

Early complications after stoma formation: a prospective cohort study in 100 patients with 1-year follow-up

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Abstract

Purpose This study aims to provide an overview of all complications that may occur after construction of an ileostomy or colostomy (loop or end) in daily practice.

Methods Between July 2007 and April 2008, all adult patients who underwent any type of intestinal stoma formation were asked to participate in this prospective cohort study. All relevant patient characteristics were gathered. Patients were evaluated for complications eight times in a 1-year postoperative period. Enterostomal therapy nurses scored complications on specially designed forms.

Results One hundred patients were included; two patients were lost before initial follow-up (FU). During FU, 21% of the patients deceased, and 15% were lost, physically unable to visit the outpatient clinic or withdrew from FU. In 37% of the patients, bowel continuity was restored. Only 26% of the patients were able to complete FU. Overall, 82% of all the patients had one or more stoma-related complications. Most common complications were skin irritation (55%), fixation problems (46%) and leakage (40%). Superficial necrosis, bleeding and retraction occurred in 20%, 14% and 9% of patients, respectively. More stoma related complications were found in stoma's on inappropriate locations.

Conclusions In this heterogenic patient population with formation of different stoma types, a high complication rate was detected.

Keywords Enterostoma · Complications · Prospective · Cohort

Background

The formation of a stoma is one of the most performed gastrointestinal surgical procedures. In the Netherlands, the estimated incidence for the construction of intestinal stomas is 37 per 100,000 habitants with an estimated prevalence of 175 per 100,000 [1]. Ostomies are used for either temporary or permanent purposes and are subdivided in end or loop ileostomies or colostomies [2].

Several complications may occur after formation of a stoma, such as parastomal herniation, dermatitis, necrosis, parastomal fistula and abscesses, high stoma output and retraction [3]. Various studies have been published reporting on stoma complications. Most of these studies demonstrate a high overall incidence of stoma-related complications, varying between 10% and 70% depending on the number of complications scored [3–5]. Other studies focus on risk factors of stoma complications. The majority of information is incomplete or based on retrospective data analysis. This may cause under-registration of complications in most studies [5–8]. The aim of this pragmatic prospective cohort study was therefore to provide an overview of all complications that may occur after construction of an ileostomy or colostomy (loop or end) in daily practice in a large teaching hospital in the Netherlands.

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Table 1 General patient characteristics

Gender M:F	48:52
Mean age (range)	67 (19–93)
SD	15.5
Elective versus emergency surgery	59:41
Intention, temporary versus permanent	50:48
unknown intention	2
Median hospital stay (range)	12 days (3–97 days)

Methods

Study population

This study was performed in a large teaching hospital in the Netherlands. Between July 2007 and April 2008, all adult patients who underwent any type of intestinal stoma formation were asked for participation in this prospective cohort study. There were no exclusion criteria.

Surgical technique

There was no standardisation of the technique for stoma formation. Pre-operative stoma site marking is a standard procedure at our department, but it was not always possible in emergency situations. In loop ostomies, temporary supportive synthetic bridges were used for positioning to the abdominal wall. These were removed between 10 to 12 days after surgery.

Data acquisition and follow-up

All pre- and peri-operative relevant patient characteristics (age, sex, body mass index, medical history, indication for surgery, type of operative procedure and stoma, hospitalisation time, technical aspects of stoma formation) were gathered by the research coordinator. Follow-up ended after

1 year and was performed by two specialised enterostomal therapy nurses. The incidence of complications related to the stoma construction was recorded according to a standardised protocol. All patients were examined at 1, 3 and 14 days; 4 and 6 weeks and 3, 6 and 12 months after surgery. On all eight visits, a standardised form was used to score the complications. This form contained 19 possible complications: necrosis (superficial or deep), bleeding, retraction, parastomal hernia, stenosis, parastomal abscess, peristomal fistula formation, incisional hernia, skin irritation, fixation problems, leakage, flush, wound dehiscence, allergy, troublesome passage of stool, hypergranulation, prolapse and high output. All these complications had to be scored 'yes' or 'no'. The location of the stoma on the abdominal wall was also examined and scored. Stomas constructed too high, too low or outside the rectus abdominus sheet were considered suboptimal. Stomas constructed in skin folds were also considered suboptimal. Digital examination of the stoma was performed on indication. Hospital readmission or surgical reintervention due to enterostomy-related problems was registered.

Definitions of complications

Retraction was defined as a stoma that is 0.5 cm or more below the skin surface; a flush stoma was defined as a stoma that is at skin surface or less than 0.5 cm below. Prolapse was scored if prolapse of bowel occurred causing the stoma to increase in size after maturation. Parastomal hernia was defined as a symptomatic hernia or a hernia present at physical examination. Wound dehiscence was defined as separation of the bowel mucosa from the skin. A stoma output of more than 2 litres per 24 h was set as 'high output'. Necrosis of bowel mucosa was defined as superficial necrosis; deep necrosis was defined as necrosis beyond the mucosa of the bowel. Problems with the fixation of stoma care materials were called fixation problems. Leakage existed when regular leakage of faeces outside these materials was seen. Stenosis

Table 2 Overview of indications of stoma construction

Stomas constructed during surgery for	Procedure performed during		Total (<i>n</i>)
	Elective surgery (<i>n</i>)	Emergency surgery (<i>n</i>)	
Colorectal malignancies	33	13	46
Complicated diverticulitis	8	12	21
Inflammatory bowel disease	8	2	10
Anastomotic leakage	0	5	5
Obstruction due to malignancies outside the gastrointestinal tract	3	2	5
Deviation from non-malignant processes (e.g., fistula)	4	0	4
Miscellaneous	2	7	9

Table 3 Applied procedures/frequencies of stomas

Loop colostomy/loop sigmoidostomy	<i>n</i> =45 (45%)
End colostomy/Hartmann procedure	<i>n</i> =36 (36%)
Loop ileostomy	<i>n</i> =12 (12%)
End ileostomy	<i>n</i> =7 (7%)

was defined as narrowing during digital examination of the stoma. Troublesome passage of stool through the stoma was scored when these complaints led to prescription of laxative medication. Hypergranulation was defined as an excess of granulation tissue on or around the stoma. If stoma materials or leakage caused dermatitis or excessive erythema, it was named ‘skin irritation’. An allergic reaction caused by stoma care materials was deemed ‘allergy’.

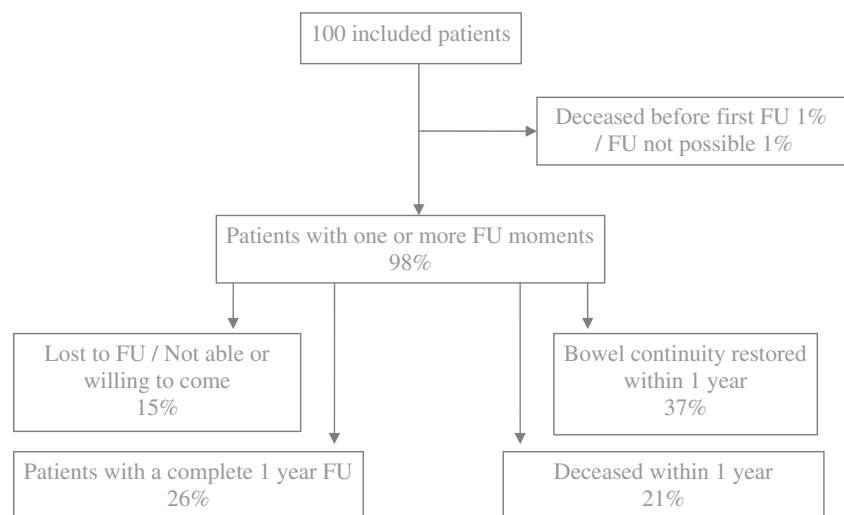
Stoma care

Two specialised enterostomal therapy nurses provided standard stoma care. If possible, pre-operative stoma site marking was applied, and information was given. These dedicated nurses gave extensive information, instruction and training in stoma care before and after surgery. Appropriate stoma care materials were selected per patient with respect to the type of stoma, allergies, preferences and complications. Two-piece stoma appliances were used for all patients.

Statistical analysis

SPSS 17.0 (SPSS, Chicago, IL, USA) was used for statistical analysis. All pre-operative, peri-operative and follow-up data were gathered in a SPSS database. All patients with one or more follow-up moments were used for statistical analysis. Descriptive statistics were used for statistical analysis.

Fig. 1 Flowchart on the follow-up characteristics of patients



Results

General patient, hospital admittance and stoma characteristics

One hundred consecutive patients (48 women, 52 men) with a mean age of 67 years (SD±15.5) were included (Table 1). Stomas were most frequently constructed during surgery for colorectal malignancies, complicated diverticulitis (Hinchey stage III/IV) [9], left-sided colonic obstruction and inflammatory bowel disease (Table 2). In Table 3, the distribution of the applied procedures is described. Median hospitalisation time was 12 days (range 3–97).

Follow-up characteristics

The inclusion and follow-up characteristics of the participating patients are depicted in Fig. 1.

Of the 100 included patients, 2 were lost before initial follow-up (one died due to abdominal sepsis; one was lost and could not be retrieved after extensive search). The remaining 98 patients were seen at least once during follow-up. Eight patients were physically unable to visit the outpatient clinic or were not willing to cooperate any longer during follow-up. Another seven patients were lost to follow-up.

Seven patients (7%) deceased within 1 month after operation. Six of these patients died after initial emergency surgery for perforated diverticular disease, stenosis, extensive Fournier gangrene and an anastomotic leakage after resection of ischemia of the ileum. One patient died because of anastomotic leakage after elective surgery for a carcinoma of the sigmoid. Another 14 patients deceased between 1 month and 1 year after surgery. Thirteen of these patients had undergone palliative stoma construction because of irresectable colon, sigmoid or rectal tumours (*n*=10), obstruction due to intra-

Table 4 Overview of all complications

Skin irritation	<i>n</i> =54 (55%)
Fixation problems	<i>n</i> =45 (46%)
Leakage	<i>n</i> =39 (40%)
Flush	<i>n</i> =25 (26%)
Superficial necrosis	<i>n</i> =20 (20%)
Wound dehiscence	<i>n</i> =15 (15%)
Allergy	<i>n</i> =14 (14%)
Bleeding	<i>n</i> =14 (14%)
Troublesome passage of stool	<i>n</i> =10 (10%)
Hypergranulation	<i>n</i> =10 (10%)
Retraction	<i>n</i> =9 (9%)
Parastomal hernia	<i>n</i> =6 (6%)
Prolapse	<i>n</i> =6 (6%)
High-output	<i>n</i> =5 (5%)
Stenosis	<i>n</i> =3 (3%)
Deep necrosis	<i>n</i> =3 (3%)
Parastomal abscess	<i>n</i> =3 (3%)
Fistula formation	<i>n</i> =1 (1%)
Incisional hernia	<i>n</i> =0 (0%)

peritoneal metastasis of a gastric carcinoma (*n*=1), extensive local prostate carcinoma causing rectal obstruction (*n*=1) and rectal obstruction due to metastasis of a bladder carcinoma (*n*=1). One patient died after elective surgery for a colovesical fistula with subsequent abdominal sepsis. In 37 patients (37%), bowel continuity was restored during follow-up. This was done at a mean of 146 days (range 11–284, SD±79) after initial stoma formation. Consequently, only 26 of 100 (26%) patients were able to complete 1-year follow-up.

Overall stoma complications

Overall, 82% of all the patients had one or more complications during one or more moments of follow-up. Most common complications were skin irritation (55%), fixation problems (46%) and leakage (40%). Overview of incidences of all complications is given in Table 4. A higher risk for high output was found in the loop ileum stoma group (25% versus 0–2% in other types).

A total of 41 stomas were constructed during emergency surgery. Most common indications for emergency surgery were colonic malignancies with obstruction (*n*=13), complicated diverticulitis (*n*=12) and anastomotic leakage (*n*=5). More parastomal hernias were found during follow-up after emergency surgery: 14% versus 2% after elective surgery.

More complications were found in stoma's on inappropriate locations (*n*=22). Fixation problems (77% versus 37%), leakages (77% versus 29%), flush stomas (46% versus 20%), retractions (27% versus 4%), parastomal herniation (18% versus 3%) and bleedings (36% versus 8%) were all found

significantly more in stomas sited at suboptimal locations on the abdominal wall.

Stoma complications led to a total of eight readmissions and reoperations. Causes for reoperation were stenosis (*n*=2), parastomal hernia, deep necrosis, parastomal fisteling, large stomal prolaps, retraction and high output.

Discussion

Although it is known that construction of any type of stoma may be accompanied with significant stoma-related complications, realistic overviews of complications in large patient cohorts are scarce in the currently available literature. This study focused on all complications that occurred in the first year after stoma formation in 100 consecutive patients who received a stoma for different indications.

In this study, quite high general incidences of stoma-related complications were found when compared to the available literature. It is anticipated that this may be a result of the methods used for follow-up of patients included. To our knowledge, no studies exist with a similar extensive and thorough follow-up. We assume that the prospective design, the frequency of follow-up moments and the use of standardised evaluation questionnaires during all of these moments are other likely causes of relatively high complication rates. Furthermore, the amount of complications scored in this study is higher compared to most studies in literature, resulting in higher numbers of total complications. For example, Robertson et al. scored only 9 complications, resulting in a general complication percentage of 23.5%, whereas 19 possible complications were scored for this study [10]. Conversely, all patients with one or more follow-up moments were analysed, indicating that actual incidences of complications may even be higher than those reported in this study, as 74% of patients were not able to complete 1-year follow-up.

Parastomal hernia was seen in only 6% of our study population. In literature, this complication is reported in up to 50% of patients [3]. However, parastomal hernia may be considered a 'late complication', and in the majority of studies, the incidence of this complication is raising in the second and third year of follow-up [8, 10]. No differences were encountered between patients with a colostomy or ileostomy with regards to the incidence of parastomal hernia in this study, bearing in mind that the heterogenic aspect of this patient population limits comparative purposes.

Ongoing discussion about the preferred type of (temporary) stoma can be recognised in literature. In some systematic reviews, a loop ileostomy is not encouraged because of prolapse rates [11]. In other reviews, no clear preference is demonstrated [12]. In the current study, the only remarkable difference between stoma types was a higher risk for high

output in the loop ileum group, which is a predictable complication after formation of this type of stoma. Other studies underline this complication as a risk factor for other complications like skin excoriation [10]. However, due to the unequal distribution of stoma types in this study, differences with regard to skin-related complications could not be recognised [11, 12].

Despite counselling by our stoma nurses before surgery when possible, intense follow-up and usage of the most appropriate stoma care materials, stoma complication rates remained high in this study. Inappropriate location of stomas was seen predominantly in patients who underwent emergency surgery. Furthermore, higher rates of several complications were seen in these patients. Therefore, even in emergency situations, the position of the stoma on the abdominal wall should be well considered and preferably sited by an enterostomal therapy nurse before surgery. This recommendation is in accordance with recent literature as well in order to lower complication rates as much as possible [13].

Additional risk factors could not be determined in the current study. In literature, body mass index, diabetes, emergency surgery and stoma height have been indicated as possible risk factors for complications after stoma construction [14]. Except for emergency surgery, these factors could not be identified in our study cohort. Technical aspects of stoma formation could also be important in order to reduce the number of complications: the height of the stoma has been identified as a risk factor for stoma-related complications in literature [15]. This could not be confirmed with the current study as we have not measured the exact height of the stomas during our FU. In order to determine additional technical factors that could influence the rate of complications, a Dutch clinical trial has recently been initiated to investigate the effect of different suture techniques on the occurrence of stoma-related complications after surgery. Overall, it may be emphasized that the construction of any type of stoma is accompanied by high complication rates and thus remains a procedure that should be performed with meticulous attention.

In conclusion, stoma formation in 100 consecutive patients with follow-up of 1 year after surgery resulted in a complication rate of 82% after a prospective and intensive study design. Inappropriate stoma location was identified as a risk factor for the occurrence of stoma-related complications. Therefore, counselling by dedicated stoma nurses before surgery is highly recommended in all patients.

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Conflict of interest The authors declare that they have no conflict of interest.

References

1. Numbers via Dutch association for stoma patients (2010)
2. Shellito PC (1998) Complications of abdominal stoma surgery. *Dis Colon Rectum* 41(12):1562–1572
3. Shabbir J, Britton DC (2009) Stoma complications: a literature overview. *Colorectal Dis* 2009 Jul 10
4. Salvadalena G (2008) Incidence of complications of the stoma and peristomal skin among individuals with colostomy, ileostomy, and urostomy: a systematic review. *J Wound Ostomy Continence Nurs* 35(6):596–607
5. Nastro P, Knowles CH, McGrath A, Heyman B, Porrett TR, Lunniss PJ (2010) Complications of intestinal stomas. *Br J Surg* 97(12):1885–1889
6. Caricato M, Ausania F, Ripetti V, Bartolozzi F, Campoli G, Coppola R (2007) Retrospective analysis of long-term defunctioning stoma complications after colorectal surgery. *Colorectal Dis* 9(6):559–561
7. Harris DA, Egbear D, Jones S, Benjamin H, Woodward A, Foster ME (2005) Complications and mortality following stoma formation. *Ann R Coll Surg Engl* 87(6):427–431
8. Mylonakis E, Scarpa M, Barollo M, Yarnoz C, Keighley MR (2001) Life table analysis of hernia following end colostomy construction. *Colorectal Dis* 3(5):334–337
9. Kaiser AM, Jiang JK, Lake JP, Ault G, Artinyan A, Gonzalez-Ruiz C, Essani R, Beart RW Jr (2005) The management of complicated diverticulitis and the role of computed tomography. *Am J Gastroenterol* 100(4):910–917
10. Robertson I, Leung E, Hughes D, Spiers M, Donnelly L, Mackenzie I, Macdonald A (2005) Prospective analysis of stoma-related complications. *Colorectal Dis* 7(3):279–285
11. Guenaga KF, Lustosa SA, Saad SS, Saconato H, Matos D (2007) Ileostomy or colostomy for temporary decompression of colorectal anastomosis. *Cochrane Database Syst Rev* (1):CD004647
12. Armendariz-Rubio P, de Miguel V, Ortiz HH (2007) Comparison of colostomies and ileostomies as diverting stomas after low anterior resection. *Cir Esp* 81(3):115–120
13. Bass EM, Del PA, Tan A, Pearl RK, Orsay CP, Abcarian H (1997) Does preoperative stoma marking and education by the enterostomal therapist affect outcome? *Dis. Colon Rectum* 40(4):440–442
14. Arumugam PJ, Bevan L, Macdonald L, Watkins AJ, Morgan AR, Beynon J, Carr ND (2003) A prospective audit of stomas—analysis of risk factors and complications and their management. *Colorectal Dis* 5(1):49–52
15. Persson E, Berndtsson I, Carlsson E, Hallen AM, Lindholm E (2010) Stoma-related complications and stoma size—a 2-year follow up. *Colorectal Dis* 12(10):971–976