International Surgery Journal
Hossain A et al. Int Surg J. 2024 Sep;11(9):1484-1489
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20242448

Original Research Article

Outcome of early and delayed closure of temporary ileostomy in children

Arman Hossain[1]*, M. Kabirul Islam[2], Abdul Matin[3], Rozina Akter Lota[1], Faridul Islam[4], Raihan Islam[2], Sharmin Rahman[5]

[1]Department of Paediatric Surgery, Us-Bangla Medical College and Hospital, Dhaka, Bangladesh
[2]Department of Paediatric Surgery, Dhaka Community Medical College, Dhaka, Bangladesh
[3]Department of Surgery, Us-Bangla Medical College and Hospital, Dhaka, Bangladesh
[4]Chattogram International Medical College and Hospital, Chattogram, Bangladesh
[5]Institute of Child and Mother Health, Matuail, Dhaka, Bangladesh

Received: 08 July 2024
Accepted: 09 August 2024

***Correspondence:**
Dr. Arman Hossain,
E-mail: drarmanhossain87@gmail.com

ABSTRACT

Background: Ileostomy is frequently utilized in the surgical management of various congenital and acquired gastrointestinal conditions, often leading to significant patient morbidities. This study aimed to evaluate the outcomes of early versus delayed closure of temporary ileostomies.
Method: A prospective comparative interventional study was conducted at Dhaka Shishu (Children) Hospital from March 2017 to September 2019. A total of 48 patients with temporary loop ileostomies were included based on specific inclusion and exclusion criteria. These patients were randomly divided into two groups: early closure (Group A, n=25) and delayed closure (Group B, n=23). Comparative parameters included wound infection, anastomotic leakage, and incisional hernia, with a follow-up period of 6 months postoperatively.
Results: In the early closure group, over 50% of patients were less than 1 month old, while 78.3% in the delayed closure group were aged 2-3 months. The cohort comprised 26 males (54.2%) and 22 females (45.8%). Group A patients had a significantly lower mean weight than group B ($p<0.05$). The predominant diagnosis in both groups was meconium ileus, followed by volvulus neonatorum, small gut atresia, and typhoid ulcer perforation. Post-closure, the overall wound infection rate was 35.4% (40.0% in group A and 30.4% in group B). Anastomotic leakage occurred in 8.0% of group A and 13.0% of group B. Incisional hernia developed in 4.0% of group A and 13.0% of group B ($p=0.388$). Mortality rates were 4.0% in group A and 8.7% in group B ($p=0.601$).
Conclusion: Early closure of temporary loop ileostomy appears to be a comparatively safe option with lower morbidity, suggesting it as a viable alternative to delayed closure.

Keywords: Delayed closure, Early closure, Meconium ileus

INTRODUCTION

An ileostomy is a surgical operation in which a section of the small gut, namely the ileum, is brought to the surface, linked, and left open on the anterior abdominal wall.[1] Ileostomy is primarily used as a protective cover for distal colorectal or ileoanal pouch anastomosis, but it is also frequently performed in emergency surgical settings where meconium ileus, small gut artesia, volvulus neonatorum, total colonic aganglionosis, and infectious conditions such as enteric or tubercular perforations are common. Ileostomy can be classified into two types: permanent and temporary ileostomy. Permanent ileostomy is used to treat distal obstruction caused by unresectable pelvic cancer, total proctocolectomy in Crohn's disease, and other conditions.[2]

Temporary ileostomies can include loop ileostomy, dividing ileostomy, Bishop koop ileostomy, and Sentuli ileostomy. Temporary ileostomy is often used for surgical therapy of several congenital diseases (Meconeum ileus) and acquired conditions such as multiple small bowel perforation, difficult intussusception, and to protect the distal anastomosis of the gastrointestinal system1. Ileostomy is related with morbidity such as skin irritation, diarrhea, prolapse, retraction, parastomal hernia, ileus, and occasionally increased salt and fluid loss. For these reasons, the patient requires frequent hospitalization. Ostomies are economically expensive because to the need for ostomy care training and multiple hospitalisations.[3] Following ostomy development, physicians tend to postpone ostomy closure for at least 8 weeks because of its maturity, surgical aspects such as postoperative abdominal adhesions, and anaesthetic features such as morbidity related with ventilation expected in case of premature closure.[4]

Ileostomy closure can result in significant morbidity, including wound infection, dehiscence or incisional hernia, and anastomotic leaking. Temporary ileostomies typically close within 8 to 12 weeks. Delayed closure of a temporary ileostomy is associated with severe morbidity such as electrolyte imbalance and poor weight gain because the duration is long enough to face stoma-related problems, lowering quality of life.[5] Early closure of a temporary ileostomy (within 4 weeks) has been characterized in numerous studies as safe and successful, with very little morbidity and death. In comparison to traditionally timed closure (8-12 weeks), reported stoma related complication rates were reduced in patients having early closure. Both mortality and small bowel blockage rates compare favorably to standard timed closure; however, wound infection rates appear to be higher.[6,7] The present study was designed to compare the outcome between early and delayed closure of temporary ileostomy in children. General objective was to compare the outcome between early and delayed closure of temporary ileostomy. Specific objectives were to compare the wound infection between early and delayed temporary ileostomy closure. To compare the anastomotic leakage at early and delayed closure of temporary ileostomy. To compare incisional hernia at early and delayed closure of temporary ileostomy.

METHODS

Study design

This prospective comparative interventional study was conducted in the Division of Pediatric Surgery at the Bangladesh Institute of Child Health and Dhaka Shishu (Children) Hospital in Dhaka. The study focused on patients admitted with temporary loop ileostomy for any gastrointestinal (GIT) condition.

Study period

It was carried out over a period from March 2017 to September 2019.

Inclusion criteria

All patients with temporary loop ileostomy for any GI condition with distal patency in Dhaka Shishu (Children) Hospital during the study period. Age ranged from 3 weeks to 15 years. Patients of both sexes.

Exclusion criteria

Ileostomy for stage procedure like total colonic aganglionosis, pouch colon (rare). Patient with co-existing medical condition like pneumonia, cardiac anomaly, very poor general condition, sepsis and other congenital anomaly. Patients whose parents did not give written informed consent.

Sample size

Sample size was calculated by the following formula:

$n = [P1(1- P1)+P2(1- P2)/ (P1 - P2)2]\times (Z\alpha + Z\beta)2$

Where, n=sample size required in each group, Zα=1.96 (Z value at 5% level of significance), Zβ=0.85(at 80% power, when β=0.2), P1=0.33 (post-operative complication after early ileostomy closure), P2=0.17 (post-operative complication after late ileostomy closure).[7] Hence, the sample size was $n=[0.33(1-0.33)+0.17(1-0.17)/(0.33–0.17)2]\times(1.96+0.85)2\approx142.13$.

So, according to this formula, each group required 143 participants.

Sampling technique

Purposive sampling technique was done. Out of the study population, the individual sample units were selected according to selection criteria until the desired sample size was attained.

Randomization

Detailed procedure and benefit of the study was explained to the legal guardian. They were encouraged to voluntarily participate and were allowed freely to withdraw from the study. If they agreed they were enrolled in the study. Then written informed consent was taken from them. Total 52 patients were included in this study and divided into two groups. All patients in early closure group were included in Group A and patients in late closure group were included in Group B. Patients were divided in two groups by lottery.

Data collection

In each case information about the patient was obtained in pre-designed, semi-structured questionnaire. After admission each patient was thoroughly examined, investigated and all relevant information were noted.

Group A

Patients were prepared for early closure within 4 weeks of construction of temporary ileostomy.

Group B

Patients were prepared for delayed closure between 8 week-12 weeks of construction of temporary ileostomy.

Preoperative investigations

The following investigations were done preoperatively:

Blood test

Complete blood count (CBC), serum albumin, serum electrolyte and serum creatinine. Distal loopogram using water soluble contrast in all cases to ascertain the distal patency of intestinal tract.

Pre-operative treatment

Patients were kept nothing per oral for 6 hours. Intravenous fluid (1/2 strength normal saline with 10% dextrose in aqua according to age & weight, fluid were changed according to electrolyte requirement). Prophylactic antibiotics were given at the time of induction. Inj. Ceftazidim 75 mg /kg/day in two divided dose. Inj. Metronidazole 1.5ml/kg/dose 8 hourly. Distal loop irregation with Normal Saline (5 ml/ kg).

Operative technique

Operative procedure was same in both group. Patient was placed in supine position on the operative table. After general anaesthesia (GA), proper painting with povidone iodine and draping was done. One preoperative dose of antibiotic was given. Circumstomal elliptical incision was made and stoma was mobilized from surrounding fascial peritoneal adhesion.

All the stoma were closed with 5/0 vicryl (polygalactin 910) in interrupted Single layer. Wound gap was closed with vicryl 4/0 continuous stitches. Skin incision was closed intradermaly with 4/0 vicryl and aseptic dressing was given.

Data analysis

The data collected from the respondents were analyzed. After completion of data collection, the data were checked and edited manually and verified before tabulation. Data were coded, entered and analyzed in a computer. The statistical analysis was conducted using SPSS (statistical package for social science) version 25 statistical software.

The findings of the study were presented by frequency, percentage in tables and graphs. Means and standard deviations for continuous variables and frequency distributions for categorical variables were used to describe the characteristics of the total sample. Associations of continuous data were assessed using student t test. Associations of categorical data were assessed using Chi-square test and Fisher exact test. For both test, $p<0.05$ was considered significant.

Ethical issues

Ethical clearance was taken from ethical committee of Bangladesh Institute of Child Health and Dhaka Shishu (Children) Hospital. Informed written consent was taken from all the parents or legal guardians of the patients after adequately explaining them about the purpose of the study. They were assured of protection of patient's autonomy, privacy, confidentiality.

RESULTS

Within this time frame, it was not possible to treat 143 patients in each group with six months follow up. For this reason, 52 patients (26 patients in each group) who fulfilled the selection criteria were taken as sample. But among these patients, 1 patient in group A and 3 patients in group B did not come for surgery. Finally, 25 patients in group A and 23 patients in group B completed the treatment schedule.

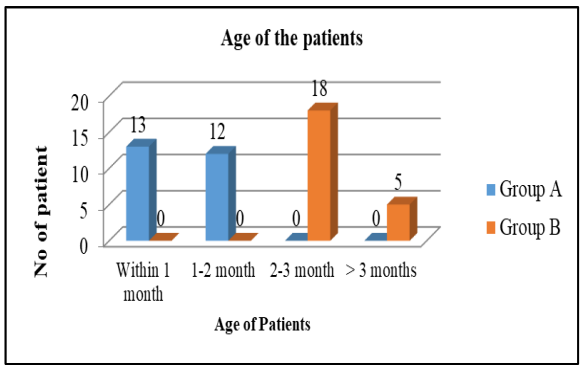

Figure 1: Comparison of age of the patients between two groups.

Figure 1 shows that in group A, more than 50% of the patients (13) were of age within 1 month and 12 (48.0%) patients were within 1 to 2 months age group. In group B, 5 (21.7%) patients were above 3 months and rest 18 (78.3%) were within 2-3 months age group.

Table 1: Gender distribution of the respondents in two groups.

Sex	Group A (n=25) N (%)	Group B (n=23) N (%)	P value
Male	11 (44.0)	15 (65.2)	0.161
Female	14 (56.0)	8 (34.8)	

Table 1 shows the gender distribution of two groups. No significant gender difference was seen between the groups as the p value was >0.05 (obtained from chi-square test).

Table 2: Weight of the patients in two groups.

Weight (in kg)	Group A (n=25)	Group B (n=23)	P value
Mean±SD	3.45±0.42	6.01±2.61	<0.001

Table 2 showed the weight distribution of two groups. In group A, the mean weight of patients was 3.45 (±0.42) kg. In group B, the mean weight of patients was 6.01 (±2.61) kg.

There was significant statistical difference between weights of two groups as the p<0.001(obtained by student's t test).

Table 3: Spectrum of disease of group A and Group B.

Primary diagnosis	Group A (n=25) N (%)	Group B (n=23) N (%)	P value
Meconium ileus	16 (64.0)	16 (69.6)	0.490
Volvulus neonatorum	6 (24.0)	3 (13.0)	
Typhoid ulcer perforation	0 (0.0)	2 (8.7)	
Small gut atresia	3 (12.0)	2 (8.7)	

Table 3 shows that in both groups, majority of the patients had Meconium ileus. In group A, volvulus neonatorum and small gut atresia were present in 6 and 3 patients respectively.

In group B, patients were suffering from volvulus neonatorum 3 (13.0%), Typhoid ulcer perforation was 2 (8.7%) and small gut atresia 2 (8.7%).

The result showed that there was no significant statistical difference in primary diagnosis between two groups as the p=0.490 (obtained from Fisher's exact test).

Table 4: Wound infection in two groups (post-operative).

Wound infection	Group A (n=25) N (%)	Group B (n=23) N (%)	P value
Present	10 (40.0)	7 (30.4)	0.367
Absent	15 (60.0)	16 (69.6)	

Table 4 shows that in group A, 10 patients (40%) developed wound infection. Whereas, in group B, wound infection was developed in 7 patients (30.4%). The result showed that there was no statistical difference in developing wound infection between two groups as the p=0.367 (obtained from Chi-square Test).

Table 5: Type of wound infection in two groups (post-operative).

Disease	Minor Wound Infection		Major Wound Infection	
	Group A	Group B	Group A	Group B
MI	8	3	1	2
Small Gut atresia	-	1	-	-
Typoid ulcer perforation	-	1	-	-
Volvolus neonatoram	1	-	-	-
Total	9	5	1	2

Table 5 shows that in group A, total 9 minor wound infection their primary diagnosis were MI and 1 patient had major wound infection with MI. On the other hand, in group B, total 5 patients had minor wound infection and 2 patients had major wound infection.

Table 6: Anastomotic leakage in two groups

Anastomotic leakage	Group A (n=25) N (%)	Group B (n=23) N (%)	P value
Present	2(8%)	3 (13%)	0.487
Absent	23 (92%)	20 (87.0%)	

Table 6 shows the post-operative anastomotic leakage in two groups. In group A, 2 (8.0%) patients had anastomotic leakage. On the other hand, in group B, 3 (13%) patients had anastomotic leakage. The result showed that there was no statistical difference in developing anastomotic leakage between two groups as the p=0.487 (obtained from Fisher's exact test).

Table 7: Anastomotic leakage with primary diagnosis in two groups (post-operative)

Disease	Anastomotic leakage	
	Group A	Group B
MI	2	2
Small Gut atresia	-	1
Total	2	3

Table 7 shows total 5 patients were found anastomotic leakage of which 2 from group A and 3 from group B. In the group A 2 patients were found MI and in group B 2 patients were found MI and 1 with small gut atresia.

Table 8 shows the comparison of developing incisional hernia between two groups. In group A, only one (4.0%)

patient had developed incisional hernia. On the other hand, in group B, (13.0%) patients had developed incisional hernia. The result showed that there was no statistical difference in developing incisional hernia between two groups as the p=0.388 (obtained from Fisher's Exact Test).[3]

Table 8: Incisional hernia between two groups.

Incisional hernia	Group A (n=25) N (%)	Group B (n=23) N (%)	P value
Present	1 (4.0)	3 (13.0)	0.388
Absent	24 (96.0)	20 (87.0)	

DISCUSSION

This prospective comparative interventional study included 52 patients with temporary loop ileostomy at Dhaka Shishu (Children) Hospital from March 2017 to September 2019. The study aimed to compare outcomes between early (within 4 weeks) and delayed (8-12 weeks) ileostomy closure. Exclusions included patients with total colonic aganglionosis, pouch colon, and coexisting conditions like pneumonia, cardiac anomalies, severe general conditions, sepsis, and other congenital anomalies. Patients were randomly divided into two groups: group A (early closure, 26 patients) and group B (delayed closure, 26 patients). One patient from group A and three from group B did not undergo closure due to death, leaving 48 patients for analysis.

In group A, 52% were aged within 1 month, while in group B, 78.3% were 2-3 months old. The cohort included 26 males (54.2%) and 22 females (45.8%), with 32 patients diagnosed with meconium ileus. No significant gender difference was observed between the groups (p>0.05). Patients were followed for six months. Though there remains no sex difference regarding developing meconium ileus, a study reported higher number of male neonates had meconium ileus compared to female neonates8.[8]

In group A, the mean weight of patients was significantly (p<0.05) lower than patients of group B. As the patients of group A were younger than patients of group B, the mean weight (3.45±0.42) was lower in group A. As already mentioned, majority of the patients had Meconium ileus in both groups. Other primary diagnosis was volvulus neonatorum, small gut atresia and typhoid ulcer perforation. The result showed that there was no significant statistical difference in primary diagnosis between two groups. The closure of surgical stomas is associated with significant morbidity and even mortality.[9] Van de Pavoordt et al reported overall complication rate of ileostomy closure ranged between 10% to 17%.[10]

Several factors have been associated with increased risk of postoperative complications developing after ileostomy closure, such as the interval between primary surgery and closure, the use of bowel preparation, antibiotic prophylaxis and technical strategies.[11] The most commonly reported complications after ileostomy closure include bowel obstruction, surgical site infection, anastomotic leaks, fistulae formation and incisional hernia.[12] In the current study, surgical site infection, anastomotic leaks, and incisional hernia were observed after ileostomy closure. The time interval to ileostomy closure has been reported in some studies as not being a significant contributor to development of postoperative complications.[7] The present study did not found any significant difference between the two groups regarding developing complications. In the current study, the overall wound infection rate after ileostomy closure was 35.4%. In group A, 40.0% patients and in group B, 30.4% developed wound infection where the difference was not statistically significant (p>0.05).

Different authors reported different rates of wound infection after ileostomy closure. Van de Pavoordt et al (1987) found 2.7% wound infection rate after ileostomy closure, Kiely and Sparnon (1987) found it 3.8%, while, Memon et al (2009) reported 41.6% after ileostomy closure.[12-14] In current Group A, one patient affected with major wound infection which was managed by regular dressing followed by secondary wound closure. Another 9 patients were affected with minor wound infection which was managed by dressing and antibiotic according to CS. In group B, there were 5 minor wound infection and 2 major wound infection which were managed by above mentioned processes. Ileostomy closure is a contaminated surgery which may be the causes of wound infection.

As the majority of patient in Group A were neonate so their immature immunity is another cause of wound infection. In group B, most of the patient were affected with skin excoriation which may be other causes of wound infection. In the present study, 11.1% patients had anastomotic leakage post-operatively. Two (8.0%) patients in group A and 3 (13.0%) patients in group B had anastomotic leakage which showed no significant statistical difference in two group as the p=0.487. Literature suggested that an anastomotic leak rate following closure of ileostomy, whether early or late, in the range of 0% to 8%.[7,14] They showed 8.3% anastomotic leakage after ileostomy closure. In group B, these 3 patients were admitted in the hospital several times for diarrhea and dehydration. However, among them, two (8.7%) patients died later on due to sepsis. In group A, among the two patients with anastomotic leakage, one died. Leakage may be due to ischemia of the intestine at the suture line, malnutrition, technical fault and hypoalbuminemia. Incisional hernia is a late complication seen several months post closure.

In this study, the overall rate of incisional hernia was 8.9% which was consistent with the study of Memon et al, (2009) who reported 8.3% incisional hernia rate after ileostomy closure.[14] In group A, only one (4.0%) patient

had developed incisional hernia. Samiullah et al, (2010) evaluated the results of early closure of ileostomy and found 6.6% patient had developed incisional hernia.[1] The study of Amin SN et al (2001) reported this rate up to 2.8%.[15] In group B, three patients (13%) had developed incisional hernia. The incisional hernia in the present study might be due to high rate of wound infection. No statistical difference was observed in developing incisional hernia between two groups as the p>0.05. Closing a temporary ileostomy within 4 weeks was associated with equal morbidity compared to delayed closure.

The study has a few limitations. Operations were not conducted by a single surgeon, which could have an impact on the outcome. The study was only conducted at Dhaka Shishu (Children) Hospital, which was not representative of the entire country. Only loop ileostomies were included in the research population. Due to the short research period, a small sample size was used, and long-term observation was not possible, which may have an impact on the study's external and internal validity.

CONCLUSION

This study indicated that early closure of a temporary loop ileostomy is comparatively safe and effective, with extremely low morbidity and mortality, and minimizes the risk of stoma-related problems compared to delayed closure. Additionally, early closure does not raise the incidence of postoperative problems.

Recommendations

Given the comparative safety and minimal morbidity, early temporary loop ileostomy closure is a preferable option for managing temporary loop ileostomy closure.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Samiullah A, Rahman MS, Khan A, Khalily Y. Evaluation of early closure of ileostomy. Global Journal of Med Sci. 2010;8(2):143-5.
2. Banerjee D. Complications of ileostomy closure and their risk factors, an unpublished dissertation submitted for the fulfilment of the requirements of master of medicine in surgery. University of Cape town. 2014:8-50.
3. Hindenburg T, Rosenberg J. Closing a temporary ileostomy within two weeks. Danish Medical Bulletin. 2010;57(6):4157.
4. Struijs MC, Sloots CE, Hop WC, Tibboel D, Wijnen RM. The timing of ostomy closure in infants with necrotizing enterocolitis: a systematic review. Pediatric Surgery International. 2012;28(7):667-72.
5. Krand O, Yalti T, Berber I, Tellioglu G. Early vs delayed closure of temporary covering ileostomy: a prospective study. Hepatogastroenterology. 2008;55(81):142-5.
6. Farquharson M, Hollingshead J, Moran BJ. Farquharson's Textbook of Operative General Surgery 9th ed. CRC Press. 2005:389.
7. Sarawgi M, Singh SK, Tiwary AK, Kumar A. Early vs delayed loop ileostomy closure: a comparative study. J Dental Med Sci. 2017;16(7):8-13.
8. Hasan MS, Mitul AR, Karim S, Noor-ul Ferdous KM, Islam MK. Comparison of T tube ileostomy and Bishop Koop ileostomy for the management of uncomplicated meconium ileus. J Neo Surg. 2017;6(3):56.
9. Freund HR, Raniel J, Muggia-Sulam M. Factors affecting the morbidity of colostomy closure. Dis Col Rec. 1982;25(7):712-5.
10. Van de Pavoordt, Fazio HDWM, Jagelman VW, Lavery IC, Weakley FL. The outcome of loop ileostomy closure in 293 cases. Int J Coll Dis. 1987;2(4):214-7.
11. Hasegawa H, Radley S, Morton DG, Keighley MR. Stapled versus sutured closure of loop ileostomy: a randomized controlled trial. Ann Surg. 2000;231(2):202-4.
12. Saha AK, Tapping CR, Foley GT, Baker RP, Sagar PM, Burke DA, et al. Morbidity and mortality after closure of loop ileostomy. Colorectal Disease. 2009;11(8):866-71.
13. Kiely EM, Sparnon AL. Stoma closure in infants and children. Pedia Surg Int. 1987;2(2):95-7.
14. Memon ZA, Qureshi S, Murtaza M, Maher M. Outcome of ileostomy closure: an audit in Surgical Ward 2, JPMC, Karachi. Pak J Surg. 2009;25(4):230-4.
15. Amin SN, Memon MA, Armitage NC, Scholefield JH. Defunctioning loop ileostomy and stapled side-to-side closure has low morbidity. Ann Roy Col Surg Eng. 2001;83(4):246-9.

Cite this article as: Hossain A, Islam MK, Matin A, Lota RA, Islam F, Islam R, et al. Outcome of early and delayed closure of temporary ileostomy in children. Int Surg J 2024;11:1484-9.