Stomal complications of intestinal conduit urinary diversion

ERIC A. KLEIN, MD; JAMES E. MONTIE, MD; DROGO K. MONTAGUE, MD; ANDREW C. NOVICK, MD; RALPH A. STRAFFON, MD

■ Intestinal conduits of the ileum, colon, or jejunum were used for urinary diversion in 319 patients at The Cleveland Clinic Foundation between 1970 and 1981 due to pelvic malignancy, primary bladder cancer, or benign conditions. End stomas were constructed in 65% and Turnbull loop stomas in 35%. Follow-up ranged from one to 152 months (median, 35 months). The mean number of days between appliance changes was 5.7 (range, 2–10). The overall complication rate was 8.5%. Stomal revisions were required in 5%. There were no significant differences in the mean number of days between appliance changes, type or number of complications, or rate of revision between end and loop stomas or between the various intestinal segments used for diversion. The presence or absence of previous irradiation and the indication for diversion were independent of complications. Stomas constructed from any segment of the intestinal tract in end or loop fashion yielded equivalent long-term function and complication rates. Stomal complications can be minimized and the time between appliance changes maximized by careful attention to all phases of stomal construction and care.

□ INDEX TERM: URINARY DIVERSION, COMPLICATIONS □ CLEVE CLIN J MED 1989; 56:48–52

THE INTESTINAL cutaneous conduit has been the most popular method for urinary diversion since the description of the ileal conduit by Bricker.[1,2] Although this conduit can be configured in various ways with the use of large or small intestine, a common feature is the continuous efflux of urine via a stoma requiring an external collecting device. With their widespread use has come an ever-increasing number of medical complications related to the stoma and, subsequently, a greater recognition of the social inconvenience of external collecting devices. These problems spawned the creation of enterostomal therapy, and the first school to train such therapists at the Cleveland Clinic, the Rupert B. Turnbull School of Enterostomal Therapy, was established in 1961. These new therapists ushered in the modern era of stomal care. Through their efforts, as well as recognition of the importance of patient education, preoperative site selection, and eversion of the stomal bud, the number of complications and the ease with which patients manage appliances have improved significantly.

Recognition of the limitations of the ileal conduit and its variants has also led to the development of alternative forms of diversion that incorporate anti-reflux ureteroenteric anastomoses and continent internal reservoirs not requiring appliances. While the results of such alternatives are socially more acceptable, the procedures are more complex and are therefore more prone to complications. Their use is indicated in selected cases, but the

From the Department of Urology, The Cleveland Clinic Foundation. Submitted Oct 1987; accepted April 1988.

Dr. Klein is a fellow of the American Cancer Society.

Address reprint requests to E.A.K., Memorial Sloan-Kettering Cancer Center, 1275 York Avenue, New York, New York 10021.

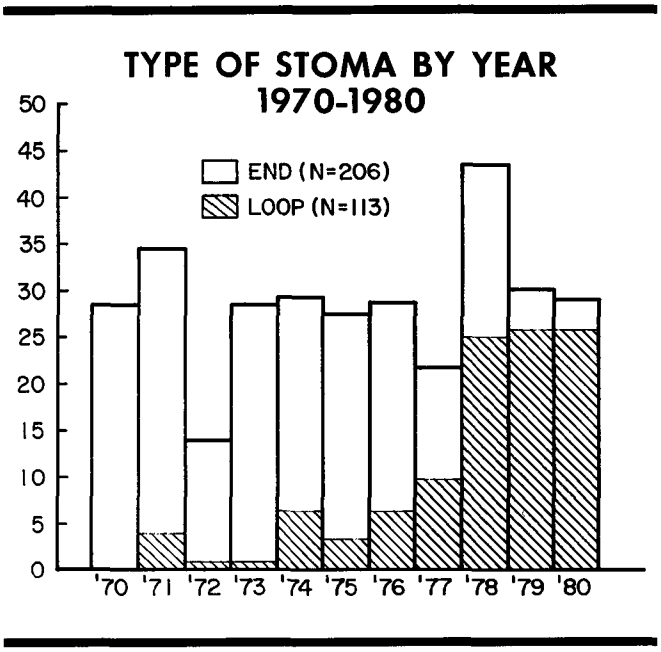

FIGURE 1. End *v* loop stoma.

ease and speed with which the ileal conduit can be constructed will continue to make it the procedure of choice for most patients requiring urinary diversion. This is particularly so for older patients with pelvic malignancy, who, coincidentally, constitute the majority of patients requiring urinary diversion[3] because they are at less risk for deterioration of renal function over the long term. The efficacy and usefulness of newer procedures will continue to be compared with the ileal conduit and its "weak link"—the stoma.

This report details the excellent results that can be obtained with the ileal conduit and its variants, the colon and jejunal conduits, when surgeons and enterostomal therapists jointly focus attention on all phases of stomal construction and function.

MATERIALS AND METHODS

The charts of all patients undergoing urinary diversion via intestinal conduits at the Cleveland Clinic between January 1, 1970, and December 31, 1980, were reviewed. There were 319 patients (218 males [68%] and 101 females [32%]; age, 2–82 years [mean, 52 years]). Twenty-seven (8.5%) were less than 18 years at the time of diversion.

The most frequent indication for urinary diversion was bladder cancer (172 patients, [54%]). Most of these patients underwent radical cystectomy concurrently with diversion. Other indications included neurogenic bladder in 62 (20%), incontinence in 18 (6%), pelvic exenteration for gynecologic or rectal malignancy in 11 (3%), lower urinary tract obstruction in 11 (3%), bladder exstrophy in 10 (3%), and various other conditions in 35 (11%). Patients with benign disease were younger than those with malignancy (mean age, 39, *v* 60; $P<0.001$). One hundred patients (31%) had undergone radiation therapy (mean dose, 4,300 cGy) previously.

Conduits were isolated from either small or large intestine and brought transperitoneally to the skin by standard techniques.[4] Ileal conduits were used in 291 patients (91%), colon conduits in 17 (5%), and jejunal conduits in 11 (4%).

Stoma location was determined preoperatively for all patients. The configuration of the stoma was determined by the surgeon (end stomas for 206 [65%] and Turnbull loop stomas for 113 [35%]). Details of stomal construction have been described.[4–6]

Enterostomal therapists instructed the patients in care of the stoma and appliances. During the immediate postoperative period, appliance changes were done by the therapists. Patients were not discharged after surgery until they had recovered sufficiently to learn and become adept at appliance changes. This usually took three lessons on successive days. Difficulty in learning appliance care only rarely caused a delay in hospital discharge. Patients were instructed to change the appliance at least once a week or sooner if leakage occurred.

Follow-up ranged from one to 152 months (median, 35 months). Because the use of end stomas predominated in the early part of the series (*Figure 1*), mean follow-up was significantly longer than for loop stomas (49 *v* 33 months; $P < 0.001$). Patients were seen by both the surgeon and enterostomal therapist at all follow-up visits. At the initial visit (four to six weeks after operation), the stoma was remeasured for fitting with a permanent appliance. During the initial and subsequent visits, the appliance was removed, the stoma inspected, and a 14-F Foley catheter passed into the conduit to determine residual volume and obtain a urine specimen for culture or cytology. The patient was then observed in reapplication of the appliance. The size and condition of the stoma, the condition of the peristomal skin, the type of appliance used, the time between appliance changes, and any difficulties reported by the patient were recorded in the chart at each visit. Problems experienced by patients were discussed and reinstruction or modification of the appliance was provided as necessary.

TABLE 1
TIME BETWEEN APPLIANCE CHANGES

	Mean (days)	Range (days)
Stomal configuration		
End (n = 119)	5.7± 1.4	2–10
Loop (n = 82)	5.6 ± 1.5	3–10
Intestinal conduit		
Ileum (n = 181)	5.8 ± 1.5	2–10
Colon (n = 9)	5.9 ± 1.4	3–7
Jejunum (n = 11)	4.5 ± 1.6*	3–7

* $P < 0.04$ as compared to ileum.

TABLE 2
COMPLICATIONS*

	End stomas (n = 206)	Loop stomas (n = 113)	Total (n = 319)	Mean no. months after surgery
Parastomal hernia	8	4	12	44
Peristomal dermatitis	3	3	6	30
Bleeding	4	1	5	30
Appliance difficulty	3	1	4	25
Ulceration	3	0	3	46
Prolapse	1	1	2	33
Stenosis	2	0	2	44
Retraction	1	0	1	24
Ischemia	2	1	3	1
Leakage due to poor location	1	1	2	10
Other†	4	2	6	–
TOTAL	32	14	46	

* Complication rate defined as number of patients with any complication divided by total number of patients. For end stomas, the complication rate was 17/206 = 8.3%; for loop stomas, 10/113 = 8.8%; for all stomas 27/319 = 8.5%.

† Includes appliance allergy in two and conduit/stomal infarct, leakage secondary to ventral hernia, stomal invasion by tumor, and parastomal enterocutaneous fistula in one patient each.

Urograms were obtained and serum electrolyte levels determined at the initial postoperative visit and at 12-month intervals unless otherwise indicated.

Statistical analysis was performed by Student's t test.

RESULTS

Data pertaining to mean time between appliance changes were available for 201 patients (63%). The average interval between appliance changes for all patients was 5.7 days. There was no difference in the time between appliance changes for end or loop stomas nor between ileal and colon conduits (*Table 1*). Mean time between appliance changes was significantly less for patients with jejunal conduits.

TABLE 3
STOMAL REVISIONS

Indication for revision	End stomas (n = 206)	Loop stomas (n = 113)	Total (n = 319)
Parastomal hernia	5	4	9
Retraction	1	0	1
Ischemia	2	1	3
Stenosis	2	0	2
Prolapse	1	1	2
Poor location	1	1	2
Abdominal wall tumor	2	0	2
Enterocutaneous fistula	2	0	2
Ventral hernia	0	1	1
TOTAL	16	8	24

Twenty-seven patients suffered a total of 46 complications (overall complication rate, 8.5%) (*Table 2*). Thirteen had a single complication, seven had two, six had three, and one had five. Only one complication (stomal/conduit infarct) occurred in the pediatric age group. No patient suffered from a deterioration in renal function due solely to a stomal complication.

There was no statistically significant difference in the overall complication rate (8.3% *v* 8.8%) nor in the type or frequency of individual complications between end and loop stomas. The rate at which complications occurred in each group as a function of length of follow-up was similar. Complication rates for the various intestinal conduits were also similar: 7.9% (23 of 291) for ileal conduits, 17.6% (3 of 17) for colon conduits, and 9.1% (1 of 11) for jejunal conduits. Because 91% (42 of 46) of the complications occurred in ileal conduits, statistical comparison with colon and jejunal conduits was not meaningful. Of the patients with colon conduits, two suffered parastomal hernia and one had stomal prolapse. Stomal prolapse was the only complication of the jejunal conduits.

Sixteen patients required 24 operations for stomal revisions (overall revision rate, 5.0% [16 of 319]). Revisions were required for 5.3% of end stomas (11 of 206) and 4.5% of loop stomas (5 of 113). There was no

statistically significant difference in the number of revisions or reason for revision between end or loop stomas (*Table 3*). Eleven patients underwent one revision, two underwent two, two underwent three, and one underwent four.

Factors found to be independent of complications or the need for revision included the indication for urinary diversion and whether the patient had undergone irradiation previously.

DISCUSSION

The urinary stoma has been described as the weak link in external urinary diversion because of its propensity for complications and its social inconvenience.[7] Historically, stomal complications have been the most common adverse effect following ileal conduit diversion, with a reported incidence of up to 49%.[8] In addition, the presence of an external appliance with the concomitant patient concerns of odor, leakage, and concealability represent significant social limitations of this technique. This study suggests that both the complication rate and frequency of appliance changes can be minimized with careful attention to preoperative site selection, operative technique, patient education, and postoperative care.

One measure of adequate stomal function is how long an appliance can be worn before it requires changing. This time period is usually determined by several factors relating to appliance application and fit, such as an appropriate stomal location in easy view of the patient, placement away from areas of skin retraction and skin folds, an adequate stomal bud with eversion above the skin, good peristomal skin condition, the absence of parastomal hernia, and how well the patient has learned to handle the appliance. Little attention has been paid in the literature to the time between appliance changes, although Jones et al[9] reported an interval of two to four days for most patients with ileal conduits. Our patients achieved a mean interval between appliance changes of 5.7 days. Some patients, motivated primarily by economic concerns (that is, the cost of the appliances), wore an appliance for up to 10 days without leakage.

The 8.5% incidence of stomal complications in this series compares favorably to previous reports. Like Bloom et al,[7] who reported complications involving 100 loop stomas, we found that parastomal hernia was the most frequent complication, although this occurred less frequently in our series (3.8% *v* 14%). Unlike Bloom and his associates, we routinely anchored the stoma only to the subcutaneous tissue and have not found it necessary to also anchor it to the abdominal wall fascia in order to prevent hernia. The incidence of stomal stenosis (0.6%) in our series was also less than reported in many other series and involved adults with end stomas. We achieved equally good results in both the adult and pediatric populations. Although the pediatric group was small (27 patients), there was only one complication in this group (stomal/conduit infarct).

The 5% revision rate in our series also compares favorably with previous reports. Because it was the most frequent complication, parastomal hernia was the most frequent indication for revision. The need for revision in several patients arose from conditions not directly related to stomal construction (*Table 3*). One patient required two revisions because of recurrent desmoid tumor involving the stoma, another had recurrent parastomal enterocutaneous fistulas, and a third experienced leakage caused by a ventral hernia of a midline incision. Although in most instances only a single revision was required, one third of the patients (5/16) needed more than one operation, emphasizing the importance of attaining a good result with initial stomal construction.

Our data suggest that equivalent results can be obtained with the use of any intestinal segment. We found no difference in the nature or incidence of complications using the ileum, jejunum, sigmoid, or transverse colon. In addition, there was no difference in the mean interval between appliance changes for ileal and colon conduits. The shorter time between appliance changes for jejunal conduits may be a statistical artifact due to the small number of patients with this type of urinary diversion.

Several authors have suggested that the use of colon conduits results in a better stoma with fewer complications.[2,10–12] Our data do not support this observation, although the number of patients with colon conduits was small. Most of the reported series dealing with colon conduits do not report a concurrent series of small bowel conduits with which to compare results. In addition, the incidence of stomal complications in some series involving colon conduits approaches that reported for ileal conduits, with stomal stenosis reported in up to 61.5%,[13] parastomal hernia in 9.7%,[11] and stomal prolapse in 15.4%.[13] We believe that no intestinal segment carries any inherent advantage for stomal construction or function.

Only a single previous report has compared the complications of end and loop stomas constructed concurrently, concluding that loop stomas are superior because of fewer complications.[14] We found equivalent results with end and loop stomas, with no difference in complications, the need for revision, or the length of appliance

wear. It is possible that the incidence of complications in loop stomas in our series may increase as follow-up time approaches that for end stomas. The role of selection bias in choosing an end or loop stoma in this series is difficult to assess. It is our clinical impression that a loop stoma is a superior configuration in only two situations:

1. In the obese patient, in which a loop stoma avoids tension on the mesentery as it traverses the thick abdominal wall, and
2. To gain additional length on a conduit that is otherwise too short to reach the abdominal wall without tension on the stoma.

The degree to which these considerations influenced choice of using end or loop stomas in our patients is unknown because neither abdominal wall thickness nor intraoperative judgments on the length of the loop were generally recorded in the charts. Thus we believe that, except in these two situations, the choice of stomal configuration should be dictated by the preference of the surgeon.

The ideal form of urinary diversion has yet to be devised. While newer techniques that address some of the limitations of ileal conduits are promising and deserve an adequate evaluation, we believe that the safest and most expedient form of urinary diversion in the patient with normal ureteral caliber is the ileal conduit or one of its variants. This study documents that the drawbacks of an external stoma can be minimized so that most patients are served well by this technique.

REFERENCES

1. Bricker EM. Bladder substitution after pelvic evisceration. Surg Clin North Am 1950; **30**:1511–1521.
2. Bricker EM. Current status of urinary diversion. Cancer 1980; **46**:2986–2991.
3. Skinner DG. In search of the ideal method of urinary diversion (editorial). J Urol 1982; **128**:476.
4. Straffon RA. The ileal conduit. [In] Stewart BH, editor. Operative Urology: The Kidneys, Adrenal Glands, and Retroperitoneum. Vol. 1. Baltimore, Williams & Wilkins, 1975, pp 299–321.
5. Weakley FL, Turnbull RB Jr. Special intestinal procedures. [In] Stewart BH, editor. Operative Urology: The Kidneys, Adrenal Glands, and Retroperitoneum. Vol. 1. Baltimore, Williams & Wilkins, 1975, pp 322–356.
6. Turnbull RB Jr, Hewitt CR. Loop-end myotomy ileostomy in the obese patient. Urol Clin North Am 1978; **5**:423–429.
7. Bloom DA, Lieskovsky G, Rainwater G, Skinner DG. The Turnbull loop stoma. J Urol 1983; **129**:715–718.
8. Dunn M, Roberts JBM, Smith PJB, Slade N. The long-term results of ileal conduit urinary diversion in children. Br J Urol 1979; **51**:458–461.
9. Jones MA, Breckman B, Hendry WF. Life with an ileal conduit: results of questionnaire surveys of patients and urological surgeons. Br J Urol 1980; **52**:21–25.
10. Loening SA, Navarre RJ, Narayana AS, Culp DA. Transverse colon conduit urinary diversion. J Urol 1982; **127**:37–39.
11. Hagen-Cook K, Althausen AF. Early observations on 31 adults with nonrefluxing colon conduits. J Urol 1979; **121**:13–16.
12. Middleton AW Jr, Hendren WH. Ileal conduits in children at the Massachusetts General Hospital from 1955 to 1970. J Urol 1976; **115**:591–595.
13. Elder DD, Moisey CU, Rees RWM. A long-term follow-up of the colonic conduit operation in children. Br J Urol 1979; **51**:462–465.
14. Emmott D, Noble MJ, Mebust WK. A comparison of end versus loop stomas for ileal conduit urinary diversion. J Urol 1985; **133**:588–590.