

Rectal Cancer: The Impact of a Colorectal Unit on the Preservation of the Anal Sphincter*

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Abstract

Background: Mid- and lower rectum cancer is a technical challenge to the surgeon aiming to preserve the anal sphincter. The choice between abdominoperineal resection and anterior resection is often related to surgical skills.

Objectives: To evaluate the role of a specialized colorectal unit in preserving the anal sphincter mechanism in the treatment of rectal cancer.

Methods: Between 1991 and 1996, 75 patients with rectal cancer up to 12 cm from the anal verge were operated at the Sheba Medical Center. Among them, 21 patients (group 1) underwent surgery in the colorectal unit and 54 patients (group 2) in the other two surgical departments. All patients had a complete preoperative investigation and were followed for 12–90 months.

Results: Background and tumor parameters were similar for both groups. In group 1, 20 patients (95%) had low anterior resection and 1 patient (5%) had abdominoperineal resection as compared to 20 patients (37%) and 34 patients (63%), respectively, in group 2 ($P < 0.005$). There was no statistical difference in the systemic recurrence rate. Local recurrence was more frequent in group 2 ($P < 0.05$).

Conclusions: Special training in colorectal surgery enables the surgeon, in keeping with the principles of oncologic surgery, to preserve the anal sphincter mechanism in most patients with adenocarcinoma located in the mid- and lower third of the rectum.

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The local recurrence rate following resection of rectal cancer varies widely [1–5]. Many randomized trials were undertaken to determine the prognostic factor for local recurrence or survival after resection of rectal tumor, such as stage, grade, size of the tumor, carcinoembryonic antigen levels, or blood transfusion [6–10]. Some studies also referred to surgical experience and special colorectal training as affecting the outcome and local recurrence rate [11–14]. Yet, the effect of special colorectal training on the quality of the patient's life and the sphincter-preserving surgery rate is largely unknown.

In an attempt to determine the role of colorectal subspecialty in preserving the anal sphincter mechanism, we compared the immediate and long-term results of curative surgery for mid- and low rectal cancer as performed by a colorectal surgeon with those of surgery performed by general surgeons.

Patients and Methods

The Sheba Medical Center has two departments of general surgery and one specialized unit in colorectal surgery. We reviewed the charts of all patients with rectal cancer operated at the Sheba Medical Center between 1991 and 1996. A subgroup that included only patients with cancers located at the mid- and lower rectum (up to 12 cm from the anal verge) constituted the basis of this survey.

The study population included 75 consecutive patients (41 males, 34 females). Preoperative data, operative details, and postoperative follow-up information were obtained from a review of hospital and surgeons' office charts. The data included demographic background, clinical presentation, histologic staging and grading, need for blood transfusion, perioperative radiation and chemotherapy, immediate and long-term complications, recurrence and survival.

Local recurrence was defined as the presence of anastomotic, pelvic or perianal disease and documented by imaging methods or histologic examination. Patients who were operated by a colorectal surgeon were defined as group 1, and by general surgeons as group 2.

Statistical analysis

Bivariate analysis to compare patients of the colorectal unit and the other surgical departments used chi-square tests and Fisher exact test for categorical variables and Student's *t*-tests for continuous variables. All *P* values were two-sided, and a value less than 0.05 was considered to indicate statistical significance. Values of the continuous variables are expressed as means \pm SD. Logistic regression analysis was used to assess the independent influence of each group on the recurrence rate [15].

Results

Between the years 1991–1996, 75 patients (41 males, 34 females) were operated at the Sheba Medical Center for rectal carcinoma located up to 12 cm above the anal verge as determined by endoscopic examination. Surgery was performed in 21 patients from the colorectal unit (group 1) and 54 patients from the other two surgical departments (group 2). The choice of the surgical method employed was dependent solely on the surgeon's skill, experience and performance. Patients of both groups were similar in terms of background, clinical presentation, staging, grading, distance from the anal verge, and the need for blood transfusion. Perioperative radiation treatment was given to 9 patients (42.9%) in group 1 and

* This study, conducted at Sheba Medical Center, was presented at the Israel Surgery Conference, Haifa, February 1999.

Table 1. Comparison of demographic, preoperative, operative, tumor characteristics and treatment-related factors in the two groups

	Group 1	Group 2
Age (yrs)	67 ± 13	63 ± 12
Gender		
Male	9 (43%)	32 (59%)
Female	12 (57%)	22 (41%)
Height of tumor above anal verge according to endoscopic examination (cm)	7.0 ± 3.1	7.7 ± 2.8
Perioperative blood transfusion	18 (86%)	43 (80%)
Perioperative irradiation	9 (43%)	37 (69%)*
Tumor diameter	3.9 ± 2.1	3.7 ± 1.5
Distance from distal surgical margins	1.9 ± 1.7	2.6 ± 2.1
Dukes staging		
A	3 (14%)	4 (7%)
B	12 (57%)	36 (67%)
C	6 (29%)	14 (26%)
Abdominoperineal resection	1 (5%)	20 (37%)*
Low anterior resection	20 (95%)	34 (63%)*
Colorectal anastomosis with J pouch	4 (19%)	0 (0%)

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.005$

Table 2. Early and Late postoperative complications

	Group 1	Group 2
Early complications	15 (71%)	42 (78%)
Late complications		
Strictures	4 (27%)	2 (5%)*
Local recurrence	1 (7%)	14 (35%)*
Systemic recurrence	3 (20%)	8 (20%)

* $P < 0.05$.

37 (68.5%) in group 2 ($P < 0.05$). Low anterior resection was more frequent in group 1 than in group 2 (95% vs. 37%, respectively, $P < 0.005$). Abdominoperineal resection, on the other hand, was less frequent in group 1 as compared to group 2 (1 vs. 20 patients respectively, $P < 0.005$) [Table 1].

There was no difference in hospitalization period (average 12 ± 6 days) or postoperative complications between the two groups, except for three cases of bowel obstruction in group 1 as compared to one in group 2. One patient with abdominoperineal resection in group 2 died on the 10th postoperative day from cardiac arrest [Table 2].

In 15 patients of group 1 (71%) and 40 patients of group 2 (74%) the follow-up time was 72 to 90 months (average 27 months). Among the local complications, strictures were the most common in group 1 as compared to group 2: 4 patients (27%) vs. 2 patients (5%) respectively ($P < 0.05$). Local recurrence was more frequent in group 2: 14 patients (35%) vs. 1 patient (7%) in group 1 ($P < 0.05$). There was no difference between the two groups in systemic recurrence (20% in both groups) [Table 2].

Analysis of preoperative factors predicting local recurrence reveals a high correlation with pain ($P < 0.001$), obstructive mass ($P < 0.005$), carcinoembryonic antigen levels ($P < 0.05$), tumor diameter ($P < 0.05$), staging and grading ($P < 0.001$). When a tumor

was located at the low rectum (under 7 cm) the recurrence rate was higher in males than in females ($P < 0.05$). Surgical method, blood transfusion, adjuvant therapy, and the distance from surgical margins did not influence the recurrence rate.

A stepwise regression revealed that group did not independently influence local or general recurrence. That is, the fact that more patients in the colorectal unit underwent low anterior resection did not adversely influence their outcome.

Discussion

The impact of surgical skills on the treatment of rectal cancer was previously investigated by other authors in terms of local recurrence and overall survival [11–13]. Porter et al. [14] showed that the outcome of patients with rectal cancer was improved if treated by a trained colorectal surgeon. However, there is insufficient evidence of the surgeon's role in preserving the anal sphincter mechanism and improving the quality of life for patients undergoing surgery for rectal cancer.

In the current study we showed that colorectal specialty not only improves the quality of life by a frequent use of sphincter-preserving surgery, but is also associated with a lower local recurrence rate. Although there was no significant difference between the two groups, sphincter-preserving surgery (low anterior resection) was performed in 20/21 patients (95%) in group 1, with only 7% local recurrence as compared to 20/54 patients (37%) in group 2 with 35% local recurrence ($P < 0.05$). Similar findings were presented by Porter et al. [14] who found that trained colorectal surgeons performed low anterior resection more frequently (72.5%) than general surgeons (35.1%). These facts, as in the current study, were not influenced by demographic variables, except for the fact that the trained surgeons had a smaller proportion of low rectal tumors (15.6 vs. 26.3%, respectively) and a higher proportion of middle level tumors (55.0 vs. 35.9%, respectively).

This study also supports the finding, already presented by others [1,2,14,16–19], that the surgical approach does not influence the recurrence rate. This fact justifies the tendency towards sphincter-preserving surgery performed by trained colorectal surgeons. Furthermore, our data support the idea, shared by others [3], that a meticulous surgical technique for resection of rectal cancer is a crucial factor in reducing local recurrence. Despite the less frequent use of perioperative radiotherapy, the lower rate of local recurrence observed in group 1 patients reinforces the importance of the surgical technique in the treatment of rectal cancer.

The colorectal unit patients had relatively higher rates of bowel obstruction during the immediate postoperative period and rectal strictures in the long-term follow-up (14% and 27%, respectively). These complications were described previously in patients who underwent low anterior resection and colo-anal anastomosis with or without diverting ileostomy [20–22]. Therefore, these differences probably reflect the result of a higher rate of low anterior resection in group 1 as compared to group 2.

The overall local recurrence rate in the study population was 27%. The factors found to correlate with recurrence rate were quite similar to those described in other studies [4–9,20,23]. The role of staging and grading as outcome predictors is well established in the

literature, but there is controversy regarding the prognostic value of perioperative blood transfusion on outcome [24]. In the current study, in contrast to other studies [25], blood transfusion was not correlated to outcome.

Gender was related to local recurrence only in low tumors (under 7 cm), and in those cases, male gender was a poor prognostic factor. This is probably due to the narrow male pelvis, which makes the operation technically more difficult.

In conclusion, special training in colorectal surgery enables the surgeon, with the use of innovative techniques and in keeping with the principles of oncologic surgery, to preserve the anal sphincter in most cases with rectal cancer at the middle and lower thirds of the rectum.

References

- Amato A, Pescatori M, Butti A. Local recurrence following abdominoperineal excision and anterior resection for rectal carcinoma. *Dis Colon Rectum* 1991;35:317-22.
- Williams NS, Johnston D. Survival and recurrence after sphincter saving resection and abdominoperineal resection for carcinoma of the middle third of the rectum. *Br J Surg* 1984;71:278-82.
- Heald RJ, Ryall RD. Recurrence and survival after total mesorectal excision for rectal cancer. *Lancet* 1986;i:1479-82.
- Rubbini M, Vettorello GF, Guarrera C, et al. A prospective study of local recurrence after resection and low stapled anastomosis in 183 patients with rectal cancer. *Dis Colon Rectum* 1990;33:117-21.
- Colombo PL, Scotti Foglieni CL, Morone C. Analysis of recurrence following curative low anterior resection and stapled anastomosis for carcinoma of the middle third and lower rectum. *Dis Colon Rectum* 1987;30:457-64.
- Wiggers T, Arends JW, Volovics A. Regression analysis of prognostic factors in colorectal cancer after curative resection. *Dis Colon Rectum* 1988;31:33-41.
- Hermanek P, Guggenmoos-Holzmann I, Gall FP. Prognostic factors in rectal carcinoma – a contribution to the further development of tumor classification. *Dis Colon Rectum* 1989;32:593-9.
- Carlon CA, Fabris G, Arslan-Pagnini C, et al. Prognostic correlations of operable carcinoma of the rectum. *Dis Colon Rectum* 1985;28:47-50.
- Tominaga T, Sakabe T, Koyama Y, et al. Prognostic factors for patients with colon or rectal carcinoma treated with resection only. *Cancer* 1996;78:403-8.
- Hannisdal E, Thorsen G. Regression analysis of prognostic factors in colorectal cancer. *J Surg Oncol* 1988;37:109-12.
- McCardle CS, Hole D. Impact of variability among surgeons on postoperative mortality and morbidity and ultimate survival. *Br Med J* 1991;302:1501-5.
- Phillips RK, Hittinger R, Blesovsky L, et al. Local recurrence following 'curative' surgery for large bowel cancer. Part II: The rectum and rectosigmoid. *Br J Surg* 1984;71:17-20.
- Hermanek P, Wiebelt H, Staimmer D, Riedl S. Prognostic factors of rectum carcinoma – experience of the German Multicentre Study SGCRC. German Study Group Colo-Rectal Carcinoma. *Tumori* 1995;81(3 Suppl):60-4.
- Porter GA, Soskoine CL, Yakimets WW, Newman SC. Surgeon-related factors and outcome in rectal cancer. *Ann Surg* 1998;227:157-67.
- Altman DG. Practical Statistics for Medical Research. Boca Raton, FL: Chapman & Hall/CRC, 1999.
- Slanetz CA, Herter FP, Grinnell RS. Anterior resection versus abdominoperineal resection for cancer of the rectum and rectosigmoid, an analysis of 524 cases. *Am J Surg* 1972;123:110-17.
- Fick TE, Beaten CG, von Meyenfeldt MF, Obertop H. Recurrence and survival after abdominoperineal and low anterior resection for rectal cancer, without adjuvant therapy. *Eur J Surg Oncol* 1990;16:105-8.
- Mohiuddin M, Marks G. High dose preoperative radiation and sphincter preservation in the treatment of rectal cancer. *Int J Radiat Oncol Biol Phys* 1987;13:839-42.
- Holm T, Rutqvist LE, Johansson H, Cedermark B. Abdominoperineal resection and anterior resection in the treatment of rectal cancer: results in relation to adjuvant preoperative radiotherapy. *Br J Surg* 1995;82:1213-16.
- Bullen BR. Stricture of the descending colon following low anterior resection of the rectum. *Br J Clin Pract* 1981;35:55-6.
- Woodward A, Tydeman G, Lewis MH. Eder Puestow dilatation of rectal stricture following anterior resection. *Dis Colon Rectum* 1990;33:79-81.
- Pahlman L, Glimelius B, Frykholm G. Ischaemic strictures in patients treated with a low anterior resection and perioperative radiotherapy for rectal carcinoma. *Br J Surg* 1989;76:605-6.
- Griffin MR, Bergstralh EJ, Coffey RJ, et al. Predictors of survival after curative resection of carcinoma of the colon and rectum. *Cancer* 1987;60:2318-24.
- Tartter PI. Perioperative blood transfusion and colorectal cancer recurrence: a review. *J Surg Oncol* 1988;39:197-200.
- Parrott NR, Lennard TWJ, Taylor RMR, et al. Effect of perioperative blood transfusion on recurrence of colorectal cancer. *Br J Surg* 1986;73:970-3.

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Capsule

Holliday junction complex and homologous recombination

Homologous recombination (HR) is a vital DNA damage-repair pathway. A common intermediate of HR is the Holliday junction complex, a structure that also occurs during meiosis and mitosis. Mus81 is an endonuclease implicated in Holliday junction resolution and/or in the processing of stalled replication forks in yeast. In order to probe the function of Mus81 in mammals, McPherson et al. generated mice lacking the gene. Surprisingly, the mice are viable and fertile, and demonstrate normal

lymphocyte development and activation, ruling out a role for Mus81 in the repair of programmed DNA breaks as well as in meiotic recombination. However, heterozygous and homozygous mice show an elevated incidence of chromosomal aberration and various types of malignancy, revealing that Mus81 is a haplo-insufficient tumor suppressor protein.

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