Short Term Outcome of Early Closure of Diverting Loop Ileostomy in Patients with Emergency Benign Colo-Rectal Pathologies; a Prospective Controlled Pilot Study

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Introduction: The aim of creating loop ileostomy is to avoid complications of anastomotic leak after colonic anastomosis procedure. This has to be balanced with the consequences of prolonged diversion. The aim of this study is to investigate the short-term outcome of early closure of loop ileostomy in cases diverted for emergency benign indications after distal colectomies and primary anastomosis.

Patients and method: 30 patients presented in the emergency department with destructive colonic and rectal injuries who underwent left colonic, sigmoid, or rectal resection with primary anastomosis and diverting loop ileostomy procedure, were recruited for early loop ileostomy reversal. Patients were observed for stoma complications before reversal operation, in addition to the feasibility of reversal and postoperative complications developed in the first month after restoration of bowel continuity. Findings were compared to those of the last 30 correlated patients in our database who had their ileostomy reversed after 3-6 months.

Results: Before reversal, 3 patients developed peristomal dermatitis, 2 cases developed retraction, 5 cases developed dehydration and electrolyte imbalance. Failure of anastomosis healing occurred in 3 cases with 3 other patients excluded for failure of labs normalization. Uneventful reversal operation was done to the rest of cases. After reversal, 8 cases of wound infection and 2 cases of localized collection were detected, all managed non-operatively. 1 case needed re-laparotomy for colonic perforation away from the anastomosis.

Conclusion: Upon a strict selection criterion, short-term diversion with loop ileostomies is an appealing, feasible option for non-malignant indications of fecal diversion in coloproctology.

Key words: Loop ileostomy, early reversal, stoma complications.

Introduction

A temporary loop ileostomy is usually performed as a "cover" for a distal at-risk colorectal or coloanal anastomosis.[1] It is even, a "life-saving" procedure in some cases of intestinal obstruction. However, it is associated with numerous complications.[2] Skin complications are the most common one ranging from mild skin irritation up to ulceration and necrosis.[3] Dehydration is a common cause of readmission in those patients.[4] The psychological impact and the disturbed psychosocial life are not to be underestimated.[5] The stoma-related complication rate ranges from 10-52%.[6] It is estimated that 85-90% of patients with loop ileostomies are not in need of their stoma i.e., they are getting complications rather than benefits.[7] This is why early closure of loop ileostomies was advocated by many authors in selected cases.[7] Investigating that assumption in patients with distal colon and rectal malignancies, the idea was strongly condemned and thus, refused for safety concerns; having many studies been terminated prematurely.[8,9] Limited research to investigate the idea of early closure of loop ileostomies in patients with benign conditions, was accomplished especially in emergency cases and usually not in dedicated research.[10] The aim of our study is to explore the feasibility of early loop ileostomy closure in patients having their ileostomies for emergency benign indications after limited distal colonic resection i.e., left colonic, sigmoid or rectal resection and primary anastomosis; recording the short-term outcome after stoma reversal as well as the morbidities sustained during the interval between stoma creation and take-down.

Patients and methods

The acceptance of the ethical committee was received for the whole protocol of the study. Subsequently, 30 patients with virgin abdomen i.e., no history of previous laparotomy, presenting with non-malignant distal gastrointestinal emergencies i.e., obstruction, destructive trauma whether penetrating, blunt or iatrogenic, severe inflammatory lesion within the left colon or rectum requiring resection, anastomosis, and diversion, were recruited. Anal lesions were excluded (they would need either diversion or abdominoperineal resection). Destructive trauma was defined as those affecting more than 50% of the bowel circumference. Patients recruited in our study, should be fit for anesthesia i.e., ASA I, II and candidate for the assigned operation i.e., distal colonic resection, anastomosis with proximal covering loop ileostomy. Patients with impaired wound healing, e.g., those with collagen disease and those on steroid or immunosuppressive medications, were excluded. Initial resuscitation was done for all cases according to the ATLS protocol. The required consents were obtained from the patients or their first-degree relatives if the patient was unconscious. Otherwise, a triple committee would sign the consent instead. Under general anesthesia, formal exploration was done through a midline incision. Patients with malignant lesions, terminal

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ileal disease, or mesenteric vascular insult, were excluded and replaced by other patients. Patients requiring multiple segmental resections were also, excluded for better interpretation of the data. Colonic resection was done followed by primary anastomosis using endo GIA staplers (linear or circular according to the level of the lesion). This was followed by construction of proximal loop ileostomy 15-20 cm from the ileocecal junction using 3/0 polyglactin sutures. The application of plastic rod to prevent stoma retraction is not a routine in our institution; all patients had their stoma matured and nippled, using mucocutaneous sutures. For ethical purposes and to avoid bias in data interpretation, patients requiring postoperative ICU admission beyond the second postoperative day, were excluded, and replaced with other patients. The time needed for patients to have their ileostomy functioning, was recorded. That was the time when patients would start oral diet gradually. The stoma and peristomal area, beside the midline incision were examined daily for any developing complication, namely: peristomal dermatitis, wound infection, stoma mucocutaneous separation, stoma retraction and stoma viability. Full lab investigations were done every other day (CBC, Na, K, albumin). Pelviabdominal ultrasound was done on day 5 for intraabdominal collection and distal loopogram at postoperative day 7 to assess anastomosis healing, provided patient`s lab results were normalized. Patients with abnormal labs or incomplete anastomotic healing (as evident by leaking contrast during the loopogram), were considered as failed technique and were managed accordingly. Otherwise, patients had their stoma reversed at postoperative day 10-14. Under general anesthesia, local dissection of the stoma was done, followed by bowel continuity restoration using linear staplers. The abdominal wall defect was closed in layers using zero polydioxanone (PDS) sutures for the muscle layer, 2/0 polyglactin (vicryl) sutures for subcutaneous tissue and prolene 2/0 sutures for the skin. Those patients would be followed for postoperative complications, namely: anastomotic leakage, prolonged ileus and wound infection. Patients were put on enhanced recovery after surgery (ERAS) track i.e., adequate perioperative hydration, early oral feeding as tolerated by the patient, judicious use of drains and catheters. They were discharged when tolerating regular diet, vitally stable with normal labs; most of the cases on postoperative day 4. Regular post-discharge visits were scheduled weekly at the outpatient department for one month, recording any evolving complications as regards the main as well as the second operation of restoring bowl continuity i.e., both wounds' complications (midline and stoma site), unexplained abdominal pain (suspicious for anastomotic leakage), unexplained fever and oral intake intolerance. For sake of comparison of the outcome with our current status, the results were compared with a control group of 30 correlated patients from our database having their loop ileostomies closed after a latent period 3-6 months after diversion.

Results

During the period from October 2023 till November 2024, 30 patients presenting to our ER department were recruited. The data of the patients is shown in **Table 1**. Of the recruited patients, 7 males and 4 females, were medically free by history. The rest of patients had variable comorbidities **Table 2**. Recruited patients had their pathologies, and thus the site of resection, distributed among the rectum (10 patients), sigmoid colon (12 patients), descending colon (2 patients) and splenic flexure (6 patients). Rectal injuries included traumatic injuries (Rectal enemas in 2 cases and accidental foreign body introduction in 2 cases) and iatrogenic injuries (Gynecological in 5 cases and 1 case during rectopexy) **(Table 3)**. Sigmoid pathologies were more common and were versatile **Table 4**. 2 male cases presented with descending colonic injury following stab wound and 6 patients with splenic flexure injury; 5 cases of them followed colonoscopy for idiopathic constipation and 1 case following a stab wound (That was affecting the left lung and spleen simultaneously) **(Fig. 1)**. 10 patients required one day of ICU for overnight observation of vital signs for associated comorbid conditions. One case developed mucosal gangrene (That became prominent on day 2) and 3 patients began to develop peristomal dermatitis. 5 patients suffered from high output from their stoma to the extent that they had dehydration and required aggressive fluid therapy and pharmacological therapy to decrease bowel motility. 3 patients developed mucocutaneous separation, that developed to subcutaneous retraction of their stoma in two cases. For them, bedside suturing of the separated mucocutaneous junction was done. Failure to meet the predetermined conditions for stoma reversal, was noticed in six patients; three of them had their anastomosis leaking during the distal loopogram and the other three had abnormal labs beyond day 7, making them unfit for ileostomy closure **(Fig. 2).** The data of those patients is shown in **Table 5**. Early closure of the covering loop ileostomy was done for 24 cases. Of them, 3 cases developed ileus persisting beyond day 3. They needed longer observation time, and they were all open bowel by postoperative day 7. One case developed peritonitis by day 3 and required re-exploration. It was a case of sigmoid diverticular disease and the site of perforation during the second laparotomy was found to be in the splenic flexure (That was apparently normal in the loopogram at day 7 after the initial laparotomy). Wound infection developed in 8 cases in the midline wound of exploration and /or stomal site wound around day 10 (Managed by frequent dressing, antibiotics and premature opening of

some sutures for adequate drainage of the wound). One case developed localized collection in the left paracolic gutter and required ultrasound guided aspiration of the collection (Found to be pus) and pig-tail insertion for three days. It was another case of diverticular disease (As proven by the specimen pathological examination) not extending beyond the sigmoid colon (Having the margins of the resected specimen free of diverticulae with normal loopogram before closure). None of the cases developed parastomal hernia by clinical examination on the short term follow up period i.e., one (1) month. It is important to mention that patients` safety was our concern. For this reason, interim analysis of the data was done after the first and second (Five patients) cluster, to assure safety of the recruited patients before continuing the research. The results of the control group are shown and compared to those of the study group in **Table 6**.

Table 1: Basic data of study population

	Study group No. = 30
Age	
Mean±SD	43.77±8.34
Range	22 – 55
Gender	
Female	12 (40.0%)
Male	18 (60.0%)
BMI	
Below 30	19 (63.3%)
Above 30	11 (36.7%)
Smoking	
No	14 (46.7%)
Yes	16 (53.3%)

Table 2: Comorbidities of the recruited patients

	Study group No. = 30
Co-morbidities	
No	11 (36.7%)
Yes	19 (63.3%)
DM	7 (23.3%)
HTN	7 (23.3%)
Asthmatic	2 (6.7%)
IHD	5 (16.7%)
Rheumatic Heart	1 (3.3%)

Table 3: Rectal injuries

Pathology	Male (n=3)	Female (n=7)
Traumatic (n=4)	2	2
Iatrogenic (n=6)	1	5

Table 4: Sigmoid injuries

Pathology	Male (n=8)	Female (n=4)
Accidental (Stab) (n=1)	1	------
Endoscopic (n=1)	1	-----
Volvulus (n=3)	1	2
Ruptured DD (n=5)	4	1
Iatrogenic (During Appendectomy) (n=2)	1	1

Table 5: Excluded patients

	Sigmoid colon=4	Splenic flexure=2
Ruptured DD	3	.....
Endoscopic injury	1	2
Comorbidities	IHD=3, HTN=2, DM=1	IHD=2

Table 6: Short-term outcome of study and control group

	Study group	Control group	p-value	
Mean age±SD (Range)	**43.77±8.3 (22–55)**	**47.17±6.4 (26–60)**	**0.082**	**NS**
Initial ICU admission	10 (33.3%)	12 (40%)	0.592	NS
Stomal gangrene	1 (Mucosal) (3.3%)	2 (Mucosal) (3.3%)	1.000	NS
Peristomal infection	3 (10%)	11 (36.7%)	0.015	S
Mucocutaneous separation	3 (10%)	10 (33.3%)	0.028	S
Stomal retraction	2 (6.7%)	6 (20%)	0.129	NS
Failure of closure at predetermined time	6 (20%)	0 (0%)	0.01	S
Ileus after reversal	3 (12.5%)	9 (30%)	0.124	NS
Leakage after reversal	1 (4.2%)	3 (10%)	0.416	NS
Abdominal collection after reversal	1 (4.2%)	0 (0%)	0.259	NS
Secondary wound infection	8 (33.3%)	3 (10%)	0.034	S
Parastomal hernias	0	10	0.001	HS

N.B., In the lower half of the table i.e., in bold Ariel font, the percentage of the study group was calculated based on total number of patients, that is 24; having 6 patients excluded from the second operation. Secondary wound infection means infection after ileostomy reversal.

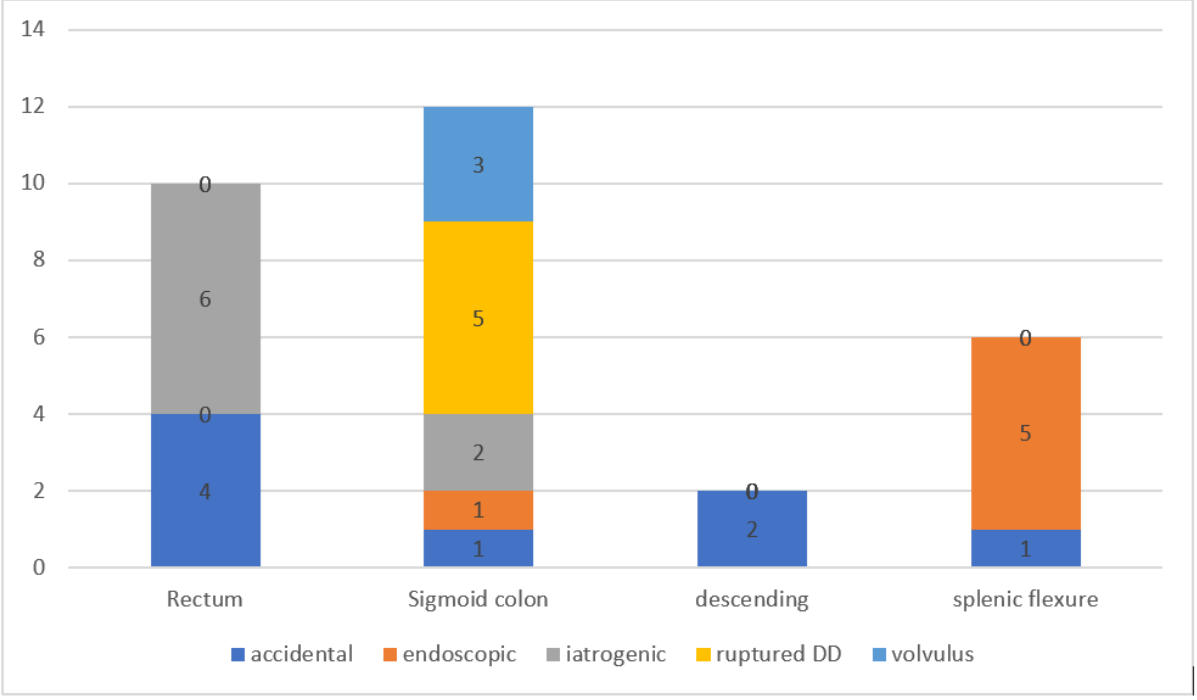

Fig 1: Etiology of recruited patients.

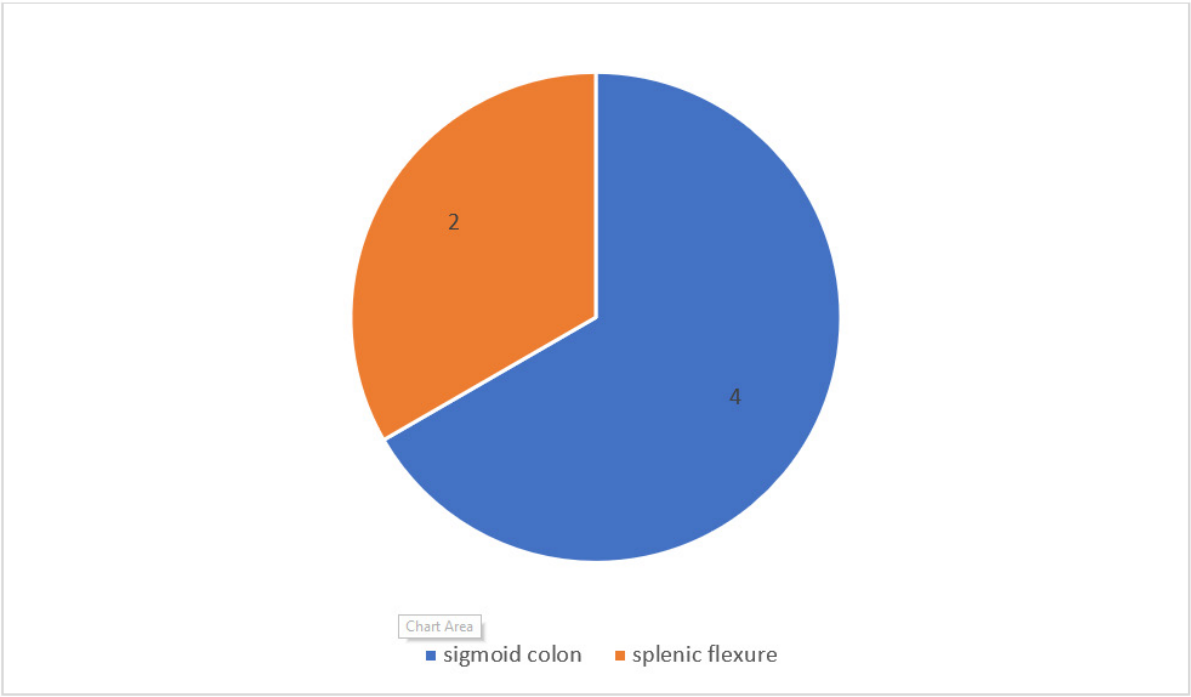

Fig 2: Cases excluded from early closure.

Discussion

With various indications, either benign or malignant, fecal diversion is a common procedure in the field of coloproctology to guard against the possible leak in distal colonic anastomosis.[11] Loop ileostomy is a common procedure for fecal diversion in cases of distal colonic (Beyond mid-transverse colon) resection anastomosis operations; being safe with less postoperative sequelae when compared to transverse loop colostomy technique.[2,4,12] The timing of loop ileostomy reversal is still a matter of debate in the literature especially in cases with benign indications for diversion due to scarcity of dedicated research. Typical timing of reversal of loop ileostomies is 6-12 weeks.[13] It reached 1-2 months in some studies 2 and more than 18 months in others.[5] Loop ileostomies have a bad impact on patient`s life that is directly proportional to the duration of diversion.[5,14] Prolonged stoma would result in wound infection, skin excoriation, parastomal hernias, dehydration among other stoma-related complications,[15] and minimizing the time needed for reversal of such stomas would

prevent those consequences.[5] Another point upon which early ileostomy reversal was advocated, is the debate concerning the benefit of such diversion.[7] Subsequently, many surgeons advocated early reversal of loop ileostomies within the first 14 days following diversion.[5] The ideal time for early reversal is proposed to be 10-14 days following distal anastomosis;[7] having the tensile strength of the anastomosis rapidly increasing starting from day 5 to 7 that the anastomosis is safe by this time.[16] Taking in account the dense postoperative adhesions starting to form 2 weeks till 6 weeks after laparotomy,[17] the time 10-14 days after distal anastomosis is advocated. In our research, we recruited 30 patients with various emergency benign indications for distal colonic and rectal resection, primary anastomosis and proximal loop ileostomy diversion; having their ileostomies intended to be reversed early (About 10-14 days following diversion). Patients with terminal ileal disease were excluded as this was the intended site for diversion. Terminal ileal disease, whether at site of diversion or near it would adversely affect the second procedure of bowel continuity restoration. The same applies to patients with mesenteric vascular insult. Stapled anastomosis technique was chosen to decrease surgeon factors that may affect the results of bowel continuity restoration. In comparison to another 30 correlated patients from the database (the control group), whose ileostomies were reversed at the standard interval i.e., after 3-6 months, only 24 out of 30 patients in the study group, were fit for early closure. 6 patients were not fit for early reversal:3 cases for non-healed distal anastomosis and 3 cases for failure of labs normalization i.e., failure rate in our study is 20%. Deeper analysis of those patients for possible causes of failure revealed some facts. They were of age group 47-55 years having systemic vasculopathy as a common feature (5 cases had ischemic heart disease and the remaining case had diabetes mellitus for 7 years uncontrolled on oral hypoglycemic drugs). With the polymedications they were taking, failure of lab normalization and anastomotic disruption can be explained. The prolonged interval time between the two operations in the control group helped to avoid such failure. Despite concordance of co-morbid conditions and indication for surgical intervention, peristomal infection before reversal was higher in the control group. Similar results were reached by Nelson et al.[10] This result was expected due to the shorter time elapsed before stoma reversal in the study group. What goes with this explanation is having those results nearly reversed after restoration of bowel continuity. However, it is important to state that having the source of infection removed early in the study group, made management of such infection easier. Decreasing the time elapsed before restoration of bowel continuity led to other consequences: no case of parastomal hernia was detected in the study group on the short run. The problem of mucocutanuous separation and stoma retraction was lower in the study group, for the same reason. Secondary ileus after stoma reversal was less common in the study group; a finding that goes with the results reached by Guidolin et al.[18] The resulting diversion colitis in the control group may have a role.[19] All those consequences are time dependent.[18-21] Based on the results attained, we strongly recommend early reversal of diverting ileostomies provided the indication of diversion is protection of distal anastomosis following resection for a benign cause as soon as the main insult is controlled. It is to state that similar recommendations were reached by Aldardeer et al,[6] recommending stoma reversal within the same admission for selected cases. In our research, we recommended 10-14 days to be the optimal time for reversal. As a secondary finding in our research, we found that cases with diverticular disease have to be managed cautiously. Distal loopogram was not sufficient to detect diverticulae that may have been missed during the initial operation (Having a case needed relaparotomy for rupture of a new diverticulum and another case with localized pus collection at the left paracolic gutter suggesting a contained rupture of a missed diverticulum as proved by a later colonoscope revealing multiple proximal diverticulae). We recommend using colonoscope as an adjunct in those cases. Another finding is that patients with multiple medical co-morbidities have higher incidence of being unfit for early reversal (They were 16 cases in our study and 6 of them were the cases of reported failure).

Conclusion

Within a carefully tailored selection criteria, patients with diverting loop ileostomy protecting a distal colonic anastomosis after colonic resection for emergency non-malignant indications can have their ileostomies reversed within 10-14 days.

Limitation

Discussing a highly debated issue as early reversal of ileostomies, the inclusion criteria was a strict one. Patients with resection at multiple levels were excluded, despite being a common situation among patients with accidental colonic injuries. The same fact applies for patients with vascular insult, either an isolated mesenteric disease or a diffuse systemic pathology. Those cases had to be studied in dedicated research. The role of applying a glass or plastic rod to decrease stoma retraction was not clear in our research as it is not an internationally recommended technique nor is it a protocol in our institution. It is to mention that some authors considered rod application as a predictor for poor outcome after diversion ileostomy operation.[22] Whether closure done by staplers has a role in postoperative consequences, is for further

studies. In our research, stapler-based technique was chosen for feasibility and to unify the technique in all patients. Indeed stapler-based technique had some advantage; being wider, faster and easier, as concluded by Sherman & Wexnar.[23] However, hand-sewn technique could be the only option in emergency setting especially in low resource areas. The role of perioperative medications is another field for further research either for wound infection or the integrity of the performed anastomosis; a scope that is still debated in the literature.[24] Finally, the idea of performing a distal loopogram, as early as postoperative day 7 to assess the integrity of a distal colonic anastomosis, is controversial in the literature despite being routinely used.[25] Early usage is similar to the state of using contrast for CT evaluation of esophageal and gastric anastomosis (Malignancy, bariatric). The effect of contrast study on anastomosis healing; especially during early stages of healing, worth to be an idea for a dedicated research.

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