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Original Research Article

Loop transverse colostomy versus loop ileostomy after low and ultralow anterior resection

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ABSTRACT

Background: Since the introduction of sphincter saving procedures for low and mid-rectal carcinoma and the associated high anastomotic leakage rate is a matter of troublesome. There is a consensus between surgeons that diverting proximal stoma decreases the incidence of clinical leakage. But the choice between loop transverse colostomy (LTC) and loop ileostomy (LI) still a matter of debate. In this study we tried to compare both methods and evaluate the outcome of each.
Methods: This is a prospective observational study included 28 patients suffering from mid- or low-rectal cancer who underwent elective low anterior resection (LARs), admitted to Sohag University Hospital between July 2013 to July 2017. Patients were randomly allocated into two groups; group (A) included 15 patients and managed with LTC, and group (B) included 13 patients and managed with LI. The data of the patients were collected, tabulated and analyzed, with special consideration of the general outcome measures related to stoma construction, special outcome measures related to stoma construction, and the outcome measures related to stoma closure. All of the patients were followed up for 6 months.
Results: Author found a significantly higher incidence rate of skin excoriation ($p<0.001$), leaks from the appliance ($p<0.005$), in the LI group than in the LTC group and higher incidence of parastomal hernia ($p=0.042$) in the LTC than in the LI. Also, author found a significantly higher incidence rate of intestinal obstruction in the LI group ($p<0.001$), also we found a significantly higher incidence of wound infection after stoma closure ($p=0.006$) in the LTC group than in the LI group. The mean time to first bowel movement (days) was earlier in the LI than LTC group and showing also a significant value ($p<0.001$). The mean cumulative total hospital stay was significantly longer in the LTC group than in the LI group ($p<0.001$).
Conclusions: LTC and LI; both have advantages and disadvantages and the use of any for fecal diversion after low and mid-rectal carcinoma should be considered for every patient individually according to his circumstances.

Keywords: Colostomy, Ileostomy, Low rectal carcinoma, Stoma

INTRODUCTION

With the introduction of circular staplers, the double-stapling technique, the "1cm" safety distal margin, intersphincteric resection, and coloanal anastomosis, sphincter-saving resection becomes applicable for more patients with low rectal carcinoma. These techniques mean that low anastomoses can be done safely in resectable low rectal cancers that do not involve the anal sphincter complex.[1-3] Add to this the principle of total mesorectal excision (TME) with (neo)adjuvant therapies made the local recurrence rate after 5 and 10 years less than 10% and the 5-year survival rate is 80% in a time where the local recurrence rate was 20% to 40% after

abdomino-perineal resection.[3,4] Still abdomino-perineal resection has its own indications; for those with anus or pelvic floor invasion and when an R0 resection cannot be attained.[5]

However, the incidence of anastomotic leakage after such surgery has also increased ranging from 4% to 26% drawing attention to this serious problem.[6,7] Possible factors contributing to this problem include the reduced blood supply of the anorectal remnant and the large pelvic cavity after TME, which predispose to potential fluid accumulation and pelvic infection complicated by poor anastomotic healing post (neo)adjuvant radiotherapy.[8,9] The leak rates are significantly high if there is no diverting ileostomy (44.4% versus 12.7% respectively).[10,11] On the contrary, temporary diverting stoma, including LI and LTC, is associated with a decreased incidence of clinical anastomotic leakage.[12]

So, prophylactic proximal fecal diversion of a distal rectal anastomosis is practiced in order to decrease the incidence of anastomotic leakage with consequent septic complications as well as re-operation which can be achieved by using either a LTC or a LI, both are comparable although the latter is more common, is often adopted in clinical practice by keeping the anastomosis or the site of leakage free of material in the hope that less bacterial contamination results in preventing anastomotic leakage.[13,14]

The debate remains as to whether LTC or LI is the optimal way of defunctioning such anastomosis. The aim was to compare the outcome of LTC and LI to determine the optimal mode of fecal diversion following LARs with TME for rectal cancer.

METHODS

From July 2013 to July 2017, 28 consecutive patients with mid- or low-rectal cancer who underwent elective LARs were included in this study at Sohag University Hospital, Department of General Surgery. The study was performed after approval granted by the Institutional Medical and Ethics Committee. A written and verbal informed consent was obtained from all patients participating in the study.

The inclusion criteria included a localized mid- or low-rectal cancer for which sphincter-saving surgery was applicable. In all patients distance between the tumor's lower edge and the anal verge ranged from 5 to 10 cm. Patients with locally advanced rectal carcinomas (T3N0 and all N+ patients) received neoadjuvant chemoradiation. After completion of neoadjuvant chemoradiation they underwent operations 8 weeks later. All of the patients underwent preoperative mechanical bowel preparation. Pelvic drainage was routinely performed. Then patients were randomly allocated in two groups; group A (LTC) and group B (LI) according to the surgeon's preference.

Patients were excluded from the study because of palliative surgical resection for cancers infiltrating contiguous organs (T4b), patients with locally unresectable rectal cancer, an emergency operation for bowel obstruction, patients who required permanent stoma (those who did not have the stoma closed due to any reason, distal unhealed or obstructed gut were also excluded, loss to follow-up, and those with associated co-morbidities (ASA >3); not fit for immediate surgical intervention due to persistent postoperative instability, those with persistent wound sepsis were also excluded from the study, and those who required conversion to an end-colostomy following clinical leakage from the coloanal anastomosis.

The LTC was formed proximal to the middle colic artery by the technique described by Goligher.[15] Construction of the LI followed the principles described by Alexander-Williams.[16] In LI both the loops of bowel are exteriorized as ostomy. Stoma closure was done 12 weeks after sphincter-saving surgery with diverting stoma, or approximately 1 month after completion of adjuvant therapy depending on contrast studies and digital rectal examination, confirmed with absence of local sepsis proved by US ensured distal healing and patency. On the other hand, if a leak or stenosis was observed, closure was postponed until the leak healed or the stenosis disappeared with one or more dilations.

A 48 hours bowel preparation preceded colostomy closure with cessation of oral feeding the day before operation and orthograde lavage mannitol solution orally administered, and saline irrigation of the distal loops prior to surgery, but no preparation was given for patients with an ileostomy.

A circumstomal elliptical incision was used for stoma closure. The loop of colon or ileum was freed by sharp dissection from the rectus abdominus muscle and intra-abdominal mobilization of the bowel from surrounding fascial and peritoneal adhesions. Primary closure of the anterior colonic wall was performed for the LTCs while resection and anastomosis were the procedure for closure of the LIs. All anastomoses of LTC were done by interrupted, double layer technique using non-absorbable suture material and by extra-mucosal, continuous, single layer technique using non-absorbable suture material in LI group of patients.

The data of the 28 patients were collected, tabulated and analysed. The following outcomes were used to compare patients of the two groups.

General outcome measures related to stoma construction included days to 1st stoma action, dehydration, renal insufficiency, hyperkalaemia, hypokalaemia, hyponatremia, hypocalcemia, total number of complicated cases, and length of hospital stay (days) for stoma construction.

Special outcome measures related to stoma construction included skin excoriation, sepsis, stoma prolapse, retraction, necrosis, stenosis, parastomal hernia, leaks from the appliance, and total number of complicated cases.

Outcome measures related to stoma closure included mean time between stoma construction and closure (days), mean duration of stoma closure operation (min), mean time to first bowel movement (days), median time to fluid diet (days), median time to solid diet (days), surgical complications including wound infection, anastomotic leakage and reoperation related to leakage, intestinal obstruction, total number of complicated patients, mean cumulative hospital stay (stoma construction and closure), and postoperative mortality.

All of the patients were followed up for a minimum of 6 months after stoma closure for the incidence of complications.

Demographic data, general outcome measures related to stoma construction, special outcome measures related to stoma construction, and outcome measures related to stoma closure were registered and analysed using SPSS version 20.0. A P value less than 0.05 was considered statistically significant. Data were expressed as median (range) and were compared using analysis of variance or χ^2 test.

RESULTS

Patients included in this study were comparable and there were no significant differences in demographic data between the two groups (Table 1).

Table 1: Demographic data.

	Loop transverse colostomy (n=15)	Loop ileostomy (n=13)	p value
Gender			
Male	7 (47%)	9 (69%)	0.758
Female	8 (53%)	4 (31%)	
Mean age (years)	60±1.2	61±1.1	0.121
Smoking	3 (20%)	5 (39%)	0.035
Cardiac disease	4 (27%)	5 (39%)	0.601
Diabetes	3 (20%)	2 (15%)	0.811
COPD	2 (13%)	4 (30%)	0.329
Renal insufficiency	1 (7%)	2 (15%)	0.185

Analyzing the general outcome measures rates, we found a significantly higher incidence of dehydration, due to high output from stoma which required hospitalization for correction of electrolyte abnormalities and were managed with intravenous fluid, (0% vs. 23%; p<0.001), renal insufficiency (7% vs. 31%; p=0.005), and hypokalemia (7% vs. 23%; p=0.002), in the LI group than in the LTC group. Other parameters did not show any significance in between the two study groups (Table 2).

Table 2: General outcome measures related to stoma construction.

	Loop transverse colostomy (n=15)	Loop ileostomy (n=13)	p value
Days to 1st stoma action	5 (3-7)	2 (1-6)	0.415
Dehydration	0	3 (23%)	<0.001
Renal insufficiency	1 (7%)	4 (31%)	0.005
Hyperkalemia	1 (7%)	0	0.316
Hypokalemia	1 (7%)	3 (23%)	0.002
Hyponatremia	1 (7%)	0	0.316
Hypocalcemia	1 (7%)	3 (23%)	0.085
Total number of complicated cases	2 (13%)	4 (31%)	0.118
Length of hospital stay (days) for stoma construction	12±1.2	11±1.3	0.097

Analyzing the special outcome measures related to stoma construction, we found a significantly higher incidence rate of skin excoriation (7% vs. 62%; p<0.001), leaks from the appliance (13% vs. 38%; p<0.005), in the LI group than in the LTC group and higher incidence of parastomal hernia (20% vs. 0%; p=0.042), in the LTC than in the LI. So, the number of bags used was consequently greater in the LI group by a ratio of 3 to 1.

Table 3: Special outcome measures related to stoma construction.

Complications	Loop transverse colostomy (n=15)	Loop ileostomy (n=13)	p value
Skin excoriation	1 (7%)	8 (62%)	<0.001
Sepsis	2 (13%)	1 (8%)	0.412
Stoma prolapse	1 (7%)	0	0.316
Retraction	1 (7%)	0	0.316
Necrosis	0	0	0
Stenosis	1 (7%)	0	0.316
Parastomal hernia	3 (20%)	0	0.042
Leaks from the appliance	2 (13%)	5 (38%)	<0.005
Total no. of complicated cases	6 (40%)	5 (38%)	0.718

Other parameters did not show any significance in-between the two study groups. So, there was an advantage of LI over LTC in terms of lower incidence of sepsis, lower incidence of parastomal hernia, no stoma

prolapse no retraction or stenosis, although this did not reach statistically significant values (Table 3).

Stoma closure was performed in 28 patients (15 LTC and 13 LI). The mean time between stoma construction and closure was 90±12 days for LTC group and 70±15 days for LI group, without any significant statistical difference (P=0.491). The mean duration of LI closure was 60±12 (range 50-80 min), and for LTC was 45±11 (range 42-64 min), without any significant statistical difference (P=0.083).

Table 4: Outcome measures related to stoma closure.

	Loop transverse colostomy (n=15)	Loop ileostomy (n=13)	P Value
Mean time between stoma construction and closure (days)	90±12	70±15	0.491
Mean duration of stoma closure operation (min)	45±11	60±12	0.083
Mean time to first bowel movement (days)	4±2	2±1	<0.001
Median time to fluid diet (days)	3	3	0.793
Median time to solid diet (days)	5	5	0.793
Surgical complications			
Wound infection	3 (20%)	1 (8%)	0.006
Anastomotic leakage	2 (13%)	1 (8%)	0.412
Intestinal obstruction	1 (7%)	4 (31%)	<0.001
Incisional Hernia	1 (7%)	0	0.316
Total no of complicated patients	3 (20%)	4 (31%)	0.070
Mean cumulative hospital stay (stoma construction and closure)	21.43±2.92	17.70±3.13	0.001

Analyzing the outcome measures related to stoma closure after a follow-up period of 6 months, we found a significantly higher incidence rate of intestinal obstruction in the LI group (7% vs. 31%; p<0.001) which resulted in 2 re-operations to relieve this obstruction, also we found a significantly higher incidence of wound infection after stoma closure in the LTC group than in the LI group (20% vs. 8%; p=0.006) which resolved by antibiotics and dressings. The mean time to first bowel movement (days) was earlier in the LI than LTC group and showing also a significant value (2±1 vs. 4±2; p≤0.001). The mean cumulative total hospital stay was significantly longer in the LTC group than in the LI group (21.43±2.92 vs. 17.70±3.13 days; p<0.001). Other complication parameter did not show any statistical differences between the two study groups. The total number of complicated patients related to the different procedures related to stoma was higher in the LI patients rather than the LTC patients but this did not constitute a significant value (30% vs. 20%; p=0.070). Distribution of these parameters in-between the two study groups and p values are shown in Table 4.

Complications excluding colorectal suture line dehiscence occurred in 11 stoma operations (39%). The patients' general outcome events were more in LI group than the LTC group without evidence of significant difference between the two groups (31% vs. 13%; p=0.118) (Table 2). While the number of patients had special outcome events related to stoma construction was higher in the LTC group than the LI group without evidence of significant difference between the two groups (40% vs. 38%; p=0.718) (Table 3). In other words the total number of complications associated with stoma construction, stoma reversal, and the stomas themselves showed no significant differences between the LTC and LI groups. There were no deaths attributable to a stoma or following stoma closure.

DISCUSSION

With the advances in surgical techniques, sphincter saving surgeries dealing with low rectal cancer become a possible issue. Making such low and ultra-low colorectal or coloanal anastomoses (less than 3cm from the sphincter) carry a great risk of anastomotic leakage. Fecal diversion with temporal stoma was found to allow sound healing of the anastomosis reducing the incidence of clinical anastomotic leakage.[17] Although LTC and LI are equally feasible as methods of fecal diversion, it is not settled whether a LTC or a LI is superior, and the selection process should not be left to the surgeon preference alone.

The LTC is known as a simple technique, but it needs to be placed above belt line which makes it more difficult to manage.[18] While quality-of-life outcomes favor LI since the small intestine feces typically exhibit less feculent odor in comparison to large intestine feces.[19] Add to this the avoidance of the risk of compromise of the marginal colonic blood supply that could occur with the formation of a colostomy.[20] In contrast, morbidity results favor LTC.[21]

According to the results of the general outcome results related to stoma construction proved significantly higher rates of dehydration with an incidence of 23%, also higher rates of electrolyte disturbances and renal failure in patients with LI stoma rather than those with LTC stomas, thus requiring readmission to be managed on a stringent diet and anti-diarrheal medication often.[22] Some recommend such measures only if urinary sodium concentration is low (0-10meq/L), and delay discharge till effluent is less than 1 L/day. This is in accordance

with the others.[23] So patients with any degree of preoperative renal impairment should be handled cautiously regarding the application of LI especially in hot climate areas like ours. Early closure was resorted to as the only solution for these patients.[24] This solution may be not valid especially when patients are left with a permanent stoma owing to postoperative complications of LAR in about 20% of patients which complicate the condition more and more.[25]

Furthermore, the construction of LI was associated with significantly higher incidence rate of skin excoriation than LTC which required prolonged dressings; needing more total hospital stay and more money expenditure. This is probably due to the more aggressive behaviour of small bowel feces.[26] This is in accordance with the others.[23]

There is a significantly higher incidence rate of leakage of liquid stool after loss of the seal of the ileostomy bag than that of the colostomy bag thus making patients suffer more of financial problems pressing more also towards early closure of the stoma which may not be applicable when there is a risk of permanent stoma.[25,27]

As described in previous studies, the LTC has higher incidence of stoma prolapse without reaching statistical significance in present study (p=0.316).[28] This is because the larger fascial defect created during LTC construction.[26] The occurrence of parastomal hernia after the construction of a LI or LTC depends on the same risk factors as for stoma prolapse and incisional hernia. Thus, the size of the fascia defect and wound infection might be the main causes for these complications.[29]

In present study 3 months is the usual time for stoma closure to give a chance for edema and inflammatory adhesions to settle.[30] Closure time was considered earlier in LI patients who were suffering from dehydration and multiple re-admissions to correct their conditions. Although this was conducted earlier in the LI group this did not constitute any significant difference. However, many recent studies had advocated a concept of early closure of intestinal stoma after 4 weeks from its construction provided that: healed distal colon as proved by contrast study or endoscopy, absence of abdominal sepsis, good general condition and informed consent.[31] As the early postoperative adhesions tend to be soft, flimsy and avascular, this can be swept away with minimal tissue injury.[32] But this also depends on adjuvant therapy. Closure of a LI is a more difficult operation than closure of a LTC.[28] This is interpreted by longer time taken for closure of the stoma in LI group than the LTC group, although this did not reach a significant value. This difficulty of dissection and closure of LI due to dense adhesions around the LI intra-abdominal, and policies such as wrapping the limbs of the LI with bio-absorbable membranes suggested as methods of preventing adhesions and facilitating stoma takedown.[33]

Closure of the stoma is associated with a complication in 40% of patients.[34] In present study the complication rate after stoma closure was 25% without a statistical difference in-between the groups this is in line with other studies.[35]

Small intestinal obstruction is a recognized complication associated with stoma formation since its construction and later on. Author reported a significantly higher incidence of small intestinal obstruction with LI group of patients rather than the LTC group (31% vs. 7%) which is in accordance with other studies.[21] Small intestinal obstruction before LI closure has been reported to be due to adhesions adjacent to the stoma, increase the chance of twisting the small intestine, retraction of loop ileostomy and herniation of proximal bowel lateral to the ileostomy.[36] The occurrence of small bowel obstruction, associated with LI, in present study is greater (34%) than that reported in literature of 1.2-14%, as these studies have reported only those patients that subsequently required re-operation after closure of the covering LI.[37,38]

In present study the incidence of incisional hernias was not a significant complication of LI although they were significant in other studies, this may be due to the small number of patients included in present study. Further study of the use of prophylactic mesh to reduce the incidence of this complication may be further evaluated.[39]

Collectively the total number of complications associated with stoma construction, and stoma closure proved no significant differences between the LTC and LI groups. So, the decision making of choice of a type of stoma to divert fecal matter after LARs or ultra-LARs should be taken individually and tailored for every patient separately according to his circumstances. Although we prefer to apply LTC in these situations due to its ease to do and to close and the non-grave complications associated with its construction and closure.

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