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ORIGINAL ARTICLE

Journey for patients following ileostomy creation is not straightforward

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Abstract

Background An ileostomy is usually created to avert systemic sepsis in a patient with a tenuous anastomosis. However, what is often not reported are the numerous issues facing these patients subsequently, ranging from readmissions, non-reversal of the stoma, and complications from the closure. This study was performed to identify these issues among patients following creation of an ileostomy.

Methods We conducted a retrospective analysis of consecutive patients who had an ileostomy created from January 2011 to December 2016 at two institutions. Statistical analysis was performed to identify risk factors associated with readmissions and ileostomy non-reversal.

Results In total, 193 patients had an ileostomy created during the study period. Twenty-six (13.5%) patients developed stoma-related complications requiring readmission. The most common cause of readmission (9.3%) was due to dehydration and acute kidney injury secondary to high stoma output. One hundred thirty (67.4%) patients had their ileostomy reversed. On multivariate analysis, only stomas created during an ultra-low anterior resection were associated with reversal (OR 2.88 [95% CI, 1.24–6.68]; $p = 0.014$). Among the patients who underwent ileostomy reversal, seven (3.6%) patients developed complications from their ileostomy reversal. Four patients (2.1%) suffered from an anastomotic leak which required repeat surgical intervention with one mortality from the ensuing sepsis.

Conclusion Almost half of the patients who had an Ileostomy had an undesirable outcome, including readmissions, non-reversal, and post-operative complications following closure. Patients need to be properly counselled about the risks involved prior to the index operation.

Keywords Ileostomy · Complications · Reversal

Background

Ileostomy creation is commonplace in colorectal procedures. The main reason for ileostomy creation is to reduce the incidence of clinical anastomotic leaks and its associated morbidity, especially in scenarios in which there is a tenuous anastomosis, such as in a low rectal cancer requiring an ultra-low anterior resection, or in an irradiated pelvis. Other scenarios include immunosuppressed patients, or in patients suffering from acute abdominal infections [1].

Whilst the advantages in the diversion of faecal material away from the anastomosis are clear, stoma creation is not without its own risks. As ileostomy output is usually watery in nature, this may lead to dehydration, electrolyte abnormalities, and acute kidney injury and therefore may be associated with increased readmissions [2]. The liquid nature of the output can also contribute to skin excoriation around the stoma. Reversal of the stoma requires a subsequent operation which can carry an overall morbidity of up to 11%, with an anastomotic leak rate of 3% [3]. Finally, although the intent of ileostomy creation may be temporary, not all stomas are eventually reversed, leading to an impact on the patient's quality of life and sexual function [4].

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It is clear that the implications of ileostomy creation are complex and extend much longer into the patient's disease course then simply at the time of creation. In order to more accurately counsel a patient prior to surgery about the likelihood of readmission and stoma reversal, we conducted this study to identify potential risk factors which may predispose a patient readmission whilst having the stoma, and subsequently, to not having the ileostomy reversed. We investigate the potential morbidity of having a stoma, and the complications associated with stoma reversal.

Methodology

A retrospective review of all consecutive patients who had an ileostomy created from January 2011 to December 2016 was performed. Demographic data collected included the patient's age and gender. Factors related to the surgery including the indications, urgency, and description of the operations were documented. A low anterior resection (LAR) was defined as occurring when a colorectal anastomosis was performed below the peritoneal reflection, whilst an ultra-low anterior resection (ULAR) was defined as occurring when a total mesorectal excision was performed with the anastomosis at the pelvic floor. Complications of stoma creation were then identified. In our study, complications were classified as any event that required an unexpected inpatient hospital stay. Institutional Review Board (IRB) ethics approval was obtained for this study.

Patients who had their ileostomy reversed and those who did not were labelled as cases and controls respectively. Univariate and multivariate regressions were conducted on pre-operative variables to determine if they constituted risk factors for readmissions and non-reversal of the stoma. In both parts, significance was deemed to occur at p value < 0.05. Statistical analysis was performed using Stata software, version 14 (StataCorp, College Station, TX).

Patients who had their ileostomy reversed were evaluated for the time from ileostomy creation to reversal, as well as for any complications which occurred after reversal. Time to death was compared between patients who had their ileostomy reversed and those who did not. Comparison between these two groups was conducted with Kaplan-Meier curves. Patients who did not have their ileostomy reversed were evaluated for reasons.

Results

During the study period, a total of 193 patients, with a median age of 62.2 (28.1–91.1) years, had an ileostomy created, of which 109 (56.5%) were of male gender. The ileostomy was electively created in 148 (76.7%) patients, whilst 79.3% of the ileostomies were created following a cancer operation. The majority of surgeries performed was an anterior resection (69.4%), and this was performed via a minimally invasive approach for 83 (43.0%) patients. Unsurprisingly, a loop ileostomy was created for 182 (94.3%) patients. Among this cohort, 130 (67.4%) patients had their stomas eventually reversed. Table 1 demonstrates the demographic and population characteristics of our study population. Patients were followed up for a median duration of 94 (interquartile range 37–182) weeks.

Overall, 26 (13.5%) patients developed complications associated with having the stoma which required readmissions (Table 2). This occurred at a median duration of 7 (interquartile range 3–19) weeks after ileostomy creation. Eighteen (9.3%) patients were readmitted due to dehydration and acute kidney injury secondary to high stoma output. Four (2.1%) patients had bleeding from the stoma, two (1.0%) had nursing issues relating to the stoma, one suffered from stomal prolapse (0.5%), and another had intestinal obstruction at the stoma site (0.5%).

When we looked at factors predicting ileostomy reversal, several factors such as elective surgery (OR 3.19 [95% confidence interval 1.60–6.37]; $p = 0.001$), cancer surgery (4.38 [2.11–9.09]; $p < 0.001$), and a minimally invasive approach (OR 2.02 [1.07–3.80]; $p = 0.029$) were significantly associated with stoma reversal on univariate analysis (Table 3). However, on multivariate analysis, only stomas created during an ULAR were statistically significantly associated with

Table 1 Demographics and population characteristics of patients with stoma created

Determinant	Ileostomy patients ($n = 193$) (%)
Male sex	109 (56.5)
Age, median (CI)	62.2 (28.1–91.1)
Elective surgery	148 (76.7)
Cancer surgery	153 (79.3)
Minimally invasive approach	83 (43.0)
Surgery performed	
AR/LAR	58 (30.1)
ULAR	76 (39.4)
Right hemicolectomy	11 (5.7)
Left hemicolectomy	2 (1.0)
Total colectomy	11 (5.7)
Bowel resection	2 (1.0)
Stoma creation only	33 (17.1)
Stoma type	
Loop	182 (94.3)
End	11 (5.7)
Stoma reversed	130 (67.4%)

AR anterior resection, *LAR* low anterior resection, *ULAR* ultra-low anterior resection

Table 2 Univariate and multivariate regression analysis of risk factors for readmission

Determinant	Univariate analysis (odds ratio)	*p* value (confidence interval)	Multivariate analysis (odds ratio)	*p* value (confidence interval)
Sex				
Male	1		1	
Female	1.352	0.475 (0.591–3.09)	1.25	0.617 (0.524–2.97)
Age				
≤50	1		1	
>50	0.878	0.826 (0.277–2.78)	0.876	0.830 (0.263–2.92)
Elective	0.640		0.420	
Emergency	1	0.337 (0.258–1.59)	1	0.253 (0.095–1.86)
Cancer	0.852		1.32	
Non-cancer	1	0.751 (0.318–2.29)	1	0.693 (0.332–5.25)
MIS	0.805		0.740	
Open	1	0.615 (0.345–1.88)	1	0.536 (0.285–1.92)
Surgery performed				
AR/LAR	1		1	
ULAR	1.23	0.686 (0.446–3.41)	1.50	0.464 (0.507–4.44)
Right hemicolectomy	-	-	-	-
Left hemicolectomy	-	-	-	-
Total colectomy	0.729	0.778 (0.081–6.59)	0.454	0.508 (0.044–4.71)
Bowel resection	7.29	0.177 (0.408–130.1)	4.87	0.301 (0.242–97.8)
Stoma creation only	1.62	0.426 (0.495–5.30)	1.12	0.871 (0.277–4.55)
Loop	1		1	
End	0.628	0.664 (0.077–5.12)	0.651	0.714 (0.065–6.51)

eventual reversal (OR 2.84 [1.18–6.85]; $p = 0.020$). Although not statistically significant, we noted a trend towards permanent stomas among patients > 50 years old (OR 0.358 [0.120–1.07]; $p = 0.065$) as well as in patients in whom only a stoma was created alone (OR 0.358 [0.124–1.03]; $p = 0.057$). Notably, malignancy was not associated with ileostomy reversal on multivariate analysis.

Among the 130 (67.4%) patients who had their ileostomies reversed, median time to ileostomy reversal was 4 (interquartile range 2–5) weeks. Seven out of 193 (3.6%) patients developed complications from their ileostomy reversal. Four patients (2.1%) suffered from an anastomotic leak which required repeat surgical intervention. These patients underwent a relaparotomy, take down of the anastomosis, and stoma creation. One of these four patients with an anastomotic leak eventually demised secondary to severe sepsis and multiorgan dysfunction syndrome. The other three patients have not yet undergone reversal of the new stoma during this study period. Two (1.0%) other patients were readmitted for bleeding. One (1.4%) patient developed a wound infection and was treated with intravenous antibiotics. Log-rank analysis between patients who had their ileostomy reversed and those who did not showed that there was a statistically significant difference in time to death ($p < 0.0001$) (Fig. 1).

Among the 63 (32.6%) patients who did not have their ileostomy reversed, the most common reason for non-reversal was progression of disease. Forty-two (42.9%) of patients developed metastatic lesions which precluded reversal of the stoma. In the remaining patients, 26 (41.7%) had comorbidities which were deemed during discussions between the patient and surgeon to not justify stoma reversal, whilst a further 10 (15.9%) patients were lost to follow-up.

Discussion

Ileostomy creation is commonplace in colorectal surgery in situations whereby the anastomosis may be tenuous, with the aim of averting systemic sepsis which may manifest should there be an anastomotic leak [5]. Although the advantages of ileostomy creation may be evident, the disadvantages and potential complications arising from the patient having an ileostomy need to be addressed. Our study shows that 13.5% of patients will require readmission following ileostomy creation due to complications which occur prior to reversal. Non-reversal of stoma is not as rare as expected, as 33.6% of patients will have a permanent ileostomy. Finally, even after

Table 3 Univariate and multivariate regression analysis of risk factors for ileostomy reversal

Determinant	Univariate analysis (odds ratio)	*p* value (confidence interval)	Multivariate analysis (odds ratio)	*p* value (confidence interval)
Sex				
Male	1		1	
Female	0.533	0.043 (0.290–0.980)	0.585	0.125 (0.295–1.16)
Age				
≤ 50	1		1	
> 50	0.546	0.218 (0.209–1.43)	0.358	0.065 (0.120–1.07)
Elective	3.19		0.875	
Emergency	1	0.001 (1.60–6.37)	1	0.801 (0.309–2.47)
Cancer	4.38		1.92	
Non-cancer	1	< 0.0001 (2.11–9.09)	1	0.207 (0.698–5.27)
MIS	2.02		0.950	
Open	1	0.029 (1.07–3.80)	1	0.898 (0.431–2.09)
Surgery performed				
AR/LAR	1		1	
ULAR	2.88	0.014 (1.24–6.68)	2.84	0.020 (1.18–6.85)
Right hemicolectomy	0.585	0.421 (0.158–2.16)	0.880	0.869 (0.193–4.02)
Left hemicolectomy	0.487	0.618 (0.289–8.22)	0.396	0.528 (0.022–7.04)
Total colectomy	0.585	0.421 (0.158–2.16)	0.500	0.500 (0.140–2.613)
Bowel resection	0.487	0.618 (0.289–8.22)	0.877	0.930 (0.047–16.22)
Stoma creation only	0.278	0.005 (0.114–0.682)	0.358	0.057 (0.124–1.03)
Loop	1		1	
End	0.254	0.034 (0.071–0.903)	0.657	0.582 (0.147–2.93)

reversal, severe complications can occur, with up to 3.6% of patients requiring readmission as well as re-intervention.

Prior to consideration for reversal of the ileostomy, the ileostomy itself may lead to complications that require readmission. This occurred in 13.5% of our patients. The most common complication suffered was dehydration secondary to high stoma output. This appears to be the main challenge associated with ileostomy creation among several authors [6–8]. Dehydration often occurs after the patient has been discharged, suggesting the importance of care that continues even after the hospital stay. Stoma therapists may be required to educate patients about the importance of hydration, and the primary health community may need to be engaged to follow-up on patients following discharge from acute care, so as to prevent readmissions and sequelae of dehydration such as acute kidney injury.

The stoma reversal rate in our study was 67.4%, which is concordant with rates published in other studies [9]. In our study, we noted after multivariate analysis that stoma creation following an ULAR was associated with a statistically increased likelihood of stoma reversal. We hypothesise that this is related to stomas being created for diversion in a prophylactic setting during an ULAR.

Although not statistically significant, we noted a trend towards stoma reversal in patients who were less than or equal to 50 years of age compared with a patient older than 50 years. Younger patients were 2.8 times more likely to have their stoma reversed. We hypothesise that this might be related to risk factors and comorbidities which may preclude the patient from having the stoma reversed. In addition, elderly patients are more likely to suffer complications following the initial operation, such as acute myocardial infarction or pneumonia. As a result, commencement

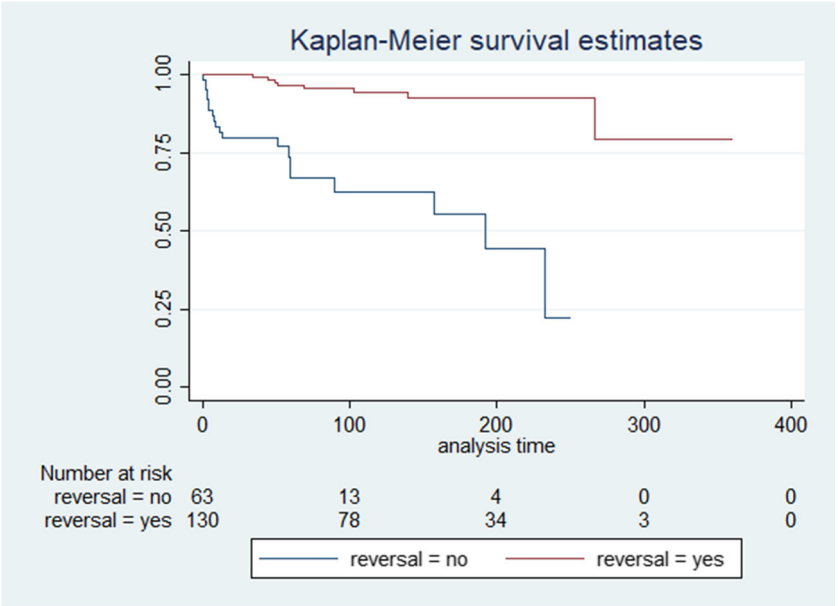

Fig. 1 Kaplan-Meier curve showing overall survival between patients who had stoma reversed versus not reversed ($p < 0.0001$)

of chemotherapy may result, leading to disease progression. Stoma reversal ultimately does require a separate surgery which needs to be performed under general anaesthesia. The additional risk of morbidity and mortality in undertaking a second operation needs to be considered especially in light of the comorbidities of the patients.

It is therefore important also to look into complication rates following reversal of stoma, given that many of these patients may be of advanced age and have pre-existing comorbidities. Stoma reversal also led to complications requiring rehospitalisation and re-intervention in 3.6% of our patients, with complication rates reaching up to 20% as reported in other series [10–12]. Anastomotic leakage is the most feared complication requiring relaparotomy in a small number of patients [13]. This is thankfully a rare event, with four patients in our series requiring repeat surgery to manage the reversal anastomotic leak. Although the rate of severe complications is low, it must still be treated seriously, as one patient suffered from an anastomotic leakage and demised as a result of it.

Stoma creation alone was also noted to be 2.8 times more likely to result in the stoma not being reversed. It is unsurprising that patients who underwent stoma creation alone during surgery without any colonic resection were associated with a higher rate of a permanent stoma. Patients who have stoma creation alone may have surgery which was deemed unresectable, suggesting either metastatic disease or locally advanced disease with invasion into adjacent organs or structures precluding safe and complete resection. Time to death in patients without an ileostomy reversal was significantly shorter than patients who had their ileostomy reversed ($p < 0.0001$), perhaps reflecting the increased tumour burden and shortened overall survival which was reflected in stoma creation alone being performed. These findings support our observation that patients who did not have their stoma reversed were found to have progression of cancer or a heavier burden of comorbidities which precluded safe reversal.

The implications of our study should lead to more robust discussion with the patient prior to the index surgery. Whilst we do not dispute the key advantages ileostomy creation brings to the patient, surgeons should not understate the potential disadvantages and complications creating an ileostomy may bring to the patient. Patients must be aware that about three in ten patients will not have their stoma reversed, and patients who have their stoma reversed require another procedure performed under general anaesthesia which carries the risk of rehospitalisation and even death. In particular, elderly patients need to be informed of the increased likelihood that their ileostomy has a lower likelihood of not being reversed. Very often, patients accept the creation of an ileostomy with the false hope that it will only be temporary. Patients need to be made aware prior to surgical intervention about the potential paths in the journey of a patient with an ileostomy in order to avoid subsequent disappointments. In fact, more patients may need to be offered and counselled for a permanent end colostomy. Given that more than 30% of patients end up having a permanent ileostomy, the end colostomy would bring a lower risk of dehydration and electrolyte abnormalities due to more solid stools at the colostomy.

Limitations of our study include the significant heterogeneity associated with our retrospective study. The creation of an ileostomy was ultimately performed at the discretion of the colorectal surgeon. Procedures which required stoma creation was also not uniform, with some being created in the setting of cancer, whilst others for benign disease. Our study may also have had an insufficient sample size, leading to a type 1 error in the identification of possible risk factors leading to readmission as well as non-reversal. Nonetheless, we believe that

our study provides a broad overview of the key challenges which a patient with an ileostomy may face, and will help in a more detailed counselling of a patient prior to stoma creation, as patients need to be made aware of the significant risk of both readmission and non-reversal of the stoma.

Conclusions

Almost half of the patients who had an Ileostomy had an undesirable outcome, including readmissions, non-reversal, and post-operative complications following closure. Patients need to be properly counselled about the risks involved prior to the index operation.

Compliance with ethical standards

Institutional Review Board (IRB) ethics approval was obtained for this study.

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