



Morbidity associated with closure of ileostomy after a three-stage ileal pouch-anal anastomosis

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Abstract

The aim of the study was to compare the perioperative outcomes of patients undergoing ileostomy closure after a three-stage ileal pouch-anal anastomosis to a control group of patients who had elective colorectal resections and stoma, and to analyse the differences based on the technique of closure. The cases were retrospectively compared for demographic characteristics and postoperative outcomes. Chi-square, Fisher's exact and Wilcoxon rank sum tests were used as appropriate. Between 2011 and 2016, 338 patients having their stoma reversed after three-stage IPAA were compared to 158 patients in the control group. A younger age (43.2 vs 60.6 years, $p < 0.0001$), a lower body mass index (22 vs 24.4 kg/m², $p < 0.0001$), a higher rate of hand-sewn anastomosis (84.3 vs 15.7%, $p < 0.0001$), a lower rate of intraoperative complications (0 vs 1.2%, $p = 0.038$), a shorter operative time (91.5 vs 99.4 min, $p = 0.0046$) and length of hospital stay (6.6 vs 7.6 days, $p = 0.045$) were seen in the IPAA group. The 30-day rate of wound infection, anastomotic leak (0.6 vs 0.6%), small bowel obstruction (SBO, 8 vs 11.4%) and reoperation (1.8 vs 1.3%) was similar. Among IPAA patients, the hand-sewn anastomosis was correlated with a higher chance of developing SBO (9.1 vs 1.9%, $p = 0.03$). Closure of ileostomy after three-stage IPAA is associated with low rate of serious complications, despite the higher number of previous abdominal surgeries. This supports the construction of routine ileostomy during IPAA to reduce the risk of pelvic sepsis.

Keywords Ileostomy closure · Morbidity · IPAA · IBD

Introduction

Restorative proctocolectomy and formation of ileal pouch-anal anastomosis have been widely accepted as the standard treatment for ulcerative colitis and familial adenomatous polyposis requiring surgery [1].

The procedure, however, could be frustrated by the onset of several complications, the most serious being the pelvic sepsis secondary to an anastomotic leak, which could occur in almost 20% of patients even in tertiary centres [2, 3].

Therefore, many surgeons prefer to perform a loop ileostomy at the time of the pouch formation, as studies in the past showed improved outcomes in patients who had a protective stoma [4, 5]. However, this cautious behaviour has been recently challenged by few authors, who showed a similar incidence of anastomotic dehiscence regardless of the presence of the ileostomy [6]. Moreover, a non-ignorable rate of complications related to the presence of the stoma or to the reversal procedure has to be acknowledged [7, 8].

A recent systematic review showed that the ileostomy closure was associated with an overall morbidity of 16.7%, and in particular with an incidence of anastomotic leak and bowel obstruction of 2% and 7.6%, respectively [9].

The ileostomy could be closed either using a stapler or performing a hand-sewn anastomosis. Several studies analysed the outcomes of the procedure depending on the technique. While a multicentric randomised clinical trial showed no differences [10], subsequent meta-analyses showed a superiority of the stapled technique regarding the rate of bowel obstruction [11, 12]. The great majority of patients

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involved in the studies, however, had an ileostomy formation after a rectal resection for cancer.

Patients who have their ileostomy closed after IPAA are likely to differ from cancer patients. A significant percentage of them, in fact, still undergoes a three-stage pouch formation, meaning that they had at least two previous abdominal procedures. Therefore, more adhesions and a lack of mobility of bowel should be expected. This could negatively affect the rate of intraoperative complications and postoperative small bowel obstruction. In those cases, the surgeon might prefer a hand-sewn suture, to reduce the necessary dissection of the adhesions, the operative time and the risk of bowel injury.

It is not clear whether the morbidity related to the reversal could be different if the ileostomy was performed during an IPAA or other colorectal procedures, as there is a lack in the literature of studies comparing large volumes of patients.

Similarly there is a paucity of studies analysing the outcomes based on the surgical technique (stapled or hand-sewn) of closure of ileostomy after IPAA, and the few published included only small series of patients [13, 14].

The aim of the study is, therefore, to compare two groups of patients undergoing ileostomy closure after a three-stage IPAA or elective colorectal resection, for patient's characteristics, perioperative variables and rate of 30-day complications, in a tertiary centre for inflammatory bowel disease and colorectal surgery.

The secondary aim is to compare the postoperative outcomes among IPAA patients depending on the technique of closure.

Materials and methods

All patients who underwent an elective ileostomy reversal procedure between 2011 and 2016 were retrospectively analysed.

The data regarding the previous surgery were evaluated. Patients who had a procedure for Crohn's disease were excluded from the study, as the population case-mix, as well as the type of stoma performed, could differ widely in this subgroup of cases. Patients who had a one- or two-stage IPAA (including those with a diagnosis of familial adenomatous polyposis) were also excluded.

Patients were divided into two groups, those who had a three-stage IPAA formation and those who underwent an elective open colorectal resection for cancer or diverticular disease plus protective loop ileostomy. From the latter group, patients who had previous laparotomies were excluded, to make the group more homogenous.

Demographic characteristics and perioperative variables were analysed. In particular, the operative time, the closure technique, the time to first bowel movements, the rate of

30-day postoperative complications, and the length of hospital stay were compared between groups.

A sub-analysis was performed only among the IPAA patients based on the technique of reversal, to detect any difference in outcomes.

Postoperative complications were grouped according to the Clavien–Dindo classification [15].

Variables were presented as mean (\pm standard deviation, SD) or number (%). Comparison of categorical variables was analysed with chi-square or Fisher's exact test as appropriate, and Wilcoxon rank sum test was used for quantitative and ordinal variables.

A p value < 0.05 was considered significant. Statistical analyses were performed using JMP version 11 (SAS Institute, Cary, NC, USA).

Study data were collected and managed using REDCap (Research Electronic Data Capture) tools hosted at Alma Mater Studiorum University of Bologna [16].

The study was approved by the Institutional Ethical Committee.

Results

After application of the exclusion criteria, 338 and 158 patients were included in the IPAA and colorectal surgery groups, respectively.

The comparison between groups is summarised in Table 1. Patients who underwent a closure of ileostomy after an IPAA formation had a significantly younger age, lower rate of American Society of Anesthesiologists (ASA) score 3, lower Body Mass Index (BMI), and a lower rate of ileostomies performed during an emergency reoperation.

The time between the ileostomy formation and its closure was similar between groups. A significantly higher percentage of IPAA patients had an ileal–ileal hand-sewn anastomosis at the time of ileostomy closure (84.3 vs 15.7%, p 0.0003), and a shorter operative time was recorded in the study group. No intraoperative complications or need of laparotomy were recorded in this group (in control group 1.27%, p 0.0038).

No differences in the incidence of 30-day complications, as well as in their distribution among the Clavien–Dindo classification, were seen in the two groups. IPAA patients required a significantly shorter time to first bowel movements (2.6 vs 3.3 days, $p < 0.0001$) and length of hospital stay (6.6 vs 7.6 days, p 0.045).

A similar rate of patients (9.5 vs 10.4%, p 0.77) underwent an emergency operation in the long-term follow-up due to bowel obstruction.

When sorted by the technique of closure, the two subgroups of IPAA patients were characterised by similar BMI, time from ileostomy formation, operative time, time to first

Table 1 Comparison of perioperative variables and characteristics of patients who underwent a reversal of ileostomy after IPAA surgery or colorectal resections

	IPAA	Control group	<i>p</i> value
Number of patients	338	158	
Age	43.2 (± 14.3)	60.6 (± 16.4)	<0.0001
Male gender	196 (58%)	85 (53.8%)	0.38
ASA score 3	74 (22.1%)	68 (44.1%)	<0.0001
BMI	22 (± 3.8)	24.4 (± 4.5)	<0.0001
Stoma performed during reoperation	7 (2.1%)	11 (7%)	0.0067
Time from formation (months)	8.8 (± 9.7)	9.3 (± 5.3)	0.25
Hand-sewn anastomosis	285 (84.3%)	53 (15.7%)	0.0003
Intraoperative complications	0	2 (1.2%)	0.0038
Operative time (min)	91.5 (± 24.3)	99.4 (± 34)	0.0046
Necessity of laparotomy	0	2 (1.27%)	0.0038
First bowel movement (days)	2.6 (± 1)	3.3 (± 1.3)	<0.0001
Length of hospital stay (days)	6.6 (± 3)	7.6 (± 7.4)	0.045
30-day medical complications	21 (6.2%)	16 (10.1%)	0.12
Anastomotic leak	2 (0.6%)	1 (0.6%)	0.95
30-day SBO	27 (8%)	18 (11.4%)	0.21
Wound infection	14 (4.1%)	8 (5%)	0.81
Clavien–Dindo classification			
Grade I–II	27 (8%)	20 (12.7%)	0.1
Grade IIIb	6 (1.8%)	2 (1.3%)	0.7
Long-term reoperation rate for SBO	32 (9.5%)	15 (10.4%)	0.77

Variables are expressed as number (%) or mean (± standard deviation)

ASA American Society of Anesthesiologists, BMI body mass index, SBO small bowel obstruction

bowel movement and length of hospital stay, regardless of having had a stapled or a hand-sewn anastomosis.

Patients who underwent a hand suture closure had a higher chance to develop small bowel obstruction (9.1 vs 1.9%, *p* 0.03). However, no reoperation was necessary and the conservative treatment was successful in all cases (Table 2).

Among the 285 hand-sewn cases, the surgeon preferred a direct closure of the enterotomy (hemi-anastomosis) in 38 patients (13.3%), while in the others a resection of the stoma and an end-to end interrupted suture was performed. No difference was seen in these two subgroups.

Discussion

The routine formation of ileostomy during IPAA procedures has been put in discussion in the last years, as a high rate of morbidity specifically related to the presence of the stoma was shown that, in some author’s opinion, could overcome the advantages of the diversion [4]. It was advocated, therefore, that in selected patients a one-stage procedure could be safely performed [7, 8, 17].

On the other hand, a recent meta-analysis demonstrated a significantly higher risk of anastomotic leak in patients undergoing an IPAA without ileostomy [18].

Table 2 Comparison of perioperative variables and characteristics of patients who underwent a reversal of ileostomy after IPAA sorted by the technique of closure

	Hand sewn	Stapled	<i>p</i> value
Number of patients	285	53	
BMI	22.1 (± 4)	21.8 (± 3.1)	0.30
Time from formation (months)	8.8 (± 10.4)	8.5 (± 3.9)	0.31
Operative time (min)	92.1 (± 24.3)	87.7 (± 24.2)	0.11
First bowel movement (days)	2.6 (± 1)	2.77 (± 1)	0.54
Length of hospital stay (days)	6.7 (± 3.2)	6.3 (± 1.8)	0.9
30-day medical complications	16 (5.6%)	5 (9.4%)	0.31
Anastomotic leak	1 (0.4%)	1 (1.9%)	0.25
30-day SBO	26 (9.1%)	1 (1.9%)	0.03
Wound infection	11 (3.9%)	3 (5.7%)	0.71
Clavien–Dindo classification			
Grade I–II	26 (9.1%)	1 (1.9%)	0.038
Grade IIIb	4 (1.4%)	2 (3.8%)	0.23
Long-term reoperation rate for SBO	28 (9.9%)	4 (7.6%)	0.72

Variables are expressed as number (%) or mean (± standard deviation)

BMI body mass index, SBO small bowel obstruction

In our unit, the routine procedure remains a two- or three-stage pouch formation. Being a national tertiary centre, we

mainly operate on ulcerative colitis patients treated by gastroenterologists all over the country. Therefore, there is no uniformity of the medical treatment algorithm, as well as of the timing of the surgical indication. Most of these patients have been exposed to anti-TNF- α drugs for a long period of time, and come to our attention being in an impaired nutritional status. The same situation happens in other referral centres. The Cleveland Clinic group, for instance, reported a significantly higher risk of pelvic sepsis in patients undergoing IPAA who preoperatively had biological medication, and suggested to perform an initial subtotal colectomy in these cases [19].

In any case, regardless of the previous medical treatment, the formation of a pouch without a diverting stoma remains a risk. These patients are usually young and very motivated not to have permanent ileostomy. Pelvic sepsis was shown to be a great risk factor for long-term pouch failure [20].

A recent, retrospective multicentric study showed that the rate of IPAA anastomotic dehiscence was not reduced by the presence of a stoma [6]. The study included 621 patients from three European centres. The reported incidence of leaks was particularly high (around 17% in both groups), and no difference was seen in the rate of reoperation and long-term pouch failure. However, the authors did not report any long-term functional result. A previous study from the Cleveland Clinic (including over 3000 patients) confirmed that pelvic sepsis is associated with poor functional outcomes [21]. It is reasonable to expect a leak to be more easily manageable should the anastomosis be already diverted, especially in consideration of the new endoscopic techniques that can be performed also in IPAA leaks and are associated with a great chance of healing of the defect [22].

The morbidity surrounding the presence of the ileostomy and its closure, however, must be taken into account [23]. In a recent review, Mennigen et al. showed an overall rate of small bowel obstruction (SBO) following stoma reversal after IPAA of 7.6%, with 2.9% of patients requiring a reoperation [9]. Anastomotic leak occurred in 2% of cases.

The present study aimed to evaluate the outcomes after closure of ileostomy in patients undergoing a three-stage IPAA. These are supposed to be at higher risk of SBO and reoperations, as at least two previous abdominal surgeries were performed. A recent study showed that IPAA is per se an important risk factor for developing SBO, and Bueno-Lledó et al. confirmed that the risk of failure of conservative management of SBO was associated with a history of two or more previous laparotomies [24, 25].

The higher rate of hand suture in the IPAA group could indirectly support the findings mentioned above. A hand-sewn anastomosis, in fact, requires less mobilisation of the bowel, which could be technically demanding and associated with a chance of undiagnosed enterotomies, especially in the presence of severe adhesions.

The choice of the technique, obviously, also depends on the surgeon's inclination. Given the retrospective nature of the study, it was not possible to distinguish whether a manual suture was performed due to a difficult adhesiolysis or just for the operator's preference. However, the distribution of the surgeons between the two groups was homogenous, thus reducing the bias.

The rate of anastomotic leak in the present study is 0.6% in both groups, likely reflecting the high volumes of the centre and the standardisation of the techniques among senior surgeons and registrars. The rate of SBO is similar to that reported in the previous studies, 8% in IPAA cases and 11.4% in the control group. A reoperation was necessary in 1.8% of IPAA patients (1.2% for SBO and 0.6% for anastomotic leak). All patients in the control group who suffered a SBO were managed conservatively.

Among IPAA patients, a significant rate of 30-day SBO was seen when a hand-sewn suture was performed. Similarly, two recent meta-analyses showed a lower risk of SBO after stapled anastomosis [11, 12]. On the contrary, in their randomised control trial, Hasegawa et al. did not detect any difference based on the technique in the subgroup of patients who had an IPAA operation, although the number of cases was less than 60 [14].

This study confirms that ileostomy closure after a three-stage IPAA is inexorably associated with morbidity, although the rate of anastomotic leak and SBO requiring a relaparotomy remains low in tertiary centres, and that the outcomes are at least comparable to those of patients who had an ileostomy associated with other colorectal procedures.

Although a one-stage procedure could be advocated in selected patients, a balance between the risk of these complications and that of pelvic sepsis, poor functional outcomes and pouch failure has to be made. In our opinion, the preservation of the functionality of the pouch remains the priority.

A hand-sewn suture might overcome the intraoperative difficulties associated with the presence of dense adhesions, and it should be performed when necessary as it does not negatively impact the operative time and the length of hospital stay, although a greater chance of developing small bowel obstruction has to be expected.

Conclusions

Ileostomy closure after a three-stage IPAA procedure is associated with a low rate of serious complications and reoperations. However, the patients should be aware of the morbidity correlated to the presence of the stoma, in particular the small bowel obstruction. Given the current scientific evidence that the absence of the stoma brings risks of poor long-term pouch function due to previous pelvic sepsis, an

ileostomy should be routinely performed during pouch construction surgery.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals All procedures performed in the present study involving human being were in accordance with the ethical standards of the institutional and national research committee and with 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was signed by all patients.

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