

Prospective analysis of indications and early complications of emergency temporary loop ileostomies for perforation peritonitis

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Abstract

Background To determine the indications, nature, and rate of early complications of temporary loop ileostomy created in emergency for benign diseases, their management, and to find out the associated risk factors.

Methods A total of 630 patients undergoing temporary loop ileostomy for benign diseases were studied prospectively over a period of 6 years. Stoma-related early complications occurring within 6-8 weeks were analyzed. Only emergency cases were included in this study. Descriptive statistics were used to summarize the data and statistical significance was evaluated by applying the Pearson's chi-square test.

Results Typhoid perforation (n=402) was the most common pathology, followed by tuberculosis (n=106); trauma (n=81); and intestinal obstruction with gangrenous bowel (n=41). 299 patients had no stoma-related complications. Skin excoriation was the most common stoma-related complication. Age more than 50 years; shock at presentation; delay in presentation; delay in surgery; presence of comorbidities; and surgery done out of working hours, were associated with increased complications.

Conclusion Temporary loop ileostomy for perforation peritonitis due to benign systemic diseases like typhoid fever and tuberculosis confers a very high morbidity.

Keywords Perforation peritonitis, temporary loop ileostomy, indications, early complications

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Introduction

Ileostomy, a frequently performed surgical procedure, is an external communication constructed between the distal part of the small intestine and the abdominal wall. The rationale for a temporary loop ileostomy is to provide defunctioning in case of potentially dangerous anastomotic complications with an obvious risk for mortality. Fecal diversion through a temporary stoma can reduce the effects of anastomotic leak and also the rate of leak-related interventions [1-4]. The thought of stoma, whether permanent or temporary, is frightful and anxiety provoking. It is important to relieve the patient's fear about living with a stoma by proper counseling and providing

literature on their disease and the proposed surgery is often helpful.

Although formation of defunctioning loop ileostomy is usually a straightforward and a life-saving procedure, there is an appreciable complication rate [5,6]. Most of the complications seen after temporary loop ileostomy are due to severe sepsis, advanced pathology and relative inexperience of the residents in an emergency situation. It is convenient to prevent complication by means of an adequate surgical technique and a better rehabilitation by a multidisciplinary team. Complications related to stoma may occur early or late, intermittently or progressively and may be acute or chronic in nature.

Ileostomy is a life-saving procedure, particularly in those cases where there is fulminant enteritis and peritonitis of long duration. Despite the major advancement in the field of surgery, construction of intestinal stoma is still a common and frequently performed procedure. It is mandatory to apply meticulously sound surgical principals in order to achieve good results, and it should be performed by a surgeon not only technically skilled but who also understands the potential metabolic and mechanical problems associated with the loop ileostomy. So, a judicious assessment for the need of stoma,

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Conflict of Interest: None

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Careful surgical technique and skilled enterostomal nursing are essential for a satisfactory outcome. The management of a patient with stoma must begin before the surgery, and the key to management of surgical complications is prevention.

The purpose of the present study was to assess the indications and stomal, peristomal and other systemic complications in terms of incidence, rate and their nature during the first 8 weeks after creation as most of the psychological, metabolic and mechanical complications occur during this period.

Patients and methods

Study design

This was a single-center prospective descriptive follow-up study conducted by the department of Surgery from January 2008 to December 2013. 630 patients who underwent exploratory laparotomy for perforation peritonitis with creation of temporary loop ileostomy were studied. The protocol was approved by the Institution's Ethics Committee. According to the principles of the declaration of Helsinki 1975, written, informed consent was obtained from all participants.

Patients

Patients were selected from those attending the emergency department at the hospital. The age of the patient varied from 14-72 years with most of the patients falling within the age range of 31-40 years. A total of 630 patients, diagnosed in surgical emergency as a case of perforation peritonitis, underwent exploratory laparotomy and found to have benign disease with construction of temporary loop ileostomy, and subsequent closure after a period of 6-8 weeks were included in this study. Exclusion criteria were: patients with perforation peritonitis not undergoing creation of temporary loop ileostomy; patients diagnosed with malignancy on exploration or on histopathological examination; and patients with complications occurred after 8 weeks of creation of ileostomies. A total of 638 patients were enrolled, and 8 were excluded as they were found to have malignancy on final histopathological report. Patients were clinically evaluated by detailed history, routine examination on initial contact and the following investigations were done: complete blood count, liver function tests, renal function tests (RFTs), blood sugar, serum protein, serum electrolytes, coagulation profile, Widal test, blood culture, ELISA for tuberculosis, X-ray chest with both domes of diaphragm posterior anterior view, X-ray abdomen erect and supine films, and ultrasonography.

Methods

Pre-operative height, weight, and mid arm circumference of all the patients was recorded. Pre-operative counseling, psychological preparation, and marking for appropriate

siting of stoma was done by the operating resident surgeon, as all the cases were done in an emergency setting, and an experience denterostomal therapist/nurse was not available in our department. Exploratory laparotomy with construction of ileostomy was done under general anesthesia. Operative findings were recorded properly and stoma was created at the previously marked site, one third from umbilicus on the spino-umbilical line in most of the cases. All of these surgeries were performed by resident surgeons with at least 3 years of experience during working as well as out of working hours.

Ileostomies created in such a manner were closed subsequently within 6-8 weeks and all the complications occurring during this period were recorded and managed optimally. Ileostomy was considered to be retracted when it was 0.5 cm or more below the skin surface and required intervention. Prolapse was diagnosed if the stoma increased in size and required change of size of appliance. Poor siting was defined as any ileostomy which subsequently was found in a skin crease and was associated with difficulties in fixing a stoma appliance. High output was defined when the output was more than 1 L in 24 h. Detachment was recorded if any part of the ileostomy had detached from the mucocutaneous junction.

Participants were examined for the presence of complications on a daily basis for the first 7 days after surgery and then at the end of the second week and then every 2 weeks until the eighth week (i.e. at 4th, 6th, and 8th week after surgery). Incidence, nature, and rate of complications were recorded and managed optimally on an out patient basis and patients were readmitted if there was any indication for management of complications. Body mass index (BMI) was recorded at admission or within 2 days after surgery, and thereafter on a weekly basis.

Statistical analysis

Descriptive statistics were used to summarize the data. The statistical significance of data was evaluated by applying the Pearson's chi-square test and a P-value of less than 0.05 was considered statistically significant.

Results

There were 406 male and 224 female patients. Their mean age was 34 (range 14-72) years. Their presenting complaints were fever, loss of appetite, vomiting, pain abdomen, and 42 patients presented in shock. All the patients were found to have total leukocyte count $>18,000/\text{mm}^3$. RFTs were deranged in 512 patients, and 42 patients who presented in emergency with shock were found to have severely deranged RFTs (Table 1).

On exploration, there was a severe degree of contamination in 356 patients. Of these 356 patients, 68 needed ICU care, 6 developed pleural effusion, and 12 patients had complete wound dehiscence. 56 patients received higher antibiotics other than ceftriaxone. 7 patients died within 15 days of surgery.

Typhoid perforation (n=402) was the most common pathology, followed by tuberculosis (n=106); trauma (n=81);

Table 1 Patient characteristics

Characteristics	Result (n=630)
Age (year)*	34 (range 14-72)
Sex (M:F)	406:224
Comorbidities	
Hypertension	16
Diabetes mellitus	13
Congestive cardiac failure	8
Coronary artery disease	2
Previous abdominal surgery	19
Presence of shock at presentation	42
Delay in presentation (>2 days)	145
Operative time (h)*	1 (range 45-80 min)
Delay in surgery (h)*	4 h 40 min
Severe degree of contamination (no. of patients)	356
ICU Care	
Yes (no. of days)*	68
No	562
IV antibiotic use	
Ceftriaxone	630
Tazobactam	56
Meropenem	12
Antifungal	4
Initiation of oral intake (post-op day)*	3
Post-operative stay*	9
Morbidity (other than stomal)	
Post-operative prolonged ileus	106
Wound dehiscence	65
Resurgery	23
Electrolyte disturbance	79
Severe electrolyte imbalance	
Need of prolonged IV/IM analgesics (duration in days)*	110 (5)
Depression	16
Chest infection	64
Urinary tract infection	22
Acute renal failure	16
Hospital stay*	
Patients requiring readmission	12
Dehydration	76
Wound dehiscence	42
Skin excoriation	12
Mortality	7

*Data are given as mean; ICU, intensive care unit; IV, intravenous; IM, intramuscular

and intestinal obstruction with gangrenous bowel (n=41) (Table 2). 299 patients had no stoma related complications. Skin excoriation was the most common stoma-related complication (Table 3). 42 patients developed retraction of stoma, of which 10 needed revision under general anaesthesia. In the majority of cases (n=568) the perforation site was brought out as stoma (Table 4). Stoma-related complications were more numerous with typhoid perforations (262/402) as compared to those

Table 2 Indications of emergency temporary loop ileostomies

Indications	Frequency	%
Typhoid enteric perforation	402	63.8
Tuberculosis	106	17
Trauma	81	12.8
Intestinal obstruction with gangrenous bowel	41	6.5

Table 3 Complications (morbidity) of emergency temporary loop ileostomies

Complications	Frequency	%
Nil	299	47.5
Skin excoriation	127	20
Poor siting	80	12.6
High output	78	12.3
Retraction	42	6.6
Superficial bleeding	23	3.6
Transient edema	21	3.3
Stomal prolapse	4	0.7

Table 4 Type of surgery and stoma for perforation

Type of surgery/stoma	No. of patients (n=630)	%
Perforation site exteriorized	568	90.15
Resection of bowel with double barrel ileostomy	56	8.89
Resection and anastomosis with proximal ileostomy	6	0.9

with non-typhoid perforations (69/228). Fecopurulent fluid was present in all the cases of typhoid perforations. Age more than 50 (P=0.002), delay in presentation (0.001), delay in surgery (0.001), presence of comorbidities (0.002) and shock at presentation (0.001), surgery done out of working hours (0.009) are the factors associated with increased rate of stomal and other systemic complications (Table 5).

Twenty three patients underwent resurgery for indications other than stoma-related complications. In nineteen patients with typhoid perforation, there was bile in the drain for which they were re-explored and found to have fresh perforations proximal to the ileostomy site. In such cases the affected part was resected and ileostomy was made again. Two of these patients developed more perforations and were explored. Four patients probably had iatrogenic perforation for which they needed resurgery.

Interestingly, most of the patients showed an increase in BMI, and decreased BMI was seen only in few patients. 7 patients who died had a BMI of <16.5 at the time of admission (Table 6).

Table 5 Comparisons of epidemiological variables

Characteristics	Stoma-related complications (n=331)	Complications other than stoma-related (n=84)	Pearson chi square value	Degree of freedom	P value Asymp sig (2-sided)
Age			31.844	1	0.002
<50	185/412	18/412			
>50	146/218	66/218			
Shock at presentation			67.762	1	0.001
Yes 42	28/42	38/42			
No 588	303/588	46/588			
Delay in surgery			94.481	1	0.001
<5 h 510/630	290/510	32/510			
>5 h 120/630	41/120	52/120			
Degree of contamination			1.014	1	0.314
Mild 274/630	111/274	33/274			
Severe 356/630	221/356	51/356			
Presence of comorbidities			161.803	1	0.002
Yes 68/630	18/68	54/68			
No 562/630	313/562	30/562			
Primary pathology			1.658	1	0.198
Typhoid 402/630	262/402	61/402			
Non-typhoid 228/630	69/228	23/228			
Delay in presentation			98.886	1	0.001
<2 days 485/630	246/485	13/485			
>2 days 145/630	85/145	71/145			
Surgery done			6.883	1	0.009
During working hours 482/630	210/482	66/482			
Out of working hours 148/630	121/148	18/148			
BMI at presentation			0.060	1	0.807
<18.5 451/630	264/451	68/451			
>18.5 179/630	67/179	16/179			

BMI, body mass index

Table 6 Body mass index (BMI) at admission, on post-operative day 2 (POD2), 4 and 8 weeks after surgery

BMI	At admission or POD2	4 weeks of surgery	8 weeks of surgery
Underweight (<18.5)	451	392	239
No. of patients	16.8	17.2	17.9
BMI*			
Normal (18.5-22.9)	147	212	379
No. of patients	19.2	20.1	20.8
BMI*			
Overweight (23-24.9)	32	19	5
No. of patients	24.6	23.7	23.9
BMI*			

*Data are given as mean

Discussion

The first surgical stoma was created more than 200 years ago. The earliest stomas were actually unintentional ones, enterocutaneous fistulas resulting from penetrating abdominal injuries or complications of intestinal diseases such as

incarcerated hernias [7]. In developing countries, including India, intestinal perforation resulting from typhoid fever and tuberculosis has always been a concern because of their high morbidity and mortality rates [8-10]. In these cases, most perforations occur in the terminal ileum.

Unlike the west typhoid is still a common cause of perforation in our country, followed by tuberculosis, being common diseases of India [11,12]. The most common indication in our study was typhoid enteric perforation accounting for 63.8% of ileostomies while tuberculosis accounted for 17% of ileostomies. Typhoid fever is endemic in India with the prevalence rate of 88 cases/lac population and death rate 0.029/lac population for the year 2011 [13]. Delayed presentation, marked sepsis, and poor nutritional status were the common factors in these patients with perforation peritonitis, so preference was given to temporary loop ileostomy over primary closure or resection of the diseased segment and anastomosis. Loop ileostomy does not provide complete defunctioning but it decreases the incidence and severity of sepsis following a leak from the anastomosis or primary closure site. Loop ileostomy is considered generally easier to manage and is not associated with a greater rate of complications than loop colostomy.

A loop ileostomy has an adverse effect on quality of life, which gets further enhanced if stoma related complications occur [14-16]. Complication rate of temporary loop ileostomy ranges between 5-100%. These rates vary due to varying length of follow up [7,17,18]. Delayed presentation, age of the patient, urgency of surgery, degree of contamination, diagnosis at the time of presentation, availability of expertise, and presence of shock at admission are the factors associated with a high level of morbidity. Peritonitis had an adverse effect on the morbidity hence pre-operative resuscitation, judicious use of antibiotics and acid base imbalance correction plays an important role in preventing future morbidity of the patients. Complication rates between 20 and 60 percent were also reported [19] and this difference may be related with different time points. In our study, the complication rate was 52.5%. These complications were prolapse of the loop ileostomy, high output fluid loss, retraction of the stoma, transient edema of the stoma which may be associated with obstructive symptoms, peristomal dermatitis, and local wound abscesses. A higher complication rate was seen in patients with typhoid fever and tuberculosis, and in those who presented in shock at emergency. The majority of these complications were treated conservatively. A complication rate of 41% associated with loop ileostomy construction, with 6% of patients requiring surgical intervention has been reported in one study [2] while another had a complication rate of 25% and all required surgical intervention [20].

There are a number of factors which predispose to stoma related complications; high body mass or body habitus, systemic diseases like typhoid fever and tuberculosis, inflammatory bowel disease, use of steroids and immunosuppressants, diabetes mellitus, old age, emergency surgery, surgical technique, and surgeon's experience. All the surgeries, in the present study were done by trainee surgeons in emergency. Also, there is no enterostomal therapist in our institute for counseling and care, so this was also done by resident surgeons. Surgeon and surgery-related factors play a major role in prevention of stoma related complications. Although all of these stomas were made by resident surgeons with at least 3 years of experience, if they had been done by a specialist surgeon results would have been different. Even more than the experience, what matters is the work load and timing of surgery, whether they were done during working hours or out of working hours. Almost one-third of the surgeries were performed out of working hours. Supervision of a specialist surgeon was sought for the majority of surgeries performed during working hours but those surgeries done out of working hours were unsupervised.

Skin excoriation was found to be the major complication in this study. The usual incidence of peristomal skin problems is 10-14% [11,12], and the probable cause may be improper siting, high or low BMI, and postoperative care. In emergency situations, it is often not possible to mark the stoma site in standing and sitting position as the patients who present late are usually in shock at the time of presentation. In such cases, it is difficult to judge the skin folds and waist line in patients with high BMI. In our study, the problems of skin excoriation and retraction were seen mostly in patients with a high BMI. The probable reasons for skin excoriation and retraction in patients with high BMI are a thickened fatty mesentery making

mobilization of the bowel loop more difficult and traction is exerted on the bowel wall. On the other hand, in patients who have thin build and poor nutritional status, bony prominences pose a problem in proper placement of stoma appliances and result in frequent leakage and skin excoriation.

Skin excoriation was also seen in patients with abdominal tuberculosis due to generalized muscle wasting and weight loss which is a feature of this disease process. Patients with abdominal tuberculosis had very prominent bony prominences due to the significant weight loss before surgery, so it became difficult to apply stoma appliances properly in these patients which resulted in frequent leakage of bag and spillage of relatively watery effluent from the bag. After initiation of standard antituberculous treatment and high protein diet, BMI improved in these patients and peristomal skin complications were also decreased.

Stoma prolapse was seen in 4 patients in this study during the 3rd and 4th post-operative week. Stoma prolapse causes distress and looks alarming and unsightly. This can be managed by manual reduction, local resection and reformation of the stoma or revision by abdominal approach for incarcerated or strangulated prolapse. None of our patients required surgical intervention for stoma prolapse. Retraction or prolapse of stoma and transient stoma ischemia are usual sequelae of an improper surgical technique.

Many patients with loop ileostomy are known to have episodes with excessive fluid loss through the stoma. In some of these patients, the losses over several days can severely derange water and electrolyte balance. During the first few post-operative days, fluid and electrolyte imbalance is the main problem, which needs great care and this was found in 12.6% of our patients, needing fluid and electrolytes. 3.4% of our patients needed aggressive fluid and electrolyte management. For unknown reasons, this complication was seen more commonly in cases with typhoid perforation.

Summary Box

What is already known:

- It is safe to make stomas instead of primary closure or resection and anastomosis in emergency situations
- Temporary loop ileostomy created for perforation peritonitis done in emergency situations is associated with increased complications

What the new findings are:

- Typhoid perforation is one of the common causes of perforation peritonitis in developing countries
- Age more than 50, shock at presentation, delay in presentation, delay in surgery, presence of comorbidities, and surgery done out of working hours are associated with increased complications

At the time of admission, only 147 patients had normal BMI while after 8 weeks 379 patients were in the normal range. This indicates that there was significant weight gain, hence improvement in BMI of patients at the end of the study. Apart from the role of improved diet and resolution of pathology, regular counseling played an important role in improvement.

In conclusion, temporary loop ileostomy for perforation peritonitis due to benign systemic diseases such as typhoid fever and tuberculosis confers a very high morbidity. Peritonitis patients develop more stomal and systemic complications if they present late and also if surgery is delayed. Presence of shock at presentation and association of comorbidities are also associated with increased rate of complications. Ileostomy had a positive effect on the BMI of severely debilitated patients with perforation peritonitis, although not a direct effect. Most of the patients cope well with adjustments required after creation of temporary loop ileostomy because of psychological support provided by clinicians and reassurance about stoma closure within a few weeks.

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