



Technical Aspects and Complications of End-Ileostomies

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Abstract. During a period of 10 years (1980–1990) we constructed or reconstructed 358 end-ileostomies: 224 were primary constructions, 96 were reconstructed by laparotomy, and 38 were local reconstruction. Only 2 ileostomies were primarily located on the left side. The mean length was 5 cm. We had 11.6% reoperations after primary stomy and 7.3% and 7.9% reoperations after reconstruction by laparotomy and local approach, respectively. There were 12.9% and 8.7% reoperations after emergency and elective primary operations, respectively. Closing the lateral gutter or fixation of ileum to the rectus fascia did not influence significantly the number of reoperations. Postoperative discolored stomy did not indicate more dysfunction of the ileostomy. Stenosis of the ileostomy, peristomal fistulas, and peristomal dermatitis were seen in 23 (10.3%), 21 (9.4%), and 18 (8%) of the patients after primary ileostomies, respectively. Patients with Crohn's disease had significantly more of these problems than patients with ulcerative colitis. Only a few patients had retraction of the ileostomy (2.7%), stomal prolapse (1.8%), or parastomal herniation (1.8%). Women had significantly more parastomal herniation than men; otherwise there were no differences between the sexes.

Since Brooke [1, 2] constructed the everted mucosal ileostomy with mucocutaneous sutures in 1952, it has become the conventional method to divert the fecal stream in most centers throughout the world. During the last three decades there has also been a considerable development in stomal equipment, facilitating management of the stoma and improving quality of life for the patients, although they still have problems. In addition to regular postoperative complications there are problems related to the construction of the ileostomy with respect to its mechanical qualities, leading to impaired stomal function. Other problems are connected to the underlying disease.

The aims of this paper are to identify the postoperative complications and to determine if technical aspects during construction of the ileostomy influence immediate postoperative complications and later stomal function. We were also interested in determining if patients with any particular disease or either sex were more liable to complications than others.

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Material and Methods

Material

From January 1, 1980 to December 31, 1989, we constructed or reconstructed 358 end-ileostomies in 247 patients [102 women (41%), 145 men (59%)]. The material was divided in three groups: 224 of the ileostomies were primary ileostomies (first construction), 96 were reconstructed through laparotomy, and 38 were reconstructed without laparotomy. Mean observation time was 2.65 years (range 0–20 years).

Indications for Ileostomy

Inflammatory Bowel Disease. Before colectomy with ileo-anal anastomosis (IAA) was an alternative for the treatment of ulcerative colitis (UC), both Crohn's disease (CD) and UC patients with fulminant colitis or toxic dilatation first had a subtotal colectomy with an ileostomy and rectostomy. After approximately 3 months the rectum was removed. In elective operations colectomy with an ileostomy was done in one procedure.

Familial Adenomatous Polyposis. Patients with familial adenomatous polyposis (FAP) had a colectomy with ileostomy in one operation.

Other Diseases. Ileostomy was also used as a fecal diversion in patients with unremovable obstructions in the colon, enteric fistula, or inflammatory conditions in the peritoneum.

Methods

End-Ileostomy. The end-ileostomy was sited on a flat area of the right lower part of the abdominal wall, well away from scars, deformities, and bony prominences. The exact site was chosen and tested preoperatively. In general, it was located below the waistline in the outer half of the rectus muscle. The ileostomy was constructed according to Brooke [2]. Some surgeons closed the lateral gutter between the ileal mesentery and the anterior abdominal wall, and some fixed the seromuscular coat to the posterior rectus sheet with anchoring sutures.

Table 1. Postoperative reoperations among 358 operative procedures.

Procedure	Operations (no.)	Reoperations (no.)	Day at reoperation mean (range)
Primary stomy	224	36 (16.1%)	11 (1–30)
Reconstruction with laparotomy	96	7 (7.3%)	12 (2–25)
Reconstruction without laparotomy	38	3 (7.9%)	10 (1–24)

Treatment of Stomal Prolapse (Sliding Retraction). The stoma was straightened out with two Babcock's. Two rounds with a GIA-S stapling device (without knife) were placed in the length of the stoma, avoiding the mesenteric blood supply. The procedure was done without general or local anesthesia.

Statistical Analysis. A personal computer (Cartel Computer) with standard statistical software (Biostat, McGraw-Hill) was used to analyze the data sets. Differences between the two portions were measured by contingency tables (chi-square test). Statistical significance was accepted at $p < 0.05$.

Results

Site of the Ileostomy

Of 224 primary ileostomies, 222 were placed on the right side of the abdomen and only 2 on the left. One of these patients (CD) had fistulas in the right iliac fossa. A total of 96 patients had one or more reconstructions, and 31 of them had their stoma moved to the left side (37% of the patients with CD and 8.2% of the patients with UC) ($p < 0.00016$). Thirteen of the patients who had their stoma moved to the left side had peristomal fistulas, nine had stomal stenosis, eight had peristomal dermatitis, and four had parastomal herniation.

Length of the Ileostomy

The mean length of the ileostomy in 174 patients was 5 cm (range 1–8 cm). There were no significant differences in the length of the ileostomy among the various types of operations or the different diagnoses (data not shown). Nor was there any correlation between the stomal length and the function of the ileostomy (data not shown).

Postoperative Reoperations

Among the 358 operative procedures were 36 postoperative (30 days or less) reoperations (10.1%). The 11th postoperative day (range 1–30 days) was the mean day of reoperation (Table 1). There were 15 reoperations (12.9%) after emergency operations and 21 reoperations (8.7%) after elective operations (no significant difference: NS). For 224 patients the primary stomal operations were in relation to either colectomy/proctocolectomy ($n = 193$), proctectomy ($n = 13$), or small or large bowel resections ($n = 18$). Among this group there were 26 reoperations (11.6%) (Table 2); however, only 5 (2.2%) of them were because of stomal necrosis. Among 96 stomal reconstructions with laparotomy there were 7 reoperations (7.3%), and among 38 reconstructions with-

Table 2. Postoperative reoperations among 358 procedures.

Complication	Primary stomy ($n = 224$)	Reconstruction with laparotomy ($n = 96$)	Reconstruction without laparotomy ($n = 38$)
Ileal perforation/ abscess formation	9	2	1
Postoperative ileus	3	3	2
Stomal necrosis	5	1	
Bleeding from rectostomy	7		
Miscellaneous	2	1	

out laparotomy, there were 3 reoperations (7.9%) (Table 2). There were no significant differences in reoperations in relation to the different diagnoses (data not shown). Two patients with reconstructions without laparotomy were reoperated postoperatively because of ileus.

Influence of Gutter Closure

Closure of the lateral gutter did not influence the frequency of postoperative ileus in 231 ileostomy constructions with laparotomy. Moreover, no differences in the postoperative passage of gas (2nd day) and stool (3rd day) or the duration of hospitalization (13 days) were seen.

Effect of Fixation of Ileum to Rectus Fascia

The ileum was fixed to the rectus fascia in 210 of 243 patients. Fixation of the ileum did not influence the reoperation rate (data not shown), and patients with CD did not have more reoperations (data not shown). Discolored stoma were seen postoperatively in 15.2% when the ileum was not fixed and in 8.1% when the ileum was fixed to the rectus fascia (NS).

Consequences of Necrotic or Discolored Ileostomy

Six patients had a necrotic ileostomy postoperatively. Each of these patients underwent a reconstruction (mean 12 days, range 8–20 days) with a good result. Three had UC and 3 had CD.

In addition, 24 patients had a discolored ileostomy during the postoperative course. One of these patients underwent a reconstruction after 18 days; 15 (62.5%) had UC and 5 (20.8%) had CD. Seven (46.7%) of the UC patients had their ileostomy performed as emergency operations for fulminant colitis, whereas only 1 (20%) of the CD patients was an emergency operation (a reconstruction).

Only four of the patients with a discolored ileostomy had a later reconstruction: one had a parastomal hernia and three had a peristomal fistula and stomal retraction. Three of the patients had CD and one had UC.

Stenosis of the Ileostomy

Stenosis of the ileostomy was seen in 23 (10.3%) of the 224 patients (Table 3) after primary construction. Three of the patients had a discolored ileostomy postoperatively after primary

Table 3. Stomal stenosis in 224 patients.

Diagnosis	Primary stomy	Stenosis after primary stomy	<i>p</i>
Ulcerative colitis	145	6 (4.1%)	<0.00002
Crohn's disease	54	17 (31.5%)	
Familial adenomatous polyposis	8		
Colonic carcinoma	6		
Miscellaneous	11		
<i>Total</i>	224	23 (10.3%)	

construction (two CD, one UC). Patients with CD had significantly more problems with stomal stenosis than did those with UC ($p < 0.00002$).

After reconstruction another 14 patients developed stomal stenosis, 8 with CD and 6 with UC ($p < 0.037$). Two patients with UC had discolored stoma after reconstruction. There was no difference between the two sexes (data not shown). Eleven men (45.8%) and 13 women (54.2%) with stomal stenosis had preoperative problems with subileus.

Retraction of the Ileostomy

Retraction of the ileostomy was seen in six patients (2.7%) after primary stomy and in nine patients (6.7%) after reconstruction. Fixation of the stoma to the rectus fascia or closing the lateral gutter did not prevent retraction of the ileostomy (data not shown). There were no significant differences between the sexes or between the diseases.

Peristomal Fistula

Patients with CD ($n = 16$) had significantly more peristomal fistulas than UC patients ($n = 5$) ($p < 0.00001$); and CD patients with reconstructions had a relapse of peristomal fistulas significantly more often than those with UC ($p < 0.01$). There was no difference between men and women.

Thirteen patients with fistulas had their stoma moved to the left side, only one of whom had a relapse. Fourteen patients had their stoma revised without laparotomy, and four developed a new fistula. One person (CD) underwent three reconstructions for peristomal fistulas; 20 of the patients had their fistulas located medial, 7 caudal, and 5 lateral to the ileostomy.

Neither fixation of the rectus fascia nor closing the lateral gutter resulted in more peristomal fistulas (data not shown). Eleven patients had fistulas, stomal stenosis, and mucosal changes simultaneously; 16 patients had fistulas and mucosal changes; and 18 patients had fistulas and stomal stenosis.

Peristomal Dermatitis

Peristomal dermatitis was seen in 18 patients (8%), and patients with CD had significantly more problems than patients with UC ($p < 0.014$). However, there was no difference in the number of patients with UC ($n = 2$) or CD ($n = 4$) who had peristomal dermatitis after reconstruction. There were no significant differences between male and female subjects (data not shown). Four

of the patients (22%) had stomal retraction. Peristomal dermatitis was not correlated to stomal length.

Stomal Prolapse (Sliding Retraction)

Four patients (1.8%) had stomal prolapse after primary stomy. After reconstructions another seven patients had a prolapse. All of the patients were women ($p < 0.0004$) and only one patient had a relapse after operative treatment. Six of the patients were treated with a GIA-S stapling device (without knife), five of them successfully. The other six had an operative reconstruction with excellent results. There were no significant differences in the number of patients or in the number of reconstructions for the CD and UC patients.

Parastomal Herniation

Four patients (1.8%) had a parastomal hernia after primary construction. Three of these hernias were successfully treated with one reconstruction; two patients underwent a local reconstruction, and the third had his stoma moved to the left side. The fourth had an unsuccessful local reconstruction but was cured by a later reconstruction on the left side.

In addition, four patients developed parastomal herniation after reconstruction for other stomal complications. These four patients had a total of 10 reconstructions. One was cured by a local reconstruction, whereas the other three had three reconstructions each. One had three local reconstructions, and one had two local reconstructions before a successful reconstruction was done on the left side. The last patient had a local reconstruction, followed by a transposition to the left side; finally, the stoma was successfully moved back to the right side. In summary, four of eight patients were cured by one reconstruction, whereas the other four patients required 11 reconstructions.

Discussion

The construction of ileostomies has become an integral part of many abdominal operations. The most common reasons for constructing end-ileostomies are UC (61%) and CD (20%) [3]. As expected, more than 99% of the primary ileostomies were sited on the right side of the abdomen. After reconstruction 30 patients had their stomas moved to the left side, especially CD patients. The main reasons for moving stomas were peristomal fistulas and stomal stenosis, which are problems mostly seen in patients with CD.

The ideal length of the ileostomy is disputed. However, at the time we performed this study, the proper length was defined as 4 to 6 cm [4]. Our study revealed no difference in stomal function at a 4 or 5 cm length. Now we tend to make the ileostomies shorter, about 2 to 3 cm, on request from the patients. A problem such as stomal leakage seems to be reduced by modern stomal equipment and improved stomal nursing.

After construction of primary ileostomies, there was a large number of postoperative reoperations (11.6%). However, these constructions were done in connection with other major surgical procedures (92%) as colectomies or proctocolectomies, which may influence the number of reoperations. Five patients (2.2%) were reoperated because of stomal necrosis after primary ileostomy; only one (0.4%) was reoperated after reconstructions. One

explanation of this difference (even not significant) may be a significant backwash ileitis in fulminant colitis, making the terminal ileum and the ileostomy more vulnerable. This explanation has also been stated by others [5]. The number of postoperative reoperations after reconstructions were the same even if the reconstruction was performed through a laparotomy (7.3%) or without a laparotomy (7.9%). Anyhow, this is a considerable incidence of reoperations, indicating that constructions of ileostomies are difficult surgical procedures even for skilled surgeons.

Some authors [2, 6] recommend closure of the lateral gutter to avoid herniation of the small intestine and postoperative ileus. Our data do not support this notion. Three patients in the "no closure group" had postoperative ileus, but none of that type. On the other hand, we observed that some of the sutures in the "closure group" slipped, allowing small intestine to intrude through the defect, creating an ileus.

Fixation of the seromuscular coat to the peritoneum did not seem to protect against such postoperative complications as discolored/necrotic stomy or later problems such as stomal prolapse or parastomal herniation. This finding is in accordance with others [4].

Only 1 of 24 patients with discolored stomy required a postoperative reoperation. Most (62.5%) suffered from UC, and backwash ileitis is a possible explanation. The long-standing consequences of a discolored stoma seem to be uncertain.

In agreement with others [5, 6], about 31% of our patients required a reconstruction because of stomal dysfunction (stomal problems impairing uncomplicated stomal care). Women with CD have significantly more reconstructions than patients with UC and FAP [3, 5-7]. Only 28% of the reconstructions were done as local procedure without laparotomy. Carlstedt et al. [6] reported 83% local procedures. The ratio between CD and UC patients may influence the number of reconstructions. In our study 59.3% of CD and 18.6% of UC patients had a reconstruction because of dysfunction. This difference is significant ($p = 0.0002$).

As previously reported [6], a large number of the patients developed stomal stenosis after primary stomy (10.3%), especially patients with CD (31.4%) (only 4.1% of UC patients). This significant difference may be explained by the fact that CD is an transmural inflammation that later may lead to fibrosis and stenosis. Discolored stoma seemed not to dispose to stenosis. As expected, patients with stomal stenosis had problems with subileus before reconstruction.

Only six (2.7%) patients developed stomal retraction, which is a low number compared to a previous report of 20% [4]. Stomal retraction after reconstruction was seen in seven patients (7.6%), but not in the same patients as after primary stomy. Stomal leakage was seen in 43.5% of the patients with stomal retraction.

More than 9% of the patients with a primary ileostomy and as many as 29% of the patients with CD developed peristomal fistula. This figure is higher than that reported by Greenstein et al. [8] in CD patients (6.7%), but corresponded to the report of Carlstedt et al. [6].

Eighteen patients (8%) had peristomal dermatitis after primary stomy and another six (4.5%) after reconstruction. A previous report [9] has concluded that there is a relation between age and peristomal skin problems. We did not see such a correlation. That CD patients had more problems with peristomal dermatitis than UC patients is probably explained by the fact that CD patients (31.5%) have more leakage problems than UC patients (4.1%).

However, it is not likely that CD in itself is more liable to be associated with dermatitis than UC.

In our material, stomal prolapse was relatively rare (1.8%). However, women seemed to be more prone to stomal prolapse than men. All of the patients were successfully treated either by reconstruction or with the GIA-S stapling device.

Previous reports [10, 11] indicate that parastomal herniation is a common complication with ileostomy (10-36%). Our incidence was only 2.2%.

Résumé

Entre 1980 et 1990 (10 ans) nous avons construit de première intention ($n = 224$) ou reconstruit (96 par laparotomie, 38 par reconstruction locale) 358 iléostomies terminales. Deux iléostomies seulement ont été localisées à gauche. La longueur moyenne de l'iléostomie a été de 5 cm. Une réintervention a été nécessaire chez 11.6% des patients opérés de première main, chez 7.3% et chez 7.9% des patients réopérés la première fois par laparotomie et par reconstruction locale, respectivement. Les taux de réintervention ont été de 12.9% et de 8.7%, respectivement, pour les iléostomies en urgence et électives. La fermeture de la gouttière latérale ou la fixation de l'iléon à l'aponévrose de la paroi abdominale n'a pas changé le nombre de ré-interventions de façon significative. Une couleur douteuse de l'iléostomie en postopératoire immédiat n'était pas forcément indicative d'un mauvais fonctionnement ultérieur. Après une iléostomie primaire, le nombre et les taux de sténose, de fistule péristomiale et de dermite péristomiale ont été de 23 (10.3%), de 21 (9.4%) et de 18 (8%), respectivement. Les complications étaient plus fréquentes chez les patients porteur d'une maladie de Crohn par rapport à la rectocolite ulcérohémorragique. Les autres complications ont été une rétraction de la stomie (2.7%), le prolapsus stomial (1.8%) ou l'éventration (1.8%). Les femmes ont eu significativement plus d'éventrations parastomiales que les hommes, mais à part cette complication, il n'y avait aucune différence en ce qui concerne le sexe des patients.

Resumen

En el curso de un período de 10 años (de 1980 a 1990) practicamos la construcción o reconstrucción de 358 ileostomías terminales; 224 fueron operaciones primarias. 96 reconstrucciones por laparotomía y 38 reconstrucciones locales. Solamente dos ileostomías fueron ubicadas primariamente en el lado izquierdo. La longitud media fue de 5 cm. Tuvimos una tasa de 11.6% de reoperaciones luego del estoma primario y de 7.3% y 7.9% de reoperaciones luego de reconstrucción por laparotomía y por abordaje local, respectivamente. Tuvimos 12.9% y 8.7% como tasa de reoperaciones luego de operaciones de urgencia y electivas, respectivamente. El cierre de la gotera lateral o la fijación del ileon a la fascia del recto no tuvo influencia en cuanto al número de reoperaciones. La descoloración postoperatoria del estoma no significó disfunción luego de la ileostomía. Se observó estenosis de la ileostomía, fistulas periostomales y dermatitis periostomal en 23 (10.3%), 21 (9.4%) y 18 (8%) de los pacientes luego de ileostomías primarias, respectivamente. Los pacientes con enfermedad de Crohn exhibieron significativamente más problemas que los

pacientes con colitis ulcerativa. Sólo unos pocos desarrollaron retracción de la ileostomía (2.7%), prolapso del estoma (1.8%) o herniación paraostomal (1.8%). Las mujeres presentaron mayor frecuencia de herniación paraostomal, pero por lo demás no se observaron diferencias entre los dos sexos.

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Invited Commentary

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This report on a large series of patients with end-ileostomies underscores several important principles. First, the morbidity for the construction of an ileostomy is higher than for many other types of intestinal stoma even when metabolic complications are excluded. Of the 358 ileostomies reviewed, more than one-third (37.4%) were stomas that necessitated reconstruction by either laparotomy or local means.

The formation of an ileostomy is technically demanding and requires considerable attention to detail. Ileostomy effluent is invariably liquid, rich in proteolytic enzymes and bile salts that can irritate the surrounding skin. This point is especially significant when the ileostomy has been placed too close to a skinfold, scar, or bony prominence that may interfere with the adherence of an ostomy pouch to the peristomal skin.

The authors conclude that closing the lateral gutter or fixing the ileum to the rectus fascia did not influence the number of reoperations, although these factors were not studied in a properly randomized fashion. It has been our practice to initially attempt complete closure of the lateral gutter. If it is not possible without undue tension, it is better left wide open. Either alternative seems to minimize the chances for incarceration of a loop of small bowel. In addition, fixing the ileum to the rectus fascia (seromuscular tacking sutures) does not prevent prolapse or

retraction of an ileostomy. The propensity for a segment of small bowel to prolapse is related to the length of associated unfixed mesentery. Conversely, suturing the ileum to the skin of the abdominal wall under tension because it has not been adequately mobilized does not prevent stomal retraction.

I disagree with the authors' contention that a discolored ileostomy is of minimal concern. If the discoloration is due to mild mucosal edema, close observation may be all that is warranted. However, if the vascular compromise is severe as a result of too much tension on the mesentery or overzealous trimming of the blood supply from the end of the transected ileum, it is wiser to reform the stoma early under controlled conditions rather than to wait until it dies. It is often helpful to illuminate the mucosa of the ileostomy by shining a flashlight into a small test tube that has been inserted into the stoma to evaluate viability at the fascial level. Another bedside maneuver to assess the blood supply to a stoma is to carefully puncture the mucosa with a small needle to check for bleeding originating from the submucosal vessels.

In general, most major complications of ileostomy are preventable and can be avoided by careful preoperative planning. When problems are recognized, however, they usually necessitate stoma revision utilizing a laparotomy rather than correction by local means alone. Of special interest is the authors' method of local revision of a sliding prolapse with two rounds of a GIA stapler without the knife, which most likely evolved from their experience with a similar problem in Koch pouches.

Perhaps the most important message is that the construction of an ileostomy is a major part of the surgical procedure and should be performed or directly supervised by a senior member of the operative team, because it is the part of the operation that the patient sees and must deal with every day.