Background: Symptomatic anastomotic leakage is the most important surgical complication following rectal resection with intestinal anastomosis. Therefore, the routine use of a protective stoma is suggested by several authors. In our department 2 different techniques are performed to protect the anastomosis. Patients receive either a loop colostomy/ileostomy (C/I) or a tube cecostomy (TC).

Hypothesis: No significant difference is noted between C/I and TC for protection of a low anastomosis regarding clinical anastomotic leakage rate, reoperation rate for anastomotic leaks/fistulas, postoperative mortality, and permanent colostomy rate. By avoiding a second operation (for colostomy closure), median hospital stay should be significantly reduced.


Setting: Tertiary care center

Patients: One hundred fifty-eight patients who had undergone anterior resections for rectal cancer were studied. Protective C/Is were used in 19 patients; a TC was fashioned in 30 patients.

Main Outcome Measures: Clinical anastomotic leakage rate, reoperation rate for anastomotic leaks/fistulas, postoperative mortality, permanent colostomy rate, and median hospital stay.

Results: The rate of anastomotic leaks (C/I, 16%; TC, 17%), fecal peritonitis (C/I, 0%; TC, 10%), reoperation for anastomotic leaks/fistulas (C/I, 0%; TC, 13%), permanent colostomies (C/I, 0%; TC, 7%), and postoperative mortality (C/I, 5%; TC, 0%) did not differ significantly in both groups. Median hospital stay was significantly reduced in patients with TC (C/I, 28 days; TC, 15 days).

Conclusion: In our patients with low resections for rectal cancer, a C/I for protection of the anastomosis did not improve outcome significantly as compared with a TC. With a properly fashioned TC and adequate postoperative management a second operation (for colostomy closure) can be avoided and the overall hospital stay is significantly reduced.

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N PATIENTS with rectal cancer a radical resection is the cornerstone of treatment. Symptomatic anastomotic leakage is the most important surgical complication following rectal resection with intestinal anastomosis. The clinical leakage rate after anterior resection varies from 1% to 19%.1-5 The mortality rate and risk of permanent stoma after clinical leakage are 6% to 22%,6-11 and 10% to 100%, respectively.6-12

Fecal diversion seems to offer protection against the complications of anastomotic dehiscence. Proponents of the defunctioning colostomy maintain that it is impossible to predict which anastomosis will leak although the probability seems greatest for the lowest anastomoses,2 after total mesorectal excision,7 and after neoadjuvant radiochemotherapy.8 In these patients routine use of a protective stoma is suggested by several authors.1,2,4,5

See Invited Critique at end of article

Concerns about the routine use of defunctioning colostomies are the morbidity and mortality associated with their closure10,14,15 and the prolonged overall hospitalization and convalescence.16

In our department 2 different techniques are performed for defunctioning an anastomosis. Patients receive either a loop colostomy/ileostomy (C/I) or a tube cecostomy (TC).

The aim of this retrospective study was to review our results after C/I as com-
PATIENTS AND METHODS

One hundred fifty-eight patients (94 men, 64 women; mean [SD] age, 66 [11] years) had anterior resections for rectal cancer performed in our department between 1985 and 1997. A C/I was used in 19 patients (group 1). A TC was fashioned in 30 patients (group 2). The technique used was at the surgeon’s discretion. Anastomotic protection by either technique was performed on a selective basis where there was a particular concern about the anastomosis (eg, difficulty in dissection, incomplete doughnuts, or tension on the anastomosis).

Routine contrast enema was not performed after the operation. Anastomotic leakage was suspected if the patient had fever; leukocytosis; persistent ileus; gas, pus, or fecal discharge from the drain; pelvic abscess; or peritonitis. In these cases a water-soluble contrast enema was performed.

Patients and tumor characteristics, clinical anastomotic leak rates, reoperation rates, postoperative mortality, permanent colostomy rates, and median hospital stay were documented (Table 1 and Table 2).

SURGICAL PROCEDURE

Resection and Anastomosis

The day before the operation, bowel lavage with 3 to 4 L of polyethylene glycol was carried out. All patients received perioperative antibiotic prophylaxis. A midline abdominal incision was performed. The inferior mesenteric artery was ligated at its origin either flush with the aorta or just below the ascending left colic artery. The descending colon and the splenic flexure were mobilized in most low anterior resections to achieve anastomosis without tension. The sigmoid colon was transected. The mesorectum and the lateral perirectal tissue were removed with the specimen, and a distal margin of clearance of at least 1.5 cm was always obtained.

Anastomoses were either hand sewn or stapled.

For stapled anastomoses the double-stapling technique was performed.

A linear stapler was used to divide the distal rectum (Autosuture TA 53; US Surgical Corp, Norwalk, Conn; or RL60; Ethicon, Somerville, NJ). A purse-string suture was placed in the proximal segment, and the anastomosis was completed by passing the circular stapler per anum. The end-to-end anastomosis (US Surgical Corp), Premium curved end-to-end anastomosis (US Surgical Corp), or intraluminal (Ethicon) staplers were used for circular stapling. The tissue doughnuts were carefully inspected for completeness.

Hand-sewn anastomoses were carried out using interrupted 3-0 polyglactin sutures in an inverting double-layer technique.

Perianastomotic drainage was routinely performed.

Some patients received preoperative radiotherapy or radiochemotherapy.

C/I and TC

The C/I s were performed in the usual technique. For a TC the cecum is mobilized and a double row of concentric purse-string sutures is placed into the lateral cecal wall. A small incision is made within the inner purse-string and a 34F or 36F Pezzer mushroom catheter (Rusch AG, Kernen i. R., Germany) with enlarged tip openings in the bulge of the mushroom is then inserted into the lumen using an obturator. The inner purse-string suture is then tied, followed by the outer purse string. A generous purse-string suture must be made, with enough tissue invaginated around the TC to prevent leakage.

A small stab incision is then made in the lateral abdominal wall and the distal end of the catheter is drawn through. The incision site in the cecum (exit of the catheter from the colon) is approximated to the inner abdominal wall (where the catheter exits the abdominal wall) and extraperitonealized by fixing the mobilized cecal wall around the catheter to the inner abdominal wall. This can easily be accomplished with 3 to 4 interrupted sutures (Figure).

A skin suture tied around the catheter at its exit from the abdominal wall is desirable. The catheter is immediately attached to gravity drainage and allowed to stay open. After 24 hours gentle irrigation through the catheter (to keep it open) may be started. In the first 3 to 4 postoperative days, parenteral nutrition is administered. The next 2 to 3 days patients are given a liquid diet.

On day 11 or 12, after the TC has served its purpose, the tube can be withdrawn easily. Although it is not essential, an obturator may be inserted through the cuff catheter, thereby stretching out the mushroom bulge, and thus lessening the discomfort of removal. Drainage of feces through the catheter site is minimal and usually stops entirely within a few hours. The small stab incision is allowed to heal by secondary intention.

STATISTICAL ANALYSIS

Differences between both treatment groups were examined by means of frequency tables or medians and ranges. Nonparametric tests ($\chi^2$ for nominal data, Mann-Whitney test for ordinal data) were used for statistical comparisons. $P<.05$ was considered to be statistically significant.
ter deferring colostomy closure. The colostomies were closed 4, 5, and 8 months after the primary operation. In 15 patients without clinical leaks the stomas were successfully closed without mortality. Two patients subsequently developed an incisional hernia at this site. One patient died of myocardial infarction 29 days after rectal resection before colostomy closure could be performed.

In group 2, three of 5 patients with leakage developed fecal peritonitis that necessitated emergency laparotomy. Peritoneal toilet, removal of the TC, and a colostomy were performed in 2 patients. In one patient the colostomy was closed after 4 months; in the other patient early local recurrence of an advanced tumor precluded colostomy closure. This patient died of local and distant recurrence 6 months after the primary operation. In the third patient who required an emergency relaparotomy, an abdominoperineal excision had to be performed.

In the fourth patient an anastomotic fistula into the vagina was diagnosed 3 months after the primary operation. To facilitate healing of the fistula an end colostomy using the descending colon was performed, thereby leaving the rectal stump in place. This colostomy was never closed due to persistent fistula. The fifth patient with an anastomotic leak did not develop peritonitis and recovered with antibiotic treatment and transperineal drainage of a pelvic abscess. In all other patients (25 of 30) the postoperative course was uneventful and the TC was removed between day 12 and day 14.

In our hospital we routinely use a TC for protection of rectal anastomoses. The leakage rate in patients with TCs did not differ from patients with C/Is.

Table 1. Characteristics of Study Population

<table>
<thead>
<tr>
<th></th>
<th>Group 1† (n = 19)</th>
<th>Group 2† (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/female</td>
<td>11/8</td>
<td>19/11</td>
</tr>
<tr>
<td>Mean age (SD), y</td>
<td>65.4 (11.2)</td>
<td>67.2 (12.1)</td>
</tr>
<tr>
<td>Tumor stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 + T2</td>
<td>8 (42)</td>
<td>9 (30)</td>
</tr>
<tr>
<td>T3 + T4</td>
<td>11 (58)</td>
<td>21 (70)</td>
</tr>
<tr>
<td>Quality of resection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curative</td>
<td>17 (90)</td>
<td>26 (87)</td>
</tr>
<tr>
<td>Palliative</td>
<td>2 (10)</td>
<td>4 (13)</td>
</tr>
<tr>
<td>Level of anastomosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤6 cm</td>
<td>16 (84)</td>
<td>24 (80)</td>
</tr>
<tr>
<td>&gt;6 cm</td>
<td>3 (16)</td>
<td>6 (20)</td>
</tr>
<tr>
<td>Type of anastomosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand sewn</td>
<td>9 (47)</td>
<td>15 (50)</td>
</tr>
<tr>
<td>Stapled</td>
<td>10 (53)</td>
<td>15 (50)</td>
</tr>
<tr>
<td>Preoperative radiotherapy</td>
<td>2 (10)</td>
<td>7 (23)</td>
</tr>
</tbody>
</table>

*Values are expressed as number (percentage) unless otherwise indicated.
†Group 1 indicates patients with loop colostomy/ileostomy; group 2, patients with tube cecostomy.

Table 2. Results of Group 1 and Group 2 for Anastomotic Protection in Rectal Cancer

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n = 19)</th>
<th>Group 2 (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anastomotic leakage</td>
<td>3 (16)</td>
<td>5 (17)</td>
</tr>
<tr>
<td>Fecal peritonitis</td>
<td>0 (0)</td>
<td>3 (10)</td>
</tr>
<tr>
<td>Reoperation for anastomotic leakage/fistula</td>
<td>0 (0)</td>
<td>4 (13)</td>
</tr>
<tr>
<td>Permanent colostomy</td>
<td>0 (0)</td>
<td>2 (7)</td>
</tr>
<tr>
<td>Complications after colostomy closure</td>
<td>2 (10)</td>
<td>. . .</td>
</tr>
<tr>
<td>Median hospital stay,a†</td>
<td>28</td>
<td>15‡</td>
</tr>
<tr>
<td>Mortality</td>
<td>1 (5)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

*Group 1 indicates patients with loop colostomy/ileostomy; group 2, patients with tube cecostomy. Values are expressed as number (percentage) unless otherwise indicated.
†Median hospital stay in group 1: stay for primary operation and colostomy closure.
‡P < .05, Mann-Whitney test.

COMMENT

The high rate of clinical anastomotic leaks in this series is due to the fact that most anastomoses were very low, situ-ated 6 cm or less from the anal verge, and because sphinctersaving resection for an obese patient or because of a narrow pelvis was rarely avoided. When a stoma was in place, the anastomotic leakage rate was higher than when it was not. This finding is also reported by others and might be explained by the fact that only anastomoses were defunctioned where there was a particular surgical concern.

Many surgeons believe that a defunctioning colostomy reduces the incidence of anastomotic breakdown and minimizes the consequences if it occurs. In other series, no benefit has been found from defunctioning colostomy and thus it has been considered unnecessary. In conclusion, the possible benefits of a stoma must be weighed against the morbidity and disability conferred on most patients who would recover without complications.

However, several authors recommend a protective stoma, after sphincter-saving resections for rectal cancer, for anastomoses situated at or less than 5 to 6 cm from the anal verge, and particularly for men and obese patients after either total mesorectal excision or preoperative radiochemotherapy. In our hospital we routinely use a TC for protection of rectal anastomoses. The leakage rate in patients with TCs did not differ from patients with C/Is.
When an anastomotic dehiscence occurred emergency relaparotomy due to fecal peritonitis was necessary in 3 patients with TCs as compared with 0 patients with C/Is. However, mortality from fecal peritonitis and relaparotomy was 0. In 2 patients in group 2 (after relaparotomy and colostomy for anastomotic leakage), the stomas were never closed (1 patient with an abdominopereineal excision and 1 patient with a persistent fistula), no patient in group 1 received a permanent colostomy. Hospital mortality rates were 5% in group 1 and 0% in group 2.

**CONCLUSION**

The rates of clinical anastomotic leaks, emergency relaparotomies, fecal peritonitis, reoperations for anastomotic leaks/fistulas, postoperative mortality, and permanent colostomies did not differ significantly in either group. With a properly fashioned TC and adequate postoperative management, a second operation (for colostomy closure) with its associated morbidity can be avoided and the overall hospital stay is significantly reduced.

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**REFERENCES**