Life Table Analysis of Stomal Complications Following Colostomy

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PURPOSE: This study was designed to evaluate the long-term complication rate of left iliac fossa end sigmoid colostomies and to determine etiologic factors. METHODS: A retrospective chart review and actuarial analysis were performed. RESULTS: The crude and actuarial risks of paracolostomy complications in 203 patients were 51.2 percent and 58.1 percent at 13 years, respectively. Paracolostomy hernia was the most common complication (36.7 percent at 10 years). Siting the stoma through the belly of the rectus abdominis muscle did not reduce the risk of hernia, but an extraperitoneal course had a significantly lower risk of herniation when compared with a transperitoneal course and intestinal obstruction was marginally less frequent. Paracolostomy hernias were otherwise more likely in the elderly, and in those with other abdominal wall hernias. Mesenteric fixation did not reduce the subsequent chance of prolapse. The reduction in the risk of intestinal obstruction when lateral space closure was employed was not statistically significant (4 percent *vs.* 10 percent, $P < 0.1$), and all three patients with stomal retraction had had lateral space closure. CONCLUSION: The evidence in this study that spans a 22-year period questions much surgical technical dogma and raises the possibility that parastomal hernias may, like inguinal hernias, represent a failure in the transversalis fascia that might technically be avoidable. [Key words: Colostomy; Complications; Life table analysis; Surgical dogmas]

The frequency of stomal complications after construction of a permanent end sigmoid colostomy was examined using life table analysis. Aspects of surgical techniques as related to the final outcome are discussed.

PATIENTS AND METHODS

This is a retrospective study of permanent end colostomies created at St. Mark's Hospital during the decade from January 1971 to December 1980, inclusive. All operations (emergency/elective, curative/palliative) have been included, but patients dying within the immediate perioperative period, patients from abroad, and patients that were not

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seen even once postoperatively in the outpatient department were excluded.

There is a standard operative proforma at St. Mark's Hospital for patients undergoing surgery for colorectal cancer. From this proforma, the following details were extracted: the presence or absence of mesenteric fixation, lateral space closure, the methods of stomal maturation; the intraperitoneal or extraperitoneal location of the proximal bowel, and the siting of the stoma with regard to the abdominal wall musculature (through or lateral to the rectus abdominis). The stomal complications evaluated were necrosis, prolapse, retraction, parastomal herniation, and intestinal obstruction. In addition, particular attention was paid to current or previous evidence of hernias at other sites (*e.g.*, incisional, inguinal).

Life table analysis was used to determine the cumulative probability of stoma complications[1] and analysis of stratified variables was performed using the log rank test. Standard chi-squared tests and Fisher's exact test were used when stratification was not employed. Results are quoted as statistically significant if the probability of chance occurrence was less than 5 percent.

RESULTS

Two hundred eighty-nine patients had a permanent end colostomy performed during this period; 203 of these patients were eligible for study. The reasons for exclusion in the remaining 86 patients were died early postoperatively (n = 5), referred from and followed up at another hospital (n = 11), living abroad (n = 27), no follow-up recorded after operation (n = 36), and files could not be found (n = 7).

There were 131 males and 86 females with an average age of 62 (range, 23–86) years. The mean follow-up was 5.5 (range, 0.2–21.4) years. Indications for surgery are listed in Table 1; the majority (91 percent) of operations were performed for rectal cancer.

Table 1.
Indications for End Colostomy

	No. of Cases	%
Abdominoperineal resection		
Rectal cancer	184	90.6
Squamous-cell anal cancer	14	6.9
Rectal leiomyosarcoma	1	0.5
Hartmann's procedure	4	2.0
Total	203	100.0

Stomal complications developed in 104 patients, which is a crude rate of 51.2 percent and an actuarial rate of 58.1 percent, at 13 years (Fig. 1). Twenty-two patients had more than one complication. The crude and actuarial rates for individual complications are listed in Table 2. The crude rate of revisional surgery was 13.3 percent and the cumulative probability of revisional surgery by 11 years was 17 percent.

Hernia

The cumulative probability of developing a paracolostomy hernia at ten years was 36.7 percent. The risk was significantly higher when an intraperitoneal route was chosen compared with an extraperitoneal route (35 percent $vs.$ 3.5 percent, chi-squared = 6.32, $P < 0.025$). Other abdominal wall hernias were more commonly seen when there was a paracolostomy hernia (5 of 43 patients, 11.6 percent) when compared with patients without a paracolostomy hernia (4 of 160 patients, 2.5 percent, chi-squared = 6.66, $P < 0.01$).

In 103 patients the exact siting of the colostomy was specified. In 72 of them it was sited through the rectus abdominis muscle and in 31 through the oblique muscles. In the other 100 patients the colostomy was only said to be localized in the left iliac fossa (n = 86), through the umbilicus (n = 3), or data were not accurately recorded (n = 11). Herniation occurred in 17 (23.6 percent) patients sited through the rectus abdominis muscles and in 7 (22.6 percent) patients sited through the oblique muscles (chi-squared = 0.01287, $P > 0.5$). Older patients were more likely to develop a hernia (<55 years, 8.1 (4/45) percent, 55 or older 24.7 (39/158) percent; chi-squared = 5.23, $P < 0.025$).

Surgical revision was performed in 10 of the 43 patients, two of whom required a second operation for recurrence one and one-half and four years later. In the other eight patients there was no
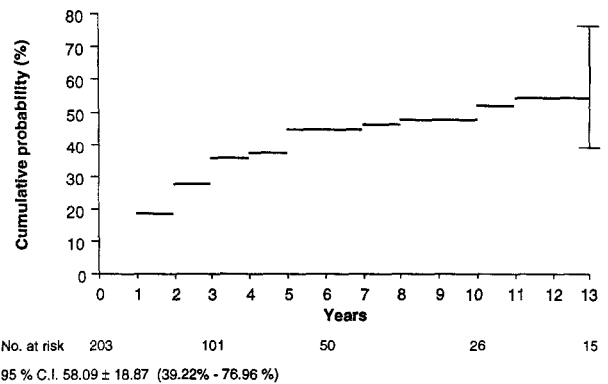

Figure 1. Cumulative probability of complication. Error bars represent 95 percent confidence limits. The incidence of complications after fashioning of an end colostomy is shown. Complications continue to occur over elapsed time at a slower rate. The greatest risk of colostomy complication is in the first five years, although there does remain a small but continuing risk thereafter.

Table 2.
Late Colostomy Complications

	No. of Patients	Crude Rate (%)	Actuarial Rate (%)	Years
Paracolostomy hernia	43	21.2	36.7	10
Skin	24	11.8	17.4	11
Prolapse	11	5.4	11.8	13
Obstruction	11	5.4	13.7	13
Stenosis	10	4.9	7.3	10
Retraction	3	1.5	NA*	—
Fistula	2	1.0	NA*	—

* NA = not applicable as numbers are too few.

evidence of recurrence. One of these patients died after refashioning and resiting of the colostomy as a consequence of a cerebrovascular accident. In only 10 of 43 patients was their weight recorded at the time of the original operation; when the hernia was diagnosed there had been a mean increase of 5.9 kg. (Mean increase in 20 patients who did not develop hernia was 6.2 kg; t-test, $P > 0.5$).

Stenosis

Ten patients were affected (cumulative risk of 7.3 percent at ten years). Four patients developed stenosis during the first postoperative year and all of them during the first five years of follow-up. In only one patient was stenosis related to early postoperative retraction of the colostomy. Four patients required revisional surgery (two had a local plastic repair, two had laparotomy and resiting of the colostomy), and one was treated using Hegar's

dilators. In the other five patients the stenosis was not considered severe enough to require revision.

Prolapse

Eleven patients were affected (cumulative risk of 11.8 percent at 13 years). Nine patients (81.1 percent) developed this complication during the first five years of follow-up. The risk was not significantly higher when mesenteric fixation was used compared with no fixation (5.2 (4/77) percent *vs.* 5.5 (7/126) perecnt, chi-squared = 0.0121, $P > 0.5$). Surgical revision of the colostomy was required in two patients. One had a local procedure and the other required resiting. An extraperitoneal route did not reduce the chance of prolapse (extraperitoneal route, 7.1 (2/28 percent) *vs.* intraperitoneal route, 5.3 (9/170) percent, chi-squared = 0.1566, $P > 0.5$).

Obstruction

Eleven patients developed intestinal obstruction, giving a cumulative risk at 13 years of 13.7 percent, and seven of them underwent an operation for this. The presumed causes for obstruction are listed in Table 3. Lateral space closure was performed in 159 patients and no lateral closure was performed in 40 patients; it was not recorded in four patients. Of the 11 patients with intestinal obstruction, seven (4.4 percent) had had lateral space closure and four (10 percent) did not (log rank, chi-squared = 3.087, $0.05 < P < 0.1$). Furthermore, obstruction developed in 1 of 28 (3.5 percent) patients with an extraperitoneal course, compared with 10 of 170 (5.9 percent) patients with an intraperitoneal course (chi-squared = 6.32, $P < 0.025$).

Retraction

This complication developed in only three patients. All of the stomas had been performed transperitoneally and the lateral space was closed. In one patient the mesentery was also fixed. Two patients required surgical treatment, one having a concomitant paracolostomy hernia and the other presenting with local suppuration.

Skin Complications

These were sufficient to be recorded in 24 (11.8 percent) patients, in 13 of whom another complication was also present (Table 4).

Other Complications

Two patients developed fistulas from their colostomies. One developed two months after the original operation and was laid open. Stenosis developed subsequently and required local refashioning. The other fistula developed after surgery for a parastomal hernia and healed spontaneously. Both were considered to be caused by full-thickness placement of the sutures used for maturation. There was one additional case of peristomal suppuration in a patient who had retraction of the stoma early after operation; refashioning was necessary.

DISCUSSION

Stomal complications are quoted to have a crude incidence rate of 21 percent to 70 percent,[2–10] and are even considered by some to be "inevitable."[11] However, when surgeons who devote a substantial amount of their time to colorectal surgery and who have extensive personal experience of stomal surgery are also found to have a high rate of stoma-related complications (crude incidence, 51.2 percent and a cumulative risk of 58.1 percent at 13 years), it is time to question some of the tenets that are currently accepted as a *sine qua non* of good stomal surgery.

The first among these is siting the stoma through the belly of the rectus abdominis muscle in order to avoid parastomal herniation.[2, 8, 11–13] The earlier practice of more lateral siting through the oblique

Table 3.
Causes for Obstruction and Type of Treatment

	Surgical	Medical
Adhesions	4	3
Local recurrence	1	—
Fecal impaction	—	1
Perineal hernia	1	—
Paracolostomy hernia	1	—

Table 4.
Other Complications Associated with Skin Complications

	No. of Patients*
Retraction	1
Prolapse	2
Stenosis	2
Parastomal hernia	8

* Two patients had two concomitant complications.

muscle was followed by herniation in a number of patients and one must suppose that it was reasoning rather than evidence that led to the almost universal acceptance that if only the stoma were supported by the muscles of the rectus abdominis, herniation would become a thing of the past.[14] Coupled with this intellectualization was the more sinister accusation that stomal complications were the mark of a poor surgeon;[15] so few were prepared to audit their results and fewer still to publish what they found.

There has been a revolution in thinking insofar as the etiology of inguinal hernia is concerned, where failure of the transversalis fascia is considered by many to be central.[16-18] By this thinking, one would not expect a stoma sited through the rectus abdominis muscle to be any different from one sited through the oblique muscles, as the defect in the transversalis fascia would be the same. One might expect, however, that an extraperitoneal course could have an advantage, particularly if that course were oblique (like the inguinal canal) and broke through the transversalis fascia well lateral to the intended skin exit.

Goligher[10] was a strong advocate of an extraperitoneal course for a stoma, although for him the hope that it would reduce paracolostomy herniation was evanescent. Nevertheless, his view is supported by the findings in this study where only 1 of 28 (3.6 percent) extraperitoneal colostomies developed a hernia under follow-up compared with 17 of 72 (23.6 percent) sited through the rectus abdominis muscles and 7 of 31 (22.6 percent) sited through the oblique muscles, which is a highly significant difference. Furthermore, although this is not a randomized study, there is no support for the surgical dogma of siting the stoma through the belly of the rectus abdominis muscle.

If surgeons were to adopt an extraperitoneal course[19, 20] for stomas more universally, then they might expect advantages also in terms of prolapse. Such an advantage was not seen here. No patient with an extraperitoneal stoma developed an obstruction in Porter et al.'s[21] study and in our study only 1 of 28 (3.5 percent) patients did, while there were 10 obstructions in the remaining 170 (5.9 percent) patients, which is a small but statistically significant difference. But such advantages could well be offset by the extra difficulty.

Whereas an extraperitoneal ileostomy is a simple thing to construct because intestinal length is not at a premium, in the case of a sigmoid colostomy the longer extraperitoneal route might mean that splenic flexure mobilization would be required and that retraction and necrosis might even occur more frequently. Furthermore, some might argue that an extraperitoneal route might make surgery for recurrent disease more difficult.

Other factors that might contribute to parastomal herniation include the recognized etiologic factors for hernias at other sites, such as chronic straining, infection, and obesity. Information on chronic cough, work activity, and urinary flow was not available in this study, but we were able to relate parastomal hernia development to the history of hernias at other sites, which does suggest that one mechanism may be the loss of tissue strength related to collagen degeneration (which is more marked in the elderly).[17, 18]

Surgeons are more open to variation in whether they close the lateral space[21] or place sutures between the bowel wall/mesentery and the inside of the abdominal wall. Lateral space closure reduced the chance of subsequent obstruction, but not by a statistically significant amount (4 percent vs. 10 percent), unlike the situation decribed above with regard to extraperitoneal course. Mesenteric fixation showed no advantage.

CONCLUSION

The evidence presented here casts doubts over a number of surgical dogmas and, in particular, over the etiology and strategies for prevention of paracolostomy hernia.

ACKNOWLEDGMENTS

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