Early Infective Complications and Late Recurrent Cancer in Stapled Colonic Anastomoses

P. SAUVEN, M.S., F.R.C.S.,* M.J. PLAYFORTH, F.R.C.S., MARY EVANS, B.A., A.V. POLLOCK, F.R.C.S.

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Between 1978 and 1981, 73 patients with colonic or rectal cancer were randomized to have their anastomoses made by either a single interrupted layer of braided polyester sutures, or by a circular stapling instrument. Of these operations, 20 were considered to have been palliative, the remaining 53 being potentially curative. The incidence of local recurrence in the latter group was analyzed in relation to initial septic and anastomotic complications. The 53 patients were followed for a median of 36 months (range, 1 to 87); 24 were alive and well and 22 had died of disseminated cancer or unrelated causes. Seven patients died with local recurrent disease proved at laparotomy or autopsy after a median of 33 months (range, 3 to 72). Thirty anastomoses were stapled and 23 sutured; of the seven patients who died with local recurrent disease, six had stapled anastomoses (Fisher's exact probability $F_2 = 0.12$; log rank chi-square = 3.53, $0.05 < P < 0.10$). Two patients who died with locally recurrent disease had had clinically apparent anastomotic leaks and one other patient had had a radiologically demonstrated leak. This compares with a total of seven leaks (clinical or radiologic) in the remaining group of 46 patients with no recurrence (Fisher's exact probability $F_2 = 0.11$). These results tend to support the hypothesis that anastomotic leaks may lead to locally recurrent disease, particularly after stapled anastomoses. [Key words: Colonic neoplasms; Rectal neoplasms; Surgery, operative; Neoplasm recurrence, local]

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*Present address: St. Mary's Hospital, London W2 1NY, England.

Address reprint requests to Mr. Pollock: Scarborough Hospital, North Yorkshire Y012 6QL, United Kingdom.

From the Scarborough Hospital, North Yorkshire, United Kingdom

THE EARLY RESULTS of a prospective random control clinical trial comparing sutured and stapled colonic and colorectal anastomoses have been reported previously from this unit.[1] The authors now present a follow-up study that includes data on the correlation between late local recurrent disease and the anastomotic complications of the initial operation in those patients operated on for potentially curable cancer.

Patients and Methods

Between 1978 and 1981, 100 patients requiring colonic resections were randomized to have their anastomoses made by either a single interrupted layer of braided polyester, or by the SPTU stapling instrument. Randomization was revealed to the surgeon only after resection of the diseased bowel, and was stratified for right and transverse colectomies (N = 31), left and high anterior resections (N = 50), and low anterior resections, (N = 19). All left-colon operations were performed with the patient in the lithotomy-Trendelenberg position and when the operation was for cancer, the rectum was irrigated with 1 percent chlorhexidine before anastomosis. Water-soluble contrast enemas were performed 10 to 16 days after surgery in patients with left-colon anastomoses.

TABLE 1. *Operations Performed and Their Outcome*

Operation	Sutured Anastomosis			Stapled Anastomosis		
	Anastomotic Leak	Recurrence	No Recurrence	Anastomotic Leak	Recurrence	No Recurrence
Right hemicolectomy	-	-	9	-	2	6
High anterior resection	1	-	8	1	2	13
Low anterior resection	3	1	5	5	2	5
TOTAL	4	1	22	6	6	24

Of the 73 operations for colorectal cancer in this series, 20 were palliative because of the presence of liver or peritoneal metastases; the remaining 53, whose operations were potentially curative, were followed for a median of 36 months (range, 1 to 87).

Fisher's exact probability test was used to analyze the significance of differences between proportions, and a value for chi-square was calculated from a log rank analysis.

Results

Table 1 shows the operations performed and their outcome. Seven patients died with local recurrent disease, proven at laparotomy or autopsy after a median of 33 months (range, 3 to 72). Twenty-four patients remain alive and well, 8 have died with disseminated cancer, and the remaining 14 of unrelated causes; there was no evidence of recurrent local cancer in these 22 patients.

Six leaks, five clinical and one radiologic, occurred after 30 stapled anastomoses, and there were four leaks, three clinical and one radiologic, in the 23 patients with sutured anastomoses ($P = 1.0$).

Six of the seven patients who died of local recurrent disease had stapled anastomoses ($P = 0.12$, log rank chi-square = 3.53, $0.05 < P < 0.10$) (Fig. 1). Three of these 7 patients had anastomotic leaks (two clinical and one radiologic) compared with a total of 7 anastomotic leaks in the remaining group of 46 patients with no local recurrence ($P = 0.11$).

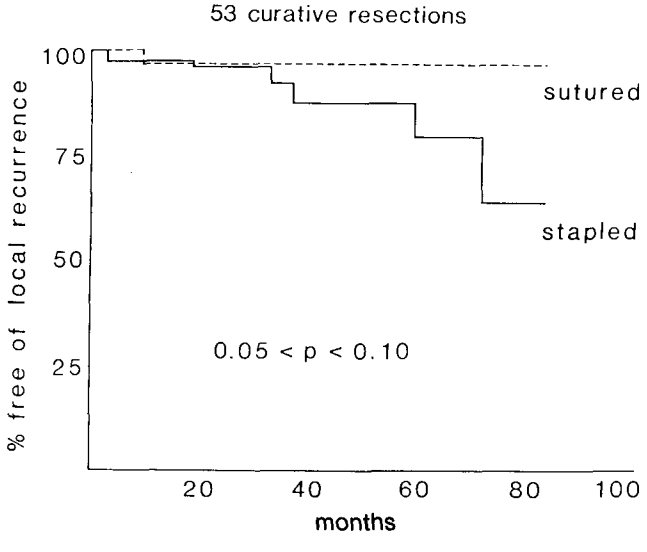

FIG. 1. Life table analysis of local recurrence rates after sutured and stapled colonic anastomoses.

The incidence of minor postoperative wound infections was higher in the stapled group (15 of 30, 50 percent) than in the sutured group (7 of 23, 30 percent; $P = 0.17$).

Discussion

The etiology of local recurrence after apparently curative operations for colonic and rectal cancers is still controversial, although many of the factors involved are recognized. Phillips *et al.*[2] analyzed data on 2220 patients from 22 centers contributing to the Large Bowel Cancer Project; these patients were followed after curative operations for colorectal cancer. They concluded that significantly higher rates of local recurrence were associated with locally advanced growths, with poorly differentiated growths, with obstruction and perforation, and with fixity of the tumor. In rectal tumors, they found a significantly higher rate after sphincter-saving operations than after abdominoperineal excision. Surgeon-related variables were important, with the rates for individual consultant surgeons varying between less than 5 percent and greater than 20 percent.

Umpleby *et al.*[3] presented evidence that viable tumor cells are shed into the lumen of the bowel during surgery and may cause locally recurrent cancer, whereas other surgeons believe that local recurrences (as opposed to metachronous cancers) will not take place if the lateral resection margins are free of cancer cells. Durdey *et al.*[4] serially sectioned 52 specimens after excision of rectal cancers and found microscopic involvement of the lateral resection margins in 20. After a median follow-up of 23 months, 15 of these 20 had developed local recurrences compared with 1 of the 32 without involvement ($P < 0.001$). One of the lowest recurrence rates yet reported is by Heald and Ryall.[5] They reported a local recurrence rate of 2.6 percent after 115 rectal resections with stapled anastomoses, and stressed total removal of the mesorectum at operation.

In the present series there was a greater incidence of local recurrence associated not only with early anasto-

TABLE 2. *Published Local Recurrence Rates After Stapled and Sutured Colorectal Anastomoses*

First Author	Stapled Anastomoses Number	Stapled Anastomoses Percent Recurrences	Sutured Anastomoses Number	Sutured Anastomoses Percent Recurrences
Hurst[9]	34	32.4	-	-
Anderberg[10]	38	23.7	-	-
Bokey[11]	44	13.6	108	22.2
Leff[12]	70	11.4	58	17.2
Rosen[13]	76	21.1	43	14.0
Pheils[14]	-	-	200	10.0
Williams[15]	35	17.1	31	12.9
Reid[16]	29	27.6	-	-
Wolmark[17]	82	12.0	99	19.0
Heald[5]	115	2.6	-	-
Neville[18]	38	31.6	28	17.9

motic dehiscence, but also with the use of steel staples. In neither case, however, was statistical significance achieved. It has been shown that anastomoses are more likely to fail if there are cancer cells at the resection margins,[6] and Phillips and Cook[7] presented experimental evidence that dimethylhydrazine-induced colonic cancers in rats were more numerous at the sites of steel-sutured anastomoses than at those sutured with silk. Another factor that may be important in relation to recurrence rates after sutured compared with stapled colorectal anastomoses is the higher wound infection rate after stapled anastomoses reported both by us[1] and by Panton *et al.*[8]

In the present follow-up study of patients who were considered to have had a curative operation, the local recurrence rate when the circular stapling instrument had been used is a matter of concern, because six of the seven patients who developed local recurrent disease had stapled anastomoses.

Because the randomization of the method of anastomotic closure was not disclosed until surgical dissection was complete, inadequate clearance cannot be incriminated as the cause of the difference in the rates of recurrence. The authors recognize, however, that these results may have arisen by chance, and controversy still exists on the role of the stapling instrument in the etiology of local recurrences. Table 2 shows the outcome after sutured or stapled anastomoses in a number of recently published nonrandomized series.

These results do, however, support the hypothesis that anastomotic leaks may cause not only local infective complications, but also spillage of neoplastic cells that subsequently leads to locally recurrent cancer.

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