British Journal of Surgery 1998, 85, 76–79

Temporary decompression after colorectal surgery: randomized comparison of loop ileostomy and loop colostomy

A. W. GOOSZEN, R. H. GEELKERKEN*, J. HERMANS†, M. B. LAGAAY‡ and H. G. GOOSZEN

*Departments of Surgery, University Hospital of Utrecht, Utrecht, *Medisch Spectrum Twente, Enschede and ‡Red Cross Hospital, The Hague, and †Department of Medical Statistics, University of Leiden, Leiden, The Netherlands*
Correspondence to: Dr A. W. Gooszen, Department of Surgery, University Hospital of Utrecht, Heidelberglaan 100, 3584 CX Utrecht, The Netherlands

Background Loop ileostomy or loop transverse colostomy for temporary decompression of a left colonic anastomosis represents an important issue in abdominal surgery.
Methods A randomized study, comparing loop ileostomy ($n = 37$; group 1) or loop transverse colostomy ($n = 39$; group 2), was conducted. Patients were followed from construction to closure of the stoma.
Results Age, weight, sex and indication for surgery were similar in both groups. After stoma construction complications were reported in nine of 37 patients in group 1 and in one of 39 in group 2 ($P < 0{\cdot}01$), leading to postoperative death in five of 37 in group 1 and one of 39 in group 2. In the period between stoma construction and closure significant differences were observed only in prolapse rate (one of 32 group 1, 16 of 38 group 2; $P < 0{\cdot}01$), need for temporary adaptation of clothing (eight of 32 group 1, 22 of 38 group 2; $P < 0{\cdot}01$) and dietary guidelines (23 of 32 group 1, four of 38 group 2; $P < 0{\cdot}01$). One patient died in group 1 and four in group 2; the deaths were not stoma related. After stoma closure eight of 29 patients in group 1 had complications and there were two deaths compared with three of 32 and no deaths in group 2.
Conclusion Both types of stoma carry a high complication rate with a considerable associated mortality rate. The interval between stoma construction and closure has substantial impact on social and economic status. Based on all three phases studied, routine use of transverse colostomy is advised if decompression of the left colon is indicated.

Decompression of a left colonic anastomosis by a loop ileostomy or loop transverse colostomy represents an important issue in abdominal surgery. Several studies[1–7] have addressed the question of which of these stomas should be used when a left colonic anastomosis needs decompression. Two randomized[1,2] studies and five non-randomized studies[3–7] have not provided a definitive answer nor have they covered all the relevant aspects of stoma creation, stoma ownership and stoma closure. A prospective defunctioning stoma trial in 76 patients, operated on under acute and elective conditions, is now reported. The morbidity and mortality rates associated with loop ileostomy and loop transverse colostomy at all three stages are reported and discussed.

Patients and methods

Between 1990 and 1995 a randomized multicentre study was conducted in five Dutch surgical centres to compare loop ileostomy with loop transverse colostomy. All patients undergoing colorectal surgery who were likely to need a defunctioning stoma were eligible for inclusion and were asked to give informed consent. The final decision about the need for construction of a defunctioning stoma was made at operation. Construction of a loop ileostomy or loop colostomy and a planned elective stoma closure operation were criteria for inclusion. The patients were randomly allocated to loop ileostomy or loop transverse colostomy.

Seventy-six patients were recruited; 37 patients had a loop ileostomy and 39 a loop transverse colostomy. The two groups were comparable with respect to age, weight, sex and primary pathology (*Table 1*). Patients were operated primarily for malignancy of the left-sided colon or rectum, for complicated diverticular disease, and for a variety of other indications, such as colorectal perforation by foreign body, faecal incontinence or perianal abscess. Thirty-four emergency operations (16 ileostomy, 18 colostomy) and 42 elective operations (21 in each group) were performed.

At the primary operation the surgeon was requested to report the diagnosis, type of bowel preparation and the reason for construction of a temporary defunctioning stoma. Indications for construction of a stoma were divided into (1) anastomotic factors (17 patients each group), (2) general factors (15 ileostomy, 19 colostomy) and (3) deviation for various distal colonic or anorectal pathology (five ileostomy, three colostomy) (*Table 2*). The category 'anastomotic factor' included patients with proven anastomotic leakage at operation, anastomosis below the peritoneal reflection and patients with an unreliable or compromised anastomosis for reasons of technical difficulty, previous irradiation or a restricted view of the operative field. The category 'general factors' included patients with faecal contamination (extraluminal faeces in the pelvis), severe (faecal

Table 1 Patient characteristics

	Ileostomy ($n = 37$)	Colostomy ($n = 39$)
Mean (range) age (years)	63·2 (26–86)	64·7 (29–83)
Mean (range) weight (kg)	73·6 (45–123)	71·8 (52–115)
Sex ratio (M:F)	14:23	13:26
Diagnosis		
Malignancy	14	19
Diverticulitis	16	14
Other	7	6

Paper accepted 8 May 1997

Table 2 Indications for construction of a stoma

	Ileostomy ($n = 37$)	Colostomy ($n = 39$)
Anastomotic factors	17	17
Compromised anastomosis	9	5
Low anastomosis	3	2
Anastomotic leak	5	10
General factors	15	19
Faecal contamination	7	3
Peritonitis	3	9
Ileus	5	7
Deviation	5	3
Fistula	3	2
Other	2	1

or purulent) peritonitis and ileus. The distribution of various indications was similar for both groups.

Complications and deaths were recorded during the three phases of the study: at the time of stoma construction, during follow-up with the stoma and after stoma closure. Morbidity was divided into 'stoma-related' and 'general' complications. Stoma-related complications included stenosis, prolapse, necrosis, retraction, leakage of the stoma, parastomal hernia or fistula, and adjustment of clothes or diet to the stoma. General complications included those not directly related to the construction or presence of the stoma, such as abdominal sepsis or abscess formation.

Technique of stoma construction

The techniques of loop ileostomy and loop transverse colostomy were standardized amongst all five participating centres.

Stoma closure

Closure was conducted preferably 9–12 weeks after construction. After routine bowel preparation the stoma was closed by freeing it from the abdominal wall, and bowel continuity was restored by end-to-end anastomosis. During the postoperative period complications were recorded.

Follow-up

All patients were followed on a 3-monthly regular basis in the outpatient clinic for 1 year after stoma closure.

Statistical analysis

All data were entered in a computer database and analysed by an independent statistician. To test for differences between the two groups χ^2 test, *t* test and Mann–Whitney *U* test were used as appropriate. Differences were considered significant at $P < 0{\cdot}05$.

Results

Complications after stoma formation, during follow-up and after closure of the stoma are reported. The course of the study is outlined in *Table 3*.

Complications after stoma construction

After stoma construction nine patients in the loop ileostomy group and one who had a loop colostomy had complications ($P < 0{\cdot}01$) (*Table 4*). Complications were all serious and led to surgical reintervention. In four patients these complications were directly due to the presence of the ileostomy: prolapse, stoma leakage and small bowel ileus on two occasions. The other five patients had more general complications, such as abdominal abscess formation (two patients), rectal carcinoma causing fistula,

Table 3 Course of the study

	Ileostomy	Colostomy
Randomized and operated	37	39
Early death	5	1
Follow-up with stoma	32	38
Death during follow-up	1	4
Stoma not taken down	2	2
Stoma taken down	29	32
Death at closure	2	0
Follow-up without stoma	27	32
Total deaths	8	5

Table 4 Complications after stoma construction

	Ileostomy ($n = 37$)	Colostomy ($n = 39$)
Complications		
Stoma related	4	0
General	5	1
Total	9*	1
Deaths	5	1

*$P < 0{\cdot}01$ *versus* colostomy group (χ^2 test)

abdominal wound dehiscence and acute femoral artery occlusion. The complication in the patient who had a colostomy was of general nature (abdominal abscess formation).

After stoma construction five patients with an ileostomy and one with a colostomy died (*Table 4*). Causes of death in the ileostomy group were abdominal sepsis in two, small bowel ileus in two (one of whom also had a myocardial infarction) and complications due to post-operative femoral artery embolism in one. The patient with a colostomy died from abdominal sepsis with abscess formation.

Complications during follow-up with the stoma

Stoma-related complications during follow-up are described in *Table 5*. Stoma prolapse was significantly more common after colostomy. Clothing had to be adjusted significantly more often in the presence of a colostomy. Stoma leakage and skin irritation were frequently reported in both groups. Because of the more excessive fluid and electrolyte loss through the ileostomy the diet had to be adjusted significantly more often in patients with a loop ileostomy. During the follow-up period before stoma closure, 30 complications were observed in the ileostomy group (0·9 per patient) and 40 in the colostomy group (1·1 per patient).

There were five deaths before stoma closure. One patient with an ileostomy died as a result of colonic liver metastases. Two patients who had a colostomy died from acute myeloid leukaemia, one from colonic metastases and one from local recurrence of rectal carcinoma before stoma reversal had taken place.

Twenty-nine of the 31 surviving patients with an ileostomy and 32 of the 34 with a colostomy underwent stoma closure.

Complications after stoma closure

Complications were reported in eight patients after ileostomy closure and three after colostomy closure

Table 5 Stoma-related complications during follow-up with stoma

	Ileostomy ($n = 32$)	Colostomy ($n = 38$)
Prolapse	1*	16
Retraction	4	1
Parastomal hernia	2	0
Parastomal fistula	1	2
Stenosis	0	1
Necrosis	0	1
Leakage	12	18
Skin irritation requiring therapy	3 11	9 9
Adaptation of clothes	8*	22
Dietary measures	23*	4
Other	16	14
Total stoma-related complications	30	40

*$P < 0{\cdot}01$ *versus* colostomy group (χ^2 test)

Table 6 Complications after stoma closure

	Ileostomy ($n = 29$)	Colostomy ($n = 32$)
Complications		
Ileus	2	1
Wound infection or haematoma	2	1
Fistula	2	1
Anastomotic leakage	1	0
Respiratory insufficiency	1	0
Total	8	3
Deaths	2	0

($P = 0{\cdot}06$) (*Table 6*). All but one of the complications seen after stoma closure were related to the stoma reversal: ileus, wound infection or wound haematoma, enterocutaneous or colocutaneous fistula and anastomotic leakage.

Two patients died after ileostomy closure. One death was caused by anastomotic leakage and the other by respiratory insufficiency (due to lung metastases).

During outpatient clinic follow-up no significant morbidity was observed. No patient was lost to follow-up.

Discussion

This randomized study focuses on three different, important aspects of stoma care and stoma surgery: (1) the primary operation under elective and acute circumstances, (2) complications and problems of having a protective stoma and (3) complications of a second operation to reverse the stoma.

There are a few studies[1–7] comparing loop ileostomy with loop transverse colostomy, and these studies mainly focus on the primary operation. Of these studies two were randomized[1,2] and showed no important differences between ileostomy and colostomy. The other studies[3–10] were also essentially inconclusive. The present study was conducted in a group of relatively old patients in whom the impact of a stoma for daily life is potentially enormous. More stoma-related and general disease-related complications were observed in the ileostomy group. Ileostomy was a major source of complications compared with colostomy. The incidence of significant complications, including death, due to loop ileostomy in this series is larger than that published in the literature. In two smaller prospective trials comparing loop ileostomy and loop colostomy[1,2] no death from the stoma was experienced. In two large series describing temporary loop ileostomy after restorative proctocolectomy (203 and 296 ileostomies respectively)[11,12] there were no deaths and the complication rate was low (7 per cent). The patients included, however, were much younger, a large proportion in one of these studies[11] was on steroids (67 per cent) and all underwent elective operation. In the evaluation of the present results, however, it is very difficult to separate morbidity related to the underlying disease from complications caused by adding a stoma to the procedure. Complications can be 'local' such as prolapse, retraction, parastomal fistula or herniation, stenosis, necrosis and leakage. Of these, prolapse is more often seen in patients with a colostomy. Complications can also be of a more general nature, such as wound infection, abdominal abscess formation and sepsis. These complications are not directly attributable to a specific type of defunctioning stoma. Since significantly more complications occurred in the ileostomy group, it can be postulated that a loop ileostomy might be less efficient for bowel decompression. It is questionable whether a stoma can protect patients from the complications of colorectal disease. However, this trial revealed a difference in perioperative complication and mortality rates. Perioperatively, seven patients in the ileostomy group died (five after construction and two after closure of the ileostomy) and one in the colostomy group. All of these patients needed one or more surgical reinterventions. Three of these deaths resulted from ileostomy-related complications (parastomal leakage, prolapse and small bowel ileus).

The interval between primary and secondary operation has not been studied previously. None of the complications noted in the period before stoma closure needed surgical reintervention. Prolapse was very common in the colostomy group, and was the reason for modifying clothing in almost all of these 16 patients. Leakage was observed in a high percentage in both groups. Ensuing irritation of the surrounding skin occurred more often than expected in the colostomy group. Adaptation of daily food intake and drinks was needed in two-thirds of the patients with an ileostomy and dehydration was effectively prevented by relatively simple means. Four patients did not have the stoma reversed, because they were frail. This is serious because these old patients consequently will be seriously restricted in lifestyle, and may even become restricted temporarily or permanently to a nursing home.

Closure of the stoma is, in general, an elective procedure under optimal circumstances. Nevertheless, many complications that are directly attributable to the former presence of a stoma were recorded. Taking down the ileostomy was accompanied by more serious complications than closure of the colostomy. Reversal of a loop ileostomy is not always 'just a local procedure'. The small bowel can be adherent to the abdominal wall as well as to adjacent loops with risk of damage to such loops. Because of the small entry to the abdomen, such damage can go unnoticed and lead to bowel leakage, abscess formation or intra-abdominal sepsis. Stenosis of the anastomosis, leading to (temporary) obstruction, can develop if the technique is not modified in the presence of luminal discrepancy. Repositioning of the anastomosis through a small hole can lead to torsion, obstruction and small

bowel ileus. Closure of a loop transverse colostomy is usually more straightforward.

Construction, as well as closure, of a loop ileostomy had frequent and more serious complications in comparison to loop colostomy. It is therefore concluded that loop ileostomy is not the stoma of choice for routine use for temporary decompression of the large bowel, although it is acknowledged that excellent results with loop ileostomy have been published from centres with considerable experience in routine use of this type of covering stoma in pelvic pouch surgery[11,12]. Considering that complications frequently occur with both types of stoma, it is also concluded that use of a stoma should be restricted, and that attention should be paid to the technical aspects of a temporary stoma. It should always be kept in mind that at least 15 per cent of 'temporary' stomas will turn out to be permanent.

Acknowledgements

The authors thank Convatec BV for financial support, and the following hospitals for including their patients in the study and for careful follow-up: Groene Hart Hospital, Gouda; Reinier de Graaf Hospital, Delft; Red Cross Hospital, The Hague; Westeinde Hospital, The Hague; and University Hospital, Leiden, The Netherlands.

References

1 Williams NS, Nasmyth DG, Jones D, Smith AH. Defunctioning stomas: a prospective controlled trial comparing loop ileostomy with loop transverse colostomy. *Br J Surg* 1986; 73: 566–70.
2 Khoury GA, Lewis MCA, Meleagros L, Lewis AAM. Colostomy or ileostomy after colorectal surgery? A randomised trial. *Ann R Coll Surg Engl* 1987; 69: 5–7.
3 Phillips RKS, Pringle W, Evans C, Keighley MRB. Analysis of a hospital-based stomatherapy service. *Ann R Coll Surg Engl* 1985; 67: 37–40.
4 Rutegard J, Dahlgren S. Transverse colostomy or loop ileostomy as diverting stoma in colorectal surgery. *Acta Chirurgica Scandinavica* 1987; 153: 229–32.
5 Fasth S, Hulten L, Palselius I. Loop ileostomy – an attractive alternative to a temporary transverse colostomy. *Acta Chirurgica Scandinavica* 1980; 146: 203–7.
6 Fasth S, Hulten L. Loop ileostomy: a superior diverting stoma in colorectal surgery. *World J Surg* 1984; 8: 401–7.
7 Geelkerken RH, Carmiggelt C, Struyk N, Hermans J, Gooszen HG. Dubbelloops ilestoma of dubbelloops colostoma ter ontlasting van een linkszijdige colonanastomose. *Ned Tijdschr Geneeskd* 1988; 42: 1960.
8 Fielding LP, Stewart-Brown S, Hittinger R, Blesovsky L. Covering stoma for elective anterior resection of the rectum: an outmoded operation? *Am J Surg* 1984; 147: 524–30.
9 Grabham JA, Moran BJ, Lane RHS. Defunctioning colostomy for low anterior resection: a selective approach. *Br J Surg* 1995; 82: 1331–2.
10 van de Pavoordt HD, Fazio VW, Jagelman DG, Lavery IC, Weakley FL. The outcome of loop ileostomy closure in 293 cases. *Int J Colorectal Dis* 1987; 2: 214–17.
11 Khoo REH, Cohen MM, Chapman GM, Jenken DA, Langevin JM. Loop ileostomy for temporary fecal diversion. *Am J Surg* 1994; 167: 519–22.
12 Senapati A, Nicholls RJ, Ritchie JK, Tibbs CJ, Hawley PR. Temporary loop ileostomy for restorative proctocolectomy. *Br J Surg* 1993; 80: 628–30.