al.[3] maintained that in ulcer type tumors, resection should be carried out at a level 4–4.5 cm from the lower edge of the tumor.

During a 22-year period, of 205 patients of carcinoma of rectum surgically treated in our department, 70.7% underwent abdominoperineal resection, 18.6% anterior resection and in 10.7% the pull through method was used.

In our reviews, sphincter preserving operations were primarily performed in tumors located between 5 and 15 cm from the anal verge; pull through was used preferentially in recent years in cases in which the tumors were located between 5 and 10 cm from the anal verge, cancer invasion was confined to the mucosa, submucosa, or muscle layer, and/or the tumor was within 3 cm in diameter size. Anterior resection, on the other hand, was used in more advanced cancers.

In patients with tumor of the localized type, abdominoperineal resection, and in those with tumorous type, sphincter preserving operations were preferentially chosen in our series. A 100% rate of curative resectability was obtained in cancer of early stage, in which cancer invasion was confined to the mucosa or submucosa, irrespective of the operative method used. On the other hand, in cases with cancer invasion to the muscle layer or the serosa, the curative resectability on the patient of anterior resection was much lower than the other two methods (Table 3). This result is ascribable to the fact that palliative anterior resections were performed in patients with anal bleeding or rectal stenosis caused by cancer.

In our series, a five year survival rate was 54.4% in patients who had undergone abdominoperineal resection, 52.6% in anterior resection and 53.3% in pull through method. Other workers[4,6,8,9,12] reported about 50% in abdominoperineal resection. However, in patients treated by anterior resection, their five year suvival rates were 65% or higher. The discrepancy between their and our findings may be attributed to the fact that our series included patients with lymph node metastasis who, in the early period of our study, underwent incomplete resection.

The curative resectability has increased in the more recently operated patients.

The recurrence of cancer is an important problem in patients who were treated by the sphincter preserving operations. Grinnel[2] has reported that with respect to recurrence, there is no correlation between the abdominoperineal resection and sphincter preserving operation. Rather, he maintained that local recurrence was closely related with cancer invasion of the rectal wall and Wheelock et al.[10] also pointed to the important role played by dissemination of cancer cell in the lumen of the bowel.

Our findings that local recurrence occurred primarily in cases in which the tumors located at 5 cm distance from anal verge with lymph node metastasis, suggest that the grading of cancer invasion and lymph node metastasis play a greater role in local recurrence than the operative methods performed.

Based on our findings, we suggest that in the surgical treatment of cancer of rectum, sphincter preserving operations are indicated in localized tumors, if cancer invasion is confined to the muscle layer of rectal wall, if Dukes type A is applicable, and in cases in which cancer invasion to the levator muscle is not suspected. Anterior resection is indicated in tumors located in the rectum or rectosigmoid, above 8 cm from anal verge, and pull through method is indicated for tumors above 6 cm from anal verge.

Summary

During the last twenty-two years, 244 patients with carcinoma of the rectum were treated in our clinic, of which 205 cases underwent operation. They were divided into three groups according to the operative methods: abdominoperineal resection, anterior resection and pull through method.

The abdominoperineal resections were performed on cases in more advanced stage irrespective of loaction of cancer, while sphincter preserving operations on cases in less advanced stage; anterior resection for the tumor located at upper rectum and pull through method for one at lower rectum, preferably.

There were no remarkable difference both in five year survival rate and in local recurrence rate between three groups.

The sphincter preserving operations should be indicated for the cancer with localized type which are located at 6 to 8 cm distance above anal verge and with cancer invasion limited to the muscle layer.

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和文抄録

直腸癌の手術々式の評価について

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われわれの教室で過去22年間に経験した直腸癌は244例であり，その手術々式および手術成績に及す因子について検討した．手術々式のうちわけは腹会陰合併切除は145例，前方切除術38例，貫通法22例である．

腹会陰合併切除術は癌の占居部位に関係なく，高度の進行癌に実施され，肛門括約筋保存術は進行度の低い癌で，上部直腸癌には前方切除術，下部直腸癌には貫通法が主として実施された．5年生存率ならびに癌の局所再発率は手術々式には関係なく，遠隔成績には癌占居部位，壁深達度，リンパ節転移などと手術々式の選択が大きく作用することをのべた．

肛門括約筋保存術の適応は限局性腫瘤で，癌浸潤が筋層に留まり，腫瘍の下縁が肛門縁より8cm以上口側の場合は低位前方切除術，6cm以上の場合は貫通法としている．