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Early Complications of Intestinal Stoma in Gastrointestinal Surgery: A Retrospective Study of 348 Cases at a Tertiary Military Hospital

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Abstract

Background: Intestinal stoma creation remains a common and important procedure in gastrointestinal surgery. Stoma related complications represent a significant source of morbidity that affects patient outcomes, quality of life, and healthcare costs. Published complication rates vary widely from 6% to 96% depending on the study population and follow up duration. This study aimed to determine the incidence and types of early stoma complications, identify factors associated with these complications, and describe the management approaches used at a high volume tertiary center.

Methods: A retrospective cross sectional study was conducted on 348 consecutive patients who underwent intestinal stoma creation at the Department of Abdominal Surgery, Military Hospital 175, Ho Chi Minh City, from August 2022 to August 2023. Patient demographics, surgical indications, stoma characteristics, and early complications occurring within 30 days were analyzed. Statistical analysis was performed using the chi square test and Fisher exact test for categorical variables and the independent samples t test for continuous variables. A p value of < 0.05 was considered statistically significant.

Results: The overall early complication rate was 6.9% (24 of 348 patients). Seven types of early complications were identified: peristomal dermatitis (2.6%), hemorrhage and hematoma (1.4%), peristomal infection (0.8%), ischemia and necrosis (0.6%), stoma prolapse (0.6%), peritonitis due to stoma retraction (0.6%), and parastomal hernia (0.3%). Significant associations were found between early complications and the American Society of Anesthesiologists (ASA) physical status classification ($p = 0.001$), stoma configuration type ($p = 0.007$), and the surgical indication of peritonitis due to ruptured tumor ($p = 0.025$). The mortality rate was 0.3% and was unrelated to stoma complications.

Conclusions: The early stoma complication rate of 6.9% in this large cohort is lower than many previously reported rates in the international literature. Higher ASA classification, stoma configuration type, and peritonitis due to ruptured bowel tumors were significantly associated with increased complication risk. These findings may assist surgeons in patient counseling, surgical planning, and postoperative surveillance to reduce stoma related morbidity.

Introduction

Intestinal stoma creation is a fundamental and frequently performed procedure in gastrointestinal surgery. The procedure involves the exteriorization of a segment of bowel through the abdominal wall to create a controlled opening for the diversion of the fecal stream. Stomas may be constructed from the small bowel (ileostomy or jejunostomy) or from the large bowel (colostomy). They can also be classified as temporary or permanent depending on the underlying clinical indication and the patient's disease trajectory [1, 2].

The clinical indications for stoma creation are diverse and encompass a wide range of gastrointestinal conditions. These include colorectal malignancy requiring tumor resection or palliation, bowel obstruction from various causes, peritonitis resulting from intestinal perforation or tumor rupture,

traumatic injuries to the colon and rectum, mesenteric vascular occlusion causing bowel ischemia, and the need to protect a distal intestinal anastomosis that carries a high risk of leakage [1, 3, 4]. Despite significant advances in surgical techniques that aim to reduce the need for stoma creation, such as intraoperative colonic lavage combined with primary anastomosis and sphincter preserving procedures for low rectal cancer, the overall volume of stoma construction continues to be substantial in both developed and developing countries [5, 6]. In England, approximately 20,800 stoma procedures are performed annually, and in our institution alone, approximately 400 stoma procedures are performed each year [7].

Although stoma creation is often considered a straightforward component of a more complex surgical procedure, it is well established that stomas carry a significant risk of complications. These complications are broadly categorized into early complications, defined as those occurring within the first 30 days after surgery, and late complications, which develop beyond this period [8, 9]. Early complications include peristomal skin irritation and dermatitis, hemorrhage and hematoma formation, peristomal wound infection, stoma ischemia and necrosis, stoma prolapse, stoma retraction causing peritonitis, and parastomal hernia [8, 10, 11]. The reported incidence of stoma related complications in the published literature varies remarkably, ranging from as low as 6% to as high as 96%, depending on the study design, patient population, definitions used for complications, and the duration of follow up [12]. Londono Schimmer and colleagues reported a cumulative actuarial complication rate of 58.1% over a 13 year follow up period in a study of 203 patients with end colostomies [13]. More recently, a systematic review and meta analysis by Dellafiore and colleagues in 2022 calculated a pooled stoma complication incidence of approximately 36.7% across multiple studies [14].

When stoma complications develop, they impose a substantial burden on patients in terms of physical discomfort, psychological distress, financial costs, and reduced quality of life. Some complications may require additional surgical procedures for correction, further increasing the overall morbidity associated with the original operation [15]. A thorough understanding of the clinical characteristics, risk factors, and management of stoma complications is therefore essential for surgeons to provide optimal care and informed counseling to patients undergoing stoma creation.

This study was conducted with the following objectives: (1) to determine the incidence and types of early complications following intestinal stoma creation, (2) to identify patient and surgical factors associated with these complications, and (3) to describe the management approaches employed for each type of complication.

Materials and Methods

Study design and setting

This was a retrospective cross sectional study conducted at the Department of Abdominal Surgery, Military Hospital 175, Ho Chi Minh City. Military Hospital 175 is a 1,500 bed tertiary care military hospital

that serves as a referral center for complex surgical cases from across the southern region. The study period extended from August 1, 2022, to August 31, 2023. The study protocol received ethical approval from the Institutional Review Board of Pham Ngoc Thach University of Medicine (Approval Number 816/TDHYKPNT-HDDD, dated February 24, 2023). The study was conducted in accordance with the principles outlined in the Declaration of Helsinki.

Study population

All consecutive patients who underwent intestinal stoma creation during the study period were screened for inclusion. The inclusion criteria were: (1) patients of any age who underwent stoma construction as part of a gastrointestinal surgical procedure, either as an emergency or elective operation, and (2) availability of complete medical records documenting patient demographics, operative details, and postoperative outcomes for at least 30 days. Patients with incomplete medical documentation were excluded from the analysis.

Data collection and variables

Data were retrospectively extracted from the medical records by a single investigator using a standardized data collection form. The following variables were recorded: patient age, sex, body mass index (BMI), ASA physical status classification, surgical indication, timing of surgery (emergency versus elective), characteristics of the stoma including the bowel segment used, the stoma configuration type, and the location on the abdominal wall, early complications occurring within 30 days of surgery, the management approach for each complication, the time to onset of stoma function, the duration of postoperative hospital stay, and mortality.

Definitions and classifications

The stoma configuration types are summarized in Table 5. Loop stomas were the most common configuration (79.6%), followed by end stomas (14.9%) and double barrel stomas (5.5%). The association between stoma configuration type and early complications was statistically significant ($p = 0.007$), with double barrel stomas demonstrating the highest complication rate (26.3%).

Early complications were defined as any stoma related adverse event occurring within the first 30 days following the operative procedure. Stoma configuration types were classified as end stoma, loop stoma, or double barrel stoma. BMI was categorized according to the World Health Organization Western Pacific Regional Office criteria specifically designed for Asian populations: underweight (BMI < 18.5), normal weight (BMI 18.5–22.9), and overweight or obese (BMI ≥ 23) [16]. ASA physical status was classified according to the standard system of the American Society of Anesthesiologists [17].

Statistical analysis

Continuous variables were expressed as mean ± standard deviation and were compared between groups using the independent samples t test. Categorical variables were presented as frequencies and percentages and were compared using the chi square test or Fisher exact test as appropriate depending on the expected cell counts. A two sided p value of < 0.05 was considered statistically significant for all analyses. All statistical analyses were performed using SPSS software (IBM Corporation, Armonk, New York, USA).

Results

Patient demographics

A total of 348 patients met the inclusion criteria and were included in the final analysis. The demographic characteristics of the study population are summarized in Table 1.

Table 1
Patient demographics (n = 348)

Characteristic	n	%	p value
Age (years)			
Mean ± SD	59.2 ± 17.1	Range: 16 to 94	
Sex			**0.317**
Male	198	56.9	
Female	150	43.1	
ASA classification			**0.001***
ASA I	28	8.0	
ASA II	216	62.1	
ASA III	94	27.0	
ASA IV	10	2.9	
BMI category (Asian criteria)			**0.341**
Underweight (< 18.5)	66	19.0	
Normal (18.5–22.9)	230	66.1	
Overweight or obese (≥ 23)	52	14.9	

*ASA: American Society of Anesthesiologists; BMI: body mass index; SD: standard deviation. *Statistically significant (p < 0.05). P values reflect comparison between complication and no complication groups.*

The surgical indications for stoma creation are presented in Table 2. Colorectal tumor was the most common indication (39.9%), followed by obstruction by colorectal cancer (35.9%) and peritonitis from perforation (11.8%). The indication of peritonitis from ruptured tumor was significantly associated with early complications (p = 0.025).

Table 2
Surgical indications for stoma creation (n = 348)

Indication	n	%	Comp. n	Comp. %	p value
Colorectal tumor	139	39.9	8	5.8	0.493
Obstruction by colorectal cancer	125	35.9	5	4.0	0.065
Peritonitis from perforation	41	11.8	5	12.2	0.181
Peritonitis from ruptured tumor	10	2.9	3	30.0	0.025*
Upstream diversion	11	3.2	1	9.1	0.550
Obstruction by volvulus or adhesion	8	2.3	1	12.5	0.439
Mesenteric vascular occlusion	7	2.0	0	0	Not applicable
Colonic trauma	6	1.7	1	16.7	0.341
Megacolon	1	0.3	0	0	Not applicable
Total	**348**	**100**	**24**	**6.9**	

*Comp.: complication. *Statistically significant (p < 0.05, Fisher exact test).*

The majority of stoma procedures were performed as emergency operations (67.2%), as shown in Table 3. The complication rate was higher in emergency cases (8.1%) compared to elective cases (4.4%), although the difference was not statistically significant (p = 0.197).

Table 3
Timing of surgery (n = 348)

Timing	n	%	Complication n (%)
Emergency	234	67.2	19 (8.1)
Elective	114	32.8	5 (4.4)
Total	**348**	**100**	**24 (6.9)**

p = 0.197 (Chi square test). The difference was not statistically significant.

The distribution of bowel segments used for stoma creation is presented in Table 4. The sigmoid colon was the most frequently used segment (47.1%), followed by the ileum (27.3%).

Table 4
Bowel segment used for stoma creation (n = 348)

Bowel segment	Emergency	Elective	Total n	Total %	Comp. n (%)
Sigmoid colon	110	54	164	47.1	14 (8.5)
Ileum	72	23	95	27.3	3 (3.2)
Transverse colon	28	10	38	10.9	3 (7.9)
Jejunum	12	8	20	5.7	2 (10.0)
Descending colon	6	8	14	4.0	1 (7.1)
Cecum	5	6	11	3.2	1 (9.1)
Ascending colon	1	2	3	0.9	0 (0)
Unknown	0	3	3	0.9	0 (0)
Total	**234**	**114**	**348**	**100**	**24 (6.9)**

p = 0.610 (Fisher exact test). The difference was not statistically significant.

Table 5
Stoma configuration type (n = 348)

Configuration	Emergency	Elective	Total n	Total %	Comp. n (%)
Loop stoma	210	67	277	79.6	15 (5.4)
End stoma	6	46	52	14.9	4 (7.7)
Double barrel stoma	18	1	19	5.5	5 (26.3)
Total	**234**	**114**	**348**	**100**	**24 (6.9)**

p = 0.007 (Fisher exact test). *Statistically significant.*

The abdominal wall locations of stoma placement are shown in Table 6. The left iliac fossa was the most common location (59.2%).

Table 6
Abdominal wall location of stoma (n = 348)

Location	Emergency	Elective	Total n	Total %	Comp. n (%)
Left iliac fossa	133	73	206	59.2	16 (7.8)
Right iliac fossa	60	36	96	27.6	3 (3.1)
Left subcostal	22	2	24	6.9	4 (16.7)
Right subcostal	6	2	8	2.3	0 (0)
Unknown	13	1	14	4.0	1 (7.1)
Total	**234**	**114**	**348**	**100**	**24 (6.9)**

p = 0.145 (Fisher exact test). The difference was not statistically significant.

The intended duration of the stoma is presented in Table 7. Temporary stomas accounted for 60.9% of cases, while permanent stomas accounted for 34.2%.

Table 7
Intended duration of stoma (n = 348)

Duration	n	%	Comp. n (%)
Temporary	212	60.9	15 (7.1)
Permanent	119	34.2	8 (6.7)
Undetermined	17	4.9	1 (5.9)
Total	**348**	**100**	**24 (6.9)**

The overall early complication rate was 6.9% (24 of 348 patients). Seven types of early complications were identified, as detailed in Table 8. Peristomal dermatitis was the most common complication (2.6%), followed by hemorrhage and hematoma (1.4%), peristomal infection (0.8%), ischemia and necrosis (0.6%), stoma prolapse (0.6%), peritonitis due to stoma retraction (0.6%), and parastomal hernia (0.3%).

Table 8

Types, timing, and management of early stoma complications (n = 348)

Complication	n	%	Onset (POD)	Stoma type involved	Management
Peristomal dermatitis	9	2.6	1 to 6	Small bowel 5, Colon 4	Conservative: zinc oxide
Hemorrhage and hematoma	5	1.4	1 to 9	Various types	Conservative: observation
Peristomal infection	3	0.8	11 to 13	Abscess 2, Ulcer 1	Incision and drainage, antibiotics
Ischemia and necrosis	2	0.6	2 to 3	Colostomy 2	Surgery 1, Conservative 1
Stoma prolapse	2	0.6	10 to 23	Sigmoid loop 1, Ileal loop 1	Surgical revision 2
Peritonitis from retraction	2	0.6	10 to 30	Sigmoid colostomy 2	Emergency re operation 2
Parastomal hernia	1	0.3	5	Sigmoid end stoma 1	Surgical repair 1
Total complications	**24**	**6.9**			
No complication	**324**	**93.1**			

POD: postoperative day. All complications occurred within 30 days of surgery.

The time to onset of stoma function is presented in Table 9. The mean stoma function onset was 2.4 ± 1.2 days, with 85.9% of patients having stoma function by postoperative day 3.

Table 9

Stoma function onset time (n = 348)

Postoperative day	n	%	Cumulative %
Day 1	75	21.5	21.5
Day 2	125	35.9	57.4
Day 3	99	28.5	85.9
Day 4	29	8.3	94.2
Day 5	11	3.2	97.4
Day 6	8	2.3	99.7
Day 7	1	0.3	100
Total	**348**	**100**	

Mean stoma function onset: 2.4 ± 1.2 days.

The comparison of outcomes between the complication and no complication groups is shown in Table 10. There were no statistically significant differences in stoma function onset time (p = 0.419) or hospital stay duration (p = 0.237) between the two groups. The overall mortality rate was 0.3% (one patient) and was unrelated to stoma complications.

Table 10
Comparison of outcomes between complication and no complication groups

Parameter	Complication group (n = 24)	No complication group (n = 324)	p value
Stoma function onset (days)	2.3 ± 1.2 (1 to 6)	2.5 ± 1.2 (1 to 7)	0.419
Hospital stay (days)	9.3 ± 6.9 (2 to 31)	7.6 ± 3.4 (1 to 25)	0.237
Mortality n (%)	0 (0)	1 (0.3)	Not applicable

Values expressed as mean ± standard deviation (range). P values calculated using independent samples t test. The single mortality case was due to multiorgan failure from septic shock unrelated to stoma complications.

Table 11
Comparison of early stoma complication rates with other published studies

Study	Year	Country	n	Design	Comp. rate (%)
Present study	2023	Ho Chi Minh City	348	Retrospective	6.9
Cottam et al. [12]	2007	United Kingdom	3970	Prospective audit	34.0
Arumugam et al. [18]	2003	United Kingdom	97	Prospective	34.0
Nastro et al. [22]	2010	United Kingdom	1216	Retrospective	46.4
Robertson et al. [19]	2005	United Kingdom	408	Prospective	28.0
Cheung [20]	1995	Hong Kong	322	Retrospective	23.0
Koc et al. [10]	2017	Turkey	462	Retrospective	28.4
Londono Schimmer et al. [13]	1994	United Kingdom	203	Retrospective	58.1

Comp.: complication. Complication rates vary due to differences in definitions, follow up periods, and study populations.

Detailed complication descriptions

Peristomal dermatitis was the most frequently observed early complication in this study, occurring in nine patients (2.6%). Among these, five cases involved small bowel stomas and four involved colostomas. The onset ranged from postoperative day 1 to day 6. Specifically, three cases were identified on postoperative day 1, two on day 2, two on day 4, and one each on days 5 and 6. All nine cases were successfully managed with conservative treatment using topical zinc oxide application.

Hemorrhage and hematoma occurred in five patients (1.4%), all of which were classified as mild and managed conservatively. Four cases presented as stomal hemorrhage (on postoperative days 2, 2, 3, and 9 respectively), and one case presented as peristomal hematoma on postoperative day 6.

Three cases of peristomal infection (0.8%) were observed. Two patients developed peristomal abscesses, diagnosed on postoperative days 11 and 13, and were treated with incision and drainage. One patient developed peristomal ulceration on postoperative day 13, which was successfully managed conservatively.

Two cases of stoma ischemia and necrosis (0.6%) were identified. One patient developed full thickness necrosis on postoperative day 3, caused by disruption of the mesenteric arcade due to excessive tension on the colonic mesentery. This patient required emergency surgical revision with stoma reconstruction. The second patient presented with partial ischemia on postoperative day 2 and was managed conservatively with successful resolution.

Stoma prolapse occurred in two patients (0.6%). The first case involved a sigmoid loop colostomy that prolapsed on postoperative day 10 following a coughing episode. Intraoperative findings revealed that the fascial opening was excessively wide, and the prolapse was repaired by reducing the mucosa and narrowing the fascial defect. The second case involved an ileal loop stoma that prolapsed on postoperative day 23 after hospital discharge, requiring elective surgical revision.

Two cases (0.6%) of peritonitis due to stoma retraction were identified, both involving sigmoid colostomas constructed during surgery for peritonitis caused by ruptured sigmoid colon tumors. The first case presented on postoperative day 10, and the second on postoperative day 30. Both patients required emergency re operation with additional colonic mobilization and stoma revision.

One case of parastomal hernia (0.3%) developed on postoperative day 5 following a Hartmann procedure. The hernia resulted from disruption of the sutures fixing the bowel to the peritoneum, allowing small bowel to herniate alongside the stoma. Surgical repair was performed.

Discussion

This study presents a comprehensive analysis of early complications following intestinal stoma creation in a large cohort of 348 patients at Military Hospital 175, a high volume tertiary military hospital that performs approximately 400 stoma procedures annually. The overall early complication rate of 6.9% observed in our study is considerably lower than the rates reported in several major international studies, as summarized in Table 11.

Cottam and colleagues conducted a nationwide prospective audit across 256 stoma care centers in the United Kingdom and reported that 34% of stomas were identified as problematic within three weeks of surgery [12]. Arumugam and colleagues found a 34% overall stoma complication rate in their prospective audit [18]. Nastro and colleagues reported complications in 46.4% of 1216 patients over a 10 year period [22]. Robertson and colleagues reported early complications in 28% of patients [19]. Cheung analyzed 322 stomas and reported a 23% complication rate [20]. The systematic review and meta analysis by Dellafiore and colleagues in 2022 estimated an overall stoma complication incidence of approximately 36.7% [14].

Several factors may contribute to the lower complication rate observed in our study. First, the high surgical volume at our institution may confer a volume outcome advantage through the accumulated surgical experience of the operating team. Second, the retrospective nature of our study design may result in underascertainment of minor complications, particularly mild peristomal skin changes that may not have been consistently documented in the medical records. Third, complications occurring after patient discharge but within the 30 day window may have been managed at other facilities without documentation in our hospital records. Fourth, differences in reporting thresholds between various clinical settings may also play a role.

Peristomal dermatitis was the most frequently observed early complication in our series, occurring in 2.6% of patients. This finding is consistent with the published literature, which consistently identifies peristomal skin complications as the most common type of stoma related morbidity [11, 19, 21]. The higher occurrence of peristomal dermatitis in small bowel stomas (five of nine cases) compared to colostomas is likely explained by the higher volume and more alkaline, enzyme rich nature of small bowel effluent, which causes greater chemical irritation to the surrounding skin [21, 22].

The significant association between higher ASA physical status classification and increased early complication rates ($p = 0.001$) is an important finding with clear clinical implications. Higher ASA scores reflect a greater overall burden of systemic disease, which is well known to impair wound healing, compromise immune function, and reduce tissue perfusion, all of which predispose patients to stoma related complications [23]. This finding is consistent with the study by Koc and colleagues, who identified higher ASA classification as a significant risk factor for early stoma complications in their retrospective analysis of 462 patients [10]. Similarly, Duchesne and colleagues found that the severity of comorbid conditions was a significant predictor of stoma complications in their multivariate analysis [24].

The significant association between stoma configuration type and complication rates (p = 0.007) provides valuable insight for surgical decision making. In our study, double barrel stomas demonstrated the highest complication rate at 26.3%, although the relatively small sample size of this subgroup (n = 19) mandates cautious interpretation. The higher complication rate in double barrel stomas may be attributed to the inherent technical complexity of the procedure and the challenging clinical circumstances in which they are typically performed, such as traumatic bowel injuries and grossly contaminated operative fields. End stomas had a complication rate of 7.7%, while loop stomas had the lowest rate at 5.4%, though the latter accounted for the greatest absolute number of complications (n = 15) due to their predominance in our cohort (79.6%). These findings are broadly consistent with those reported by Porter and colleagues and by Shellito [8, 25].

The significant association between the indication of peritonitis due to ruptured bowel tumor and early stoma complications (p = 0.025) likely reflects the severely compromised clinical condition of these patients at the time of surgery. Patients presenting with peritonitis from tumor rupture typically have significant intraabdominal contamination, systemic inflammatory response, impaired tissue healing capacity, and compromised bowel vascularity [26, 27].

The observed trend toward higher complication rates in emergency procedures (8.1%) compared to elective procedures (4.4%) did not reach statistical significance in our study (p = 0.197).

An important aspect of our study is the detailed documentation of the management approaches for each type of complication. The majority of early complications (16 of 24 cases, 66.7%) were successfully managed with conservative measures. Surgical intervention was required in eight cases (33.3%). These findings underscore that while most early stoma complications can be managed nonoperatively, approximately one third of affected patients will require repeat surgery [8, 11].

Limitations

This study has several limitations. The retrospective single center design introduces potential selection bias and limits the generalizability of our findings. The reliance on medical record review may result in underreporting of minor complications. The 30 day follow up period may miss complications presenting after discharge. The study did not include preoperative stoma site marking data, which has been shown in some studies to influence complication rates. Future multicenter prospective studies with standardized complication definitions and longer follow up periods would provide more robust evidence.

Conclusions

This retrospective study of 348 patients demonstrates an overall early stoma complication rate of 6.9% at a high volume tertiary military hospital, which is lower than many previously published rates. Peristomal dermatitis was the most commonly observed complication. Higher ASA physical status classification, stoma configuration type, and the indication of peritonitis from ruptured bowel tumor were identified as factors significantly associated with increased early complication risk. The majority of

complications were managed conservatively, though one third required surgical intervention. These findings highlight the importance of careful preoperative risk assessment, meticulous surgical technique during stoma creation, and vigilant postoperative monitoring, particularly in patients with higher ASA scores and in emergency settings involving peritonitis.

Declarations

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. The Institutional Review Board of Pham Ngoc Thach University of Medicine issued approval 816/TDHYKPNT-HDDD (February 24, 2023).

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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