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Loop ileostomy or loop transverse colostomy for resectable rectal cancers

Mehmet Ali Çaparlar, Şeref Dokçu, Salim Demirci

Department of Surgical Oncology, Ankara University School of Medicine, Ankara, Turkey

ABSTRACT

Objectives: This retrospective study aimed to compare loop ileostomy (LI) with loop transverse colostomy (LTC) as covering stoma regarding the perioperative outcomes in patients who underwent low anterior resection for rectal cancer between 2015 and 2020.

Methods: Data were collected from patient files and the hospital's electronic database. The primary outcome measure was complications related to stoma formation, stoma reversal, and overall complications. Secondary outcome measures were hospital discharge time and readmission rate after discharge.

Results: A total of 90 patients (38 female, 52 male; 56.6 ± 6.8 years) were included in the study. There were two groups considering the technique for covering stoma: Group LI (n = 50) and Group LTC (n = 40). Demographic and perioperative characteristics were similar. Primary outcome measure: Postoperative course was complicated in 49 (54.4%) patients. The complication rate was higher in the group LI than the group LTC (62% vs 45%; $p = 0.03$). Among them, 29 (59.2%) complications were related to the stoma formation related, and 14 (28.6 %) complications were related to the stoma reversal related, and 6 (12.2%) were overall complications. The rate of complications related to the stoma formation was higher in the group LI compared to the group LTC (20 [40%] vs. 9 [22.5%]; $p = 0.01$). The most common complication was periostomal skin irritation (48.3%) followed by dehydration (13.8%), stoma retraction (10.3%) patients, parastomal hernia (10.3%), bleeding (6.9%), anastomotic leak (3.4%), incisional hernia (3.4%), and high-output stoma (3.4%). Complications including incisional hernia, high output stoma, and anastomotic leakage (Grade C; requiring laparotomy) were observed only in the group LI. The morbidity rate in 30 days after the surgery was higher in the group LI compared to the group LTC (16 [32%] vs. 8 [20%]; $p = 0.02$). A total of 14 stoma reversal complications included incisional hernia in 7 (14.3%) patients, wound infection in 5 (10.2%) patients, and rectal bleeding in 2 (4.1%) patients. The rate of complications was not different between groups (16% vs. 15%; $p = 0.41$). Overall complications were similar between study groups (3 complications in each group; $p = 0.73$). Secondary outcome measure: The group LTC patients were discharged earlier compared to the group LI (7.1 ± 2.0 days vs. 9.4 ± 2.5 days; $p = 0.03$). The readmission rate after hospital discharge was higher in the LI group than the group LTC (18% vs. 12.5%; $p = 0.02$).

Conclusions: It was concluded that LTC was superior compared to LI concerning complications after low anterior resection for rectum cancer.

Keywords: It was concluded that LTC was superior compared to LI concerning complications after low anterior resection for rectum cancer.

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Address for correspondence: *Mehmet Ali Çaparlar, MD., Ankara University School of Medicine, Department of Surgical Oncology, Balkiraz, 21, Tıp Fakültesi Cad., 06620 Mamak, Ankara, Turkey. E-mail: drmalicaparlar@yahoo.com, Phone: +90 312 595 60 00, GSM: +90 506 543 76 99*

Low anterior resection (LAR) is the gold standard for treatment of rectal cancer due to promising survival results. It is also associated with a high incidence of complications, which increase morbidity, hospitalization, and mortality [1]. The anastomotic leak is the most important complication, accounting between 3% and 30% [2]. It is also considered to be a poor prognostic factor irrespective of that the surgery is open or laparoscopic [3]. A covering stoma is widely used to protect the anastomosis by diverting fecal stream and to avoid a contact between the anastomosis and fecal material or a fecal flow through the anastomosis [4]. Two types of re functioning stoma are commonly performed in practice: loop ileostomy (LI) and loop transverse colostomy (LTC). Both are assumed to offer several advantages over LAR without covering stoma, including a lower rate of anastomotic leak, pelvic collection, peritonitis, bowel obstruction or ileus, wound infection, and better resumption of the diet [5]. However, for more than three decades, a continuing debate exists about which technique is more effective in reducing complications, and the superiority has been changed almost every decade, according to the reports in the literature [6, 7]. This present study aimed to compare LI with LTC regarding perioperative outcomes. The primary outcome measures were complications related to the covering stoma techniques classified as stoma formation related complications, stoma reversal related complications, and overall complications. Secondary outcome measures were hospital discharge time and readmission rate after discharge.

METHODS

Study Design and Patient Population

This retrospective and observational study was conducted in a tertiary academic hospital after obtaining the hospital's ethics committee approval (decision number: İ10-626-20). Obtaining informed consent from the patients was waived due to the retrospective nature of the study.

According to the Code of Ethics of the World Medical Association (Declaration of Helsinki), the study was carried out and followed the strengthening of the reporting of observational studies in epidemiology (STROBE) guidelines. Inclusion criteria were patients with American Society of Anesthesiologists (ASA) physical status classification I-III, histopathological confirmed rectal carcinoma, distance from anal verge lower than 4 cm, elective surgery, no metastasis. Exclusion criteria were urgent surgery, metastatic disease, obstructed tumour, permanent colostomy or ileostomy, loss in the follow-up period, and missing data.

Surgical Procedure

Surgical team members have performed surgical procedures under general anesthesia who were experienced in colorectal and tumour surgery. After the tumor was resected and the anastomosis was completed (colorectal or coloanal), it was decided on the covering stoma. LTC was constructed as transverse colostomy, and LI was constructed 20-25 cm proximal to the ileocecal valve. All patients were educated for stoma care during the postoperative period.

Data Collection

The electronic database, patient and anesthesia files were retrospectively evaluated to obtain demographic characteristics, ASA physical status, surgical characteristics, postoperative course, discharge time, overall complications, and specific complications related to stoma formation and stoma closure. Stoma formation related complications were defined as an anastomotic leak, stoma prolapse, retraction, ischemia, bleeding, peristomal skin irritation, incisional hernia, high output stoma, dehydration and parastomal hernia. Stoma reversal complications included anastomotic leak, incisional hernia, wound infection, rectal bleeding, ileus, and fistula. Anastomotic leakage was defined as a defect of the intestinal wall integrity at the anastomotic site, leading to a communication between inta- and extraluminal compartments or a pelvic abscess close to the anastomosis, according to the report by the International Study Group of Rectal Cancer [8]. The severity of the leak was graded as requiring no active therapeutic intervention (Grade A), requiring active intervention, but manageable without re-laparotomy (Grade B), and requiring re-laparotomy (Grade C).

Overall complications were defined as wound infection, bowel obstruction, acute kidney injury, thromboembolism, urinary retention, and other cardiorespiratory problems that occurred in the post-

operative period.

Statistical Analysis

SPSS pocket program (version 21.0; IBM SPSS Inc, Chicago, IL) was used for statistical analysis. Continuous variables were analyzed using descriptive statistics and assessed with the Kolmogorov-Smirnov test when normally distributed. The differences in distributions for categorical variables were analyzed using Pearson's chi-square (χ^2) and Fisher's exact tests between groups. Non-parametric variables were assessed with the Mann-Whitney U test for the distribution in study groups. A p - value < 0.05 was considered statistically significant.

RESULTS

A total of 110 files were evaluated during the study period. Of them, 20 files were excluded from the study due to missing data (n = 12) and lost to follow-up (n = 8). The mean age of the remaining 90 patients were

Table 1. Demographic and preoperative tumor characteristics in study groups

	Group LI (n = 50)	Group LTC (n = 40)	*p* value
Age (years) (mean ± SD)	55.3 ± 5.5	57.5 ± 7.4	0.88
Gender (Female/Male), n (%)	21 (40.2)/29 (59.8)	17 (42.5)/23 (57.5)	
ASA physical status, n (%)			0.72
1	29 (58)	25 (62.5)	
2	21 (52)	15 (37.5)	
3	0 (0)	0 (0)	
Co-morbidity n (%)	6 (12)	5 (12.5)	0.52
Hypertension	3 (6)	3 (7.5)	
Diabetes mellitus	3 (6)	2 (5)	
Coronary artery disease	0 (0)	0 (0)	
Pulmonary disease	0 (0%)	0 (0)	
BMI (kg/m^2) (mean ± SD)	23.3 ± 3.5	22.5 ± 4.2	0.03
Anal verge distance (cm) (mean± SD)	11 ± 3	9 ± 4	0.51
T, n (%)			0.61
0	0 (0)	0 (0)	
1	7 (14)	5 (12.5)	
2	25 (50)	20 (50.0)	
3	12 (24)	10 (25)	
4	6 (12)	5 (12.5)	
N, n (%)			0.42
0	12 (24)	10 (25)	
1	38 (76)	30 (75)	
M, n (%)			0.71
0	44 (88)	36 (90)	
1	6 (12)	4 (10)	
Neoadjuvant chemotherapy (Y/N), n (%)	12 (24)/38 (76)	10 (25)/30 (75)	0.54

LTC = loop transverse colostomy, LI = loop ileostomy, ASA = American Society of Anesthesiologists, BMI = Body Mass Index, T = Tumor, N = Node, M = Metastasis, Y/N = Yes/No, SD = standard deviation, p < 0.05 was considered as statistically significant.

56.6 ± 6.8 years. There were 38 female and 52 male patients assigned to two groups considering the technique for covering stoma. Group LI consisted of 50 patients, and Group LTC consisted of 40 patients. Demographic characteristics were statistically not different between groups ($p > 0.05$) (Table 1). Also, the TNM classification, anal verge distance of the tumour, and the rate of neoadjuvant chemotherapy was similar ($p > 0.05$) (Table 1). Estimated blood loss was lower in the group LT than the group LI (180 ± 65 ml vs 200 ± 70; $p = 0.02$).

Primary Outcome Measure

The postoperative course was complicated in 49 (54.4%) patients. The complication rate was higher in the group LI than the group LTC (62% vs 45%; $p = 0.03$). Among them, 29 (59.2%) complications were related to the stoma formation related complications, 14 (28.6 %) were related to the stoma reversal related complications, and 6 (12.2%) were overall complications.

Complications Related to the Stoma Formation

The complication rate was higher in the group LI compared to the group LTC (20 [40%] vs. 9 [22.5%]; $p = 0.01$), (Table 3). The most common complication was periostomal skin irritation in 14 (48.3%) patients followed by dehydration (13.8%), stoma retraction (10.3%) patients, parastomal hernia (10.3%), bleeding (6.9%), anastomotic leak (3.4%), incisional hernia (3.4%), and high-output stoma (3.4%). All complications were higher in the group LI compared to the group LTC except bleeding. Complications including incisional hernia, high output stoma, and anastomotic leakage (Grade C; requiring laparotomy) were observed only in the group LI. The morbidity rate in 30 days after the surgery was higher in the group LI compared to the group LTC (16 [32%] vs. 8 [20%]; p = 0.02) (Table 3).

Stoma Reversal Complications

A total of 14 complications was related to the stoma reversal. Those included incisional hernia in 7 (14.3%) patients, wound infection in 5 (10.2%) patients, and rectal bleeding in 2 (4.1%) patients. The rate of complications was not different between groups 134 (16% vs 15%; $p = 0.41$).

Overall Complications

A total of 6 complications (3 complications in each group; $p = 0.73$) were recorded. One patient in the group LI suffered from arrhythmia, and one patient from atelectasis. One patient in each group developed deep venous thrombosis. Delirium was diagnosed in two patients (one patient in each group). All those complications were treated successfully in the early postoperative period.

Secondary Outcome Measure

The group LTC patients were discharged earlier

Table 2. Comparing perioperative characteristics between study groups

	Group LI (n = 50)	Group LTC (n = 40)	*p* value
Anastomosis			
Mechanical (stapler), n (%)	45 (90)	35 (87.5)	0.33
Hand-sewn interrupted, n (%)	5 (10)	5 (12.5)	0.92
Operative time (min) (mean ± SD)	150 ± 40	145 ± 45	0.32
Estimated blood loss (ml) (mean ± SD)	200 ± 70	180 ± 65	0.02
Blood transfusion, n (%)	6 (12)	5 (12.5)	0.41
Admission to ICU, n (%)	7 (14)	6 (15)	0.55
Hospital discharge time (day) (mean ± SD)	9.4 ± 2.5	7.1 ± 2.0	0.03
Time to stoma closure (day) (mean ± SD)	78 ± 18	71 ± 17	0.88
Readmission after the discharge, n (%)	9 (18)	5 (12.5)	0.02

LTC = loop transverse colostomy, LI = loop ileostomy, ICU= Intensive care unit, SD = standard deviation, $p < 0.05$ wasconsidered as statistically significant.

Table 3. Comparing complications between study groups

	Group LI (n = 50)	Group LTC (n = 40)	*p* value
Total complications, n (%)	31 (62)	18 (45)	**0.03**
Complications related to the stoma formation, n(%)	20 (40)	9 (22.5)	**0.01**
Periostomal skin irritation	9 (18)	5 (12.5)	**0.01**
Dehydration	3 (6)	1 (2.5)	**0.01**
Stoma retraction	2 (4)	1 (2.5)	**0.02**
Parastomal hernia	2 (4)	1 (2.5)	**0.02**
Bleeding	1 (2)	1 (2.5)	0.31
Incisional hernia	1 (2)	0 (0)	**< 0.01**
High – output stoma	1 (2)	0 (0)	**< 0.01**
Anastomotic leak (Grade C; Requiring laparotomy)	1 (2)	0 (0)	**< 0.01**
30-day morbidity	16 (32)	8 (20)	**0.02**
Complications related to the stoma reversal, n (%)	8 (16)	6 (15)	0.41
Incisional hernia	4 (8)	3 (7.5)	0.53
Wound infection	3 (6)	2 (5)	0.51
Rectal bleeding	1 (2)	1 (2.5)	0.78
Overall complications, n (%)	3 (6)	3 (7.5)	0.73
Cardiorespiratory problems	1 (2)	1 (2.5)	0.31
Deep venous thrombosis	1 (2)	1 (2.5)	0.31
Cognitive dysfunction	1 (2)	1 (2.5)	0.31

LTC = loop transverse colostomy, LI = loop ileostomy. $p < 0.05$ was considered asstatistically significant.

compared to the group LI (7.1 ± 2.0 days vs. 9.4 ± 2.5 days; $p = 0.03$). The readmission rate after hospital discharge was higher in the LI group than the group LTC (18% vs 12.5%; $p = 0.02$).

DISCUSSION

The results of the study showed that LTC was superior to the LI as covering stoma for low anterior resection of rectal cancer for several reasons: a) The total complication rate was reduced, b) The complication rate related to the stoma formation was lower, c) Hospital discharge time was shorter, and d) the readmission rate after the discharge was lower.

These results are compatible with several studies. In a double-blind and prospective study, Abdulmohaymen compared LI with LTC in 70 patients and found that stoma-related complications were significantly higher in the LI group than in the LTC group (75.6% vs. 43.2%), [9]. Peristomal dermatitis was the most frequently recorded complication. Also, the rate of stoma reversal related complications was higher in the LI group (45.4% vs. 13.5%). Diarrhea was the most common complication.

Sun *et al*. also reported that stoma related complications were found higher in the LI group than the LTC group (74.3% vs. 48.7%) [10]. Irritant dermatitis was the most frequent complication. The LI group had a significantly higher stoma reversal complication rate (24.24% vs. 9.01%). Multivariate logistic regression analysis showed that ileostomy was a significant independent risk for stoma-related complications ($p < 0.001$) and stoma reversal perioperative complications ($p < 0.05$). On the other hand, in a meta-analysis study including five randomized and seven non-randomized studies, Chen *et al*. [11] reported that the risks of stoma relapse and LI's wound infection were lower in

the LI patients than LTC. In contrast, no other is statistically significant difference was observed for complications.

Gavriilidis *et al*. [12] reported a meta-analysis with a higher incidence of stoma prolapse, lower incidence of high-output stoma after stoma formation and significantly more complications related to stoma reversal, such as wound infections and incisional hernias in patients receiving LTC than the LI.

Nevertheless, the overall complication rate was similar. Du *et al*. [13] included two randomized controlled trials and six cohort studies with a total of 1451 patients in their recent meta-analysis and systemic review study. Stoma prolapse, stoma retraction, parastomal hernia, surgical site infection, and incisional hernia were higher after LTC, whereas dehydration was lower.

In a review by Geng *et al*. [14], it was found that the prevalence of sepsis, prolapse, parastomal hernia and overall complications were lower after stoma formation in LI patients compared to LTC patients. Also, wound infection and incisional hernia were lower, but overall complications were similar. They concluded that a defunctioning LI might be superior to LC concerning a lower prevalence of surgical complications after low anterior resection of rectum cancer.

In a prospective study including 28 patients, skin excoriation, leaks from the appliance, and parastomal hernia was lower in the LI group, but intestinal obstruction was higher compared to the LTC group [15].

Limitations

Based on the literature, there is still no consensus between LI and LTC about which technique is superior. This study has several limitations. First, the patients were not randomized due to the retrospective nature of the study. This might cause a bias despite the same inclusion and exclusion criteria. Another limitation was the limiting number of patients.

CONCLUSION

Although our results revealed that LTC was superior compared to LI concerning complications after low anterior resection for rectum cancer, it can be stated that both LTC and LI have advantages and disadvantages. The choice of the technique for fecal diversion should be considered for every patient individually.

Authors' Contribution

Study Conception: MAÇ, ŞD; Study Design: MAÇ; Supervision: MAÇ, ŞD; Funding: N/A; Materials: N/A; Data Collection and/or Processing: MAÇ, ŞD; Statistical Analysis and/or Data Interpretation: MAÇ, ŞD; Literature Review: MAÇ, ŞD; Manuscript Preparation: MAÇ, ŞD and Critical Review: SD.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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