



A PROSPECTIVE COMPARATIVE STUDY ON OUTCOME OF EARLY AND DELAYED CLOSURE OF TEMPORARY LOOP ILEOSTOMY FOLLOWING EMERGENCY BOWEL SURGERY

General Surgery

Dr. Ram Manorath Patel

MS, Junior Resident, Department of Surgery, MLN Medical College, Prayagraj.

Dr. Chhavindar Singh*

MS, Junior Resident, Department of Surgery, MLN Medical College, Prayagraj.
*Corresponding Author

Dr. V. K. Pandey

MS, Professor, Department of Surgery, MLN Medical College, Prayagraj.

Dr. Prakhar Pratap

MS, Department of Surgery, MLN Medical College, Prayagraj.

ABSTRACT

Background: Ileostomy is often constructed in emergency surgical conditions like enteric or tubercular perforations when patients present late during illness to preclude primary closure. But the ostomy carries with it lot of morbidity making the quality of life poor. **Aims & Objective:** The aim of the study to find out the suitable timing of closure and reduce the stoma related morbidity and compare the outcome. **Methodology:** This study was a Prospective observational and comparative study, carried out in P.G. Department of Surgery, S.R.N. Hospital associated with M.L.N Medical College, Prayagraj from September 2020 to September 2021. Study carried out on 96 participants, which was divided in two group on the basis of Early and delayed closure of Ileostomy, patient are equally distributed in both group. The data is entered in MS EXCEL spreadsheet and analysis is done using software SPSS Version 23. **Result:** Total 96 patients 50.0% of the participants had Group Early Closure and 50.0% of the participants had Group Delayed Closure. The mean (SD) of Age (Years) in the Early Closure group was 35.52 (13.21) and in Delayed Closure group was 45.98 (13.86). There was a significant difference between the 2 groups in terms of Age (Years) ($W = 640.000$, $p = <0.001$). The 64.6% of the participants in the Early Closure group had Gender: Male and 35.4% had Gender: Female. The 56.2% of the participants in the Delayed Closure group had Gender: Male and 43.8% had Gender: Female. The mean (SD) of Time of Closure (Weeks) in the Early Closure group was 7.17 (0.73) and Delayed Closure group was 15.32 (1.80). The mean (SD) of Duration of Hospital Stay (Days) in the Early Closure group was 8.06 (3.32) and Delayed Closure group was 8.23 (2.57). There was no significant difference between the groups in terms of Duration of Hospital Stay (Days) ($W = 973.500$, $p = 0.179$). In early closure group 8.3% (4) participants had surgical site infections and 91.7% (44) of the participants had no surgical site infections. In the delayed closure group 6.2% (3) participants had surgical site infections and 93.8% (45) of the case had no surgical site infections. There was no significant difference between the various groups in terms of distribution of surgical site infections ($\chi^2 = 0.154$, $p = 1.000$). **Conclusion:** According to my study, the suitable timing of closure of temporary loop ileostomy is early closure and the mean time was 7.17 (0.73) week. Stoma related morbidity was reduced by the early closure of temporary loop ileostomy.

KEYWORDS

INTRODUCTION

Ileostomy is a surgical opening (stoma) which is constructed by bringing the end or loop of small intestine (ileum) out on to the surface of skin usually sited above the groin on right side of abdomen from which intestinal waste passes out and collected in an external stoma bag.⁽¹⁾ Generally these ileostomies are temporary and closure is done few weeks later but sometimes ileostomy is irreversible. Temporary loop ileostomy is often created in emergency abdominal situation for ileal or colorectal surgery where primary repair has high risk of failure due to contamination and inflamed bowel so ileostomy prevents the anastomosis leakage and defunction distal bowel with enteric diseases.⁽²⁾ A loop ileostomy is one of the most common techniques used in colorectal surgery to establish a reversible faecal diversion and bypass the large bowels, in order to protect either a downstream colorectal anastomosis or a coloanal anastomosis.^(3,4)

However, in spite of its potential benefits, it is worth noting that the incidence of complications, in general, is very variable and some studies estimated it between 14% and 79%.⁽⁵⁾ Complications that arise from stoma formation can be divided into early and late. Early complications, by definition, are those occurring within three months of the stoma creation. These include abscess formation, wound infection, bleeding, stomal necrosis, stomal retraction, mucocutaneous separation, and peristomal skin breakdown.⁽⁶⁾ Late complications that develop after three months include stomal stenosis, peristomal skin breakdown, stomal prolapse, parastomal herniation, fistula formation, and negative psychological effects.^(7,8) Parastomal hernia is one of the common late complications affecting about 6.2% of patients with loop ileostomies. It is a type of incisional hernia resulting in the protrusion of abdominal content through the created defect. It presents with an abdominal swelling around the site of the hernia with or without pain, or as an acute strangulated or incarcerated hernia.⁽⁹⁾

Temporary stomas have negative effects on the quality of life (QoL). This is attributed to the fact that affected patients do not adapt well to a life with a stoma.⁽¹⁰⁾ Some studies showed that patients who underwent

low anterior resection with ileostomy had significant reductions in physical activity and role functioning.⁽¹¹⁾ Furthermore, it has negative effects on the body image. A pilot study showed that loop ileostomy patients had many concerns including feeling embarrassed about body image, feeling sexually unattractive and limited choice of clothes, among other concerns. However, anxiety about pouch filling and loosening was among the biggest concerns. All these concerns were accredited to the lack of knowledge, lack of self-confidence about handling the stoma, fear of stoma getting injured, and the social taboo of having an "unusual thing on the body".⁽¹²⁾

In this study, our goal is to analyze the short and long term outcome of closure of temporary loop ileostomy following emergency bowel surgery. To find out the suitable timing of closure and reduce the stoma related morbidity and compare the outcome.

METHODOLOGY

This is prospective Observational comparative study and total sample size 96 patients, the duration of the study was from June 2020 to August 2021. The study was conducted at the department of Surgery, MLN Medical College in association with other of SRN Hospital, Prayagraj. The patient who was admitted for temporary loop ileostomy closure was divided into two groups. Early closure of temporary loop ileostomy group in which ileostomy closure done 6-8 weeks after the primary surgery and delayed closure of temporary loop ileostomy group in which ileostomy closure done >12 weeks after the primary surgery. The physical condition of all the participants is well Proper clinical and hematological assessment done in all participants. Distal hologram done in all participants to a certain the patency of distal intestinal tract. The temporary loop ileostomy closure will be done by end to end closure of bowel loop via hand suturing technique without resection of any bowel loop and the skin closure will be done in interrupted manner in participants of both early and delayed group i.e. the closure techniques is same in both the groups. All these decision will be taken by operating surgeon. The post operative period will be closely monitored by clinical assessment, hematological assessment and radiological assessment to find out the post operative

complications. The data is entered in MS EXCEL spreadsheet and analysis is done using software SPSS Version 23.

RESULT

Total 96 patients 50.0% of the participants had Group Early Closure and 50.0% of the participants had Group Delayed Closure.

Table 1: Demographical characteristics Association between Group and Parameters

Parameters	Group		p value
	Early Closure (n = 48)	Delayed Closure (n = 48)	
Age (Years)***	35.52 ± 13.21	45.98 ± 13.86	<0.0011
Age***			0.0012
18-30 Years	21 (43.8%)	7 (14.6%)	
31-40 Years	14 (29.2%)	13 (27.1%)	
41-50 Years	7 (14.6%)	6 (12.5%)	
51-60 Years	2 (4.2%)	15 (31.2%)	
61-70 Years	3 (6.2%)	7 (14.6%)	
71-80 Years	1 (2.1%)	0 (0.0%)	
Gender			0.4042
Male	31 (64.6%)	27 (56.2%)	
Female	17 (35.4%)	21 (43.8%)	

***Significant at $p < 0.05$, 1: Wilcoxon-Mann-Whitney U Test, 2: Chi-Squared Test, 3: Fisher's Exact Test

The mean (SD) of Age (Years) in the Early Closure group was 35.52 (13.21) and in Delayed Closure group was 45.98 (13.86). There was a significant difference between the 2 groups in terms of Age (Years) ($W = 640.000$, $p = < 0.001$), with the median Age (Years) being highest in the Group: Delayed Closure group. Age in the participants of Early Closure group, 43.8% had 18-30 Years, in 29.2% had 31-40 Years, in 14.6% had 41-50 Years and in 4.2%, had 51-60 Years, in 6.2% had 61-70 Years and in 2.1% had 71-80 Years. Age in the participants of Delayed Closure group, in 14.6% had 18-30 Years, 27.1% had 31-40 Years, 12.5% had 41-50 Years, 31.2% had 51-60 Years, 14.6% had 61-70 Years, and 0.0% had 71-80 Years. Participants in the Early Closure group had the larger proportion of Age: 18-30 Years, Age: 31-40 Years and Age: 41-50 Years. Participants in the Delayed Closure group had the larger proportion of Age: 51-60 Years, Age: 61-70 Years and Age: 71-80 Years. The 64.6% of the participants in the Early Closure group had Gender: Male and 35.4% had Gender: Female. The 56.2% of the participants in the Delayed Closure group had Gender: Male and 43.8% had Gender: Female.

Table 2: Complications observed in two groups:

Complications	Early closure group	Delayed closure group
Surgical site infection (wound infection)	4	3
Bowel obstruction	5	3
Anastomosis leak	1	2
Entero-cutaneous fistula	1	1
Intra-abdominal abscess	1	0
	12	9

Table 3: Association between Group and Parameters

Parameters	Group		p value
	Early Closure (n = 48)	Delayed Closure (n = 48)	
Time Of Closure (Weeks)***	7.17 ± 0.73	15.32 ± 1.80	<0.0011
Return Of Normal Bowel Habits (Yes)	44 (91.7%)	45 (93.8%)	1.0003
Bowel Obstruction (Yes)	5 (10.4%)	3 (6.2%)	0.7143
Anastomosis Leak (Yes)	1 (2.1%)	2 (4.2%)	1.0003
Intra Abdominal Abscess (Yes)	2 (4.2%)	0 (0.0%)	0.4953
Enterocutaneous Fistula (Yes)	1 (2.1%)	1 (2.1%)	1.0003
Duration Of Hospital Stay (Days)	8.06 ± 3.32	8.23 ± 2.57	0.1791

***Significant at $p < 0.05$, 1: Wilcoxon-Mann-Whitney U Test, 2: Chi-Squared Test, 3: Fisher's Exact Test

The mean (SD) of Time of Closure (Weeks) in the Early Closure group was 7.17 (0.73) and Delayed Closure group was 15.32 (1.80). There was a significant difference between the 2 groups in terms of Time Of Closure (Weeks) ($W = 0.000$, $p = < 0.001$), with the median Time Of Closure (Weeks) being highest in the Group: Delayed Closure group.

The 91.7% of the participants in the Early Closure group had Return Of Normal Bowel Habits and the 93.8% of the participants in the Delayed Closure group had Return Of Normal Bowel Habits. There was no significant difference between the various groups in terms of distribution of Return of Normal Bowel Habits ($\chi^2 = 0.154$, $p = 1.000$).

The 10.4% of the participants in the Early Closure group had Bowel Obstruction and 6.2% of the participants in the Delayed Closure group had Bowel Obstruction. There was no significant difference between the various groups in terms of distribution of Bowel Obstruction ($\chi^2 = 0.545$, $p = 0.714$).

The 2.1% of the participants in the Early Closure group had Anastomosis Leak and the 4.2% of the participants in the Delayed Closure group had Anastomosis Leak. There was no significant difference between the various groups in terms of distribution of Anastomosis Leak ($\chi^2 = 0.344$, $p = 1.000$).

The 4.2% of the participants in the Early Closure group had Intra Abdominal Abscess. There was no significant difference between the various groups in terms of distribution of Intra Abdominal Abscess ($\chi^2 = 2.043$, $p = 0.495$).

The 2.1% of the participants in the Early Closure group had Enterocutaneous Fistula and 2.1% of the participants in the Delayed Closure group had Enterocutaneous Fistula. There was no significant difference between the various groups in terms of distribution of Enterocutaneous Fistula ($\chi^2 = 0.000$, $p = 1.000$).

The mean (SD) of Duration of Hospital Stay (Days) in the Early Closure group was 8.06 (3.32) and Delayed Closure group was 8.23 (2.57). The median (IQR) of Duration of Hospital Stay (Days) in the Early Closure group was 7 (6.75-8) and Delayed Closure group was 8 (7-9). The Duration of Hospital Stay (Days) in the Early Closure ranged from 6 – 26 and Delayed Closure ranged from 6 - 19. There was no significant difference between the groups in terms of Duration of Hospital Stay (Days) ($W = 973.500$, $p = 0.179$).

DISCUSSION

A loop ileostomy is one of the most common techniques used in colorectal surgery to establish a reversible fecal diversion and bypass the large bowels, in order to protect either a downstream colorectal anastomosis or a coloanal anastomosis. However, in spite of its potential benefits, it is worth noting that the incidence of complications, in general, is very variable and some studies estimated at between 14% and 79%. Complications that arise from stoma formation can be divided into early and late complications.

This study carried out on 96 participants, all patients were temporary loop ileostomy, which was divided in to two groups on the basis of timing of closure of loop ileostomy, group A-Early closure group (6-8 weeks) and group B-Delayed closure group (≥ 12 weeks). Participants were equally distributed in both groups. The 50.0% of the participants had Group A- Early closure group and 50.0% of the participants had group B- Delayed closure group. *Benjamin Menahem et al⁽¹³⁾* study was a meta-analysis in which six studies were included and analyzed, yielding 470 patients (242 in EC group and 318 in LC). *Thirugnanasambandam Nelson et al⁽¹⁴⁾* studied on, one hundred patients were included in this study, with 50 cases in each group. *Mritunjay Sarawgi et al⁽¹⁵⁾* studied on, a total of 47 loop ileostomies made for various indications. Patients were divided in to two cohorts by the time of stoma closure. Early closure group in which stoma was closed within 4 to 7 weeks and late or delayed closure group in which stoma was closed after 90 days. Total 17 patients were taken up for early closure and remaining 30 for late closure. *Wanglin Li et al⁽¹⁶⁾* showed in their study that a total of 347 patients were analyzed, there were 179 patients in each group [ileostomy closure (3 months)]. *Ranjan Satish Kumar et al⁽¹⁷⁾* showed in their study, that a total of 47 ileostomies were made for various indications. *Nitin Garg et al⁽¹⁸⁾* studied on total 22 patients were taken up for ileostomy closure. So, in

all of the above study, the no. of study population varied, this was depending upon no. of participants selection and their distribution in two group, and patient consent for study, study population availability in that particular study time.

There was a significant difference between the 2 groups in terms of time of closure (weeks) ($W = 0.000$, $p < 0.001$), with the median time of closure (weeks) being highest in the delayed closure group. Loop ileostomy is procedures that can cause a plethora of complications including long term ones such as the psychological effects, early reversal of ileostomy procedure as a solution to reduce these complications. *Danielsen et al⁽¹⁹⁾* study showed that, it is safe to close a temporary ileostomy 8 to 13 days after rectal resection and anastomosis for rectal cancer in selected patients without clinical or radiological signs of anastomotic leakage. *Ranjan Satish Kumar et al⁽¹⁷⁾* showed in their study that, early closure group in which stoma was closed within 4-7 weeks and late closure group in which stoma was closed after 90 days. No colostomy was closed early. So, in this study, in early closure group the mean time of ileostomy closure was 7.17 weeks and in delayed closure group the mean time of ileostomy closure was 15.32 (1.80) weeks, this was significantly different and this was favored by most of the above study.

In early closure group 8.3% (4) participants had surgical site infections and 91.7% (44) of the participants had no surgical site infections. In the delayed closure group 6.2% (3) participants had surgical site infections and 93.8% (45) of the case had no surgical site infections. There was no significant difference between the various groups in terms of distribution of surgical site infections ($\chi^2 = 0.154$, $p = 1.000$). Strength of association between the two variables (Cramer's $V = 0.04$ (Little/No Association) and (Bias Corrected Cramer's $V = 0$ (Little/No Association)). So, my study showed that the surgical site infection in delayed closure was less than early closure but the difference was not statically significant. Bowel Obstruction, in this study it is found that in early closure group 10.4% (5) participants developed bowel obstruction after ileostomy closure and 89.6% (43) participants are normal having no bowel obstruction. In delayed closure group was 6.2% (3) participants developed bowel obstruction after ileostomy closure and 93.8% (45) participants are normal having no bowel obstruction. There was no significant difference between the various groups in terms of distribution of bowel obstruction ($\chi^2 = 0.545$, $p = 0.714$). The Strength of association between the two variables (Cramer's $V = 0.08$ (Little/No Association). and (Bias Corrected Cramer's $V = 0$ (Little/No Association)). According to the study of *Benjamin Menahem et al⁽¹⁹⁾* small bowel obstruction rates (OR 0.11; 94 percent CI 0.04 0.20; $P < 0.00001$) were significantly lower in the EC group than in the LC group, respectively. According to the study of *Wanglin Li et al⁽¹⁶⁾* bowel obstruction finding were similar among the groups ($p > 0.04$). In my study, there was no any significant difference between finding of bowel obstruction in early closure and delayed closure. The anastomosis leak in the early closure group was 2.1% (1) and absent in 97.9% (47). Anastomosis leak in the delayed closure group was 4.2% (2) and absent in 95.8% (46). There was no significant difference between the various groups in terms of distribution of anastomosis leak ($\chi^2 = 0.344$, $p = 1.000$). Strength of association between the two variables (Cramer's $V = 0.06$ (Little/No Association) and (Bias Corrected Cramer's $V = 0$ (Little/No Association)). According to the study of *Benjamin Menahem et al⁽¹⁹⁾* no significant difference in the anastomotic leakage rate between the EC and LC groups (OR 0.73; 94 percent CI 0.22 1.78; $P > 0.38$), and according to the study of *Mritunjay Sarawgi et al⁽¹⁵⁾* there was no instance of anastomotic leak in early closure group and in late closure group two patients developed anastomotic leak requiring re-laparotomy and restoma formation but no any significant difference, and according to the study of *Wanglin Li et al⁽¹⁶⁾* anastomotic leak finding were also similar among the groups ($p > 0.04$). So, my study showed that there was no significant difference of anastomotic leak in between early and delayed closure group and this was supported by all of the above study. Intra-abdominal abscess, in early closure group 4.2% (2) participants developed intra-abdominal abscess and 95.8% (46) are normal. In delayed closure group, no participants developed intra-abdominal abscess. There was no significant difference between the various groups in terms of distribution of intraabdominal abscess ($\chi^2 = 2.043$, $p = 0.495$). Strength of association between the two variables (Cramer's $V = 0.15$ (Low Association) and (Bias Corrected Cramer's $V = 0.1$ (Little/No Association)). According to study of *Mritunjay Sarawgi et al⁽¹⁵⁾* there was no instance of intra-abdominal abscess in early closure group. According to the study of *Wanglin Li et al⁽¹⁶⁾* postoperative

intra-abdominal abscess, were also similar among the groups ($p > 0.04$). So, my study showed that there was no any significant difference of intra-abdominal abscess in between early and delayed closure group and this was supported by all of the above study. Entero-cutaneous fistula, the 2.1% (1) participants of the early closure group developed entero-cutaneous fistula and entero-cutaneous fistula in the participants of delayed closure group was developed in 2.1% (1) participants There was no significant difference between the various groups in terms of distribution of entero-cutaneous fistula ($\chi^2 = 0.000$, $p = 1.000$). Strength of association between the two variables (Cramer's $V = 0$ (Little/No Association) and (Bias Corrected Cramer's $V = 0$ (Little/No Association)). According to study of *Thirugnanasambandam Nelson et al⁽¹⁴⁾* the post-operative complications including entero-cutaneous fistula (4 percent vs. 8 percent $p > 0.400$) were comparable. According to study of *Mritunjay Sarawgi et al⁽¹⁵⁾* study showed that, only single case developed entero-cutaneous fistula which was managed conservatively *Ranjan Satish Kumar et al⁽¹⁷⁾* study showed that, in EC group only single case developed entero-cutaneous fistula. So according to my study the entero-cutaneous fistula was not significantly different between early and delayed closure group, and this was supported by all of the above study. The mean (SD) of duration of hospital stay (days) in the early closure group was 8.06 (3.32) and delayed closure group was 8.23 (2.57). There was no significant difference between the groups in terms of duration of hospital stay (days) ($W = 973.500$, $p = 0.179$). According to the study of *Thirugnanasambandam Nelson et al (2018)* the length of hospital stay was similar across the two groups, and according to the study of *Wanglin Li et al (2017)* length of stay (LOS) (all $p > 0.04$) were comparable in both groups. So, my study showed that there was no significant difference between early closure and delayed closure group in terms of duration of hospital stay and this was supported by all of the above study.

Stoma's have, stoma related morbidity like dermatitis, para-stomal infections, high stoma output, dehydration, metabolic disturbance, stenosis, retraction, hernia, prolapse, renal failure and many other, reductions in physical activity, social restriction and role functioning, feeling embarrassed about body image, feeling sexually unattractive, limited choice of clothes, anxiety about pouch filling and loosening, social taboo of having an "unusual thing on the body" and significant impact on the quality of life (QoL). So, early closures of stoma resolve all these. According to my study early stoma closure is safe and favorable to early reduction in stoma related morbidity and improvement in quality of life.

CONCLUSION

There was a significant difference between the 2 groups in terms of age with the median age (years) being highest in the delayed closure group. In my study, there was no significant differences in hospital stay between early closure and delayed closure groups. There was no significant difference of complications like surgical site infection (wound infection), bowel obstruction, anastomosis leak, intraabdominal abscess and entero-cutaneous fistula in both groups. According to my study, the suitable timing of closure of temporary loop ileostomy is early closure and the mean time was 7.17 (0.73) week. Stoma related morbidity was reduced by the early closure of temporary loop ileostomy.

REFERENCES

1. T. D. Franccone, Overview of surgical ostomy for fecal diversion, M. Weiser, W. Chen, editors, UpToDate, 2018
2. V. Fazio, J. Church, and J. Wu, *Atlas of Intestinal Stomas*, Springer, Berlin, Germany, 1st edition, 2012.
3. A. Tsunoda, Y. Tsunoda, K. Narita, M. Watanabe, K. Nakao, and M. Kusano, "Quality of life after low anterior resection and temporary loop ileostomy," *Diseases of the Colon & Rectum*, vol. 51, no. 2, pp. 218–222, 2008. View at: Publisher Site | Google Scholar
4. P. Saini, R. Gaba, M. S. Faridi, N. Agarwal, N. Kaur, and A. Gupta, "Quality of life of patients after temporary ileostomy for ileal perforation-A questionnaire based study," *Indian Journal of Surgery*, vol. 76, no. 1, pp. 38–43, 2014. View at: Publisher Site | Google Scholar
5. A. Chow, H. S. Tilney, P. Paraskeva, S. Jeyarajah, E. Zacharakis, and S. Purkayastha, "The morbidity surrounding reversal of defunctioning ileostomies: a systematic review of 48 studies including 6,107 cases," *International Journal of Colorectal Disease*, vol. 24, no. 6, p. 711, 2009. View at: Publisher Site | Google Scholar
6. A. Alves, Y. Panis, B. Lelong, B. Dousset, S. Benoist, and E. Vicaut, "Randomized clinical trial of early versus delayed temporary stoma closure after proctectomy," *British Journal of Surgery*, vol. 95, no. 6, pp. 693–698, 2008. View at: Publisher Site | Google Scholar
7. J. Robertson, H. Linkhorn, R. Vather, R. Jaung, and I. P. Bissett, "Cost analysis of early versus delayed loop ileostomy closure: a case-matched study," *Digestive Surgery*, vol. 32, no. 3, pp. 166–172, 2015. View at: Publisher Site | Google Scholar
8. A. K. Danielsen, J. Park, J. E. Jansen et al., "Early closure of a temporary ileostomy in patients with rectal cancer," *Annals of Surgery*, vol. 265, no. 2, pp. 284–290, 2017. View at: Publisher Site | Google Scholar
9. J. Camilleri Brennan and R. J. Steele, "Prospective analysis of quality of life after

- reversal of a defunctioning loop ileostomy," *Colorectal Disease*, vol. 4, no. 3, pp. 167–171, 2002. View at: Publisher Site | Google Scholar
10. A. W. Gooszen, R. H. Geelkerken, J. Hermans, M. B. Lagaay, and H. G. Gooszen, "Quality of life with a temporary stoma," *Diseases of the Colon & Rectum*, vol. 43, no. 5, pp. 650–655, 2000. View at: Publisher Site | Google Scholar
 11. P. Waterland, K. Goonetilleke, D. N. Naumann, M. Sutcliffe, and F. Soliman, "Defunctioning ileostomy reversal rates and reasons for delayed reversal: does delay impact on complications of ileostomy reversal? A study of 170 defunctioning ileostomies," *Journal of Clinical Medicine Research*, vol. 7, no. 9, p. 685, 2015. View at: Publisher Site | Google Scholar
 12. M. F. Sier, L. van Gelder, D. T. Ubbink, W. A. Bemelman, and R. J. Oostenbroek, "Factors affecting timing of closure and non-reversal of temporary ileostomies," *International Journal of Colorectal Disease*, vol. 30, no. 9, pp. 1185–1192, 2015. View at: Publisher Site | Google Scholar
 13. Menahem B, Lubrano J, Vallois A, Alves A. Early closure of defunctioning loop ileostomy: is it beneficial for the patient? A meta-analysis. *World journal of surgery*. 2018 Oct;42(10):3171-8.
 14. Nelson T, Pranavi AR, Sureshkumar S, Sreenath GS, Kate V. Early versus conventional stoma closure following bowel surgery: a randomized controlled trial. *Saudi journal of gastroenterology: official journal of the Saudi Gastroenterology Association*. 2018 Jan;24(1):52.
 15. Sarawgi M, Singh S, Tiwary A, Kumar A. Early vs delayed loop ileostomy closure: a comparative study. *IOSR J Dent Med Sci*. 2017;16(7):08-13.
 16. Li W, Benlice C, Stocchi L, Kessler H, Gorgun E, Costedio M. Does stoma site specimen extraction increase postoperative ileostomy complication rates?. *Surgical endoscopy*. 2017 Sep;31(9):3552-8.
 17. Ranjan Satish Kumar, Om Prakash, Ahmed Aftab, Kumar Rajesh and Usha Preeti, "Comparative study of early and delayed loop ileostomy and colostomy closure", *International Journal of Current Research*, September, 2016, Vol. 8, Issue, 09, pp.38158-38160
 18. Garg N, Charokar K. Early ileostomy closure following emergency bowel surgery: a feasible approach. *Journal of Evolution of Medical and Dental Sciences*. 2014 May 19;3(20):5408-17.
 19. Danielsen AK, Park J, Jansen JE, Bock D, Skullman S, Wedin A, Marinez AC, Haglind E, Angenete E, Rosenberg J. Early closure of a temporary ileostomy in patients with rectal cancer. *Annals of surgery*. 2017 Feb 1;265(2):284-90.