Temporary Stomas after Rectal Cancer Resection; Predilection of Being Permanent and Predictors of Complications?

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Abstract

Stomas are essential for colorectal surgery and are widely used not only for selected cases for bowel obstructions but also in rectal cancer operations to divert stool away from low rectal anastomosis. On the other hand, complications with stomas/ stomas reversal are not uncommon. In this study, we aimed at studying the frequency and the predictors of temporary stomas being permanent, and the contributing factors of surgical stoma/stoma closure related complications. In our cohort, only about 40% of the patient closed their initially planned temporary stomas. The occurrence of intestinal leak, wound sepsis, or any type of morbidity with 30 days of operation were significant predictors of permanent stomas. In addition, alarmingly although Hartmann's procedure was uncommon in our practice, only 9% of those who underwent Hartmann's have had it reversed. Moreover, the only factor that significantly increased stoma related complications was having an end colostomy. There was a tendency toward late closure of stomas with median 8.2 months, however early closure did not correlate to complications. In conclusion, further studies are needed to delineate the low rate of stoma closure. Patients who develop postoperative complications, even wound sepsis, would be at a higher risk of living with permanent stomas. Hartmann's procedures are commonly associated with stoma problems, and reluctance to reverse the stomas.

Keywords

- Rectal cancer
- Proctectomy
- Hartmann's procedure
- Stoma

Introduction

In rectal cancer surgery, creation of a diverting stoma potentially minimizes the fatal consequences of anastomotic leakage, albeit it may not substantially decrease its incidence.[1] In addition, stoma creation in patients undergoing a low/ultralow anterior resection after neoadjuvant chemoradiation may be better for the patient's well-being as in this group of patients the predicted poor bowel function in the immediate postoperative period could be avoided.[2]

A group of patients who underwent sphincter-saving rectal surgeries with a temporary stoma may consequently end with a permanent stoma status, including non-reversal or re-creation of another stoma after the initial stoma closure surgery.[2] The incidence of this scenario is non-consistent, it was up to 17% in one series[3] and up to 23% in another one.[4]

Furthermore, the timing of temporary stoma reversal is not agreed upon. However, some authors suggested that it is safe to close a temporary ileostomy as early as 8 to 13 days after proctectomy and anastomosis for rectal cancer in

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selected patients without clinical or radiological signs of anastomotic leakage.[5]

There is lack of studies assessing the rate, predictors, and timing of stoma reversal and complications associated with temporary stomas in the Middle East.

Patients and Methods

This is a retrospective study, where the institutional registry at oncology center Mansoura University (OCMU) is thoroughly revised for Rectal cancer cases that attended the hospital from 2006 till August 2020.

All procedures performed in the study involving human participants were in accordance with the ethical standards according to 1964 Helsinki declaration and its later amendments. The study has been approved by Mansoura Faculty of Medicine Institutional Research Board (MFM-IRB) with approval code (R/22.06.1748).

Patients with rectal adenocarcinoma where stoma was constructed were included. While patients were excluded if they have colon cancer, no definite pathologic diagnosis, inadequate registered data, only non-resectional surgery was done (including ostomy) or underwent abdominoperineal resection.

The primary outcome was the rate of reversal of stomas and factors predicting failure of reversal. While the secondary outcomes were complications related to stoma construction and stoma reversal and factors predicting these complications.

The data were analyzed, and statistical values were obtained using SPSS version 22 (Inc, Chicago, IL). Continuous variables are presented as mean when symmetrical or median and range when asymmetrical. Categorical variables are presented as proportions. Univariate analysis was done using Chi-Square test, Fisher's exact test (if cell count less than 5), Mann-Whitney test, and student t-test. Multivariate analysis was done using binary logistic regression. P value <0.05 was considered significant.

Results

Clinico-epidemiologic and Pathologic Criteria of Patients (►Table 1)

Out of 370 operated rectal cancer patients at the enrollment time, 215 had sphincter preserving surgery for adenocarcinoma. Of them, 142 patients had stomas constructed and were included in the study (►**Figure 1**). Mean age 48.5 +/− SD 13.2. Females represent 57%. About a third of the cases (36.6%) were low lying rectal cancer (<5cm from verge). The majority were adenocarcinoma not otherwise specified (NOS) 72.5%, followed by mucinous carcinoma (24.6%). About 2/3 of the patients (63.4%) received neoadjuvant therapy. Only 8 (5.6%) received primary resection in an emergency context secondary to bowel obstruction. 2/3 of the patients (98, 69%) underwent anterior resection (high, low, or ultra-low). Followed by intersphincteric resection (32, 22.5%), then Hartmann's procedure (11, 7.7%). Again 2/3 of patients were operated by open surgery (69%). The anastomosis was configured as end to end in 115/131 who underwent resection

Table 1 Basic clinic-epidemiologic criteria, pathology, operative details, and outcomes of the studied patients

Variable	Value
Age mean +/− SD	48.5 +/− 13.2 years
Sex	
Male	61 (43%)
Female	81 (57%)
Rectal site	
Low	52 (36.6%)
Mid	52 (36.6%)
High	25 (17.6%)
Pathology	
Adenocarcinoma, NOS	103 (72.5%)
Mucinous carcinoma	35 (24.6%)
Signet ring carcinoma	4 (2.8%)
Metastasis	
No	122 (85.9%)
Yes	13 (9.2%)
Preoperative therapy	
No	47 (33.1%)
Yes	90 (63.4%)
Intestinal Obstruction	
No	135 (94.4%)
Yes	8 (5.6%)
Operation	
Anterior resection	98 (69%)
Intersphincteric resection	32 (22.5%)
Hartmann's procedure	11 (7.7%)
Proctocolectomy	1 (0.7%)
Approach	
Open	98 (69%)
Laparoscopic	32 (22.5%)
Transanal total mesorectal excision	12 (8.5%)
Anastomosis type*	
End to end	115 (87.8%)
Other (side to end, end to side, coloplasty, pouch)	12 (9.2%)
Anastomosis*	
Hand-sewn	71 (54.1%)
Stapler	52 (39.7%)
Stoma type	
Ileostomy	114 (80.3%)
Colostomy	27 (19%)
Ileocolostomy	1 (0.7%)
Permanent Stoma	
Yes	84 (59.2%)

Table 1 (*Continued*)

Variable	Value
No	58 (40.8%)
Time to stoma closure median (range)	8.5 (1-24) months
Pathologic stage	
0	10 (7%)
I	20 (14.1%)
II	45 (31.7%)
III	57 (40.1%)
IV	9 (6.3%)
30-day Morbidity	
No	95 (66.9%)
Yes	46 (32.4%)
Wound sepsis**	
No	111 (78.2%)
Yes	30 (21.1%)
Intestinal fistula*	
No	101 (77.1%)
Yes	14 (10.7%)
Tumour recurrence	
No	101 (71.1%)
Yes	33 (23.2%)
Stoma Complications	
No	132 (93%)
Retraction	2 (1.4%)
Obstruction	1 (0.7%)
Parastomal hernia	2 (1.4%)
Peristomal collection	1 (0.7%)
Peristomal excoriation	1 (0.7%)
Fistula upon stoma closure	3 (2.1%)

*Percentage calculated in the 131 patients who underwent primary anastomosis.
**Wound sepsis defined as infection superficial or deep in the wound.

anastomosis and was hand-sewn in more than half of them 71/131.

13 (9.2%) patients were metastatic, as following: 3 had their metastasis vanished after neoadjuvant therapy, 4 underwent concomitant hepatectomy, 1 was operated in context of bowel obstruction, 2 on palliative basis, 2 had concomitant non-regional node dissection (portocaval & inguinal) and 1 was planned for staged pneumonectomy.

Most of the patients were pathologic stage III (40.1%), followed by stage II (31.7%).

Recurrence occurred in 33 patient (23.2%).

Stoma Construction

All patients had stomas, 2 of them the stoma was constructed as an emergency before the primary resection surgery, another 2 patients the stoma was exteriorized after surgery (secondary stoma) for leak management, while the rest 138 patients (97.2%) had primary stoma constructed at the time of resection of the tumor. In 80.3% the stoma was ileal, while in the rest it was colonic, with one double barrel ileocolostomy.

Stoma Closure

Only 58 patients (40.8%) of patients are stoma free at the end of follow up, while the rest lived with a permanent stoma either their stoma closure has never been attempted (79 patients, 55.6%) or reversed the stoma and recreated another one (5 patients, 3.5%).

Predictors of Failure of Stoma Closure (►Table 2)

The only predictors of failed stoma closure were Hartmann's procedure (.028), higher pathologic stage (p-value = .023), 30-day morbidity (p-value = .017), occurrence of postoperative wound sepsis (p-value = .002), overt intestinal fistula (.021), and prolonged hospital stay (.005). Otherwise, neither age, sex, tumor site, stoma site, pelvic abscess, recurrence, anastomosis configuration nor the use of staplers affect the probability of stoma closure.

Running binary logistic regression with primary anastomosis, pathologic stage and either 30-day morbidity, hospital stay, intestinal leak, or wound sepsis, those who maintained significant risk of permanent stoma were morbidity (2.5, p = .025), intestinal leak (5.2 fold, p = .04), and wound sepsis (6.5 fold, p = .001), while Hartmann's procedure was borderline significant (8.2 fold, p = .052) probably a type II statistical error as for only 11 patients underwent Hartmann's procedure.

Stoma Related Complications

Only 10 major stomal complications were reported: 2 retraction, 2 parastomal hernias, 1 obstruction, 1 peristomal collection, 1 skin excoriation, and 3 anastomotic leaks with stoma closure. 1 patient died after reversal of stoma from pulmonary embolism.

Predictors of Stoma Related Complications (►Table 3)

The only predictor of stoma complications was stoma configuration where end stomas were a risk factor (p-value = .023). However, stoma type (ileostomy vs. colostomy), age, sex, surgical approach (open vs. minimally invasive) did not affect the complications rate.

Discussion

The use of stomas is an integral part of rectal surgery. The rate of primary diverting stomas varied from 36%[6] to 54.2%[7] of low anterior resection patients. In our institution 66% of the patients who underwent sphincter preserving surgery for rectal adenocarcinoma have had a stoma constructed either primary (about 97% of stoma patients) or secondary after a major leak or even in a separate initial surgery to relieve obstruction.

The percentage of patients who closed the stomas in this study was quite low, less than half of the patients, with the

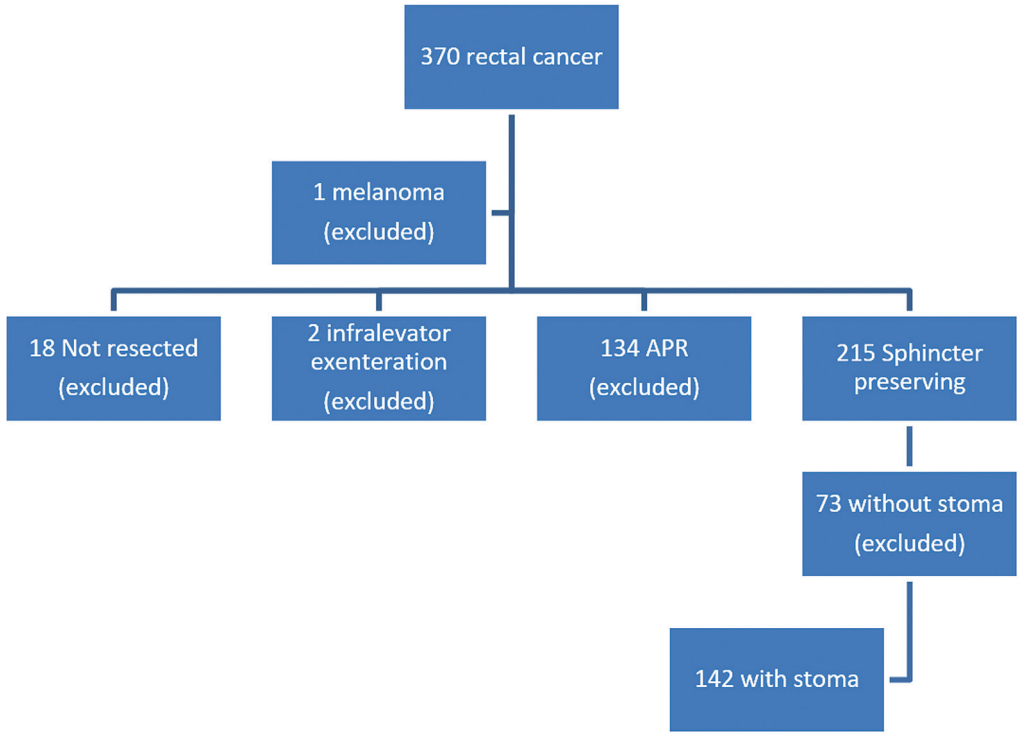

Fig. 1 Flowchart showing included and excluded patients in this study.

Table 2 Univariate and multivariate analysis of factors predicting permanent stoma.

Variable	Persistent stoma	Stoma reversed	P-value	HR (95% CI)	Significance
Age mean +/− SD	49.3 +/− 14.5	47.4 +/− 11	0.403		
Sex			0.86		
Male	37	24			
Female	47	34			
Tumour site			0.37		
Low	34	18			
Mid	27	25			
High	14	13			
Pathology			0.16		
Adenocarcinoma, NOS	62	41			
Mucinous carcinoma	18	17			
Signet ring carcinoma	4	0			
Preoperative therapy			0.36		
No	25	22			
Yes	56	34			
Obstruction (Emergency)			0.47		
No	78	56			
Yes	6	2			
Operation			0.47		
Open	60	38			
Minimally invasive	24	20			
Type of operation			0.09		

Table 2 (*Continued*)

Variable	Persistent stoma	Stoma reversed	P-value	HR (95% CI)	Significance
Anterior resection	57	41			
Intersphincteric	17	15			
Hartmann's procedure	10	1			
Proctocolectomy	0	1			
Primary anastomosis			**.028**	8.2 (0.98-68)	0.052
No	10	1			
Yes	74	57			
Anastomosis configuration			0.76		
End to end	66	49			
Other	6	6			
Anastomosis method			0.36		
Hand-sewn	42	29			
Stapler	26	26			
Stoma type			0.39		
Ileostomy	65	49			
Colostomy	18	9			
Pathologic stage			**.023**		0.18
0	6	4			
I	5	15			
II	28	17			
III	38	19			
IV	6	3			
30-day morbidity			**.017**	2.5 (1.1-5.8)	**.025**
No	49	46			
Yes	34	12			
Wound sepsis			**.002**	6.5 (2.1-20)	**.001**
No	57	53			
Yes	26	5			
Pelvic abscess			0.76		
No	71	47			
Yes	8	4			
Intestinal fistula			**.021**	5.2 (1.3-33.6)	**.04**
No	59	54			
Yes	12	2			
Anastomotic stenosis			0.35		
No	68	51			
Yes	16	7			
Tumour Recurrence			0.54		
No	57	44			
Yes	21	12			
Time to oral median (range)	2 (1-17)	2 (0-6)	0.71		
Hospital stay median (range)	9 (3-50)	7 (3-45)	**.005**	0.94 (0.9-1)	0.052

Table 3 Analysis of factors contributing to surgical stoma related complications

Variable	Stoma complications		Significance
	No	Yes	
Age mean +/− SD	48.2 +/− 13.2	52.4 +/− 13.5	0.34
Sex			0.19
Male	59	2	
Female	73	8	
Preoperative therapy			0.09
No	41	6	
Yes	86	4	
Approach			1
Open	91	7	
MIS	41	3	
Stoma type			0.4
Ileostomy	107	7	
Colostomy	24	3	
Stoma configuration			**.031**
Loop	124	7	
Terminal	8	3	
Obstruction (Emergency)			0.45
No	125	9	
Yes	7	1	
Timing of stoma			0.054
construction			
Before resection	1	1	
Primary stoma	129	9	
Secondary stoma	2	0	
Timing of stoma closure			1
Early	8	0	
Late	45	3	

majority of the rest never opted to stoma closure. Socioeconomic issues, improper counselling, or failure to refer patients back from their GPs/medical oncologists to reverse stomas may be a factor. Kuryba et al. has mentioned in explanation of his findings that patients from more deprived backgrounds may be less likely to access follow-up services after their initial surgery or that they may be more willing to live with a stoma to avoid further surgery.[8]

In Holmgren et al. multicenter study, partial mesorectal excision (PME) correlated with a stoma-free outcome. While non-reversal was considerably more prevalent among patients with leakage and Stage IV disease. Interestingly stage III patients at first had a decreased reversal rate, which increased after the initial year of surgery.[9] In contrast, in this series, the site of tumor (high, mid, low) and as such PME or TME resection was not a predictor of stoma free. Moreover, although late stages were significantly associated with more permanent stomas in univariate analysis, this was not significant in multivariate analysis. However, major intestinal leak, wound sepsis and overall, 30-day morbidity were the only significant predictors of failure of stoma closure.

In a study of NHS patients, within 1.5 years from anterior resection, 72.5% of the patients had undergone an ileostomy reversal. The reversal rate was lower in the following circumstances: older patients, male gender, higher American Society of Anesthesiologists (ASA) grade, more advanced cancer, socioeconomic deprivation, comorbidity, and open surgical procedure.[8] In our data, neither age, sex, stage, or surgical approach (open VS. laparoscopic) significantly predicts stoma reversal.

Whilst 85% of patients with primary anastomosis (PA) have had their stoma reversed, only 58% of patients with an Hartmann's procedure (HP) had a stoma reversal in one series.[10] In this study, we have a quite small number of HP (11 patients), this can be explained by the tendency to manage patients with malignant bowel obstruction secondary to

cancer by proximal diversion (loop colostomy) followed by neoadjuvant therapy and then resection on an elective basis. Albeit that, the relation between stoma closure and primary anastomosis was clearer where 57/131 (43.5%) of the patients with PA successfully reversed their stomas, while only 1/11 (9.1%) of HP patients did.

In one study, the postoperative stoma-related complications developed in 17.8% of patients. Of them stoma outlet obstructions occurred in 7.0%. Thick subcutaneous fat at the stoma-marking site (vertical distance $\geq$ 20 mm) was the only predictor of stoma obstruction.[11] In our series non-medical complications related to stoma creation/closure occurred in 7% only, with stoma obstruction affecting only one patient.

As regard stoma closure complications, 9% of the patients who underwent reversal of a stoma in one series experienced major complications requiring a return to theatre, need for intensive care or mortality.[9] In our study, only 3 patients out of 63 who attempted stoma closure (4.8%) developed major complications post stoma closure, 1 succumbed of pulmonary embolism and another 2 developed intestinal leak necessitating the creation of another stoma.

It is known that a diverting loop colostomy is associated with ostomy prolapse and parastomal hernia, while a diverting loop ileostomy is in particularly associated with the risk for high-output ostomy.[12] In a metanalysis, age $\geq$65 years, body mass index $\geq$30 kg/m2, diabetes mellitus, hypertension, renal comorbidity, regular diuretic use, ileal pouch–anal anastomosis procedure and length of stay after index admission were associated with dehydration readmission, while a diagnosis of colorectal cancer was less likely to result in readmission.[13] In our cohort terminal colostomies were the only statistically significant predictor for stoma related complications, however; none of our patients were admitted with dehydration following ileostomy construction. This is important to highlight, although this may mean that they are just managed on a primary care level, it may truly reflect what we notice in practice that readmission for stoma related dehydration, which is common in western patients, is not that feared in our patients probably due to younger age (mean 48), being all treated for colorectal cancer and that only 1 patient had ileal pouch-anal anastomosis. In addition, the stoma type (ileostomy VS. colostomy), age, sex, surgical approach (open VS. minimally invasive) did not affect the stoma complications rate.

In one study stoma closure before 109 days of construction increased risk of complications, which were mainly prolonged ileus.[14] A meta-analysis suggested that early closure ($<$14 days) of a defunctioning loop ileostomy is effective and safe in carefully selected patients without increasing overall postoperative complications,[15] while in a later systematic review the results were slightly inclined toward early closure of loop ileostomy.[16] In this series, there was tendency to late closure ($>$3 months) where 82.8% patients closed late. The median time to closure was 8.5 months, and we could not correlate stoma complication to timing of closure, however; paralytic ileus was not recognized.

This study was limited by being retrospective, as such some data as socioeconomic status and BMI, ASA of patients are not adequately assessed. In addition, complications related to stoma that was not escalated to our service by peripheral health care facilities, this would mainly include minor complications, were probably missed.

Conclusion

More than half of rectal cancer patients with intended temporary stomas will end up with a permanent one. 30-day morbidity, wound sepsis and intestinal leak and may be Hartmann's procedure are predictors of permanency. End colostomies are more liable to stoma related complications. Finally, the optimum timing for stoma closure could not be identified as timing of closure does affect outcomes.

Conflict of Interest
None declared.

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