Review Article

Intestinal Ostomy

Classification, Indications, Ostomy Care and Complication Management

Peter C. Ambe*, Nadja Rebecca Kurz*, Claudia Nitschke, Siad F. Odeh, Gabriela Möslin, Hubert Zirngibl

Summary

Background: About 100 000 ostomy carriers are estimated to live in Germany today. The creation of an ostomy represents a major life event that can be associated with impaired quality of life. Optimal ostomy creation and proper ostomy care are crucially important determinants of the success of treatment and of the patients' quality of life.

Methods: This article is based on pertinent publications retrieved by a selective search in PubMed, GoogleScholar, and Scopus, and on the authors' experience.

Results: Intestinal stomata can be created using either the small or the large bowel. More than 75% of all stomata are placed as part of the treatment of colorectal cancer. The incidence of stoma-related complications is reported to be 10–70%. Skin irritation, erosion, and ulceration are the most common early complications, with a combined incidence of 25–34%, while stoma prolapse is the most common late complication, with an incidence of 8–75%. Most early complications can be managed conservatively, while most late complications require surgical revision. In 19% of cases, an ostomy that was initially planned to be temporary becomes permanent. Inappropriate stoma location and inadequate ostomy care are the most common causes of early complications. Both surgical and patient-related factors influence late complications.

Conclusion: Every step from the planning of a stoma to its postoperative care should be discussed with the patient in detail. Preoperative marking is essential for an optimal stoma site. Optimal patient management with the involvement of an ostomy nurse increases ostomy acceptance, reduces ostomy-related complications, and improves the quality of life of ostomy carriers.

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* Joint first authors

Department of Visceral, Minimally Invasive, and Oncological Surgery, Marien Hospital Düsseldorf: PD Dr. Ambe

Department of General and Visceral Surgery, Chair of Surgery II, Helios University Hospital Wuppertal, University of Witten/Herdecke: Kurz, Dr. Odeh, Prof. Zirngibl

Helios University Hospital Wuppertal, University of Witten/Herdecke: Nitschke

Center for Hereditary Gastrointestinal Tumors, Chair of Surgery II, Helios University Hospital Wuppertal, University of Witten/Herdecke: Prof Möslin

The term “ostomy” comes from the Greek “stoma” (στόμα) and means “mouth.” In medicine, stoma/ostomy refers to a surgically created opening of a hollow organ on the surface of the body to enable excretion of waste products. An enterostomy is a surgically fashioned intestinal opening. Hardly any statistics on enterostomy are available for Germany. The self-help organization *Deutsche ILCO e.V.* estimates that the number of German residents with an ostomy exceeds 100 000 (1). German surgeons both create and close intestinal ostomies on a daily basis, so the actual number of ostomy patients at any one time is difficult to quantify. The construction of an intestinal ostomy represents a major event for any patient, potentially worsening their quality of life. Despite the advances made in medicine, intestinal ostomies are an indispensable aspect of clinical practice. Every step, from the indications through preparation and surgery to ostomy care, must be carefully planned in cooperation with each individual patient.

The aim of this article is to provide an up-to-date clinical review of intestinal ostomies. Details of surgical technique is beyond the scope of this article and will therefore not be discussed. Equally, we will not

go into detail about the economic and health insurance aspects of ostomy care, particularly in the out-of-hospital setting.

This review is based on a selective survey of the published literature and on our own clinical experience.

Classification of intestinal ostomies

Intestinal ostomies are classified according to the segment of the intestine that is brought out to the surface of the body. Small-bowel ostomies (ileostomies) can be distinguished from large-bowel ostomies (colostomies) (2), and end ostomies from loop ostomies (*Figure 1*). Ileostomies are preferentially created in the right abdomen, colostomies mostly in the left abdomen.

In end (terminal) ostomies, the bowel is divided and the proximal stump is brought out (*Figure 2*). In the case of a loop ostomy, the intestine is not transected; rather the anterior wall is opened to create the ostomy (*Figure 3*). Both kinds of openings can be temporary or permanent.

One special form of ostomy is Kock continent ileostomy. A reservoir (the Kock pouch) fitted with a

stop valve is brought out as a shallow ostomy in the abdominal wall. The valve prevents continuous leakage of stool, thus rendering the patient continent. The pouch is emptied by self-catheterization, enabling the patient to live without an ostomy bag (3). Literature reports show that patients with a Kock pouch are much more satisfied and have a greatly improved quality of life (4). However, it has to be mentioned that creation of a Kock pouch is associated with an elevated revision rate; in some cases the pouch even has to be removed (5).

In a modification of loop ostomy, a segment of bowel is resected and the two ends are joined only partially by anastomosis of the posterior wall. The anterior wall remains open and is sutured to the skin as a loop ostomy.

At our center, selected patients receive a virtual ostomy (ghost ostomy) rather than a protective ostomy. After creation of an anastomosis following rectal surgery, a narrow window is created at the mesenterial side of the last ileal segment to permit the passage of a vascular vessel loop, which is then exteriorized at the previously marked ileostomy site. In a randomized controlled study by Mari et al., anastomotic insufficiency (AI) after oncological anterior rectal resection was found in only three of 55 patients (5.4%) who had received a ghost ostomy. Ileostomy was therefore avoided in 94.6% of this population (6). These findings largely correspond with our own experience. Close postoperative monitoring is important to ensure timely action should AI occur.

Indications

Nowadays the most common indication for creation of an intestinal ostomy is bowel cancer. AI after oncological resection of the rectum is associated with a 6 to 22% risk of mortality and thus represents the most serious complication of colorectal surgery (7). The risk of AI after deep rectal resection has been reported to be 10–15% (8). A protective ostomy is routinely performed to ameliorate the consequences of AI. In a prospective study by Law et al., an ostomy was created in 291 (73.5%) of 396 patients treated with oncological rectal resection (9). In a systematic review of enterostomies by Rondelli et al., 89% of the 1529 patients treated for colorectal carcinoma received an ostomy (10). These data form the basis of the “*should* consensus” with regard to creation of a temporary ostomy after radical rectal resection with deep anastomosis in the current German S3 guideline on colorectal carcinoma (11).

While a systematic review by Güenaga et al. (12) found no difference between loop ileostomy and loop colostomy as a protective ostomy with regard to complications, the results of a meta-analysis by Tilney et al. (13), examining the same issue, showed fewer complications after loop ileostomy. The evidence is not clear-cut, so the choice of type of ostomy for this indication is at the discretion of the individual surgeon. At our center we exclusively use loop ileostomy

FIGURE 1

Classification of intestinal ostomies. Enterostomies are classified first by the segment of intestine brought out to the surface and then, according to the number of openings in the intestine, into loop ostomies and end ostomies

to protect an anastomosis following rectal surgery. Table 1 summarizes the indications for the most frequently created ostomies.

In a multivariate analysis of 616 ostomy patients (median follow-up 7.1 years, range 2.5 to 9.8 years) in a multicenter randomized trial by Dulk et al. (14), the probability that an ostomy intended as temporary will become permanent was 19%. There was no statistically significant difference between the rates for loop ileostomy (15%) and loop colostomy (13%). However, the chances of stoma closure depend to some extent on the urgency of ostomy creation. The study cited above (14) showed that primary (elective) ostomies were taken down significantly more often than secondary ostomies created in emergency situations (86% versus 49%; $p < 0.0001$). In a similar study, Sier et al. investigated the rate of takedown for ileostomies intended as temporary (15). After a median follow-up of 22.6 months, 126 (26%) of 485 ileostomies intended as temporary were still in place. The rate of closure was much higher in patients with a loop ileostomy than in those with an end ostomy. In a recently published meta-analysis including a total of 8568 patients, Zhou et al. identified the following risk factors for an ostomy that was initially planned to be temporary to become permanent: advanced age (>65 years), major comorbidity (ASA score >2), surgical complications, AI, and advanced tumor (16). These data demonstrate that the probability of re-establishing intestinal continuity is crucially determined not only by the urgency of ostomy creation and by stoma type but also by patient-specific and complication-related factors.

Physiological aspects of intestinal ostomies

Creation of an intestinal ostomy is associated with certain physiological changes, foremost among them a decrease in the surface area available for resorption and loss of continence. Mainly in small-bowel ostomies but also in proximal large-bowel ostomies, reduction of resorption area may lead to loss of fluids and electrolytes.

Each day ca. 1.5 to 2 L of fluid passes through Bauhin’s valve. Around 90% of this amount is resorbed

Figure 2: End (terminal) colostomy.
1. End ostomy; 2. abdominal wall; 3. artificial mesh; 4. colon;
5. mesentery; 6. peritoneum

Figure 3: Loop ileostomy.
1. Proximal segment of small intestine; 2. distal segment;
3. mesentery, 4. cecum; 5. appendix

during passage through the large intestine. Immediately after creation of an ileostomy, the absence of the resorption surface of the large intestine leads to loss of high volumes of a thin bilious fluid. On the resumption of oral feeding the ostomy output changes both in color (becoming brownish) and in consistency (becoming mushy). The output is mainly odorless, but consumption of certain foods, e.g., eggs and fish, may be connected with an unpleasant smell (17). Logically, the risk of significant nutritional disorders depends on the length of the segment of small intestine that has been bypassed or lost. According to Kanaghinis et al., after the postoperative phase an

ileostomy passes an average of ca. 500 mL/day (18). However, amounts exceeding 1.5 L/day are not uncommonly encountered in clinical practice. For colostomies the extent of physiological change depends on the ostomy site. The further aboral the ostomy, the better formed is the excreted material and the lower the volume. The output of a colostomy is more malodorous than that of an ileostomy owing to the bacterial colonization of the large intestine.

Ostomy care and quality of life

An ostomy changes the patient's life dramatically. The physical, psychological, and social consequences on quality of life have been described in numerous publications (19, 20). Alongside the simple presence of the ostomy, the findings of a recent systematic review by Vonk-Klaassen et al. point to a clear link between stoma-related complications and deterioration in the quality of life of the person concerned (21). This underlines the importance of proper ostomy care.

Ostomy care comprises a broad spectrum of preoperative and postoperative tasks covering the management of the various types of ostomy. For enterostomies, the principal preoperative task is the provision of professional advice and training to the potential ostomy bearer and family members. Together with direct stoma care, the psychosocial and nutritional aspects must be discussed. The positive effects of good advice and training on the quality of life of ostomy patients were demonstrated in a systematic review by Danielsen et al. (22).

At our center, preoperative consultation includes marking the planned ostomy site by affixing a test baseplate. Postoperatively, the great majority of patients receive a two-part ostomy system comprising baseplate and bag. The baseplate of a two-component system should ideally be changed every 2 to 3 days, while a single-part system must be changed daily. Patients receive training from the local ostomy nurse as early as possible to ensure they are capable of looking after their ostomy confidently and safely by the time they are discharged from hospital.

Provision of adequate care to ostomy patients in the out-of-hospital setting can be challenging. There is particular room for improvement in health insurance funds' assumption of the costs for ostomy materials. The literature points to a negative association between cost coverage problems and the quality of life of stoma patients (23). Given the differences among the various health insurance providers' regulations regarding ostomy costs, the goal must be to draw up an individually adjusted care plan for the out-of-hospital setting. Here too, changing a two-part system every 2 to 3 days and a single-component system every day seems advisable.

Ostomy complications: management and prevention

Literature reports of the incidence of ostomy-related complications vary from 10% to 70%. In a study carried out in the UK, Nastro et al. documented 1219

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TABLE 1

Indications for creation of an intestinal ostomy

	Loop colostomy	End colostomy	Loop ileostomy	End ileostomy	Kock pouch	Anastomotic ostomy	Ghost ostomy
Most frequent indications	<ul style="list-style-type: none"> – Protective ostomy in DARR – Palliative, inoperable rectal carcinoma – Complex perianal fistulas and inflammatory processes – Radiation proctitis – Stenosing rectal carcinoma – Incontinence 	<ul style="list-style-type: none"> – Perforating diverticulitis with fecal peritonitis – Rectal resection without restoration of continuity in deeplying carcinoma – Abdomino-perineal rectal resection 	<ul style="list-style-type: none"> – Protective ostomy after proctocolectomy in FAP/CIBD (otherwise indications as for loop colostomy) 	<ul style="list-style-type: none"> – Emergency proctocolectomy or colectomy – Failure of an IPAA – Extended intestinal resection in intestinal ischemia 	<ul style="list-style-type: none"> – FAP – Ulcerative colitis – Conversion from IPAA 	Segmental resection	Anastomosis in small pelvis (e.g., after DARR, proctocolectomy)
Advantages	<ul style="list-style-type: none"> – Minor skin damage, no loss of fluids and electrolytes due to firmer stool – Simple take-down 	Minor skin damage, no loss of fluids and electrolytes due to firmer stool	Simple takedown		<ul style="list-style-type: none"> – Preservation of continence – High quality of life – Conversion to IPAA possible 	<ul style="list-style-type: none"> – No anastomosis in abdomen – Rapid take-down 	No repeat opening of abdomen in the event of AI
Disadvantages/complications	Increased odor due to intestinal bacteria	Difficult restoration of continuity	<ul style="list-style-type: none"> – Loss of high amounts of fluids – Peranal secretion of mucus may occur 	<ul style="list-style-type: none"> – Loss of high amounts of fluids – Difficult restoration of continuity 	High revision rate		– Ileus due to narrowing of lumen by vessel loop

AI, anastomotic insufficiency; CIBD, chronic inflammatory bowel disease; DARR, deep anterior rectal resection; FAP, familial adenomatosis polyposis coli; IPAA, ileal pouch anal anastomosis

complications in 681 of 1216 ostomy patients, corresponding to a morbidity rate of 56.0% (29). Ostomy complications are divided into early and late events. Early complications, in the first 30 days, include bleeding, hematoma formation, edema of the ostomy, cutaneous irritation, sometimes with ulceration (*eFigure a*), and necrosis of the ostomy (*eFigure b*). Late complications are those occurring more than 30 days after operation. The most frequent among them include prolapse (*eFigure c*), retraction (*eFigure d*), and stenosis (*eFigure e*) of the ostomy, together with parastomal hernia (*eFigure f*). The reasons for the occurrence of late complications may be related to the patient or to the surgical technique. It has been shown, for example, that patient factors such as obesity and elevated intra-abdominal pressure greatly increase the risk of ostomy prolapse and parastomal hernia. Regarding surgical technique, an excessively large opening is a predisposing factor for parastomal hernia, while too much mobilization of the bowel loop used to fashion the ostomy increases the tendency towards prolapse (31–33). The most frequently occurring ostomy complications are summarized in *Table 2*.

In our opinion, dehydration (with electrolyte imbalance) is a common complication in ileostomy patients.

This complication is observed both immediately after ostomy creation and weeks or months later. Clinically significant dehydration has been reported to occur in around 20% of ileostomy bearers (32). In an analysis of 603 ileostomy patients, Messaris and colleagues found a 60-day hospital readmission rate of 16.9%. Dehydration was the commonest reason for readmission, comprising 43.1% of cases (34). In our own experience, the extent of dehydration varies from mild dehydration to renal failure requiring dialysis.

Early complications are generally treated conservatively. Cutaneous erosion and ulceration can be managed well with routine skin and ostomy care. Hematoma and edema of the ostomy require no special treatment. Necrosis and retraction of the ostomy necessitate revision surgery only if ostomy function is impaired (35).

The two most common causes of most early complications are suboptimal ostomy positioning and deficient care. In a retrospective study by Bass et al., the early complication rate was 32.5% in 292 patients with preoperative marking of the ostomy site and 43.5% in 301 patients without preoperative marking (30). Thus the importance of preoperative marking cannot be overemphasized. Marking does not have to be performed by the surgeon but can be delegated to an ostomy nurse

TABLE 2

The most commonly occurring complications of ostomies of the small and large intestine

Type of complication	Ileostomy (%)	Colostomy (%)	References
Cutaneous irritation	25–34%	7–20%	(24, 25)
Parastomal hernias	9–22%	18–40%	(37, 38)
Ostomy stenosis	2–17%	1–14%	(24–26)
Ostomy retraction	11–24%	1–8%	(25–27)
Ostomy prolapse	8–75%	2–18%	(25, 26, 28)
Ileus	11–18%	0–7%	(26, 28)

(36). Precise shaping and close fixation of the baseplate, with the aid of ostomy paste if required, prevents cutaneous irritation by the aggressive upper intestinal secretion in ileostomy patients.

The late complications can be managed conservatively or surgically. Persistence of symptoms and functional impairment of the ostomy are indications for surgical revision (31, 37). Particularly for parastomal hernia there are identifiable risk factors: obesity, treatment with steroids, secondary ostomy creation, septic complications (37). Surgical factors in the development of a parastomal hernia are the size of the ostomy outlet and the position of the ostomy in relation to the rectus sheath (38). For some years the use of a protective ostomy mesh has been thought to offer the most effective means of avoiding a parastomal hernia, and recent publications have described good evidence-based efficacy of mesh in this respect. Despite the convincing results of their systematic review, Chapman et al. point to the need for sound studies on this topic (39).

In our opinion the most commonly occurring ostomy-related complications in the out-of-hospital setting include dehydration, imperfect fitting of the baseplate, and changing of the ostomy system at inappropriate intervals. High volume loss from an ileostomy and inadequate liquid intake are a dangerous combination. It is essential to ensure proper fluid balance. In the event of signs of dehydration, hospital admission should be considered. A baseplate opening that is too large is a predisposing factor for cutaneous irritation or even ulceration. The danger of cutaneous complications is greatest for ileostomy. While irritation can be managed out of hospital by means of baseplate correction and intensive skin care, ulceration requires expert consultation. A baseplate opening that is too small leads to mucosal erosion and possibly hemorrhage. Expert consultation should be considered in such cases.

Conclusion

Despite the wide-reaching advances in medicine and surgery, enterostomies remain a fixture of clinical practice. Receiving an intestinal ostomy changes a person's life dramatically and may entail complications,

sometimes severe, and impairment of quality of life. Careful planning, meticulous surgery, and optimal care are crucial in ensuring that ostomy patients can live their lives in the best way possible.

Conflict of interest statement

The authors declare that no conflict of interest exists.

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Key messages

- Discussions with patients planned for ostomy surgery must cover not only ostomy care but also the psychosocial and nutritional aspects.
- Ileostomies are usually created in the right mesogastrium, colostomies in the left mesogastrium.
- In an end ostomy the supplying end of the divided intestine is brought out to the body surface, while in a loop ostomy the anterior wall of the intestine is opened to create the outlet.
- Most patients receive a two-part ostomy system, with which the baseplate is changed every 2-3 days.
- Dehydration, imperfect fitting of the baseplate, and delayed changing of the baseplate are commonly occurring complications in the out-of-hospital setting.

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Corresponding author

PD Dr. med. Peter C. Ambe
Klinik für Viszeral-, Minimalinvasive und Onkologische Chirurgie
Marien Hospital Düsseldorf
Rochusstr. 2, 40479 Düsseldorf, Germany
peter.ambe@vkkd-kliniken.de

► **Supplementary material**
eFigure:
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Supplementary material to:

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eFigure

Ostomy complications

- a) Cutaneous irritation with ulceration
- b) Ostomy necrosis
- c) Ostomy prolapse
- d) Ostomy retraction
- e) Ostomy stenosis
- f) Parastomal hernia