

Intestinal Stomas in Abdominal Surgery: Etiological Circumstances, Indications, High Gravity Factors and Complications

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ABSTRACT: This is a retrospective study of 264 intestinal stomas performed in the surgical unit of the Emergency Clinical Hospital "Bagdasar Arseni", Bucharest, within a 7-year period (2015-2021) aiming to evaluate their evolutive complications, risk factors, management and prevention strategies. Material and method. Colostomies: 218 (82.57%) cases, ileostomies 46 (17.43%) cases. Temporary stomas (103 cases or 39.02%) were isolated stomas of discharge in 45 cases and associated with other colorectal procedures in 58 cases. Postoperative complications included general systemic complications in 60 (22.72%) cases and local complications specific to stomas in 84 (31.81%) cases and common to abdominal surgery in 94 (35.60%) cases, which were solved by reoperation in 51 cases, with a reintervention rate of 19.31%. Stoma closures were performed in 34 (33.0%) of the 103 patients with temporary stomas. Of these, 26 (25.24%) patients died in the early postoperative period (< 30 days), the remaining 60 patients refused reintervention or were lost to follow-up. Conclusions. Faecal diversion still represents a therapeutic option for a wide range of benign or malignant digestive or extra-digestive abdominal diseases performed in emergency or scheduled surgeries, mostly for colorectal cancer and its complications.

KEYWORDS: Intestinal stoma, ileostomy, colostomy, colorectal cancer.

Introduction

Faecal diversions (intestinal stomas) present a temporary or definitive therapy for managing a wide range of benign or malignant digestive or extra-digestive abdominal conditions.

The most frequent etiological indications include colorectal cancer, bowel obstructions, ulcerative colitis, Crohn's disease, acute or chronic mesenteric ischaemia, uncontrolled bleeding of the colon and rectum, congenital malformations of the gastrointestinal tract, intestinal and colorectal trauma, genital or bladder invasive cancers and spine lesions. [1-4].

Intestinal stomas can be temporary, carried out either for the protection of a colorectal anastomosis and mitigation of the disastrous consequences of possible anastomotic dehiscence, while simultaneously allowing for conservative treatment or resolving bowel obstructions when it is impossible to restore primary transits or set up definitive stomas.

These procedures have multiple postoperative complications with a significant morbidity risk (around 50%), which varies widely.

The occurrence of complications is favoured by a series of risk factors related to the patient, the disease condition, the surgical technique and the surgeon's experience.

The complications, which could be early or late, local or systemic, specific for the stomas or common for the abdominal surgery, can be minor, requiring only local care and stomatherapy, or devastating, leading to multiple reoperations, high postoperative mortality rates, prolonged hospital stays and high cost burdens [1,4-11].

The objective of this study is to evaluate the role and place of external diversions in abdominal surgery according to their etiological indications.

We also aimed to evaluate their evolutive complications, risk factors, management and prevention strategies.

Materials and Methods

This is a retrospective study of 264 intestinal stomas performed in the surgical unit of the Emergency Clinical Hospital, Bagdasar Arseni, Bucharest, within a 7-year period (2015-2021).

This study included patients older than 16 years of age with digestive stomas for various abdominal diseases that required surgery.

Patients with feeding stomas (gastrostomy or jejunostomy) or urostomas were not included in the study.

The required data, extracted from clinical report forms, surgical records and necropsy protocols, were written out in an individual sheet for each patient.

Then, the data were centralized and statistically processed using the Excel programme.

The study parameters included demographic data (age, sex, place of origin, occupation), types of stoma and etiological indications (depending on the primary lesion and the intraoperative evaluation).

Other parameters included stomal complications, risk and high gravity factors, management and prevention methods, postoperative morbidity and mortality rates.

The study was approved (approval number 41423 dated 17 December 2018) by the Ethics Commission of Bagdasar Arseni Hospital, Bucharest, who approved the waiver of informed consent.

Results

Demographic characteristics

There were no remarkable sex differences among patients as follows: 143 (54.13%) males vs. 121 (45.87%) females and the sex ratio=1.18.

The patients’ distribution based on the place of residence was almost equal, as follows: 130 (49.25%) from urban areas and 134 (50.75%) from countryside.

The patients were aged between 30 and 97 years; the mean age was 68.2 years, with a net predominance of older patients (age groups above 60 years), who represented 65.38% of the cases (Figure 1).

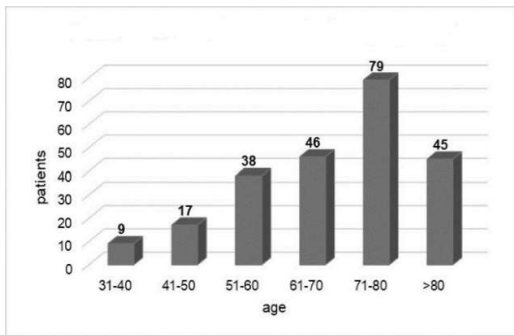


Figure 1. Distribution of intestinal stomas according to the patient's age.

Comorbidities

Of the patients, 183 (69.35%) had important comorbidities that were solitary in 65 (35.51%) cases and multiple in 118 (64.46%) cases (2 associated comorbidities in 51 cases and 3 or more in 67 cases); however, only 81 (30.68%) patients had no comorbidities.

Table 1. Comorbidities.

Comorbidities	No. cases	%
Obesity	51	19.31
Diabetes mellitus	92	34.84
Respiratory	35	13.25
- SARS-COV-2	1	
- Lung cancer	4	
- Pleurisy	2	
- ARF	11	
- TB	3	
- COPD	4	
- Asthma/chronic bronchitis	4	
- Bronchopneumonia	4	
- Acute pulmonary oedema	1	
- Pulmonary fibrosis	1	
Cardiovascular	153	57.95
- Atrial fibrillation	38	
- Cardiac failure	18	
- Myocardial infarction	8	
- HBP	133	
- Ischaemic heart disease	15	
- Peripheral arteriopathy	3	
- Thrombophlebitis	2	
- Valvular lesions	6	
- Stroke	19	
Kidney	21	7.95
- Bladder cancer	4	
- Hydronephrosis	3	
- Urinary lithiasis	3	
- Prostate adenoma	1	
- Acute kidney failure	7	
- Chronic kidney failure	3	
Digestive	63	23.86
- Liver cirrhosis	6	
- Biliary cholecystitis	21 (17 operated)	
- Hepatic steatosis	2	
- Appendectomy	15	
- Operated gastroduodenal ulcers	8	
- Acute hepatitis	2	
- Haemorrhagic gastritis	3	
- Hiatal hernia	3	
- Sigmoidal diverticulosis	3	
Genital	20	7.57
Osteoarticular	13	4.92
Operated laryngeal cancer	2	0.75
Operated breast cancer	1	0.37
Operated brain tumour	1	0.37
Total	183	69.32
*Preoperative radiation therapy	31	13.24

Cardiovascular diseases represented the main comorbidity registered in 135 patients (57.95%), followed by the diabetes mellitus (92 cases), digestive diseases (63 cases), obesity (51 cases), respiratory diseases (35 cases), kidney disease (21 cases), genital (20 cases), osteoarticular (13 cases) and others (4 cases) (Table 1).

Types of intestinal stomas, etiologic circumstances and indications

The following lesions required stomal surgeries for temporary or definitive therapy: colorectal cancer and its complications, including bleeding (23 cases), peritonitis (49 cases), bowel obstruction (40 cases), advanced local cancer (33 cases), local recurrence (1 case) and fistula (1 case), represented the main causal lesions requiring a stoma in 231 (87.5%) cases.

In the remaining 33 (12.5%) cases, various abdominal lesions requiring stomal surgeries included strangled hernia or incisional hernias, ileal volvulus with small bowel or colon necrosis, perforated sigmoidal diverticulosis or strangled femoral hernia with loop necrosis and severe faecaloid peritonitis, abdominal trauma and uterine cervical cancer with rectovaginal fistula.

The pathogenic conditions that required stomal surgery and their types and indications are detailed in Table 2.

The incidence of faecal diversion in colorectal cancers varied depending on the topography of the lesion. Faecal diversion was rarely used in right colon cancers (30 cases=12.98%); its incidence grew progressively in distal colorectal cancers (25.97%), while the most frequent incidence was in sigmoidal and rectal cancers (52.38%) (Figure 2).

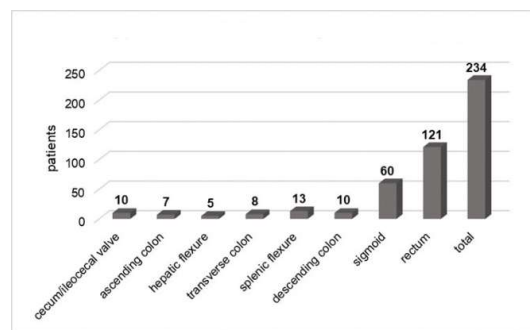


Figure 2. The incidence of stomas depending the topography of the lesion.

Colostomy, the main type of faecal diversion, was carried out in 218 (82.57%) patients, as follows (Table 2): left end colostomy (155 cases), right end colostomy (3 cases), transversal colostomy (11 cases) and loop supra-tumoral colostomy (23 cases).

In 12 cases, colostomy was performed to allow for neoadjuvant radio-chemotherapy.

Caecostomy was carried out in 26 cases, of which 21 were for discharge and 5 were protective procedures for downstream colon anastomoses.

Ileostomy was performed in 46 (17.43%) cases, of which 15 were protective measures and 31 were for discharge purposes (Table 2).

Table 2. Types and indications for intestinal stomas.

Variable Topography of the lesion. The anastomo-clinical form	Ileostomy		Colostomy					Caecostomy	
	For discharge	Protective	Left terminal			Side (loop) Supra-tumoral	Transversal colostomy	Of discharge	
			Rectal amputation type Miles	Hartmann	W/out resection			Protective	
Right colon	13	1			3			8	1
Peritonitis	3				1			7	
Stenosis	5	1			2				
Occlusion	5							1	1
Left colon		2		68		1	6	6	4
Uncomplicated				4			1		
Peritonitis								2	1
Stenosis		1		1			1		3
Occlusion		1		54			2	4	
Bleeding							2		
Local advanced				9		1			
Rectum and recto-sigmoid junction	2	10	34	43		21	1	4	
Uncomplicated		2	7	3			1		
Peritonitis		3	7	9		1			
Stenosis		3	5	13				1	
Occlusion	1	1	1	8		1		3	
Bleeding		1	6	8					
Local advanced	1		8	7		7			
Preparation for radiotherapy						12			
Other acute abdominal lesions	16	2		4	3	1	4	3	
Rectovaginal fistula					1			1	
Occlusion	14	2			2		3	2	
Peritonitis	2			4					
Trauma						1	1		
TOTAL	31	15	34	115	6	23	11	21	5

Definitive stomal surgeries were performed in 161 (60.98%) cases.

This category included terminal colostomies following Miles-type abdomino-perineal recto-sigmoid resection (34 cases) and Hartmann operation (115 cases), and supra-tumoral colostomies (end or loop colostomy) performed for locally advanced rectal cancers.

Temporary stomas (103 cases or 39.02%) were isolated stomas of discharge in 45 cases and associated with other colorectal procedures in 58 cases as follows:

- Ileostomy+left colectomy (1), sigmoidectomy (1), segmentary colectomy (1), Dixon operations (6), subtotal colectomy (3), right colectomy (13), segmentary enterectomy (13), and segmentary transverse colectomy (3) (41 cases).
- Transverse colostomy+left colectomy (5), and segmentary transverse colectomy (3) (8 cases).
- Caecostomy+left colectomy (1), sigmoidectomy (1), segmentary colectomy (1), (3 cases).
- Right colostomy+right segmentary colectomy (3 cases).
- Left colostomy+left segmentary colectomy (1 case).

Evolution. Postoperative complications (morbidity)

Furthermore, 149 (56.43%) patients had fair evolutions.

Unique and multiple postoperative complications were recorded in 115 patients, with a morbidity rate of 43.57%.

The increased morbidity rate and severity of the postoperative complications can be explained by the association of multiple risk and gravity factors, such as older patients (over 65 years; 75.76%) with important comorbidities (69.32%), net predominance of malignant lesions (87.5%), advanced stages of colorectal cancer (77.90%), severe developmental complications (70.07%), emergency surgery (74.13%) and high ASA (American Society of Anaesthesiologists) (35.59%) (Table 3).

Table 3. Postoperative morbidity-risk and gravity factors.

Risk and gravity factors	Cases	%
Elderly (over 65 years)	200	75.76
Comorbidities	183	69.32
- Obesity	51	
- Diabetes mellitus	92	
- Cardiovascular	153	
- Respiratory	35	
- Osteoarticular	13	
Malignancies - colorectal cancer	231	87.50
Colorectal cancer in advanced stages	194	77.90
- III B	134	52.26
- IV	60	25.64
Severe developmental complications	185	70.07
- Bleeding	23	8.71
- Peritonitis	55	20.33
- Bowel obstruction	60	22.34
- Advanced local lesions	47	17.80
Emergency surgery	195	74.13
Class III and IV ASA scores	94	35.59

Postoperative complications included general systemic complications in 60 (22.72%) cases and local complications specific to stomas in 84 (31.81%) cases and common to abdominal surgery in 94 (35.60%) cases (Table 4), which were solved by reoperation in 51 cases (Table 5), with a reintervention rate of 19.31%.

Table 4. Complications of intestinal stomas, (MSOF-multiple organ system failure).

Specific complications	Local complications			Other abdominal complications	Local complications			General complications	Total
	Ileostomy	Colostomy	Total		Ileostomy	Colostomy	Total		
Peristomal cutaneous lesions	11	29	40	Wound suppurations	15	48	63	MOSF	37
Necrosis	3	10	13	Occlusion	1	7	8	Septic shock	11
Retraction	-	4	4	Enterocutaneous fistula	3	11	14	Respiratory	3
Prolapse	2	5	7	Evisceration	2	9	11	Myocardial infarction	2
Stenosis	2	6	8	Localised peritonitis		2	2	Heart failure	2
Bleeding	-	2	2	Retroperitoneal abscess		2	2	Acute Renal Failure	1
Parastomal hernia	-	5	5	Rectal stump dehiscence		1	1	Severe dehydration	2
Parastomal abscess	-	5	5	Lithiasic CoA		1	1	Pulmonary embolism	1
				Acute pancreatitis		2	2	Stroke	1
TOTAL	18	66	84		21	73	94		60

Table 5. Reoperation procedures.

Reinterventions	Cases
Colostomy restorations/retouches	16
Parastomal abscess evacuations +drainage colostomies ±restorations	7
Evisceration repair	7
Prolapse reduction and fastening	3
Ileostomy restoration	2
Resection of anastomosis + colostomy	2
Resection of anastomosis + ileostomy	2
Segmental colectomy + end colostomy	2
Segmental enterectomy + side-to-side anastomosis	2
Transverse colostomy	1
Evacuation of retroperitoneal abscesses	2
Evacuation of intraperitoneal abscess	1
Cholecystectomy	1
Suturing of a rectal stump	1
Suturing of an intestinal perforation	1
Resection of a parastomal stenotic scar	1
Total	51

Stoma closures

Stoma closures were achieved between 3 weeks and 12 months after the primary operation, with an average period of 6 months.

Stoma closures were performed in 34 (33.0%) of the 103 patients with temporary stomas.

Of these, 26 (25.24%) patients died in the early postoperative period (<30 days), and the remaining 60 patients refused reintervention or were lost to follow-up.

The procedures used for stoma closure are shown in Table 6.

Table 6. Stoma closures-used procedures

Removal of ileostomy +	10
• End-to-end enteroanastomosis	3
• Ileo-transverso-anastomosis	3
• Ileo-ascending-anastomosis	1
• Ileo-caecal-anastomosis	3
Colostomy removal and side-to-side colorectal anastomosis	8
Colostomy removal and side-to-side colon anastomosis	7
Segmental enterectomy + end-to-end enteroanastomosis	4
Caecorrhaphy	5

Postoperative mortality and hospital stay

Postoperative mortality was 16.9% (42 deaths); the causes of death included myocardial infarction (2 cases), thromboembolism (1 case), occlusive shock (3 cases), toxic-septic shock (11 cases) and multiple organ failure (25 cases).

Furthermore, the mean **hospital stay** was 17.81 days, with limits between 2 and 144 days, and about 50 patients needed 2 or more readmissions.

Discussion

A stoma is a surgical opening of the intestine to the anterior wall of the abdomen, used either to protect an anastomosis located downstream, to reduce the disastrous effects of possible

postoperative anastomotic dehiscence, to mitigate against performing an anastomosis that is considered too risky, especially in colorectal surgery or to remove intestinal obstruction in emergency conditions.

The term derives from the Greek “stoma” which means opening or mouth.

The first colostomy was performed by Littre in 1710 in a child with anal imperforation.

However, ileostomy was first performed by Brown in 1913 for ulcerative colitis and was introduced into current practice in 1952, after Brooke demonstrated the efficiency of the everted ileostomy in facilitating collection of intestinal contents into a collecting bag, without damaging the adjoining integuments [1,4,5].

Since then, faecal diversion procedures have become an integral part of the treatment of benign or malignant digestive or extra-digestive abdominal conditions.

These procedures are performed as emergency or scheduled surgeries, with indications that have continuously diversified, to cover a range of conditions including colorectal cancer, bowel obstruction, ulcerative colitis, Crohn's disease, inflammatory bowel diseases, acute or chronic mesenteric ischaemia, uncontrolled bleeding of the colon and rectum, congenital malformations of the gastrointestinal tract, traumatic intestinal or colorectal injuries, genital cancers or urinary bladder with invasion of the gastrointestinal tract and spine injuries [1-4].

Colostomy and ileostomy are the main types of faecal diversions currently used in practice.

These diversions can be temporary or definitive, terminal or lateral, protective or for discharge and carried out urgently or scheduled.

The procedure is chosen according to causal lesions, presence and type of developmental complications, patients' age and biological status and surgeon's experience.

Colorectal cancer and its evolutionary complications (obstruction, peritonitis, bleeding and advanced local cancer) represent the main indication for digestive stomas [1,12].

Our study confirms that 231 (87.5%) stomas were performed in patients with advanced colorectal cancers (77.90% for stage IIIB and IV and 17.80% for advanced local cancers), or for severe complications (obstruction, severe peritonitis, bleeding and tumour recurrence) in 39.77% cases.

In comparison, the remaining 33 (12.5%) stomas for other abdominal surgical lesions

(bowel obstruction with intestinal loop or colic necrosis, severe acute peritonitis, abdominal trauma with lesions of the hollow viscera or rectovaginal fistula secondary to cervical cancer invading the rectal wall) represent almost an exception, given that they were selected out of a total of 2358 operations for acute abdominal nonneoplastic lesions performed within the same time frame.

This means that the real incidence of faecal diversion in this type of pathology was only 1.39%.

Furthermore, the net predominance of older patients (75.76%) with multiple major comorbidities (69.35%) and emergency surgery (74.13%) were some of the risk factors that represented major criteria for resorting to faecal diversion as a solution.

Faecal diversion was performed even in uncomplicated cancers in which performing a primary anastomosis after radical resection would be considered technically impossible or too risky because of multiple risk factors for suture dehiscence.

Colostomy, used in 218 (82.57%) cases, was the most frequent diversion procedure. This is because most of the patients who required stomas had advanced colorectal cancers (231 cases=87.5%) with major evolutionary complications.

Our findings are consistent with the literature, which confirms a clear colostomy/ileostomy ratio in favour of colostomy [4,9].

End colostomy is mentioned in the literature as the most frequent type of colostomy. In some studies, the frequencies of end and loop colostomies were 73.26% and 70%, respectively [13,14].

This is consistent with our findings, in which 67.68% were end colostomies while 32.32% were other colostomies.

A large number of Miles and Hartmann's procedures in uncomplicated colorectal cancers ended with left end colostomies.

This is because the introduction of mechanical suturing and the lowering of the oncological safety margin from 5 cm to 1-2cm allowed for low colorectal resections with low colorectal or coloanal anastomoses, possibly protected by an ileostomy, which is somewhat surprising.

The explanation is deducible from the study group structure, which predominantly consisted of elderly patients with uncontrollable comorbidities from emergency surgeries,

advanced disease, severe evolutionary complications and occlusive and/or peritonitic shock.

Under these circumstances, serial surgery was the prudent choice in which the faecal discharge diversion together with the treatment of peritonitis, shock and the correction of other major systemic imbalances allowed for solving the complication and saving the patient's life.

Following this, restoring transit for the patient should be done later when all the conditions for safe surgery are met.

We also consider that other types of colostomy (left loop colostomy, transverse colostomy and caecostomy) deserve some mention.

Left supratumoural loop colostomy (23 cases) was used in locally advanced rectal cancer (7 cases), peritonitis (2 cases) and bowel obstruction (1 case), and in 12 cases the colostomy was carried out to allow for neoadjuvant radio-chemotherapy.

Although some authors consider transversal loop colostomy an efficient alternative to protective ileostomy [3,15-17], we performed 11 transverse colostomies only as discharge diversions in 2 cases of peritonites, 4 occlusions, 2 bleeding tumours, 2 locally advanced cancers and 1 abdominal trauma.

Despite its known disadvantages (incomplete discharge and difficult maintenance), caecostomy, in its variants (by a Petzer probe or as a caecal colostomy) was used in 26 cases-as a discharge diversion in 21 cases, including 10 peritonites, 8 occlusions, 2 stenoses and 1 rectovaginal fistula-and for the protection of a colonic anastomosis in 5 cases.

An ileostomy (end or loop ileostomy) was performed in 46 cases.

Recommended in intestinal or colic lesions that do not involve a primary anastomosis, an end ileostomy of discharge was the preferred solution in 31 cases, including 5 peritonites, 5 stenoses, 20 bowel obstructions and 1 locally advanced cancer.

Proposed as a protective intervention against the occurrence of a postoperative anastomotic fistula or to diminish its disastrous effects, ileostomy is preferred by most authors to loop transverse colostomy (15-17), which we did not perform in any of our cases.

Temporary protective loop ileostomies were performed in 15 cases associated with intestinal or colonic resections, including right colectomy,

segmental colectomy of sigmoid, transverse or descending colon and segmental enterectomies or subtotal colectomies, in which 3 anastomotic fistulas were recorded.

Faecal diversion procedures are conceived as a last resort life-saving solution; however, they are hampered by many postoperative complications that are unavoidable and continue to occur despite continuous improvement in surgical procedures.

These complications can be general, systemic or local, specific to stomas or common to all abdominal surgeries, minor, requiring only local care and stomatherapy, or major, requiring multiple reinterventions characterised by high mortality [9-11].

The real incidence of postoperative complications is difficult to estimate, as they vary within wide limits in the literature (15-80%) depending on the author.

The main cause of this variation is a lack of consensus on the accurate definition of the complications and their reporting.

Thus, cutaneous complications, mostly identified and cared for by nurses specialised in stomatherapy (wound ostomy and continence (WOC) nurses), failed to be noticed by the surgeons and are not recognised in the literature. In older studies [18-23], complication rates were between 6% and 25%, whereas more recent studies show complication rates between 10% and 82% [24-29].

We recorded postoperative complications in 115 patients, with a morbidity rate of 43.56%, which is consistent with the literature data.

Postoperative complications were local, specific to stomas in 84 (22.32%) cases and common to abdominal surgery in 94 (35.60%) cases. General systemic complications were identified in 60 (22.72%) cases.

There is a wide range of risk and gravity factors that influence the occurrence of postoperative complications.

Specific factors associated with the patient include age, sex, body mass index, nutritional status, ASA score, preoperative irradiation and use of corticosteroids.

Specific factors regarding the operation include emergency surgery or scheduled surgery, type and location of the stoma and factors associated with the disease (malignity).

Consistent with literature data [24-29], our study identified the following risk factors for complications: advanced age, diabetes mellitus

and musculoskeletal and respiratory comorbidities.

These are considered independent risk factors, together with the net predominance of malignancy (86.63% colorectal cancer in advanced stages, with major evolutionary complications in 70.07% cases), emergency surgery (74.13%) and a high ASA score (35.59%) (Table 3).

Specific local complications were registered in 84 cases (22.32%).

These include peristomal skin lesions, stomal ischaemia/necrosis, retraction, stenosis, prolapse, bleeding and parastomal hernia (Table 4).

These complications were more frequent after ileostomies (39.13%) than after colostomies (30.27%).

Peristomal skin lesions, the most frequent local complication specific to stomas, with an incidence of 18-55% in the literature [8,29], were registered in 40 (15.1%) of our cases, more frequently after ileostomies (23.91%, 11 cases) than after colostomies (13.3%, 29 cases).

The higher incidence of peristomal skin lesions after ileostomies can be attributed to the output and the contents of the effluent, which are much larger, richer in proteolytic enzymes and more corrosive than those of colostomies.

Peristomal skin lesions, produced by chemical irritation from the contents of the effluent, allergic reactions to the collection devices and infection or mechanical injuries from changing the collection bag, were minor and erythematous in most cases.

In our study, we recorded 3 ulcerations and 5 peristomal abscesses after colostomy.

Ischaemia/necrosis of stomas occurs because of compromised vascularisations.

This can be partial, localised at the level of the superficial segment of the stoma or deep, extending subfascially, with an incidence of 2-30% for superficial ischaemia and 0.37-3% for deep ischaemia [9,20,24,25,27].

Ischaemia was encountered in 13 (4.92%) of our cases, occurring more frequently after ileostomy (6.52%) than after colostomy (4.58%).

A compromise of the stomal vascularisation can be prevented by maintaining a balance between mobilisation of the intestinal loop to the skin level and maintaining adequate vascularisation.

A retraction, with an incidence of 1.4-9%, is encountered both after an ileostomy and a colostomy [8,20], and recent studies have shown

that it is one of the commonest complications of stomas occurring in 32-40% of patients [27, 28].

A correctly constructed stoma must protrude approximately 2.5 cm above the skin level, with the lumen placed in the centre of the apex to direct the faecal flux into the collection bag.

A retraction is due to excessive tension exerted on the matured segment, usually because of insufficient mobilisation.

Circumferential or partial retraction causes the stoma's aperture to recede approximately 0.5cm beyond the skin level [5,8,30], thus creating an inadequate surface for applying the collection bag, resulting in direct discharge of intestinal content at the skin level and leading to peristomal skin lesions.

In recent stomas, acute retraction may lead to dehiscence of the mucocutaneous joint and contamination of the peritoneum, and functionally, retracted stomas are problematic because their capacity for faecal diversion is compromised [8].

Usually, retraction treatment is conservative and consists of skin care and the use of convex collection bags.

If sealing of the bag is problematic and the patient has severe or recurrent peristomal skin lesions, the stoma's revision must be considered [31].

Our 4 (1.74%) retraction cases were registered after colostomies and were solved by conservative means.

We recorded stenoses in 8 cases (3.03%), which included 2 after ileostomies and 6 after colostomies.

A stenosis can occur secondary to superficial necrosis of the stoma or the development of a retractile peristomal scar.

The presence of a stenosis considerably reduces stomal evacuation capacity and, in severe cases, can progress to complete obstruction, which requires reoperation and stomal restoration.

Prolapse, a late stomal complication, occurred in 7 cases in the study, (2 cases after an ileostomy and 5 cases after a colostomy), with an incidence of 2.65%.

Prolapses can occur after terminal and lateral stomas, with incidences between 2% and 22% in the literature.

Prolapses after lateral stomas (2% after loop ileostomies and 16-19% after loop colostomies) occur more frequently than after terminal stomas [8,9,32].

Although this may be scary for the patient, a prolapse is rarely a surgical emergency and can be treated conservatively or by minimal surgical intervention.

A parastomal hernia (5 cases in our study, all occurring after colostomies with an incidence of 2.18%) is a particular type of incisional hernia resulting from an intestinal stoma.

Usually rare and uncommon (0-3%) in the early postoperative period [12,28], its incidence rises in time to 14.1-40% [22,25,33].

Its risk factors are similar to those of any postoperative incisional hernia.

Nastro et al. [25] considered respiratory comorbidities, diabetes mellitus, cancer surgery and end colostomy important risk factors.

This is consistent with our study.

Excluding peristomal skin lesions (40 cases) and wound infections (60 cases) that benefited from conservative local treatment, resolving other local complications (specific to stomas and/or common to abdominal surgery), required 51 reoperations (with a reoperation rate of 19.31%), and the surgical procedures were chosen according to the type of complication (Table 5).

Thus, for local complications specific to the stomas, the following procedures were performed: colostomy restoration or retouch (16 cases), prolapse reduction and fixation (3 cases), ileostomy restoration (2 cases), parastomal stenosing-scar resection and mucocutaneous line restoration (1 case) and parastomal abscess evacuation and drainage (2 cases).

Common local complications of abdominal surgery were resolved using the following procedures: anastomosis removal+colostomy/ileostomy (4 cases), segmental colectomy+end colostomy (2 cases), segmental enterectomy with side-to-side entero-enteric anastomosis (2 cases), transverse colostomy (1 case), evacuation of intra-or retroperitoneal abscesses (3 cases), evisceration cure (7 cases), cholecystectomy (1 case), dehiscent rectal stump suture (1 case) and intestinal perforation suture (1 case).

Stoma closure, classically indicated at 2-3 months after the primary operation, is widely debated in the literature [35-40].

The main subjects of the debate are the optimal operating time, procedures of choice and postoperative morbidity and mortality specific to stoma closure.

About 103 patients had temporary stomas, which theoretically could have been closed if all the local and general safety conditions for the patients had been met.

In fact, stoma closures were performed in only 34 cases, with a stomal closure rate of 12.8%, and 25 patients died in the immediate postoperative period.

The remaining 60 patients whose temporary stoma could have been converted refused the operation or were missing from the records.

On average, stoma closures were performed 6 months after the primary operations, with limits between 3 weeks and 12 months.

The procedures used for closing the stoma (Table 6) included ileostomy removal and transit restoring (10 cases) (3 end-to-end entero-enteral anastomoses, 3 ileo-transverse anastomoses, 1 ileo-ascending anastomosis and 3 ileo-caecal anastomoses), colostomy removal and side-to-side colorectal anastomosis (8 cases), colostomy removal and side-to-side colonic anastomosis (7 cases) and segmental enterectomy with end-to-end enteroenteral anastomosis (4 cases) and caecoraphy (5 cases).

In our study, there was no case of postoperative morbidity or mortality after stomal closure.

In this study, we registered 42 deaths, with a postoperative mortality rate of 15.9%.

The main causes of death included myocardial infarction (2 cases), thromboembolism (1 case), occlusive shock (3 cases), toxico-septic shock (11 cases) and multiple organ failure (25 cases).

It should be noted that the high postoperative mortality was not due to the stomas or their local complications; rather, it was due to a complexity of the risk and gravity factors mentioned during the study, which mostly includes older patients with major comorbidities, emergency surgery for severe complications of the underlying disease (colorectal cancer in advanced stages, etc.).

Intestinal stomas and their complications often require prolonged hospital stays, special care and many readmissions, which is directly reflected in the consumption of time and resources.

Often, qualified staff (WOC nurses) are involved in caring for this category of patients.

Conclusions

Faecal diversion procedures still represent a therapeutic option for a wide range of benign or malignant digestive or extra-digestive abdominal

diseases performed in emergency or scheduled surgeries, mostly for colorectal cancer and its complications.

The construction and closing of stomas are hampered by a significant number of postoperative complications, which are inevitable and continue to appear despite continuous improvement of surgical procedures.

These can be prevented or reduced by an accurate surgical technique and avoiding all the risk factors associated with stoma complications.

Conflict of interests

None to declare.

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