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Stoma-Related Complications: A Single-Center Experience and Literature Review

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ABSTRACT

Introduction: The creation of an abdominal stoma is a common procedure performed by surgeons as a part of the treatment for benign and malignant conditions in general surgery. Stoma formation is simple, but sometimes the associated postoperative complications have an impact on the patients' physical and psychological state. The majority of complications do not require reoperation, but when it is indicated, we have to assess the most appropriate option for the patient. **Material and Methods:** We conducted a retrospective study in a single surgical center, the Department of Surgery, Mureș County Hospital, Târgu Mureș, Romania, using data from patients who have been admitted under elective conditions for stoma-related complications between 2005 and 2019. **Results:** A total number of 877 ostomies (653 colostomies and 224 ileostomies) were performed, and 157 patients (17.9%) developed some type of stoma complication and required surgical intervention. The mean age was 64.5 ± 2.1 years, with a male-female ratio of 1.3 to 1. The leading comorbidities included cardiovascular disease (52.2% of cases), obesity (22.2%), and diabetes (18.4%). Parastomal hernia was the most frequent complication (47.5% of cases), followed by stoma prolapse (23.4%), parastomal stenosis (20.3%), and parastomal infection (8.2%). There was an association between age and the type of complication: parastomal hernia, stoma prolapse, and stenosis were more frequent in the elderly; parastomal infection was more prevalent in young patients. A longer hospital stay was observed in case of parastomal hernia. **Conclusions:** Stoma formation is associated with significant morbidity. Typically, the complications appear in the elderly. Conservative treatment is essential, but some of the late complications, such as parastomal hernia, stoma stenosis, stoma prolapse, and parastomal infection, require a surgical solution. Parastomal hernias are the most common complications, frequently associated with comorbidities and prolonged hospitalization.

Keywords: stoma, parastomal hernia, stenosis, parastomal infection, prolapse

INTRODUCTION

The term *stoma* comes from Greek terminology and means opening or mouth. It is defined as a natural or artificial communication between the external environment and the cavities of the body. In general surgery, the basic concept is that fecal flow is diverted from the pathological site by bringing the end of the bowel through the anterior abdominal wall.[1] Stoma formation is a widely and commonly performed surgical technique in colorectal surgery, most frequently in malignant diseases, but also in benign ones, such as inflammatory bowel disease or diverticular disease, when no other options are available.[2]

Creating a stoma is usually the final step of an emergency abdominal surgery or of a difficult approach in elective surgery. The most commonly performed stomas are the ileostomy and colostomy. Stomas may be temporary or permanent. Temporary stomas are performed to protect the distal part of the bowel or to relieve bowel obstruction in case of emergency surgery. Permanent stomas are performed in case of incongruency of the distal and proximal part of the bowel, when primary anastomosis creation is unsafe due to inflammation, vascularization, or distal bowel resection.[3]

Based on their spatial distribution, stomas can be categorized into loop or end stomas. A double-barreled or loop ostomy is called external diversion, and when it is performed in a definitive manner, its aim is to relieve bowel obstruction in case of palliative procedures when the tumor is unresectable.[4] Usually, the most appropriate approach is a transverse or sigmoid colostomy.[5] Temporary external diversions are used to protect the distal anastomosis or to solve the bowel obstruction until the blockage or tumor is resected.[6] During the creation of end stomas, the proximal part of the bowel represents the ostomy. The most frequent ostomy is positioned in the left iliac fossa as the last step of the commonly performed Hartmann's procedure.[7]An end ileostomy is more frequently placed in the right iliac fossa as the endpoint of total colectomy or external diversion in case of unresectable extensive colon tumors.[8]

Stoma-related complications

The formation of an ileostomy or colostomy is a lifesaving surgical procedure and is associated with significant morbidity.[9] Careful follow-up in an outpatient clinic is essential to recognize any complications. Stoma-related complications are widely described, and several authors have reported an incidence ranging between 2.9% and 81.1%.[10–12]

A significant proportion of these complications require surgical intervention. It has been demonstrated that the presence of obesity,[13] cardiorespiratory pathology, and emergency surgery may increase the risk of complications.[14] The complications are commonly influenced by the type of stoma and can be avoided by rigorous surgical planning, but postoperative care and patient education are also mandatory. There is a consensus to group these complications according to the elapsed time from the surgical procedure. Commonly, they are registered and broadly classified as early and late complications.

Early complications typically occur within 30 days of surgery, while late complications occur after 30 days. Early complications include inappropriate location, fluid and electrolyte imbalances, peristomal skin complications, stoma ischemia/necrosis, and stoma retraction. Late complications include stomal prolapse, stomal stenosis, peristomal infection/pyoderma gangrenosum, and parastomal hernia.[15,16]

Early complications

Generally, an inadequately placed stoma does not reveal its real degree of morbidity until the patients are discharged and try to restart their daily activities. Stomas placed in unfavorable locations can have consequences such as skin irritation, leakage of effluent and gas, skin breakdown, trauma, and poor visualization of the stoma.[17]

In the preoperative period, patient assessment is necessary to mark the ideal site for the stoma before starting the surgery. During emergency surgery, when this is not possible, the best place for a stoma is at two-thirds of the imaginary line connecting the anterior superior iliac spine and the umbilicus.[18,19]

Dehydration and electrolyte imbalances occur more often in case of ileostomies. There is increased output and compromised fluid absorption due to post-procedural bowel edema. Being a transient state, 49% of high-output stomas are resolved spontaneously and 51% require medical treatment during hospitalization.[20]

Peristomal skin complications, such as irritation and ulcerations, are the consequences of inappropriate stoma care and stoma construction. There is a particularly high risk of peristomal skin complications in obese patients, occurring in 18–55% of cases. Proper management can help to heel the damaged area and to prevent further skin inflammation and stripping.[21]

The impairment of blood supply during stoma formation can lead to ischemia and necrosis, which is more common following colostomy than ileostomy. The incidence of compromised vascularization has been reported to range from 2.3% to 17%.[22] The leading causes of insufficient blood supply are high ligation, vascular damage, and tight

abdominal window. Early recognition of stomal ischemia is mandatory because poor vascular supply could lead to delayed complications.

Stoma retraction is caused by excess tension on the diverted bowel loop, which is typically the consequence of inadequate mobilization. It is important to conduct a careful assessment for this complication and also to take into consideration a minimally invasive intervention before stoma revision or resection by laparotomy.[23]

Late complications

Parastomal hernia

A parastomal hernia is an incisional hernia associated with an abdominal wall stoma. The incidence of parastomal hernias varies a lot and it is correlated with the type of stoma and the accuracy of follow-up.[24] They occur more frequently in case of colostomies, and the clinical presentation includes pain, skin modification, leakage, and the appearance of a lump near the stoma, with a high risk of bowel obstruction. Stoma-related hernias can occur in up to 40% of stomas, and the leading cause is an excessively large fascial opening.[14,25,26] Surgical repair is essential with either a sutured technique or prosthetic mesh. Nowadays, there is also a recommendation to use a prophylactic mesh during the surgical preparation of stomas.[27,28]

Stoma prolapse

Stoma prolapse is a full-thickness protrusion of the bowel through the stoma due to the excessive length of the bowel loop or a wide fascial opening. Its incidence is estimated between 2% and 26%.[29] This complication can be treated conservatively with gentle manual pressure or with osmotic therapy (ex. table sugar) in case of edema.[30,31] Surgical revision and resection are performed when the prolapse is irreducible, ulcerated, or recurrent.[32] A novel and simple technique with low recurrence includes surgical stapling with excision of the prolapsed bowel segment.[33,34]

Stoma stenosis

Stoma stenosis is a late complication that the patient may experience after a period that can vary from a few weeks to years, and its incidence has been reported at 2% to 14%.[10,35,36] Local ischemia is the usual underlying factor, but infection or retraction of the stoma may also lead to stenosis. First-line treatment includes dilation or irrigation, but pressure could cause damage which will heal with fibrosis and further stenosis. The definitive solution is surgical treatment by external stoma revision and recreation, or by laparotomy.[29]

Peristomal infection/abscess/pyoderma gangrenosum

Infectious complications, such as abscess formation, are usually uncommon in the early postoperative period. Peristomal abscesses usually require surgical intervention such as incision and drainage. Surgeons must be aware of the risk of fistula formation after a surgically solved peristomal abscess.[22] Pyoderma gangrenosum is an ulcerated area with a painful, well-defined, erythematous zone observed firstly by the patient and frequently during stoma pouch application.[37] This skin lesion is associated more often with inflammatory bowel disease, with an incidence of 0.6% of the total stoma cases.[16] Conservative treatment with systemic corticosteroids, topical steroids, and antibiotics is included in the initial treatment; surgical intervention and negative pressure wound therapy may be necessary in case of extended lesions.[38,39]

Late complications require monitorization by specialists, such as a dedicated nurse, surgeon etc., both for prevention and early intervention. Maintaining the stoma in optimal conditions leads to a better quality of life for the patient and lower financial costs.[40]

The aim of this study was to conduct a short review of the literature and to present the experience of a single general surgery center in regards to stoma-related early and late complications.

MATERIALS AND METHODS

A retrospective observational study was conducted during a 15-year period in the Department of Surgery, Mureș County Clinical Hospital, Târgu Mureș, Romania, using data from patients who have been treated surgically for stoma complications.

A total number of 877 stomas, both ileostomies and colostomies, were created between January 2005 and December 2019 in our department. Patients who required only conservative treatment were excluded from the study. All patients included in the study have been treated with an open surgical approach. Patients with incomplete clinical data were also excluded.

The collected data included the patients' age, gender, length of hospital stay, body mass index (BMI), and main comorbidities such as cardiovascular disease, diabetes mellitus, and obesity.

We grouped the patients according to the main diagnosis on admission into four main categories: parastomal hernia, stoma stenosis, stoma prolapse, and parastomal infection/pyoderma gangrenosum. We analyzed the surgical procedure protocols to assess the most important steps. From the electronic database and clinical files, the post-

TABLE 1. Clavien-Dindo postoperative complication scale (Dindo et al., 2004)

Grade	Definition
I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Acceptable therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside.
II	Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
III	Requiring surgical, endoscopic or radiological intervention
IIIa	Intervention not under general anesthesia
IIIb	Intervention under general anesthesia
IV	Life-threatening complication (including CNS complications)* requiring IC/ICU management
IVa	Single-organ dysfunction (including dialysis)
IVb	Multi-organ dysfunction
V	Death of a patient
Suffix "d"	If the patient suffers from a complication at the time of discharge, the suffix "d" (for 'disability') is added to the respective grade of complication. This label indicates the need for a follow-up to fully evaluate the complication.

*brain hemorrhage, ischemic stroke, subarrachnoidal bleeding, but excluding transient ischemic attacks (TIA); IC – intermediate care; ICU – Intensive care unit

operative complications were classified according to the Clavien-Dindo classification system and grouped into five categories (Table 1).[41,42]

Statistical analysis

Descriptive and inferential statistics were performed. The normality of the distribution of continuous variables was tested with the Shapiro-Wilk test. Continuous variables were expressed as mean ± standard deviation or as median (25th percentile, 75th percentile) and compared using one-way ANOVA or the Kruskal-Wallis test. Categorical variables were displayed as frequencies, n (%), and between-group comparisons were performed by using the Chi-square test. A value of $p < 0.05$ was considered significant. The IBM SPSS Statistics 22 (IBM Corporation, USA) software was used for the statistical analysis of the data.

This study is part of the project "Studiul factorilor de risc și a complicațiilor în chirurgia cancerului colorectal (Study of risk factors and complications in colorectal cancer surgery)" and was approved by the Ethics Committee for Scientific Research of the "George Emil Palade" University of Medicine Pharmacy, Science and Technology of Târgu Mureș, Romania.

RESULTS

During the 15 years, a total number of 877 ostomies have been performed (653 colostomies and 224 ileostomies). The number of patients who were admitted for stoma-related complications that required surgery was 157 (17.9% of the total ostomies). The mean age of the studied population was 64.5 ± 2.1 years, and the male-female ratio was 1.3

TABLE 2. Obesity incidence and degree of obesity in the study population

Obesity	BMI	N	%
Normal	19–24.9	61	38.6
Overweight	25–29.9	61	38.6
Obesity I	30–34.9	28	17.7
Obesity II	35–39.9	3	1.9
Obesity III	>40	4	2.5

TABLE 3. Anesthesia type during surgical interventions

Anesthesia type	N	%
General anesthesia	71	45.2
Spinal	54	34.4
Local	19	12.1
Analgosedation	13	8.3

TABLE 4. Types of stoma complications on admission

Complication	N	%	% of total stoma
Parastomal hernia	75	47.5	8.55
Stoma prolapse	37	23.4	4.21
Parastomal stenosis	32	20.3	3.64
Parastomal infections	13	8.2	1.48

TABLE 5. Comorbidities and mortality rates according to the type of stoma-related complication

	Parastomal hernia	Stoma prolapse	Parastomal stenosis	Parastomal infection
Cardiac pathology, n (%)	34 (45.3)	22 (59.5)	25 (78.1)	1 (7.7)
Diabetes, n (%)	13 (17.3)	7 (18.9)	No data	3 (23.1)
Death, n (%)	6 (8.0)	1 (2.7)	0 (0)	0 (0)
Parastomal infections	13	8.2	1.48	

to 1. Regarding the patients' comorbidities, cardiovascular disease was present in 52.2% and diabetes in 18.4%. Obesity was observed in 22.29% of the population (Table 2).

Surgery was performed in nearly half of the cases (45.2%) under orotracheal intubation and general anesthesia, in slightly more than one-third (34.4%) under spinal anesthesia, and in the remaining patients under local anesthesia or analgosedation (Table 3).

The length of stay (LOS) in the hospital was 9.2 ± 5.4 days, ranging from a minimum of 1 day to a maximum of 36 days. The overall stoma complications-related mortality rate was 4.5% (n = 7).

The most common complication was parastomal hernia, which occurred in nearly half of the cases. Stoma prolapse and parastomal stenosis were also frequent. The rarest surgical complications were related to parastomal infections (Table 4).

Cardiovascular comorbidities were the most frequently reported in all types of stoma-related complications, and the highest mortality rate was reported in patients that had presented with parastomal hernia (Table 5).

There was an association between age and the type of stoma complication: parastomal stenosis, stoma prolapse, and parastomal hernia were associated with older age, while patients with parastomal infection were significantly younger. We also observed an association between the BMI and the type of surgical complication, the BMI of patients with parastomal hernias being significantly higher compared to subjects with other types of stoma complications. The longest LOS was registered in patients with parastomal hernias, and the lowest was observed in subjects admitted for parastomal stenosis (Table 6).

Regarding the grade of surgical complications, low-grade complications (Clavien-Dindo I and II) were observed in most of the cases (87.4%). The distribution of postoperative complications according to the Clavien-Dindo classification are summarized in Figure 1.

An association was observed between the type of surgical complication and the Clavien-Dindo grade of complication ($p < 0.001$). Clavien-Dindo class V was most frequently encountered in patients with parastomal hernias (8%), and the most common risk category across all types of stoma-related complications was Clavien-Dindo class I (Table 7).

DISCUSSION

Stoma formation is a common procedure in general surgery, and its potential morbidity occurs during its creation and in the postoperative period. Complications appear quite frequently, but most of them can be treated using conservative methods; only 15–20% of patients require reoperation.[22,43] In our case study, 17.9% of stoma patients required readmission and surgery for stoma-related complications. This percentage may vary in time due to the lack of out-patient clinics and poor follow-up of these patients in Romania. High incidences of stoma complications have been reported mainly in emergency surgery, but they also appear in elective conditions. The number of cases could also vary according to the type of hospital in which these evaluations are conducted (emergency versus non-emergency hospitals). All of our patients have been admitted by elective conditions.

TABLE 6. Gender, age, BMI, and LOS according to the type of stoma-related complication

	Parastomal hernia	Stoma prolapse	Parastomal stenosis	Parastomal infection	p value
Sex, male/female, n (%)	44 (58.7)/31 (41.3)	23 (62.2)/14 (37.8)	15 (46.9)/17 (53.1)	7 (53.8)/6 (46.2)	0.452
Age (years)	64 (57.5–73.5)	67 (57.5–72)	67.5 (57.5–72)	54 (47–70)	0.04
BMI (kg/m^2)	27.7 ± 4.5	24.7 ± 3.5	26.4 ± 5.9	25.6 ± 6.0	0.01
LOS (days)	10 (7.5–13.5)	7 (4–12)	4.5 (3–8)	9 (7–16)	< 0.001

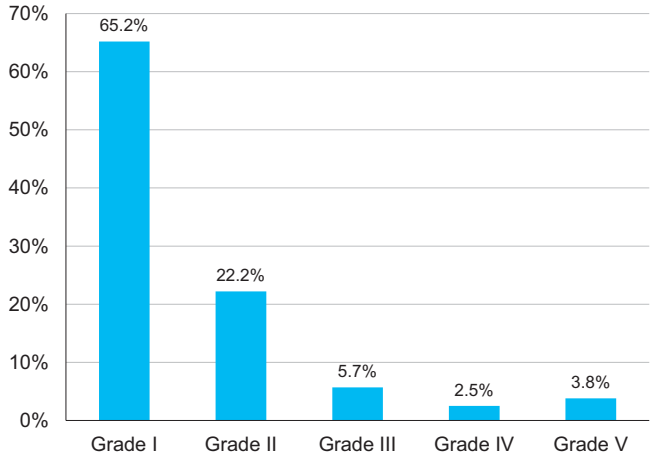

FIGURE 1. Distribution of complications according to the Clavien-Dindo classification

Obesity has been proven to influence the clinical evolution of patients who require stoma formation. Creating a stoma in obese patients remains a problem and requires more attention from the patient, the stoma care nurse, and the surgeon in order to avoid potential complications.[44] Patients with a BMI ≥25 kg/m^2 are at a significant risk to develop parastomal hernias.[45] In our experience, obesity was present in 22.29% of cases, and the most frequent complication was parastomal hernia.

A review reported by Zelga *et al.* found that age over 65 years, female sex, BMI higher than 25 kg/m^2, diabetes mellitus, abdominal malignancy, and lack of perioperative stoma site marking are risk factors associated with increased likelihood of stoma-related complications.[46] Our results showed a mean age of 64.5 years and the presence of diabetes in 18.4% of cases.

Sometimes the surgical procedure to solve these complications requires a median or parastomal laparotomy, for which proper muscular relaxation is indispensable during anesthesia. According to a study on parastomal prolapse by Makoto *et al.*, either general or spinal anesthesia was considered necessary.[32] In our study, the preferred type of anesthesia in nearly 80% of the cases was general or spinal.

Parastomal hernia has been reported as the most common complication in patients with permanent stoma,[47] occurring in more than 30% of the patients.[48] A Korean study, based on a single surgeon's experience, reported an incidence of 6.6% for stoma complications.[49] In our experience, parastomal hernia was the most frequent complication, with an overall incidence of 8.55%, which represented 47.5% of the total number of complications.

The duration of hospital stay was also analyzed for all patients. Several studies reported a length of hospital stay ranging between 5.1 and 10.5 days after parastomal hernia repair.[50–52] Our data was similar, with a median LOS of 10 days, and in the case of parastomal hernia surgery, the LOS was higher.

Regarding the postoperative result of stoma complication treatment, most of the cases (87.4%) required non-surgical intervention (Clavien-Dindo I and II), and only a few patients had a major complication with surgical reintervention.

CONCLUSIONS

Stoma formation is a common surgical procedure with significant morbidity. The key point of this treatment is to summarize the comorbidities in the preoperative period and to recognize post-operative complications early. Typically, complication rates are higher in the elderly, but fortunately, most of them can be treated conservatively. When the surgical approach is discussed, the surgeon must be aware of the presence of comorbidities such as obesity, cardiovascular pathology, and diabetes. Most of the late complications, such as parastomal hernia, stoma stenosis, stoma prolapse, and parastomal infection, require surgical management. Parastomal hernias are the most common complications, which are frequently associated with comorbidities and prolonged hospitalization periods.

CONFLICT OF INTEREST

Nothing to declare.

TABLE 7. The association between stoma complication type and Clavien-Dindo grade

Complication type, n (%)	CLAVIEN-DINDO classification				
	I	II	III	IV	V
Parastomal hernia	35 (46.7)	24 (32.0)	7 (9.3)	3 (4.0)	6 (8.0)
Parastomal infections	9 (69.2)	2 (15.4)	2 (15.4)	0 (0)	0 (0)
Stoma prolapse	32 (86.5)	4 (10.8)	0 (0)	1 (2.7)	0 (0)
Parastomal stenosis	27 (84.4)	5 (15.6)	0 (0)	0 (0)	0 (0)

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