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# Ileostomy closure: Single institute study

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***Abstract*---**Introduction: Faecal diversion is an effective procedure to protect bowel anastomosis at high risk for leak. Loop ileostomy is more or less acceptable method for faecal diversion. Some concerns still exist regarding the risk for a significant morbidity and complications associated to ileostomy creation itself and moreover to its closure. Surgical expertise and closure techniques are considered potential factors influencing mortality. Aim of the study is to present a single institutional experience with ileostomy closures, in a high-volume training hospital, where ileostomy reversal is mainly performed by young surgeons. Methods: A retrospective study was done to evaluate data of patients who underwent loop ileostomy and ileostomy closure between June 2017 to June 2021 at Dhiraj Hospital Sumandeep Vidyapeeth , Pipariya , vadodara. Ileostomy closure was always done in hand-sewn fashion, performing either a direct closure (DC) or a resection plus end-to-end anastomosis (EEA). Postoperative morbidity was graded according to Clavien-Dindo classification. Outcomes after both methods were compared by Fisher's exact test and Wilcoxon rank-sum test. Results: Hundred and four patients were included. Ileostomy reversal was performed by EEA in 86 patients

(82.69%) and by DC in 18 patients (17.30%). Surgery was performed with a peristomal access in 93 cases (89.42%). Incidence of anastomotic leak was 0.96% (1/104), abdominal abscess 0.96% (1/104). Overall reoperation rate was 0.96 % (1/104). Short-term overall morbidity rate was 17.30 % but major complication (≥ grade III) occurred only in 1 patient (0.96 %). Mortality was nil. No significant difference in postoperative morbidity were found between DC and EEA group. Conclusion: Loop ileostomy is a safe procedure, with low morbidity and good results, even if performed with a hand-sewn technique by young surgeons.

***Keywords*---**Ileostomy, institute study, closure, postoperative.

## Introduction

Ileostomies are performed in surgical tertiary care referral centre in cases of emergency laparotomy for bowel perforation peritonitis, trauma, stab injuries and in elective cases like colorectal malignancy, ileocecal tuberculosis [1].On the other hand, bowel anastomosis are impaired by the risk for faecal leak, which can lead to peritonitis, septicaemia and eventually mortality [2].The risk for anastomotic leakage (AL) may depend on several aspects: intraoperative factors (e.g., blood loss, contamination) [3], patient-related factors (comorbidities, radiotherapy, drug therapy) [4] ,the site of anastomosis [5] underlying disease for which anastomosis is made and, above all, surgeons expertise [6] When the risk for faecal leak is relatively low for elective colorectal and ileocolic resection, it gets significantly higher in emergency resections [7] and in these situations a faecal diversion through a loop ileostomy is generally considered mandatory. The choice of diversion should be probably individualised case by case in the light of the presumed complication rate related to the ileostomy fashioning itself and above all to its closure. Data from literature show a wide variety in the reported morbidity (9.3-45.9 %) [8] and mortality rate (1.7-6.4 %) [9] after ileostomy reversal, and some authors argue how a proper decision-making process should guide the surgeon whether to divert or not, because ileostomy-related complications might counterbalance the benefits from their creation [10]. One more issue to consider is the impact of the surgical expertise on ileostomy closure related complications; some authors report how postoperative morbidity may be higher if the operation is performed by non-certified surgeons [6]. Lastly, different techniques exist to revert the ileostomy (e.g., stapled side-to-side, direct hand-sewn closure and resection + end-to-end hand-sewn anastomosis), and the selected closure technique might also play a role in determining surgical outcomes [11]. Aim of the study is to present a single-institution experience in ileostomy reversal, over a 5-year period, in a teaching hospital whereas ileostomy closure is mainly considered by young surgeons. Operations were then performed by senior residents in a supervised environment; a retrospective study was done and outcomes, and complications were graded using standardised tools [12]

## Materials & Methods

A prospectively maintained database was investigated to extract data of patients who underwent surgery for loop ileostomy closure between June 2017 to June 2021. Cases were excluded if the operation was performed by a consultant surgeon or when patients underwent concurrent abdominal procedures. Baseline characteristics included age, sex, ASA status, and primary diagnosis. Operative data included operative time (min), type of incision (peristomal or midline), type of anaesthesia (spinal or general), and ileostomy reversal technique (hand-sewn resection plus end-to-end anastomosis: EEA group; hand-sewn direct closure without resection: DC group). Recovery data were also analysed and included days to bowel movement, days to tolerate soft diet, and postoperative length of hospital stay (days). Surgical complications are listed in Table *1*. Short-term overall morbidity, mortality, and reoperation rate were quantified and were scored using the Clavien - Dindo classification [12]. Patients who experienced more than one complication were counted once with their highest-grade complication. We considered as major complications, those with a Clavien-Dindo score ≥ III (Table *2*). In addition to this classification, the following surgical complications were described: ileus/partial small-bowel obstruction (defined as the inability to tolerate oral feedings after eating a regular diet and/ or 5 or more days of nothing to eat or drink or radiologic evidence of dilated small bowel, not requiring reoperation), small-bowel obstruction requiring reoperation, anastomotic leak (AL) (confirmed at abdominal exploration or abdominal imaging), abdominal abscess (confirmed at abdominal exploration or abdominal imaging without any signs of AL), and wound complications (infection/breakdown); all other causes of reoperation were also reported. Medical complications were defined as the presence of at least 1 of the following complications: electrolyte abnormalities, anaemia requiring blood transfusion, new-onset atrial fibrillation, cardiac heart failure, myocardial infarction, and renal failure.

Patients were stratified according to the surgical technique of ileostomy reversal (EEA or DC) and results between groups were compared. Ileostomy reversal was performed at least 8 weeks after ileostomy construction by a senior resident. DC was performed leaving intact the mesenteric side of the ileal loop and with a transverse double-layer suture on its anti-mesenteric side. A meticulous adhesiolysis, obtaining good fresh bowel edges, was considered mandatory to perform the direct closure. EEA technique required the resection of the ileal loop involved in the stoma and a subsequent end-to-end handsewn double-layer anastomosis: the posterior inner layer was performed continuous over and over continuous 3 - 0 Vicryl suture, followed by anterior Connell's sutures with Vicryl 3-0 suture, a outer layer was performed by Lambert's sutures with Silk 2 - 0. Continuous variables were summarised as median and range and were compared between two groups by the Wilcoxon rank-sum test; proportions were instead compared by the Fisher exact test. A p value ≤0.05 was considered to be statistically significant for all the analyses, that were performed using STATA 12 Statistical software (STATA Corp, College Station, Texas, USA)

Table 1
Complication rates

| Complication | Incidents (Patients) |
|---|---|
| Wound infection/breakdown | 8.65% (9/104) |
| Ileus | 6.73% (7/104) |
| Anastomotic leak | 0.96% (1/104) |
| Abdominal abscess | 0.96% (1/104) |
| Death | 0 |

Table 2
Complications graded according to Clavien-Dindo classification

| Grade | Definition | Incidence (patients) |
|---|---|---|
| I | Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions (Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgesics, diuretics and electrolytes and physiotherapy) | 10.57% (11/104) |
| II | Requiring pharmacological treatment with drugs other than such allowed for grade I complications. (Blood transfusions and total parenteral nutrition are also included) | 12.5% (13/104) |
| III | Requiring surgical, endoscopic or radiological intervention | |
| IIIa | intervention not under general anaesthesia | 0.96% (1/104) |
| IIIb | intervention under general anaesthesia | 0% |
| IV | Life-threatening complication (including CNS complications) and/ or requiring IC/ICU-management | 0% |
| IVa | Single organ dysfunction (including dialysis) | |
| IVb | Multi organ dysfunction | |
| V | Death of patient | 0% |

**Results**

Over a period of 5 years, 122 ileostomy closures were performed, 104 surgeries (85.24%) of these were performed by senior residents, so were included in the analysis.Fifty seven patients were female (54.80%), the median age was 43 (18-78) years, median BMI was 23.4 kg/m2 (15.5-38.2) and the most common ASA score was 4 (60.57). Primary diagnosis was ileocecal tuberculosis 18 (17.30%),

rectal malignancy 17 (16.34 %), colon malignancy 13 (12.5 %), tubercular perforation peritonitis 11 (10.57 %),Trauma 11 (10.57%), stab injuries 10 (9.61%), ulcerative colitis 10 (9.61%) enteric perforation 7 (6.73 %), diverticular disease 5 (4.81%), gangrenous rectal prolapse 1 (0.96 %), Crohn's disease 1 (0.96%). Ileostomy reversal was performed under spinal anaesthesia in 95 cases(91.35%). A peristomal incision was made in 93 cases (89.42%), midline laparotomy was required in 11 (10.58%) cases due to dense adhesions, most frequent cause was tubercular perforation followed by enteric perforation. Ileostomy reversal was performed with a resection plus end-to-end anastomosis (EEA group) in 86 patients (82.69%) while DC was performed in 18 patients (17.31%). Wound closure was performed with interrupted vertical mattress skin sutures.

Operative time was significantly longer in the EEA group, 65 (45- 145) min, than in the DC group, 50 ( 35- 110) min ($p < 0.05$). Days to bowel movement, days to tolerate soft diet and postoperative length of hospital stay were, respectively, 2 (1-11), 2( 1 - 13) and 4 (2-22) days. Overall short term morbidity rate, including both surgical and medical complications, was 17.30 % (Table *2*). According to the Clavien-Dindo classification, major complications (≥ grade III) occurred in only one patient (Table *2*). One patient had AL (0.96%) managed conservatively. One patient developed abdominal abscess; this was the only case requiring surgical intervention for drainage, determining an overall reoperation rate of 0.96 %. Postoperatively ileus occurred in 7 patients (6.73 %) and was medically treated with success in all cases. Wound infection/ breakdown rate was 8.65% (9/104); Mortality was nil. Postoperative morbidity did not differ between EEA and DC groups (Table *3*).

Table 3
Complications according to reversal technique

| Complications | EEA group (n 86) | DC group (n 18) | p value |
|---|---|---|---|
| Wound infection | 4.80% (5) | 3.84% (4) | 0.07 |
| Ileus | 3.84% (4) | 2.88% (3) | 0.12 |
| Anastomotic leak | 0.96% (1) | 0 | 1 |
| Abdominal abscess | 0.96% (1) | 0 | 1 |

## Discussion

Anastomotic leak and its sequelae is most dreadful complication to any surgeon. Faecal diversion is the most effective way to prevent this. [13,14]. Many factors influence the risk of anastomotic leak, but the most significant is anastomotic site . The risk for leak is higher for lower anastomosis and even higher for coloanal [15]. Studies assert that distal site imply greater surgical stress [16], lack of blood supply [13], anastomotic tension [15]. Some studies suggest that Intestinal flora has a central role, increased the level of intraluminal bacterial contamination aborally and therefore possibility of infected microscopic leakage [15]. Hostile intra abdominal conditions such as in perforation peritonitis, tuberculosis can also leads to anastomotic leaks [17] Hypoalbuminemia can leads to anastomotic leak. Hypoalbuminemia and nutritional deficiencies are more common in tubercular patients [18]. In fact,

and it's crucial, faecal diversion does not diminish the number of leaks, but drastically reduces the number of symptomatic dehiscences [19]; in other words just decreases the clinical effects of leaks. Some cases deserve an individualised assessment, but decal diversion shows a clear benefit in case of Colo anal anastomosis, ultra-low anterior resection, in case of neoadjuvant radio-/ chemo-therapy, tuberculosis, faecal peritonitis and enteric perforations or in any condition with contaminated peritoneal cavity.
On the other hand, concerns still exist regarding the safety ileostomy construction and reversal. Ileostomy closure is often associated to significant morbidity rates ranging between 9.3 and 45.9 %[8-10,20] and a mortality between 0.06 and 6.4 % [21,22]. These values would be even higher when Surgery is performed by surgical residents or young surgeons. Three major techniques are described to perform loop ileostomy reversal: resection plus handsewn end to end anastomosis, Direct Closure, and stapled anastomosis. Löffler et al. [6, 23] compared stapled vs handsewn and demonstrated a shorter operative time and lower incidence of postoperative ileus after stapled procedures; no other statistically significant differences could be proved. In a large series from Mayo Clinic [11], the fold-over technique resulted in a shorter operative time compared with handsewn end-to-end; this latter technique was also affected by a higher post-operative ileus rate compared with stapled closure. But when comparing these three procedures, there is probably another factor to consider: stapled technique is less operator-dependent, thus providing more homogeneous results. In fact, the use of staplers allows the definition of a completely standardised technique, and this brings to better reproducibility and constancy of results [24,25].

On the other hand, an appropriate learning curve for proper bowel anastomosis is crucial for young surgeons. Our institution is a teaching hospital and loop ileostomy reversal is considered a good learning model. Supervised young residents can become confident to intestinal wall suturing and ileostomy reversal represents an ideal bridge to more complex procedures. This consideration explains our institutional approach to choose handsewn techniques, apart from cost considerations. The presented results do support this choice. In fact, despite an overall short-term morbidity rate of 24 %, we report a very low major complications rate (0.96 %), with absent mortality and patients usually discharged 4 days after surgery.

Comparing these results with data reported from a multicentre randomised controlled trial (HASTA Trial) [6], our experience is associated to a lower incidence of post- operative ileus (6.72% vs. 11.9 %) and anastomotic leak requiring surgery (0 vs. 2.4 %) [6]. The average length of hospital stay after ileostomy closure is generally between 2 and 5 days [8], and it was 4 days in almost all our patients. In our experience, handsewn technique offers results comparable to those achieved by other Authors with stapled technique. It’s undeniable that surgery is living its stapler era and loop ileostomy closure also has been more and more commonly performed with stapled techniques in the last years. In a series from Mayo Clinic [11] stapled ileostomy reversals are 33.3 %, but in some experiences they get to 97.4 % [26]. It might be argued that this trend is not completely justified and in our experience handsewn techniques is associated with very good results, other than offering the advantage to allow the

accomplishment of a crucial training step for young surgeons and, perhaps, cost saving.

Our results are within the variability range described in literature, but are probably placed in its virtuous portion, with absent mortality (0 %), low major complications (0.96%), and reoperation rate (0.96 %). Being said, these results encourage us to persist in exploiting handsewn techniques, also as tools to improve skills of young surgeons. We deduce that a senior resident's supervision is sufficient to avoid higher complication rates and stapled techniques are not mandatory, even in a training setting. To grade surgical complications, the classification of surgical complications proposed by Clavien-Dindo was used [12]. It has been validated as a reliable and standardised tool for the assessment of post-operative complications [18]. The main purpose of a protective ileostomy is to reduce the risk of a symptomatic anastomotic leak (grade III), which can also lead to the patient to death (grade IV-V): we therefore focused on major complications (≥ grade III) related to the ileostomy reversal itself. If ileostomy protection reduces major complications, then the real counterpoints to its execution are ≥ grade III complications; in other words, the complications that can mitigate the benefit of construction and reversion of ileostomies are grades III, IV, and V complications only. Based on these considerations, we believe that loop ileostomy reversal is a safe procedure, a good training model for young surgeons, other than an effective tool to prevent major morbidity secondary to high-risk anastomosis.

## Conclusions

Loop ileostomy reversal is a safe procedure, associated to a low major morbidity and good results, even if performed with handsewn techniques by supervised young surgical resident, thus representing a good training model for bowel surgery.

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