

Role and feasibility of exteriorized bowel repair as an alternative to stomas in patients of intestinal perforation

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Abstract:

Background: Intestinal perforation is one of the leading cause of morbidity in surgical departments even after variety of treatment options because of complications and deteriorated quality of life.

Objective: To evaluate the role and outcome of primary repair with exteriorization of bowel in terms of postoperative success rate, morbidity and complications

Methodology: In a prospective study, 30 patients of intestinal perforation undergoing primary anastomosis with exteriorization of bowel were enrolled and their detailed history involving demographic data, investigations, therapeutic interventions, per operative findings, course in hospital and follow up were recorded and analysed.

Results: All the 30 patients belonged to age group of 18-75 years and male: female ratio was 2:1. Large and small bowel perforation was encountered in 4(13.33%) and 26(86.67%) patients respectively. Enteric perforation (40%), trauma (33.33%) and tuberculosis (26.67%) were most common etiology. Successful drop-back of exteriorized anastomotic segment was done in 3 (75%) and 13 (50%) patients with large and small bowel pathology respectively. Mean hospital stay was 10.2±2.1 days. Anastomotic leak in exteriorized anastomotic segment was most common complications in 14(46.67%) patients. The day of development of anastomotic leak was 5.8 ±1.78. Mean duration of hospital stay in patients with anastomotic leak of exteriorized segment was 11.8±0.7 vs.10.2±2.1 days for successful surgery with no statistical significant difference between them (P>0.05) Hypertension, tuberculosis were most common comorbidity in anastomotic leak patients.

Conclusion: Primary bowel repair with exteriorization of bowel can be a good alternative in suitable patients with less complications in trained hands as compared to stoma.

Key words: Primary bowel repair with exteriorization of bowel, intestinal perforation, complications of primary repair, stoma

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I. Introduction

As a part of life saving treatment for benign and malignant gastrointestinal conditions on an emergency basis, intestinal stoma was the most common surgical procedures adopted by surgeons worldwide (1). Fatal diseases like colorectal cancer, inflammatory bowel disorder, and colonic diverticulitis are prominent conditions which are responsible for more than 130,000 intestinal stomas in United States per year which could be temporary or permanent (2, 3). Ileal perforation peritonitis is a common surgical emergency in the Indian subcontinent and in tropical countries. It is reported to constitute the fifth common cause of abdominal emergencies due to high incidence of enteric fever and tuberculosis in these regions. Despite the availability of modern diagnostic facilities and advances in treatment regimes, this disease has an abrupt onset and a rapid downhill course with a high mortality if not treated in time. (4,5)

Colostomy and ileostomy are the most widely practiced surgical interventions to divert stool flow, protecting anastomotic site and bowel decompression indications (6). Surgical management of intestinal congenital malformation in childrens is also done by stoma formation. Nevertheless colostomy was widely used surgical approach for management of perforated colonic injuries, it was associated with higher morbidity and mortality rate. Higher prevalence of intra-abdominal infection rate with longer duration of treatment and hospital stay were additional limitations of colostomy (7, 8). Incidence of stomal complications like Stenosis,

bleeding, hernia were higher among patients who have undergone surgery on emergency basis done by an unexperienced person (8). Over time, patients with permanent ostomies may continue to have untreated ostomy-related complications and technical difficulties. (9-12) A recent study of 743 patients with long-term ostomies revealed that 61% of patients had objective evidence of peristomal skin problems, 28% were experiencing frequent leakage, and 87% were using various accessories to facilitate pouching their ostomy. (9) After care by an ostomy nurse, leakage, skin problems, and the use of accessories decreased significantly, and quality-of-life scores improved. (9).

An alternative to complicated high risk colostomy is primary repair bowel anastomoses. It is indicated for patients who underwent resection in mobile colon which enables sutured exteriorization with reduced hospital stay duration and absence of stoma (13). Anastomotic leak (AL) following colorectal resection and primary repair is a major problem of surgical care, with an incidence between 3% and 19%. (11) Although accurate prediction of risk is impossible, certain factors are known to contribute to AL, including surgeon-related factors (eg, increased incidence of AL in a colorectal anastomosis constructed after hours 5 and the positive role of specialization in reducing the complications of colorectal surgery) and patient-related risk factors (eg, the inverse relationship between the height of the colorectal anastomosis from the anal verge and the leak rate (11, 12).

The objective of the study is to compare the feasibility of primary bowel repair with exteriorization of anastomosis simultaneously evaluating the rate of complications in exteriorized bowel repair patients which would lead to selection of safer choice of treatment.

II. Methodology:

This is a prospective observational study carried out on patients admitted to a tertiary care teaching rural hospital in Ahmedabad. The study protocol was approved by the Institutional ethics committee. All patients undergoing colonic surgery whether elective or emergency with acute abdomen and coming to surgical department from July 2016 to October 2019 were considered for inclusion in this study. Informed consent was obtained from all the patients for participation in the study, as well as for the surgical procedure.

All the patients were examine thoroughly by the consulting surgeon. Details of the patients were entered in a pre-designed proforma which included demographic data, therapeutic interventions, per operative findings, course in hospital and follow up. Clinical history regarding fever, pain, vomiting, abdominal distension, constipation and any treatment prior to admission was recorded. Vital signs, hydration, abdominal distension, tenderness, guarding, rigidity, obliteration of liver dullness, absence of bowel sounds in all patients were examined and noted. All patients included in the study underwent investigations in the form of haemoglobin, prothrombin time with international normalised ratio (PT - INR), random blood sugar, renal function test, liver function test, widal test, blood grouping and cross matching, erect X ray abdomen, and ECG. Ultrasound of abdomen and pelvis was also performed for all patients. All patients were examined by the physician for the pre-opertaive fitness for surgery. Post-operatively histopathological examination of specimen tissue (like perforation margin and lymphnode) was done to identify any tubercular and typhoid etiology.

Pre-operative care: All the patients were resuscitated with correction of fluid and electrolyte balance with a nasogastric tube placed for decompression of gastric contents. All patients were given intravenous third generation cephalosporin, metronidazole, ondansetron and proton pump inhibitors. Within 24 hours after resuscitation all patient were subjected to exploratory laparotomy under general anaesthesia.

Intraoperative care: Exploratory laparotomy was performed under general anaesthesia by a midline incision and entire yellow purulent material was aspirated from peritoneal cavity. A general survey of peritoneal cavity was made and per operative findings were noted which included type of peritoneal fluid, number of perforations with condition of the adjacent bowel. On removal of the diseased bowel an anisoperistaltic lateral anastomosis was performed and exteriorised through the abdominal wall by a large incision where a hypothetical ileostomy would take place. Having exteriorised the anastomosis, if we imagine its apex to be at the twelve o'clock position, it is attached to the aponeurotic wall at two points, between the aponeurosis and the intestinal mesentery (at the three o'clock and nine o'clock positions.) The anastomosis was reinforced with a damp, vaseline-impregnated compress gauze and its evolution was monitored daily.

Post-Operative Care and Evaluation: All Patients were kept nil per oral with intravenous fluid and antibiotics for 3-5 days with or without nasogastric suction. Daily inspection of anastomosis was done for any visible leak, faecal odour, viability and edema. Minor complications like small leaks, limited necrotic area, etc. were resolved under local anaesthesia but poor evolution like extensive necrosis were limitations to be resolved. In such cases the anastomosis were converted into an ileostomy, under local or spinal anaesthesia. Orals were started when bowel activity in the form of bowel sounds and passage of flatus or stools was present. Finally if after post operative day 7 -11, the clinical situation has evolved favourably, 'Drop-back' of exteriorized anastomotic segment, if bowel is healthy with no leak, under local or spinal anaesthesia, into the abdominal cavity after release of the attachment points. A blunt dissection with the finger is usually sufficient, as there are

rarely any adhesions to the wall, or if so they are lax due to the short period of evolution. If any such adhesions are observed, they should be detached with care. Once the anastomosis has been reintroduced into the cavity, the wall is closed using the usual technique. Immediate complications were noted and dealt carefully. Patients were allowed discharged after passing of the stools with an advice of proper full diet and regular follow-up after 3 months.

Statistical analysis: All data is represented as actual frequencies, percentage, mean and standard deviation as appropriate. Data were analysed using Microsoft excel 2013.

III. Results:

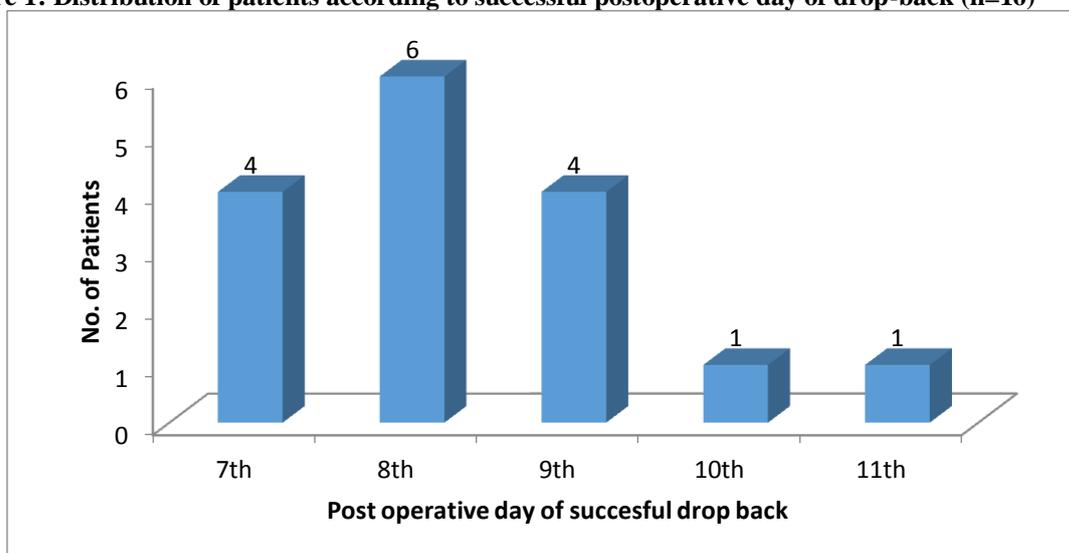
In the present study of primary bowel repair with exteriorization of anastomosis, 30 patients were selected on the basis of inclusion and exclusion criteria which comprised 20 males and 10 females in the age group of 18 to 75 years. Large bowel perforation was encountered in 4 patients. Small bowel perforation was encountered in 26 patients. Table 1 illustrates the etiology seen according to bowel involved.

Table 1: Distribution of patients according to etiology of large bowel and small bowel (n=30)

Site	Etiology	No. of patients (%)
Large Bowel	Trauma	4 (100)
Small Bowel	Enteric perforation	12 (46)
	Tubercular perforation	8 (30)
	Trauma	6 (24)
Total		30 (100)

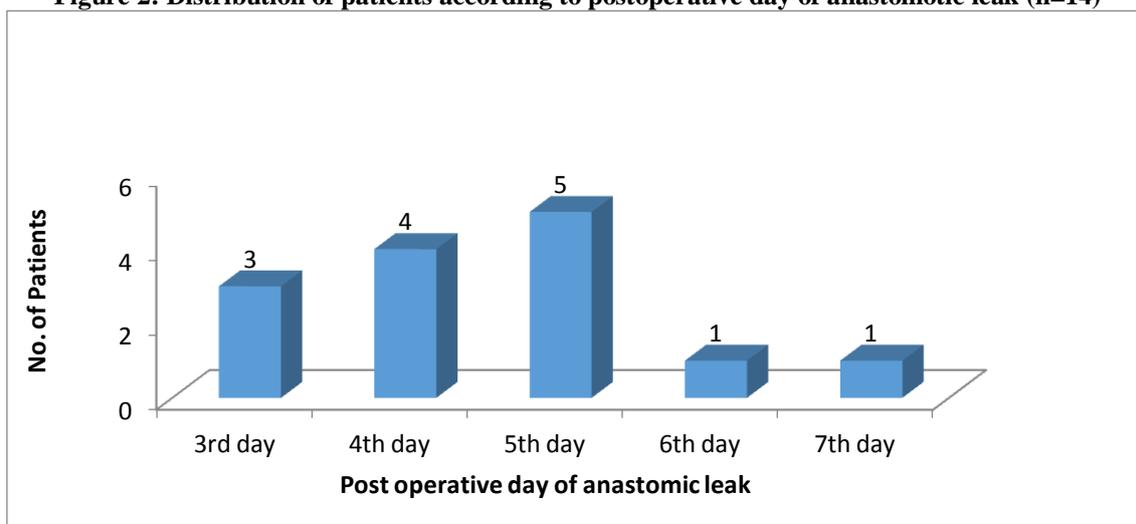
Exploratory laparotomy with perforation repair with primary anastomosis and exteriorization of bowel was carried out in all 30 patients. Successful drop-back of exteriorized anastomotic segment was done in 3 patients (75%) with large bowel pathology and 13 patients (50%) with small bowel pathology. It was observed that in 6 (38%) patients drop-back was successful by 8th postoperative day. The earliest was on the 7th day while the furthest was on 11th post-operative day. (Figure 1) The Mean \pm Standard Deviation for successful drop back of exteriorized anastomotic segment was 10.2 ± 2.1 days.

Figure 1: Distribution of patients according to successful postoperative day of drop-back (n=16)



Anastomotic leak in exteriorized anastomotic segment was seen in 14 patients which 46.66% of total suture line breakdown. In our study, anastomotic leak was seen mainly between 3rd to 5th postoperative days. The earliest was on the 3rd day while the furthest was on 7th post-operative day. (Figure 2). The Mean \pm Standard Deviation for development of anastomotic leak was 5.8 ± 1.78 days.

Figure 2: Distribution of patients according to postoperative day of anastomotic leak (n=14)



Maximum duration of hospital stay in patients with exteriorized segment anastomotic leak was 16 days and minimum duration in the same was 10 days. However all these patients had to undergo second stage surgery for revision of stoma. Mean duration of hospital stay in patients with anastomotic leak of exteriorized segment was 11.8 ± 0.7 days. Maximum duration of hospital stay in patients with exteriorized segment followed by successful drop-back of segment in the abdominal cavity was 14 days. Minimum duration in the same was 10 days. However, none of these patients had to undergo further second stage surgery. Mean duration of hospital stay in these patients was 10.2 ± 2.1 days. No statistically significant difference was found in hospital stay in patients with anastomotic leak and successful dropback of segment. ($P>0.05$) Distribution of patients as per their hospital stay is shown in table 2.

Table 2: Distribution of hospital stay in patients with anastomotic leak (n=14) and successful dropback (n=16)

Hospital stay (days)	Number of patients in anastomotic leak	Number of patients in successful dropback of segment	P value
10	2	3	0.06
11	2	6	
12	3	3	
13	2	2	
14	2	2	
15	1	0	
16	1	0	
Total	14	16	

Complications occurred in the patients are shown in table 3. Complications were divided into those related to exteriorization and those related to interiorization or drop-back. Those related to exteriorization were anastomotic leak seen in 14 patients and wound infection in 2 patients. Those related to drop-back was seen in 1 patient who presented with wound infection. It was managed conservatively by good antibiotic cover, regular dressings and keeping skin open which was allowed to heal by secondary intention.

Table 3: Complications of the procedure

Complications related to exteriorization	Number of patients	Percentage
Anastomotic leak	14	100
Anastomotic leak +Wound infection	2	14.28
Complications related to interiorization or drop-back	Number of patients	Percentage
Wound infection	1	6.25
Total	1	100

Patients who had anastomotic leak after exteriorization of large bowel anastomosis were having etiology of trauma (1 out of 4 patients) in large bowel pathology. Patients who had anastomotic leak after exteriorization of small bowel anastomosis were having etiology of enteric perforation (8), tubercular

perforation (4) and trauma (1) in a total 26 patients with small bowel pathology. (Table 4)

On analysis of comorbidity of the patients, it was revealed that patients who had anastomotic leak after exteriorization of large bowel anastomosis was having hypertension as comorbid condition. Those patients with exteriorization of small bowel anastomosis followed by leak were seen to be having pulmonary tuberculosis (3,23%), anemia (1,7%), hypertension (3,23%), Chronic obstructive pulmonary disease (4,30%) and diabetes mellitus in (2, 15%) of the 13 patients with anastomotic leak. From the above observations, it is seen that pulmonary tuberculosis, hypertension, anemia, chronic obstructive pulmonary disease and diabetes mellitus were the various co-morbid conditions in patients who had anastomotic leak in exteriorized segment. (Table 4)

Table 4: Distribution of co-morbid conditions in patients with exteriorized anastomotic segment leak

Comorbid conditions	Patients with large bowel anastomotic leak no.	Patients with small bowel anastomotic leak no.
Hypertension (HTN)	1	3
Diabetes mellitus (DM)	0	2
Pulmonary Tuberculosis (TB)	0	3
Anaemia (Hb <6 gm%)	0	1
Chronic obstructive pulmonary disease (COPD)	0	4
Total	1	13

IV. Discussion:

Intestinal perforation is one of the leading cause of morbidity in surgical departments even after variety of treatment options. The aim of the present study is to evaluate the outcome of primary repair and compare it to the available literature regarding stoma in terms of postoperative success rate, morbidity, mortality and complications so that best procedure for the patient can be offered.

Exploratory laparotomy with primary repair and exteriorization of bowel was carried out in all 30 patients and success rate was 16 (53.33%) without any complications. Trained hands and proper aseptic precautions can improve this success rate further. 14 (46.67%) patients developed anastomotic leak in this study which is higher than reported literature. A significant rise in incidence of anastomal leakage among patients with colorectal resections followed by colostomy were reported in the range of 12% to 27% globally. This has led to increased impact on rate of morbidity and mortality. Higher rates of reoperation among patients with colorectal resection with a prolonged stay in hospital and reduced quality of life of the patients are major concern for surgeons. (14-16)

Various early complications like infection and necrosis, ischemia arises in colostomy patients within 30 days of treatment which needs immediate attention to prevent reoperation. (17) Around 10% of total colostomy develops late complications like stenosis, severe dermatological complexities and parastomal herniation which demands revisional surgery. (18, 19) Even it is observed in several studies that patients with diverticulitis cannot be satisfactorily treated with first stage laparoscopic lavage and drainage (LLD). In conjugation with LLD, second stage ileostomy diversion surgery with laparoscopic sigmoidectomy followed by ileostomy closure are staged surgeries performed to minimize the risk, complications and reinterventions. (20) In our study, none of the patient required, second stage surgery for the treatment.

Various studies indicate that the most feasible and appropriate method for the treatment of perforated colon lesion of right half is primary resection followed by anastomosis. It was also observed that distribution of patients age were not significantly different among primary resection and staged resection groups and higher rate of morbidity and mortality was observed in patients after 5 years of staged resection rather than patients who underwent primary resection (21,22)

A study performed by Lou et al to evaluate exteriorized repair performed on 50 patients suffering from penetrating colonic injuries observed that in 33% of patients the colonic wounds successfully healed and the exteriorized loop was returned into the peritoneal cavity within 14 days. They observed fecal leakage at the site of repair in 34 % of patient population. Intra-abdominal abscess and one wound infection were commonly observed complications which were resolved with non-operative treatment without any deaths and serious sepsis. They observed that majority of patients escaped the necessity of colostomy with 20-25% complication rates. (23)

Study by J E Okies et al showed analysis of primary repair of colon with exteriorization on 37 patients. In all the patients a two layer closure was used to repair colonic injuries which was then exteriorized and the

repair was observed for ten to fourteen days for leak or proximal obstruction. Twenty seven percentage patients suffered from leakage of the exteriorized segment of repaired colon while only 1 mortality case was observed. Exteriorization of injured colon significantly reduced the mortality rate by 30-35% along with advantage of observation of repair to evaluate the possibility of colostomy in patients. (24)

A prospective study by Harlan stone et al also analysis of 268 patients and identified that primary closure could be considered in specific cases with less than 20% blood loss, minimal fecal contamination and not more than two intra-abdominal organs are injured. It was observed that the infection rate of incision was lower in primary closure compared to colostomy. Even morbidity with colostomy was found to be tenfold greater than primary closure contributing 28% with significantly greater complication rate. Prolonged hospitalization was consistently observed in patients who underwent colostomy compared to primary closure which was in consistence with results of present study. (25)

Another study by Mulherin J L and associates, compared the morbidity rate of colostomy, primary closure and exteriorized primary repair on 90 patients with penetrating wounds. They observed that colostomy can be avoided in selective patients by primary repair and exteriorization of injured segment as it has an advantage of protecting patients from disruption of intraperitoneal suture line and associated morbidity. An important observation made was higher mortality rate was observed in patients undergoing right colon resection compared to left colon resection. They found that the healing problems related to suture lines were comparatively less by keeping serosa moist through frequent wet saline dressings. The observations and results were in line with our study reports. (26)

A more aggressive use of primary repair is warranted for penetrating colon injuries by Thompson et al. In this study 117 patients suffering with penetrating injuries to the right or left colon were treated. It was observed that the mean hospital stay was higher among patients with right colon injury compared to those suffered from left colon injury. It was also demonstrated that the right colon responds similar to left colon injury towards primary repair approach with respect to severity of injury, percentage with associated intra-abdominal injuries, and degree of fecal contamination. Hence it was concluded that independent management of injuries should be followed in both the conditions. (27)

In a study performed by Narayansingh and associates 61 patients with colonic injuries participated out of which 57 patients underwent primary repair while four patients underwent colostomy. Various risk factors like site of injury and peritoneal contamination did not influence the decision of primary repair and safety of the procedure. The rate of septic complication followed by primary repair was observed to be less than 10%. The results of our study were adherent to previous literature (28).

In the view of various study results, decision regarding the ideal surgery for managing an intestinal perforation patient, is best governed by a combination of pre-operative and intra-operative parameters. Choosing the best method is imperative in minimising short term complications and long term morbidities. Patients having improved preoperative parameters like early presentation, non-anaemic, nonhypoproteinemic and good hemodynamic stability along with non-compromising intraoperative findings, such as low volume, non-feculent intraperitoneal collection and healthy, non edematous bowel wall are the ideal candidates for primary repair. Patients having an adverse set of preoperative and intraoperative parameters are best managed by bowel exteriorisation. Morbidity is significantly influenced by an advanced age, a low Hb, hypoalbuminemia, late presentation, high volume fecal peritonitis and poor hemodynamic stability at the time of operation, in both set of surgeries. (29)

This study has highlighted that of primary bowel repair with exteriorization of bowel can be a good alternative in suitable patients to avoid complications related stoma. Only limitation of the study was small sample size and all the patients were enrolled from the single hospital only. Further larger study involving more number of patients with genetic and environmental diversities with long term follow-up are required in this direction to make patient care more rational and affordable with improved quality of life.

V. Conclusion

Even though it is difficult to challenge surgical dictum of stoma formation in emergency management of lethal bowel injuries, but its association with higher rates of morbidity forcibly divert us towards better surgical management practice as exteriorized bowel anastomosis which offers substantial advantage of one stage surgery with lower hospital stay. If proper precaution and postoperative care is taken then leakage in the exteriorized anastomotic segment due to suture line break could be avoided which do not hamper the rate of morbidity and quality of life of patients. Incidence of complications of exteriorized bowel anastomosis can be reduced by liberal mobilization of bowel for exteriorization with no undue tension. Reintroduction of the anastomosis into the abdominal cavity can be performed between 7 to 11 days after the initial intervention which reduces risk of serositis. Stress should be given to selection of existence of a broad opening of the aponeurosis to prevent constriction of the anastomosis with which merits of both procedures can be combined and quality of life of patients can be improved.

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Ethical consideration: The study protocol was approved by the institutional ethics committee and written informed consent was obtained from all the participants before enrolment in the study. The study was carried out in accordance with guidelines mentioned in Schedule Y, Declaration of Helsinki and the new drugs and clinical trial act, 2019.

Conflict of interest: None

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