

Anterior Resection for Carcinoma of the Rectum and Rectosigmoid Area *

MICHAEL R. DEDDISH, M.D., MAUS W. STEARNS, JR., M.D.

*From the Colon and Rectum Service, Memorial Hospital for Cancer and Allied Diseases
New York, New York*

IN 1939, Dixon³ described a "rejuvenation of a plan of segmental resection of the pelvic portion of the colon with re-establishment of continuity as described many years ago by Sir Rutherford Morrison and later by Balfour." The operation became known as "anterior resection with anastomosis," or simply "anterior resection." This has come to imply an anastomosis of proximal colon, covered with serosa, to the rectum which is devoid of serosa below the peritoneal reflection.

In discussing his reasons for reviving this operation, Dixon noted that when anterior resection of sigmoid had been done, subsequent involvement of the rectal segment by residual cancer has been strikingly infrequent. In his opinion, this emphasized the feature generally recognized, that spread of malignancy is, for the most part, upward, and therefore it seemed justified to preserve the rectum whenever possible.

Since this report was published, a large body of literature concerning the role of the operation has appeared. However, its limitations and indications have not been defined to the satisfaction of all surgeons concerned.

There does seem to be agreement that anterior resection should not be employed as a curative operation for cancer in the distal rectum; that is, for lesions within 6.0 cm. of the anal verge. Apparently, most surgeons are convinced that tumors in the mid or upper sigmoid, 16 to 18 cm. from the anal verge, can be treated as effectively by abdominal resection with primary anastomosis as with any other type of proce-

dure. The subject of most current discussions is its role in the treatment of cancer lying between 6.0 and 17 cm.

Material

We are reporting results obtained by the Colon and Rectum Service of Memorial Hospital with anterior resection and primary anastomosis as treatment of cancer of the rectum and rectosigmoid lying between 6.0 and 17 cm. from the anal verge. Our usage of the term "anterior resection" implies abdominal resection of a segment of large bowel, including part of the rectum and a variable extent of proximal colon, with primary anastomosis performed below the pelvic peritoneal reflection.

For comparison we have reviewed a group of patients with tumors in similar location treated by combined abdominoperineal resection. The abdominal extent of dissection was the same for both procedures. In both series the operating surgeons performed pre- and postoperative examinations, including sigmoidoscopy. Both series include all private and ward patients treated. Finally, the pathologists performed similar examinations of the specimens in both groups.

During the years 1947 through 1954, 490 patients were treated by combined abdominoperineal resection or anterior resection for cancer of the terminal bowel located between 6.0 and 17 cm. from the anal verge. Of these, 189 had anterior resection and 301 had abdominoperineal resection.

In Table 1 are data regarding the proportion of men and women treated by abdominoperineal resection and anterior re-

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TABLE 1. *Resections for Cancer. Utilization of Abdominoperineal Resection or Anterior Resection (490 Cases, 1947-1954)*

Distance cm.	Totals	No. Men	% APR	% AR	No. Women	% APR	% AR
6-8	167	93	97	3	74	89	11
9-10	136	67	72	28	69	46	54
11-12	116	55	47	53	61	39	61
13-16	71	38	26	74	33	15	85

section at various levels. Relatively fewer men than women with low-lying lesions had anterior resection. This sex difference reflects the greater technical difficulties encountered in the pelvis of men.

In Table 2 we have indicated the relative frequency with which abdominoperineal resection and anterior resection were employed for lesions at different levels during two periods of study. It is evident that in more recent years we have employed anterior resection more frequently than ab-

dominoperineal resection for lesions located at least 11 cm. from the anal verge.

The over-all results in patients having anterior resection are presented in Table 3. Of 189 resections, 19 were considered palliative because of the presence of liver, peritoneal, or pulmonary metastases. The indeterminate patients include those dying of other causes, or, who were lost to follow up, in less than five years without evidence of recurrence or metastasis at the time of their last examination. There were 104 five-year survivors—55 per cent five-year survival.

There were ten operative deaths, an operative mortality of 5.0 per cent. In those patients whose primary tumor lay within 6.0 to 10 cm. of the anal verge, the mortality was 9.0 per cent. Four of the ten operative deaths were directly attributable to the anastomosis—leakage and peritonitis.

As this operative mortality caused much concern, anterior resections performed during the next three-year period, an additional 170 patients, were reviewed. There were three postoperative deaths in this group, an operative mortality of 1.8 per cent. Thus, of 358 resections there were 13 postoperative deaths, an operative mortality of 3.6 per cent.

Table 4 presents operative mortality of the entire series grouped according to location of the primary tumor. It is highest in the group whose tumors were located nearest the anus. This operative mortality must be compared with our over-all operative mortality for abdominoperineal resection, which has been less than 2.0 per cent for many years.

TABLE 2. *Utilization of Anterior Resection. Time Periods*

Distance (cm.)	1947-1948		1949-1954	
	No.	% AR	No.	% AR
6-8	65	0	102	10
9-10	32	22	104	47
11-12	28	35	88	64
13-16	24	54	48	92

TABLE 3. *Anterior Resections, Over all (1947-1954, 189 Patients)*

	Location of Primary		
	6-10 cm.	11-13 cm.	14-16 cm.
Total number	65	80	44
Curative	59	71	40
Palliative	6	9	4
Operative deaths	6	3	1
Operative mortality	9%	4%	2%
Indeterminate patients	8	8	4
Failures less than 5 years	18	23	14
Five-year survivors	33	46	25
No evidence of disease	31	43	25
Dead of disease after 5 years	2	3	1

The comparison of five-year survival of patients with primary tumors located at similar levels, treated by anterior resection or abdominoperineal resection, is shown in Table 5. These figures are based on determinate patients operated for cure. Because of the difference in operative mortality operative deaths are included as failures. As is shown, five-year survival is almost identical following either procedure.

Table 6 is a comparison of survival of patients grouped according to Dukes' 2 classification of operative specimens, and operative procedure. This method of comparison minimizes criticism that the series are not comparable. Comparison of survival of patients according to extent of disease as determined by the pathologist, eliminates uncertainty introduced by the highly inaccurate preoperative evaluation of "favorable" or "unfavorable." It should be noted that the distribution of Dukes' A, B and C lesions is similar in both series. Again, similarity of results is evident. The only group with a lower survival rate following anterior resection was the Dukes' A. This difference is not statistically significant. Furthermore, only one of the six died of cancer, the other five being postoperative deaths.

Much criticism concerning anterior resection has had reference to anastomotic recurrence. In Table 7 we have tabulated anastomotic recurrence; a 5.0 per cent rate. Only those living long enough for evaluation are included in this Table. We eliminated those dying immediately postoperatively, and those without evidence of anastomotic recurrence who had been lost to follow up, as well as those dying of other causes in less than three years. Anything less than this period of follow up was believed to be inadequate for evaluation of anastomotic recurrence. If the recurrence rate was based on the over-all series, it would be 4.2 per cent.

Table 8 indicates anastomotic recurrences in relation to location of the primary cancer. Unexpectedly, recurrence was most

TABLE 4. Anterior Resections. Location of Primary and Operative Mortality

	6-10 cm.	11-13 cm.	14-16 cm.
Number of patients	129	155	61
Operative deaths	7	4	2
Operative mortality	5.5%	1.7%	3.3%

TABLE 5. Comparative Five-year Survival Abdominoperineal Resection and Anterior Resection. Location of Primary Cancer

Location	No. Patients		Five-year Survivors		Five-year Survival	
	APR	AR	APR	AR	APR	AR
6-10 cm.	172	51	106	33	62%	65%
11-16 cm.	76	99	55	70	72%	78%

TABLE 6. Comparative Five-year Survival Abdominoperineal Resection and Anterior Resection. Dukes' Classification

Dukes' Class	No. Patients		Five-year Survivors		Five-year Survival	
	APR	AR	APR	AR	APR	AR
A	59	35	54	29	92%	83%
B	95	59	67	47	70%	80%
C	94	55	40	27	43%	47%

TABLE 7. Anastomotic Recurrences

Total series	159
Anastomotic recurrences	8
Anastomotic recurrence rate	5%

TABLE 8. Location and Anastomotic Recurrences

	Location of Primary		
	6-10 cm.	11-13 cm.	14-16 cm.
Total series	51	69	39
Anastomotic recurrences	3	1	4
Anastomotic recurrence rate	6%	1.5%	11%

TABLE 9. *Dukes' Classification and Anastomotic Recurrences*

	Dukes' Classification		
	A	B	C
Total series	35	59	55
Anastomotic recurrence	0	2	6
Anastomotic recurrence rate	0%	3.4%	10%

frequent in patients whose primary lesions were located furthest from the anus.

Table 9 correlates anastomotic recurrence with Dukes' classification. The highest rate was found when lymph node metastases were present: Dukes' C.

Anastomotic recurrence in relation to the free margin distal to the tumor, as recorded by the pathologist, is shown in Table 10. No correlation is evident.

Table 11 indicates anastomotic recurrence in relation to histologic grading. Again no correlation is evident.

In an attempt to evaluate possible increase of pelvic recurrence following anterior resection, the failures were compared with those following abdominoperineal resection. The data are presented in Table 12 where anastomotic recurrences are included with pelvic recurrences. While there are too few patients to be of statistical significance, no increased incidence of pelvic recurrence is evident following anterior resection as compared with abdominoperineal resection.

TABLE 10. *Free Margin and Anastomotic Recurrence (Measured by Pathologist)*

Free Margin	No. Traced	Anastomotic Recurrence
Less than 1 cm.	3	1*
1-2 cm.	8	0
2-3 cm.	21	1
3-4 cm.	30	2
4+ cm.	39	4

* Fixed specimen has gross margin of 3.0 cm. but microscopic examination showed tumor extending to line of resection.

Discussion

From this review of anterior resection in treatment of cancer located 6.0 to 17 cm. from the anal verge, several facts seem evident.

Of primary importance is that anterior resection resulted in as high five-year survival for patients with comparable lesions as was obtained by abdominoperineal resection (Tables 5, 6). This is in keeping with published results of others who have utilized anterior resection. Waugh, Block and Gage¹⁰ showed or found comparative survival rates. Mayo and Fly⁸ reported results obtained by anterior resection comparing favorably with those following abdominoperineal resection. To the best of our knowledge, the only published report of five-year survival, in which anterior resection suffers by comparison with abdominoperineal resection is that of Gilbertsen.⁵ He reports that there were no five-year cancer-free survivors in six patients treated by anterior resection, whose tumors were located in the distal 10 cm. of the rectum, and were classified as Dukes' C lesions.

A number of articles have appeared which, without reporting the over-all survival obtained, criticize anterior resection because of the large number of anastomotic recurrences seen. One of the most discouraging studies was that of Garlock and Ginzburg,⁴ who in a study of a combined series of private and ward patients reported an incidence of recurrence at the anastomosis of 27 per cent for those whose primary tumor had been located three to four inches from the anal verge, and 45 per cent for those whose primary lesion was four to five inches from the anal verge. Judd and Pellegie⁷ reported a more than 25 per cent recurrence within the bowel only. Cole¹ and, more recently, Wheelock, Toll and McKittrick¹¹ report an anastomotic recurrence rate of 10 per cent.

In our series, including those operated for palliation, the over-all anastomotic re-

currence rate is 4.2 per cent, and 5.0 per cent in those we could follow at least three years. This, as compared with other published reports, is a low over-all incidence. We attribute this low incidence to the fact that early in the course of this effort we were impressed by the article of Goligher, Dukes, and Bussey⁶ regarding concepts of etiology and prophylactic methods in the problem of local recurrence. As a result, we have given special attention to this phase of the operation. At surgery the proximal bowel is clamped and divided before the tumor is manipulated. The distal stump is prepared for anastomosis by one of two methods. In one, a Chaffin tube is inserted into the rectum preoperatively. After mobilization of the rectum is completed, a clamp is placed across the rectum at least 4.0 to 5.0 cm. below the palpable border of the tumor. The rectum is then irrigated thoroughly with distilled water, or a mild antiseptic solution. The bowel is then transected below the clamp. In the other method, after mobilization of the rectum, and application of the clamp below the tumor, suction of the distal bowel contents is employed as the bowel is divided. Swabs, saturated with tincture of zephiran, are then used to cleanse the distal stump. The proximal bowel lumen, in both methods, is swabbed thoroughly with tincture of zephiran prior to effecting anastomosis.

As we were concerned with anastomotic recurrence particularly in the very low le-

TABLE 11. *Grade of Tumor and Anastomotic Recurrence*

Grade	No. Traced	Anastomotic Recurrence
I	1	0
II	66	2
III	35	2
Ungraded	5	2

sions, we were most careful in carrying out these measures in this group. In retrospect, we were less careful with the higher lesions, which may explain why the anastomotic recurrence rate was highest at this level.

Preoperatively, these patients were prepared by saline catharsis and enemata without antibiotics. There is some experimental evidence, reported by Vink⁹ suggesting that intestinal antiseptics increased the incidence of tumor growth at the anastomosis.

Furthermore, in considering the problem of anastomotic recurrence, it is our opinion, based on repeated examinations during the postoperative follow up of these patients, that a substantial number represented secondary invasion of the bowel from pelvic wall recurrence. This would account for the extremely poor results of efforts to treat these recurrences. In one patient the anastomotic recurrence was definitely an implant, which was successfully treated by local removal. As nearly as we could determine not more than four patients in our series had anastomotic recurrences which

TABLE 12. *Analysis of Failures*

Location	No. Traced	Failures Anastomotic-Pelvic	% Due to Pelvic Recurrence
6-10 cm.			
APR	75	34	46
AR	11	2 4	55
11-16 cm.			
APR	21	11	52
AR	22	4 1	23
Total			
APR	96	45	47
AR	33	6 5	33

did not represent extension of pelvic wall recurrence.

Of 490 resections for carcinoma of the bowel, located between 6.0 and 17 cm. from the anal verge, during the period under review, somewhat less than 40 per cent were anterior resections. This would indicate that anterior resection had not replaced abdominoperineal resection in our practice. However, as indicated in Table 2, there was a tendency to employ it more frequently as our experience increased. This trend has continued to the present.

Anterior resection seems to have more limited applicability in males, because of smaller bony anatomic diameters thus limiting the performance of an adequate pelvic resection and a subsequent satisfactory anastomosis.

Conclusion

1. Anterior resection is as good a cancer operation as is abdominoperineal resection for tumors lying at least 6.0 to 7.0 cm. above the anal verge, provided: that a margin of 3.0 to 4.0 cm. below the tumor can be obtained, leaving enough distal bowel for a satisfactory anastomosis; that the same abdominal resection is done as for an abdominoperineal resection; and that detailed attention be given to preparing the proximal and distal bowel prior to anastomosis.

2. There are no more failures from recurrence within the pelvis, including anastomotic recurrences, in those patients who had anterior resection than there are in those who had abdominoperineal resection.

3. While the problem of anastomotic recurrence has been minimized by early clamping of the proximal bowel, and meticulous care of the bowel lumen prior to anastomosis, we believe additional adjunctive measures should be sought to reduce still further the number of anastomotic recurrences. We do not believe that the problem of anastomotic recurrences need be of such magnitude as to justify the aban-

donment of anterior resection with restoration of continuity of the lower bowel.

4. It is possible that the omission of antibiotics in the preoperative preparation may be a factor in the low incidence of anastomotic recurrence in this series. This deserves further evaluation, experimentally and clinically.

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