

Complications of Temporary Ileostomy in Patients with Acute Abdomen with Ileal Perforation and Obstruction

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ABSTRACT

Objective: To determine the complications, outcomes associated with temporary ileostomy and to study the complications related to its closure.

Material & Methods: This study was conducted on 60 patients for two years from 1 January 2020 to 31 December 2020 at the Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat Khairpur Mirs, Sindh Pakistan. The researchers looked at ileal perforations larger than one-third of the circumference, gangrene, severe adhesions, and ancient perforations with peritoneal contamination. Clinical, intraoperative, biochemical and stomal, and peristomal problems and tissue histology were evaluated in the research

Results: A total of 60 patients were selected, 42 (70%) patients exhibited peritoneal contamination with pus, faecal matter, or blood in cases of trauma or gangrenous gut, 38 (63.33%) Patients found with ileal perforation. We found that 15(62.5%) of patients had skin excoriation with peritoneal contamination (70%, n=42) which shows an insignificant difference (P-value=0.249), four (16.66%) patients showed Mucocutaneous separation insignificantly (p-value 0.671) who reached after 48 hours at the hospital. Twenty (83.33%) of enteric perforation were significantly seen with Paralytic ileus (p-value=0.006). Nine (37.5%) cases with loop ileostomy revealed Ileostomy diarrhea which showed a significant difference (p-value = 0.041). In 8 (12.5%) of patients had significant Incisional hernia who arrived at the hospital after 72 hours, tubercular perforation was significantly seen in 12 (50%) cases, an end ileostomy was observed in 25 (41.66%) patients (p-value=0.024, p-value=0.024, p-value≤ 0.001).

Conclusions: Loop ileostomy is still a life-saving treatment, despite the inconvenience. An easy-to-operate stoma device can help patients to avoid more serious complications, and the appropriate placement of their stomas cannot be overstated.

Keywords: Complications, Ileostomy, Temporary

INTRODUCTION

A gastrointestinal stoma is a common surgical surgery that is routinely performed. Temporary loop ileostomies are used in the event of anastomotic complications or perforation peritonitis, both of which carry a significant risk of death. Although the surgery for creating a defunct loop ileostomy is normally simple, there is a significant risk of complications.

Acute or chronic stoma complications might arise early, late, sporadically, or gradually. Preventing complications is easy when a multidisciplinary team of surgeons and therapists uses proper surgical techniques and effective rehabilitation. As a public health issue in our region, acute ileal perforation is frequently caused by typhoid and TB. Typhoid perforation can be treated surgically in several ways that are currently in use. Fulminant enteritis and peritonitis lasting for a long time necessitate an ileostomy, which can be life-saving. Intestinal stoma creation is still a widespread and commonly done technique, despite substantial advancements in the field of intestinal surgery. It is essential to adhere to the most up-to-date surgical practices.¹ Ostomy complications are still common despite contemporary surgical advancements.¹ The highest risk of problems occurs in the first five years, although there is a tiny but persistent risk after that.² The formation of a stoma is connected with an increased risk of morbidity if you have Crohn's disease.¹⁻³ Patients with ileostomies or colostomies require reoperations about 15% to 20% of the time.⁴⁻⁶ The study's goals and objectives were to examine the risks and side effects of a temporary ileostomy, as well as the long-term effects and potential consequences of removing the ileostomy.

MATERIALS AND METHODS

This study was conducted on 60 patients for one year from 1 January 2020 to 31 December 2020 at the Pir Abdul Qadir Shah Jeelani Institute Of Medical Sciences Gambat Khairpur Mirs, Sindh Pakistan. Perforation peritonitis and small intestinal obstruction were clinically diagnosed in patients who underwent an exploratory

laparotomy, which was later found to be a case of ileal perforation and ileal obstruction requiring the construction of a short-lived, temporary ileostomy, in the study population. Ileal holes larger than one-third of the circumference were included in this study, as were ancient perforations and obstructions with peritoneal contamination as well as severe adhesions around the perforations. As a result, those patients who were unsuited for general anesthesia, those with ileal perforations and obstructions that didn't need the fabrication of temporary ileostomies, and those whose ileostomies were lost in follow-up before they could be closed were not included in this study.

Parameters to be studied:

- Aspects include the patient's medical history, such as age and gender; signs and symptoms; and physical examination results, such as an X-ray of the abdomen taken while the patient is erect and supine.
- Level of peritoneal contaminant, number, location, and size of perforations, the kind of lesion producing ileal blockage, and the presence of adhesions are some of the intra-operative characteristics.
- Serum electrolytes, complete hemogram, sugar, urea, creatinine, and liver function tests are included in the list of biochemical parameters.
- Problems with the stomach and the peristomal area.
- Histopathology of tissue.

Study Tools: Complete hemogram, sugar, urea, creatinine, blood group, liver function tests, proteins, serum electrolytes: they are all hematological tests.

An x-ray of the abdomen taken when the patient is lying upright and supine is one example of a radiological test.

A data collecting form, reference materials, statistical analysis software, patient permission form, and a strategy for the analysis of data are all included in this package. The information gathered for the investigation was compiled in a large chart and summarized in tables and visual illustrations. It was subjected to typical statistical tests such as the Pearson chi-square test and

calculated using the mean, median, standard deviation, and percentages.

RESULTS

Demographic characteristics of the patients: Of the 60 patients, 15 (25.0%) were between the ages of 16 and 30, 16 (26.6%) were between the ages of 31 and 45, and 29 (48.3%) were between the ages of 46 and 60. The Mean age \pm SD of the patients was 51.23 years. Males comprised 31 (51.66%) of the cases, while females comprised 29 (48.33%).

Duration of acute symptoms: There were 11 (18.33%) patients who arrived within 24 hours of their symptoms, 14 (23.33%), within 24 hours, and 35(58.33%) who presented beyond 72 hours of their illnesses.

Presenting signs and symptoms: All of the patients complained of abdominal discomfort (100 %). Fever and peritonism were present in 56 (93.33%) of the patients, while vomiting was present in 53 (88.33%), diarrhea was present in 13 (21.66%) of the patients, constipation was present in 31 (51.66%) of the patients, abdominal distension was present in 42 (70%) of the patients, and 38 (63.33%) of the patients were in shock at the time of presentation. There was a history of trauma in 7 (11%) of the patients.

X-ray findings: Patients with numerous air-fluid levels on straight X-ray abdomen 31 (51.66%) developed mechanical obstruction or paralytic ileus following perforation peritonitis. A total of 11 patients (18.33%) showed signs of peritoneal contamination in the form of a ground-glass appearance, 4 patients (6.66%) had dilated guts, and the remaining 14 patients (23.33%) showed no such signs of contamination.

Intraoperative findings: Forty-two (70%) patients exhibited peritoneal contamination with pus, faecal matter, or blood in cases of trauma or gangrenous gut when they were examined in the abdominal cavity. Patients with ileal perforation were found in 38 (63.33%) while those with gangrenous alterations in the small intestine were seen in 24 (40%). Interloop, parietal, and postoperative band adhesions were seen in 31 (51.66%) of the patients; 13 (21.66%) had an inflammatory lump in the RIF, and 4 (6.66%) had a non-passable stricture in the ileum (Table 1).

Site of perforations: Twenty-two of the 42 patients had a single perforation; three (7.14%) had two perforations, and another three (7.14%) had three perforations in total. Perforations were found in 18 patients (30 percent), 14 patients (23.33 percent), and 17 patients (28.33 percent) within 15 to 35 cm of the ICJ. 28 (46.66%) of the holes were less than 5 mm, 4 (6.66%) were between 5-10 mm, and 7 (11.66%) were between 15-20 mm in size (Table 2).

Type of surgery: Perforation was externalized as a loop ileostomy in 28 patients (46.66 percent). The proximal perforation was exteriorized as a loop ileostomy and the distal perforation was repaired largely in two layers with interrupted stitches in seven patients (11.66 percent) with multiple perforations. End ileostomies and mucus fistulas were created by resecting the gangrenous intestinal segment in 25 (41.66%) patients (Table 3).

In this study, the enteric perforation was seen in 26 (43.33%, n= 60) patients, tubercular perforation was observed in 22 (36.66%, n= 60), non-specific causes were present in 10(16.66%, n= 60) cases and an iatrogenic perforation was found in 1(1.66%, n= 60) patient only. (Table 4)

Ileostomy complications before closure: In our study, 3 (12.5%) patients had ischemia, 30 (50%) patients had transient edema of the stoma. Most of the 44 (73.33 %) patients had ileus, 4 (6.66%) patients had superficial bleeding, 30 (50%), patients had ileostomy diarrhea, 4 (6.66%) patients developed mucocutaneous separation. No patient had stomal stenosis. (Table 5)

Peristomal and stomal complications before closure: We found other complications like skin excoriation in 38 (63.3%) patients in the majority, 37 (61.6%) patients had wound infection, 18 (30%) patients had wound gaping, 23 (38.3%), patients developed an incisional hernia, 19 (31.6%), patients had enterocutaneous fistula, 9 (15%) patients were seen with burst

abdomen and only 8 (13.3%) had dermatitis, 4 patients (6.66%) expired in our study. (Table 5)

Stoma closure: At the conclusion of the research, 42 patients had their stomas closure. The mean time for closure was 95 days with the minimum days for closure being 42 and the maximum days for closure being 186. The mean time for loop ileostomy closure was 100 mins. The minimum range of loop ileostomy closure was 90 mins and the maximum range of loop ileostomy closure was 120 mins. (Table 5)

The mean time for an end ileostomy closure was 142 mins. The minimum range of an end ileostomy closure was 105 mins and the maximum range of an end ileostomy closure was 150 minutes. The mean blood loss estimated was 155 ml with minimum to maximum ranges of blood loss estimated from 100 to 250 ml. The mean hospital stay after the stoma closure was 13 days with minimum to maximum hospital stay after the stoma closure was from 7 to 90 days. (Table 5)

Stoma closure related complications: At the conclusion of the research, 42 patients developed closure, 9.09% of patients developed an anastomotic leak. enterocutaneous fistula found in 9.09% patients, 4.54% patients were suffered from bowel obstruction, 60% patients developed wound infection, and wound dehiscence seen in 36% of patients whereas no mortality was seen in stoma closure. (Table 5)

RESULT

On applying the chi-square test we found that 15 (62.5%) of patients had skin excoriation with peritoneal contamination (70%, n=42) which shows an insignificant difference between the groups (P-value = 0.249).

In our research, 4 (16.66%) patients showed insignificantly (p-value 0.671) Mucocutaneous separation who was reached after 48 hours at the hospital. Twenty (83.33%) of enteric perforation were significantly seen with Paralytic ileus (p-value=0.006). Nine (37.5%) cases with loop ileostomy revealed Ileostomy diarrhea which showed a significant difference (p-value = 0.041). Four (16.66%) loop ileostomy patients were reported with Dermatitis (p-value 0.218). Albumin levels below 3 g/dl are associated with significant wound gaping in eight (33.33%) of the patients. (P-value = 0.417) and peritoneal contamination was present in 42 (70%) which shows significant difference (p-value = 0.002).

Burst abdomen was observed in three (12.5%) patients with peritoneal contamination, a loop ileostomy was seen in 28 (46.66%) patients, and an end ileostomy was present in 25 (41.66%) patients. There was significantly difference (p-value = 0.389, p-values <0.001 respectively).

Table 1: Distribution of patients according to Intra-operative findings (n = 60)

Findings	No. of patients	Percentage
Peritoneal contamination	42	70
Ileal perforation	38	63.33
Gangrenous gut	24	40
Adhesions	31	51.66
Lump (inflammatory)	13	21.66
Stricture (non-passable)	4	6.66

Table 2: Details of perforation.

Number of perforations (n= 42)	No. of patients	Percentage
1	22	52.38
2	3	7.14
3	3	7.14
Site from ileo-caecal junction(cm) n = 60		
15-25	18	30
25-35	14	23.33
35-45	17	28.33
Size (mm)		
0-5	28	46.66
5-10	4	6.66
10-15	0	0
15-20	7	11.66

In this study, in 8 (12.5%) of patients had significant Incisional hernia who arrived at the hospital after 72 hours, tubercular perforation was significantly seen in 12 (50%) cases, an end ileostomy was observed in 25 (41.66%) patients (p-value=0.024, p-value=0.024, p-value≤ 0.001). (Table 5)

Table 3: Type of surgery performed.

Type of Surgery	No. of patients	Percentage
Loop ileostomy	28	46.66
Proximal loop ileostomy with distal primary repair	7	11.66
Resection with end ileostomy and mucous fistula	25	41.66

Table 4: Histopathological report.

Etiology/HPE	No. of patients	%
Enteric perforation	26	43.33
Tubercular	22	36.66
Iatrogenic	1	1.66
Appendicular abscess	1	1.66
Non-specific inflammation	10	16.66

Table 5: Correlation of complications with etiology.

Complications	Enteric Perforation (n=24)	Tubercular Perforation (n=24)	Non-specific (n=12)	P-value
Ischaemia	3 (12.5%)	0	0	0.24
Transient oedema	13(54.16%)	8 (33.33%)	9 (75.77%)	0.07
Ileus	20 (83.33%)	12 (50%)	12 (100%)	0.006*
Retraction	11(45.83%)	4 (16.66%)	0	0.031*
Superficial bleeding	0	4 (16.66%)	0	0.096
Mucocutaneous separation	0	4 (16.66%)	0	0.671
Skin excoriation	15 (62.5%)	15 (62.5%)	8 (66.66%)	0.249
Ileostomy diarrhoea	9 (37.5%)	12 (50%)	9 (75%)	0.041*
Dermatitis	4 (16.66%)	4 (16.66%)	0	0.218
Wound infection	20 (83.33%)	16 (66.66%)	1 (8.33%)	<0.001*
Wound gaping	8 (33.33%)	9 (37.5%)	1 (8.33%)	0.417
Burst abdomen	3 (12.5%)	3 (12.5%)	3 (25%)	0.389
Enterocutaneous fistula	8 (12.5%)	8 (33.33%)	3 (25%)	0.268
Incisional Hernia	8 (12.5%)	12 (50%)	3 (25%)	0.024*
Death	0	2 (11.11%)	2 (16.66%)	0.388

*P-value is statistically significant calculated by Fisher's exact test of X²

DISCUSSION

Reviewing the literature, it has been shown that 41% of individuals who had their loop ileostomy constructed experienced complications and that 6% of those patients required surgical intervention.⁷ Loop ileostomy construction was associated with a 25% complication incidence in seven other patients, all of whom required surgical intervention.⁸ A 5.7-10.8 percent complication rate has also been recorded.⁹ In addition to the negative impact on the quality of life that a loop ileostomy has, it is made worse by stoma-related problems.¹⁰⁻¹³ Temporary loop ileostomy complication rates vary from 5% to 100%.¹⁴ The various lengths of follow-up account for the wide range of these rates.¹⁵ Factors related to increased morbidity and mortality include the patient's age, the urgency of operation, and the diagnosis at the time of presentation.¹⁶ Complication rates ranged from 20% to 60%, and this significant variation may be due to the multiple time points at which the study was conducted.¹⁷ Stoma-related issues also become better with time.

An estimated 10% to 14% of patients have peristomal skin problems as a result of poor stoma placement and postoperative care and maintenance. However, in the past, it has been

suggested that the use of adhesives such as latex mixtures, Karaya gum, or stoma-adhesive can assist to avoid this problem from occurring by creating a tight and secure seal with the skin around the stomach stoma.⁷ In the event of a medical emergency, it is essential to at least indicate the location of the stoma on the abdomen skin.

A retrospective analysis of 1790 patients found that individuals who were counseled and examined by an enterostomal therapist and were preoperatively designated for the right stoma placement had a considerably decreased incidence of early problems (within 30 days after surgery).¹⁸

An enterostomal therapist was shown to be six times more effective in treating stoma-related problems in one research than an unaffiliated control group.¹⁹

Another study found that the enterostomal therapist's advice was not linked to a lower incidence of complications.¹⁶

The significant fluid loss that many patients with a loop ileostomy experience are well documented. For a few days, these individuals' hydration and electrolyte balance might be significantly disrupted.²⁰ Fluid and electrolyte imbalance is the primary concern in the first few days following surgery, and it needs meticulous monitoring.⁷

Acute hydration and electrolyte treatment were needed in 76% of our patients. An estimated 2-10 percent of patients having ileostomies may experience stoma stenosis. Poor visibility of the stoma, ischemia and insufficient skin or abdominal wall openings are all possible reasons. During this investigation, there were no instances of stoma stenosis. 90% of the time, a peritoneal hernia with diffuse bulge and unenlarged fascia is caused by a real parastomal hernia, whereas the remaining 10% is caused by pseudohermias.

Most of our patients' peristomal fistulas healed on their own, without the need for surgical intervention or even antibiotics. When patients had their bags full three-quarters of the way, they were instructed to empty them and close them exclusively with healthy skin, and this was the standard treatment for cases of skin excoriation.

According to our analysis, ileal perforation (44%) was the most prevalent cause of ileostomy. Thirty-four percent were determined to be the result of TB, whereas twenty-four percent showed non-specific inflammation as the underlying cause. Eight percent of the non-specific patients exhibited widal positive, and twelve percent had a history of trauma. In contrast to Western countries, typhoid and TB are still the most prevalent causes of ileal perforation in India, each accounting for 16.6 percent of all cases.

42 patients in the study group had stoma closures. All of these individuals had a preoperative distal hologram to determine the health of their distal colon and rule out any obstructions there (Figure 3). It took an average of 95 days for the stoma to close after it was constructed, with a range of 42 to 186 days. After 180 days of therapy, the patients on anti-tuberculosis medication were given the option of being discharged. There were two cases of an anastomotic leak and an enterocutaneous fistula (9.09 percent) after stoma closure. Anastomotic leakage is reported in the literature to be between 0% and 7%. 24-26 A saline infusion test was devised to detect accidental perforation during dissection to release the loops for closure (Figure 4). There was no mortality linked with these problems, which were treated conservatively. It was only after a patient's conservative treatment failed that he had a surgical procedure. Primary anastomosis with a rectus muscle flap to strengthen the anastomosis was performed via a midline laparotomy. Many other surgeons have performed similar surgeries in the past.²¹

Before making another effort to close the fistulous segment, patients were given mesalazine, which is an anti-inflammatory medicine, to treat the non-specific chronic inflammation in the resected fistulous segment. The surgeon should be alerted to the possibility of Crohn's disease or TB if a biopsy reveals non-specific inflammation, and further testing should be performed before the

stoma is closed. Intestinal obstruction occurred in 4.54 percent of patients, with wound infection being the most prevalent consequence (90 percent), compared to 41.6%.²²

Only 1.3% of patients had their skin incisions left open, compared to 2.8%, 3.8%, and 14.2% of patients who had their skin incisions closed mostly.^{10,23,24}

Even after the anti-tubercular medication has been completed, TB patients must be checked for disease activity before the stoma is closed because of the worldwide spread of drug-resistant tuberculosis. Following stoma closure, a leak in the anastomosis may be caused by persistent disease activity. As many as 30 percent of ileostomies are reported to have a complication risk of between 10 and 17 percent, depending on the purpose of the procedure.^{25,26}

Stapled and handsewn procedures, duration between main surgery and stoma closure, usage of bowel preparation, antibiotic prophylaxis — all of these have been linked to an increased risk of postoperative problems after stoma closure.

A possible risk factor for complications is the length of time it takes for the original surgery to be completed and the wound to be closed. As a possible reason for this correlation, complete recovery of the patients following the initial procedure, which may take up to two months, is a possible explanation.³¹ It is also possible to prevent a time of adhesion hypervascularization by increasing the interval between treatments. As a result, the stoma border becomes more vascularized and less edematous over time. On the other hand, considerations in favor of early stoma closure over late closure include low patient acceptability and compliance with ileostomy, as well as the financial burden of stoma maintenance.²⁷

CONCLUSION

Temporary loop ileostomy is the most common indication for typhoid perforation. An ileostomy is a life-saving treatment that is becoming more common in emergency cases, despite the inconvenience. An ileostomy's appropriate placement is of the utmost significance. An operational biopsy result revealing non-specific inflammation before ileostomy closure must be carefully examined since it might suggest Crohn's disease or TB and, if left untreated, could lead to anastomotic leak after ileostomy closure. A complete therapy of TB with remission of disease activity is required before stoma closure in tubercular infection.

REFERENCES

1. Mealy K, O'Broin E, Donohue J, Tanner A, Keane FB V. Reversible colostomy—What is the outcome? *Dis Colon Rectum*. 1996 Nov;39(11):1227–31.
2. Londono-Schimmer EE, Leong APK, Phillips RKS. Life Table analysis of stomal complications following colostomy. *Dis Colon Rectum*. 1994 Sep;37(9):916–20.
3. Leenen LPH, Kuypers JHC. Some factors influencing the outcome of stoma surgery. *Dis Colon Rectum*. 1989 Jun;32(6):500–4.
4. Leong APK, Londono-Schimmer EE, Phillips RKS. Life-table analysis of stomal complications following ileostomy. *Br J Surg*. 2005 Dec 7;81(5):727–9.
5. Carlsen E, Bergan A. Technical aspects and complications of end-ileostomies. *World J Surg*. 1995;19(4):632–6.
6. Roy PH, Sauer WG, Behrs OH, Farrow GM. Experience with ileostomies. *Am J Surg*. 1970 Jan;119(1):77–86.
7. Wexner SD, Taranow DA, Johansen OB, Itzkowitz F, Daniel N, Noguera JJ, et al. Loop ileostomy is a safe option for fecal diversion. *Dis Colon Rectum*. 1993 Apr;36(4):349–54.
8. Senapati A, Nicholls RJ, Ritchie JK, Tibbs CJ, Hawley PR. Temporary loop ileostomy for restorative proctocolectomy. *Br J Surg*. 2005 Dec 6;80(5):628–30.
9. Hull TL, Kobe I, Fazio VW. Comparison of handsewn with stapled loop ileostomy closures. *Dis Colon Rectum*. 1996 Oct;39(10):1086–9.
10. Phang PT, Hain JM, Perez-Ramirez JJ, Madoff RD, Gemlo BT. Techniques and complications of ileostomy takedown. *Am J Surg*. 1999 Jun;177(6):463–6.
11. O'Leary DP, Fide CJ, Foy C, Lucarotti ME. Quality of life after low anterior resection with total mesorectal excision and temporary loop ileostomy for rectal carcinoma. *Br J Surg*. 2002 Nov 29;88(9):1216–20.
12. O'Toole BCH G. Defunctioning loop ileostomy: a prospective audit. *J Am Coll Surg*. 1999 Jan;188(1):6–9.
13. Gooszen AW, Geelkerken RH, Hermans J, Lagaay MB, Gooszen HG. Quality of life with a temporary stoma. *Dis Colon Rectum*. 2000 May;43(5):650–5.
14. Kaidar-Person O, Person B, Wexner SD. Complications of Construction and Closure of Temporary Loop Ileostomy. *J Am Coll Surg*. 2005 Nov;201(5):759–73.
15. Robertson I, Leung E, Hughes D, Spiers M, Donnelly L, Mackenzie I, et al. Prospective analysis of stoma-related complications. *Color Dis*. 2005 May;7(3):279–85.
16. Sier MF, Oostenbroek RJ, Dijkgraaf MGW, Veldink GJ, Bemelman WA, Pronk A, et al. Home visits as part of a new care pathway (<scp>iAID</scp>) to improve quality of care and quality of life in ostomy patients: a cluster-randomized stepped-wedge trial. *Color Dis*. 2017 Aug 2;19(8):739–49.
17. Andivot T, Bail JP, Chio F, Juglard G, Topart P, Lozac'h P, et al. [Complications of colostomies. Follow-up study of 500 colostomized patients]. *Ann Chir*. 1996;50(3):252–7.
18. Bass EM, Del Pino A, Tan A, Pearl RK, Orsay CP, Abcarian H. Does preoperative stoma marking and education by the enterostomal therapist affect outcome? *Dis Colon Rectum*. 1997 Apr;40(4):440–2.
19. Duchesne JC, Wang Y-Z, Weintraub SL, Boyle M, Hunt JP. Stoma complications: a multivariate analysis. *Am Surg*. 2002 Nov;68(11):961–6; discussion 966.
20. Hallbook O, Matthiessen P, Leinskold T, Nystrom P-O, Sjobahl R. Safety of the temporary loop ileostomy. *Color Dis*. 2002 Sep;4(5):361–4.
21. Chang P, Chun JT, Bell JL. Complex enterocutaneous fistula: closure with rectus abdominis muscle flap. *South Med J*. 2000 Jun;93(6):599–602.
22. Memon ZA, Qureshi S, Murtaza M MM. Outcome of ileostomy closure. *Pak J Surg*. 200AD;25(4).
23. Safirulla, Mumtaz N, Jan MA AS. Complications of intestinal stomas. *J Postgr Med Inst*. 2005;19:407–11.
24. Amin SN, Memon MA, Armitage NC, Scholefield JH. Defunctioning loop ileostomy and stapled side-to-side closure has low morbidity. *Ann R Coll Surg Engl*. 2001 Jul;83(4):246–9.
25. van de Pavoordt HDWM, Fazio VW, Jagelman DG, Lavery IC, Weakley FL. The outcome of loop ileostomy closure in 293 cases. *Int J Colorectal Dis*. 1987 Dec;2(4):214–7.
26. Edwards DP, Leppington-Clarke A, Sexton R, Heald RJ, Moran BJ. Stoma-related complications are more frequent after transverse colostomy than loop ileostomy: a prospective randomized clinical trial. *Br J Surg*. 2002 Dec 6;88(3):360–3.
27. Shellito PC. Complications of abdominal stoma surgery. *Dis Colon Rectum*. 1998 Dec;41(12):1562–72.