JOURNAL OF THE
ANUS, RECTUM AND COLON
dx.doi.org/10.23922/jarc.2023-013
http://journal-arc.jp

Original Research Article

Stomal Prolapse Due to Sidedness of Transverse Loop Colostomy: A Retrospective Cohort Study

Takuya Yano[1)], Masanori Yoshimitsu[1)], Chiyomi Ishibashi[2)], Atsuko Nishibara[2)], Kanyu Nakano[1)], Hitoshi Idani[1)] and Masazumi Okajima[1)3)]

1) Department of Surgery, Hiroshima City Hiroshima Citizens Hospital, Hiroshima, Japan
2) Department of Nursing, Hiroshima City Hiroshima Citizens Hospital, Hiroshima, Japan
3) Department of Gastroenterological and Transplant Surgery, Applied Life Sciences, Institute of Biomedical & Health Sciences, Hiroshima University, Hiroshima, Japan

Abstract

Objectives: Stomal prolapse (SP) is one of the most common complications of loop colostomy and can impair a patient's quality of life. Herein, we evaluated the risk factors for SP to prevent its occurrence after a transverse loop colostomy.

Methods: This retrospective study included 84 patients who underwent loop transverse colostomy between January 2016 and December 2020. We evaluated the incidence of SP and examined the relationship between perioperative factors and SP using univariate and multivariate logistic regressions.

Results: SP occurred in 11 (13.0%) patients. Median time to SP was 99 postoperative days. In the univariate analysis, a right side abdominal wall stoma site, perioperative chemotherapy, and anti-VEGF antibody therapy were associated with a significantly higher incidence of SP. Multivariate analysis identified that construction of a temporary loop colostomy in the right transverse colon during rectal cancer surgery (odds ratio, 5.07; 95% confidence interval, 1.12-22.86) is an independent risk factor.

Conclusions: In this study, multivariate analysis showed that the right side of the transverse colon was a risk factor for SP. Therefore, when constructing a transverse colon loop stoma, the stoma should be constructed in the left transverse colon to prevent SP.

Keywords

stomal prolapse, risk factor, sidedness of stoma construction

J Anus Rectum Colon 2023; 7(4): 258-263

Introduction

The number of cases of gastrointestinal stoma construction has gradually increased in Japan, and the proportion of older patients is increasing each year[1]. Transverse loop colostomy is a useful option not only for covering stoma of low anterior resections but also for diverticulitis or unresectable colorectal cancer[2]. Stomal prolapse (SP) is one of the most common complications after loop colostomy; it occurs in 2-27% of patients with loop colostomy[3-5]. In most cases, prolapses can be managed conservatively, but are associated with impaired quality of life[6]. Patients with temporary stomas await closure; however, stoma may not be closed due to patient's illness or other reasons. Surgical procedures may be necessary if the quality of life is compromised by SP, as some medical conditions, such as cancer and diverticulitis, do not allow for colostomy closure. We studied the risk factors for SP in order to prevent its occur-

Corresponding author: Masanori Yoshimitsu, myoshimitsu1970@gmail.com
Received: March 22, 2023, Accepted: June 6, 2023
Copyright Ⓒ 2023 The Japan Society of Coloproctology

rence after a transverse loop colostomy.

Methods

Eligibility

This study was approved by the Institutional Review Board of Hiroshima City Hiroshima Citizens Hospital on July 3, 2021, and all patients provided informed consent for their treatment. We included 97 patients who underwent a transverse colostomy at our institution between January 2016 and December 2020. Clinical data were retrospectively collected from the patients' medical records, and the study focused on SP. Of the 97 patients, 13 patients who did not have loop stomas were excluded. Therefore, 84 patients were included in further analyses.

Stomal prolapse

SP was defined as intestinal intussusception through the stomal orifice after its construction. SP is a full-thickness protrusion of the bowel through the stoma site[7]. Prolapse was diagnosed if the stoma increases in size after maturation requiring change in appliance or surgical treatment[8]. However, the length of the evacuated intestine was not determined. Medical doctors or certified wound ostomy continence nurses diagnosed SP.

Surgical technique of loop colostomy

The colostomy site was preoperatively marked by a certified wound ostomy continence nurse. At the pre-marked stoma site, a circular skin incision was made, subcutaneous fat tissue was pushed aside, and a longitudinal incision was made in the anterior rectal sheath. The abdominal rectal muscle was split and a longitudinal incision was made in the posterior rectal sheath. A normal tunnel was created with a two-finger width of approximately 4 cm. Finally, the transverse colon loop was raised to a height of approximately 2 cm from stoma, above the skin. Fixation of the serosa of the transverse colon to the anterior rectal sheath and numbers of sutures were based on the surgeon's discretion. We did not fix the distal loop to the adjacent parietal peritoneum. The outlet part of the stoma was fixed using the eversion technique with absorbable sutures with 4-0 polydioxanon. When determining the sidedness of transverse colostomy, if future left side colon anastomosis was anticipated, right side transverse colostomy was considered. Conversely, when anastomosis is unlikely, left side transverse colostomy was considered.

Statistical analysis

Continuous data were presented as medians with ranges according to their distribution. Categorical data are presented as frequencies and percentages. Continuous variables were compared using the Mann-Whitney U test, and categorical variables were compared using the Fisher's exact test. Data were analyzed using single-factor analysis of variance. Statistical significance was set at $P<0.05$. Multivariate logistic regression analysis was conducted using factors with $P<0.05$ in the univariate analysis as the independent variables. Body weights during stoma construction and SP surgery were compared using the Wilcoxon signed-rank test. The incidence of SP was estimated using the Kaplan-Meier survival curves. Cox proportional hazard regression models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CI). Statistical analyses were performed using IBM Statistical Package for Social Sciences for Windows (version 23.0; IBM Corp., Armonk, NY, USA).

Results

A total of 84 patients with transverse colon stoma were included in this study. Eleven patients (13.0%) developed SP after stoma construction. SP patients were categorized into the "SP group", whereas the remaining 73 patients were categorized into the "non-SP group". The baseline characteristics of the patients are presented in Table 1 for the SP and non-SP groups. There were no differences in age, sex ratio, or body mass index between the two groups. Most clinical parameters, such as American Society of Anesthesiologists (ASA) classification, original disease, preoperative colonic obstruction, chronic obstructive pulmonary disease (COPD), and albumin values, were comparable between the two groups. Surgical characteristics, such as emergency operation, preoperative stoma site marking, laparoscopic stoma surgery, operative time, and blood transfusion were not significantly different. The incidence of SP was significantly higher when the stoma site was on the right side of the abdominal wall than when it was on the left side ($P=0.04$). Perioperative chemotherapy and anti-VEGF antibody therapy were significantly more frequent in the SP group ($P<0.01$ and $P=0.04$, respectively). Postoperative hospital stay and complications were not significantly different between the two groups.

Univariate analysis revealed that the stoma location on the right side, perioperative chemotherapy, and anti-VEGF antibody therapy were predictive factors for SP. Multivariate analysis revealed that stoma location on the right side (odds ratio [OR], 5.07; 95% CI, 1.12-22.86; $P=0.03$) was the only independent predictive factor for SP (Table 2).

The median postoperative SP incidence was 99 days in the SP group (Figure 1). The incidence of SP was significantly different between the right and left sides of the stoma ($P=0.042$) (Figure 2). In the SP group, the median body weight at the time of stoma construction and SP was 58.0 kg (41.0-68.1 kg) and 54.0 kg (41.4-71.0 kg), respectively, with no statistically significant difference ($P=1.00$).

Table 1. Baseline Characteristics of the Patients in the Two Groups.

Characteristics	SP group (n=11)		Non-SP group (n=73)		p value
age, years	68	49-79	70	31-93	0.41
sex					0.74
male	7	63.6	38	53.4	
female	4	36.4	34	46.6	
BMI, kg/m^2	21.8	17.4-27.1	21.5	15.7-31.9	0.84
ASA classifiacation					0.06
1.2	7	63.6	64	87.7	
3	4	36.4	9	12.3	
original disease					0.79
colon cancer	9	81.8	49	67.1	
other malignant neoplasm	1	9.1	11	15.1	
other	1	9.1	13	17.8	
ALB, g/dL	3.3	1.6-4.8	3.2	1.6-4.8	0.98
preoperatiove colonic obstruction	5	45.5	28	38.4	0.74
COPD	1	9.1	7	9.6	1
emergency operation	5	45.5	25	34.2	0.47
preoperative stoma site marking	8	72.7	61	83.6	0.68
laparoscopic stoma surgery	1	9.1	4	5.5	0.51
operative time, min	99	60-395	83	41-268	0.23
bleeding, ml	2	0-1890	0	0-270	0.96
blood transfusion	2	18.2	8	11	0.61
stoma location					0.04
left side	3	27.3	47	64.4	
right side	8	72.7	26	35.6	
perioperative chemotherapy	10	90.9	32	45.1	<0.01
anti-VEGF antibody therapy	5	45.5	12	16.4	0.04
hospital stay, days	17	9-60	15	6-49	0.07
complication	1	9.1	4	5.5	0.51
detail	SSI	1	intestinal obstruction	2	
			pulmonary embolization	1	
			urinary retention	1	
Time to stomal relapse, days	99	16-471			

ASA, American Society of Anesthesiologists; COPD, Chronic Obstructive Pulmonary Disease; ALB, albumin; VEGF, vascular endothelial growth factor; SSI, surgical site infection

Table 2. Multivariate Logistic Regression of Independent Risk Factors for Stomal Prolapse.

Variables	Multivariate analysis		p value
	Odds ratio	95 % CI	
stoma location right side	5.07	1.12-22.86	0.03
perioperative chemotherapy	8.39	0.88-79.61	0.06
anti-VEGF therapy	1.99	0.43-9.25	0.37

VEGF, vascular endothelial growth factor

Of the 8 patients with stomal prolapse from the right side transverse colostomy, one patient was prolapsed anally, 2 patients were prolapsed orally, and 5 cases were unknown. Of the 3 patients with stomal prolapse from the left side transverse colostomy, one patient was prolapsed on both oral and anal side, 2 patients were prolapsed orally. Of 84 pa-

Figure 1. Incidence of stomal prolapse after stoma construction.

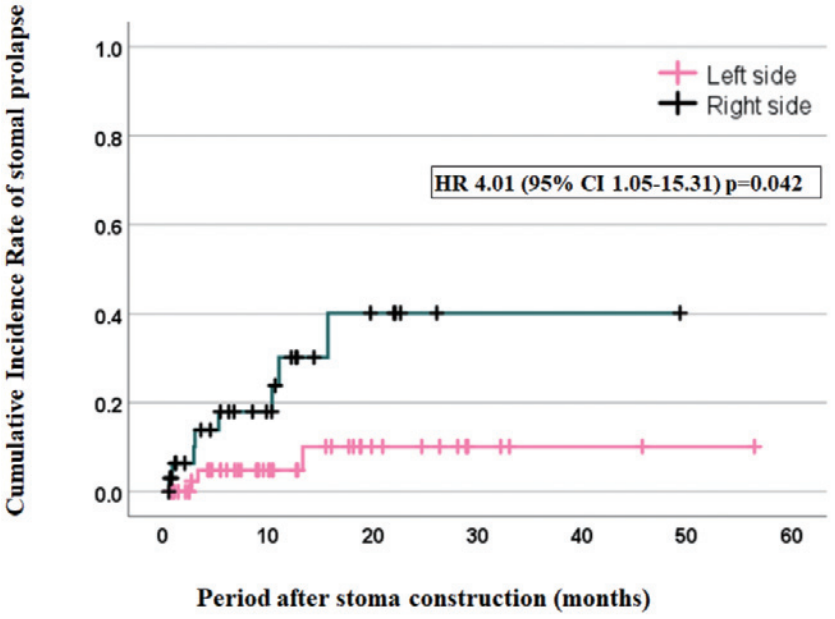

Figure 2. Comparison of the incidence of stoma prolapse at transverse colostomy sites.

tients, only two cases were created as a covering stoma, and other stomas were performed therapeutically in a palliative setting. Finally, a total of 12 stoma cases were later closed. All 12 patients had no stomal prolapse. Median time to stoma closure was 160 days. Of the 84 transverse loop colostomies, parastomal hernia occurred in 13 cases. Three of these cases were complicated by parastomal hernia and stomal prolapse. Only one patient underwent stoma reconstruction for SP because of difficulty in appliance fitting, whereas others were observed.

Discussion

This study revealed that stoma location on the right side of the abdominal wall was a factor that predicted the incidence of SP after transverse colostomy construction. SP is one of the most common late complications of stoma construction. Although SP is often functionally benign, it can

induce significant emotional distress in many patients. A significantly prolapsed stoma may cause pain, obstruction, skin inflammation, incarceration, or stoma trauma. The mass may be seen under clothing, which is also a cosmetic problem requiring attention. Furthermore, it may interfere with appliance fitting. If left untreated, it can lead to ulceration, bleeding, and stoma necrosis.

This is the first study to show that the right side of the transverse colon is a risk factor for SP using multivariate analysis. A previous report suggested that SP was more common on the right side of the colon than on the left side of the colon[5]. SP is affected by multiple factors, including being a child, loop stoma, emergency operation, size of the fascia defect, and preoperative intestinal obstruction[9-11]. Inadequate fixation of the colonic mesentery to the parietal peritoneum has been reported to be associated with SP[12,13]. Bowel wall fixation to fascial edges or tethering distal loop to the adjacent parietal peritoneum might result in decreased risk of a later prolapse[14,15]. In contrast, mesenteric fixation and creation of the tunnel for the colostomy through oblique muscles or rectus abdominus muscles have not been the risk factors to develop SP in ileostomy[16]. SP has been reported to be associated with parastomal hernias.

Prolapse has been reported to commonly involve the distal limbs of loop stoma[12,14]. Prolapse of loop stoma occurs when redundant distal colon invades the stoma with increase in abdominal pressure through a gap between the abdominal wall and redundant distal colon[14]. When colostomy is performed on the right side of the transverse colon, the distal transverse colon is mobile and long. However, if the colostomy is performed on the left side of the transverse colon, the descending colon is fixed to the retroperitoneum and the distal transverse colon, which is not fixed to the abdominal wall, becomes shorter. Therefore, we propose that colostomy on the right side of the transverse colon is one of the causes of SP. Furthermore, colostomy on the left side of the transverse colon has the advantage of a longer bowel that can be used for absorption. When a temporary loop colostomy is constructed in the left transverse colon during rectal cancer surgery with high ligation of the inferior mesenteric artery, there is a risk of necrosis of the anal side of the colon if the marginal artery is damaged during stoma closure. Therefore, considering future left side colon anastomosis, a temporary colostomy be created in the right transverse colon when a loop colostomy is created in the transverse colon as a covering colostomy.

We believe that the use of anti-VEGF antibodies in the perioperative period may cause inadequate abdominal wall fixation because of the side effects of delayed wound healing, which may lead to SP. Perioperative chemotherapy and anti-VEGF antibody were risk factors for SP in the univariate analysis but were not significant in the multivariate analysis. We also examined the change in body weight because it is assumed that there was a change in body weight due to perioperative chemotherapy; however, there was no significant difference in the change in body weight between the time of stoma construction and time of stoma evacuation. An increase in intra-abdominal pressure due to weight gain and increase in the gap between the stoma and abdominal wall due to weight loss may cause SP. In this study, we did not find any significant difference in the relationship between weight change and SP; however, this should be confirmed in future studies. Anti-VEGF antibodies may need to be further validated because of the small number of administered cases.

In this study, only one case of SP was treated surgically. Although various treatment methods have been reported, there is currently no established method. It is important to construct a stoma without an SP, and it is necessary to construct a stoma considering the risk factors extracted in this study.

This study has several limitations. First, our study was performed at a single institution and the number of patients was small. Thus, prospective studies with a larger number of patients are required for further evaluation. Second, we reviewed the records, but some CT images and findings records at the time of prolapse did not exist. All information on whether the bowel on the oral or anal side was prolapsed was not available because this was a retrospective study. Third, of the 12 patients who had stoma closure, 5 patients had stoma closure within 100 days. Thus, it is possible that the incidence of stoma prolapse would have increased if stoma closure had not been performed.

In conclusion, our multivariate analysis found that colostomy on the right side of the transverse colon was a risk factor for SP. When constructing a transverse colon loop stoma, the stoma should be constructed on the left side of the transverse colon to prevent SP, if possible, according to the patient's medical condition.

Acknowledgements

We would like to thank Editage (www.editage.jp) for the English language editing.

Conflicts of Interest

There are no conflicts of interest.

Author Contributions

TY drafted the manuscript and treated the patients. MY helped draft the manuscript. TY, MY, CI, AN, KN, HI, and MO treated patients. HI and MO determined the treatment plan and revised the manuscript accordingly. All authors have read and approved the final manuscript.

Approval by Institutional Review Board(IRB)

This study was approved by the Institutional Review

Board of Hiroshima City Hiroshima Citizens Hospital on July 3, 2021(permit number: 2021-97).

Availability of Data and Material

The authors declare that all the data in this article are available within the article

Code Availability

Not applicable

References

1. Ando Y, Takahashi A, Fujii M, et al. Survey Regarding Gastrointestinal Stoma Construction and Closure in Japan. Annals of Gastroenterological Surgery. 2021 Nov; 6(2): 212-26.
2. Fleshman JW, Lewis MG. Complications and Quality of Life After Stoma Surgery: A Review of 16,470 Patients in the UOA Data Registry. Seminars in Colon and Rectal Surgery. 2007 Mar; 18(1): 19-24.
3. Harris DA, Egbeare D, Jones S, et al. Complications and mortality following stoma formation. Ann R Coll Surg Engl. 2005 Nov; 87 (6): 427-31.
4. Husain SG, Cataldo TE. Late stomal complications. Clin Colon Rectal Surg. 2008 Feb; 21(1): 31-40.
5. Chandler JG, Evans BP. Colostomy prolapse. Surgery. 1978 Nov; 84(5): 577-82.
6. Maeda K. Prolapse of intestinal stoma. Ann Coloproctol. 2022 Oct; 38(5): 335-42.
7. Tsujinaka S, Tan KY, Miyakura Y, et al. Current Management of Intestinal Stomas and Their Complications. J Anus Rectum Colon. 2020 Jan; 4(1): 25-33.
8. Arumugam PJ, Bevan L, Macdonald L, et al. A prospective audit of stomas--analysis of risk factors and complications and their management. Colorectal Dis. 2003 Jan; 5(1): 49-52.
9. Gavriilidis P, Azoulay D, Taflampas P. Loop transverse colostomy versus loop ileostomy for defunctioning of colorectal anastomosis: a systematic review, updated conventional meta-analysis, and cumulative meta-analysis. Surg Today. 2019 Feb; 49(2): 108-17.
10. Shellito PC. Complications of abdominal stoma surgery. Dis Colon Rectum. 1998 Dec; 41(12): 1562-72.
11. Law WL, Chu KW, Choi HK. Randomized clinical trial comparing loop ileostomy and loop transverse colostomy for faecal diversion following total mesorectal excision. Br J Surg. 2002 Jun; 89 (6): 704-8.
12. Doberneck RC. Revision and closure of the colostomy. Surg Clin North Am. 1991 Feb; 71(1): 193-201.
13. Mäkelä JT, Turku PH, Laitinen ST. Analysis of late stomal complications following ostomy surgery. Ann Chir Gynaecol. 1997; 86 (4): 305-10.
14. Maeda K, Maruta M, Utsumi T, et al. Pathophysiology and prevention of loop stomal prolapse in the transverse colon. Tech Coloproctol. 2003 Jul; 7(2): 108-11.
15. Ng WT, Book KS, Wong MK, et al. Prevention of colostomy prolapse by peritoneal tethering. J Am Coll Surg. 1997 Mar; 184(3): 313-5.
16. Leong AP, Londono-Schimmer EE, Phillips RK. Life-table analysis of stomal complications following ileostomy. Br J Surg. 1994; 81(5): 727-9.

Journal of the Anus, Rectum and Colon is an Open Access journal distributed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view the details of this license, please visit (https://creativecommons.org/licenses/by-nc-nd/4.0/).