Temporary Loop Ileostomy versus Loop Colostomy for Distal Colonic Anastomosis in Emergency Cases

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ABSTRACT

Background: Anastomotic leakage is one of the most important surgical complications of distal colonic surgery, and it has been of great concern due to high occurrence of morbidity and mortality, affecting long-term survival. The proximal diversion, either by a colostomy or an ileostomy, prevents fecal flow through the anastomosis, minimizes the consequences of the anastomotic leak. The preference of loop ileostomy or colostomy is still controversial.

Objectives: To assess the evidence of using of loop ileostomy compared to loop colostomy for protection of distal colonic anastomosis and comparing the safety and effectiveness.

Methods: A prospective study was designed at Al-Yarmouk Teaching Hospital including patients who were admitted to the surgical ward during the period between the 1st of Nov. 2013 to the 1st of Nov. 2015 with emergency distal colonic pathology both (traumatic and non-traumatic) treated by primary repair or anastomosis with proximal protective stoma. Patients were followed during the early post-operative period and the data were collected regarding, complications of the stoma, leak or disruption in the distal colonic repair or anastomosis, patient's satisfaction and compliance with the stoma.

Results: This study included 57 patients with distal colonic anastomosis with proximal stoma protection, Thirty nine (68.42%) patients with loop colostomy and 18(31.57%) with loop ileostomy. Distal colonic anastomosis leak occurred in (5.12%) in colostomy and (5.55%) in ileostomy group. The overall complication rate for colostomy was (30.76%) and for ileostomy was (11.11%). Post closure complications were (21.62%) for colostomy and (11.67%) for ileostomy. General acceptance was the same for both groups.

Conclusion: There was no deference in distal anastomosis leak rate between loop colostomy and loop ileostomy. The incidence of overall complications of loop ileostomy was less than that for loop colostomy. Post closure complications occurred less frequently with loop ileostomy than loop colostomy.

Keywords: Loop ileostomy, Loop colostomy, Emergency, Colonic anastomosis.

Iraqi Medical Journal Vol. 63, No. 1, January 2017; p.78-86.

Stomas formation provide fecal diversion in emergency (traumatic and non traumatic) and elective settings. Colostomies were used in the late 1800s to treat children with an imperforate anus. Early decompressive and protective colostomies were typically constructed as skin-level "loop" ostomies. They provided effective decompression of an obstructed bowel but only partial diversion of the stool, and difficult to manage[1].

In 1888, the support rod was introduced to prevent retraction of the loop stoma until it had granulated to the abdominal wall that provided almost complete diversion of the fecal stream[2]. In the 1950s, Dr. Bryan Brooke made surgical maturation the standard of care for ileostomy[3,4]. Henry Hartmann popularized the concept of delayed anastomosis with closure of the distal stump, and formation of an end colostomy[1,5]. Mikulicz-Radecki proposed the double-barrel colostomy with the use of a crushing clamp to create a fistula between the 2 loops of bowel. This procedure never gained popularity, and over time the term double-barrel colostomy came to indicate a proximal colostomy with a distal mucous fistula[5].

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The first ileostomy was performed in the late 19th century as a temporary diversion for a patient with an obstructing lesion in the ascending colon. Early ileostomies were performed only as a last resort for patients with severe and refractory inflammatory bowel disease[6]. In 1912, the ileostomy was created by using a metal clamp to end in the sloughed off the remaining stoma with a self-matured stoma[7]. In the mid-1950s, Dr. Bryan Brooke pioneered surgical maturation of the protruding stoma[7,8]. This minor change significantly improved clinical outcomes for ileostomy patients and became the standard of care[8].

Large bowel injuries had bad reputation in wartime. In the First World War, the mortality was 60%, and was 37% in the Second World War. In the Korean and Vietnam Wars, it was 15 % and 12%, respectively. This is because surgeons had become familiar with war-time guidelines and had accepted the proximal diversion as the standard treatment for traumatic colorectal injury, even during peace time[9]. A protective stoma should be considered relating to specific conditions involving the operation (low tumors, narrow male pelvis, complications during construction of the anastomosis), or other situations such as: poor initial condition of the patient, after neoadjuvant radiochemotherapy, preoperative steroid use and long duration of operation[10]. The proximal diversion, either by a colostomy or an ileostomy, by preventing fecal flow through the anastomosis, minimizes the consequences of the anastomotic leak[11]. Both types of stoma carry a high complication rate. The interval between stoma construction and closure has a substantial impact on social and economic status. There seems to be a clear relationship between stoma care problems and the degree of social restriction. Clearly, it remains controversial whether loop ileostomy or loop colostomy is the favorable proximal diversion of a colorectal anastomosis[12,13]. In a survey with colorectal surgeons involved in the colorectal residency programs the data obtained showed the preference for a loop ileostomy as a temporary stoma[14,15]. The aim of our study to assess the use of loop ileostomy compared to loop colostomy for protection of distal colonic anastomosis and comparing the safety and effectiveness.

Methods

A prospective comparison study was designed at Al-Yarmouk Teaching Hospital for the period (1st of Nov. 2013 - 1st of Nov. 2015), which included patients admitted to the emergency department with traumatic and non traumatic conditions, who underwent explorative laparotomy with a finding of distal colonic pathology managed by repair or resection with end to end anastomosis with proximal protective stoma (loop colostomy or loop ileostomy). All patients were resuscitated in the emergency department and admitted to the operating room and followed up postoperatively in the surgical ward for any complication. Patients with primary repair of the colon were excluded from the study as well as those who had extroraization of the injured part. Three patients with incomplete data were also excluded.

A forma (questionnaire) was designed to include data regarding the general information (age, gender, cause of emergency surgery), intra-operative data (type and site of injury, time of creation of stoma and difficulty that faces the surgeon while creating the stoma) and postoperative data (stoma complication and compliance). Patients were followed up from the time of stoma formation to stoma closure and data were obtained regarding complications of the stoma and leak or disruption in the distal colonic anastomosis. Patient's satisfaction, compliance with the stoma, number of bags changed per day, the consistency of stoma output and post closure complications.

All patients with colostomy and also most patients with ileostomy were fully prepared before closure. Details about the closure of the stoma were recorded such as the time of closure after the first operation, operative time of the closure and any complication following the closure operation.

Patients were divided into two groups: Group A: patients with protective loop

colostomy. Group B: patients with protective loop ileostomy. Statistical analysis was performed using the software SPSS version 20 and chi-square test. A P-value of less than 0.05 was considered statistically significant.

Results

Fifty seven patients included in the study were divided into two groups: (Group A); includes 39(68.42%) patients had protective loop colostomy while (Group B), 18 patients (31.57%) with loop ileostomy. All of them had emergency explorative laparotomy (traumatic and non-traumatic conditions). All had distal colonic repair or anastomosis with proximal protective diversion by either loop colostomy or loop ileostomy.

The age range was (15 -64 years) with a median age of 38 years. Forty two (73.68%) patients were males, while 15 (26.31%) were females. The highest incidence of patients 20(35.8%), were in the 4th decade, while the lowest 3 (5.26%) were among age of 60 and above. The highest incidence of patients 14 (35.89%) in group A were in the 4th decade, while the lowest 2 (5.12%) in the age 60 years and above. In group (B), the highest incidence of patients was 6 (33.33%) patients in the 4th decade, while the lowest incidence was one patient (5.55%)) in both those in the 2nd decade and those of age 60 and above, (Table 1).

Mechanism of injury and the procedure performed: Forty seven (82.45%) patients were due to penetrating injury, of them, 33 (70.21%) patients were managed by loop colostomy, while 14 (29.78%) by loop ileostomy. The causes were shell injuries due to explosions in 27(57.44%) patients and 20 (42.55%) due to gunshot wounds. No patients with blunt abdominal trauma or stab or sharp object injuries presented in this study.

Patients in the “traumatic mechanism “group were subdivided according to the surgical procedure into those managed by direct repair of the distal colon injury 30 (63.82%) patients and those with resection and primary anastomosis 17(36.17%) patients. Ten (17.54%) patients had protective stoma for non-traumatic mechanism. All of them were managed by distal colonic resection and end to end anastomosis with protective loop colostomy for 6 patients and protective loop ileostomy for 4 patients. The pathology in the non-traumatic patients were, 3(30%) patients have sigmoid volvulus, 6 (60%) colorectal tumor and one (10%) perforated diverticulitis, (Table 2).

Time for stoma formation (minutes): The median operative time for group A was 23 minutes, while for group B was 18 minutes. The time of colostomy formation: the highest incidence was 22 (56.41%) that need (15 -30) minutes, while 17 (43.58%) need > 30 minutes. The time of ileostomy formation: the highest incidence was 12 (66.66%) need (15-30) minutes, while 5 (27.77%) need > 30 minutes and only one (5.55%) ileostomy needs <15 minutes, (Table 3).

Wound infection after stoma formation; Nine (23.68%) patients in group A (one patient died and was excluded) develop wound infection, while three (6.66%) patients in group B develop wound infection postoperatively, (Table 4).

Stoma prolapse developed in seven (18.97%) patients in group A and in one (5.88%) in group B. Stoma retraction was the least complication and developed in one (2.70%) patient only in group A. Stoma hernia developed in two (5.40%) patients in group A and developed in only one (5.88%) in group B. Stoma necrosis developed in two (5.40%) patients only in group A, (Table 5).

Distal colonic anastomosis leak; Distal colonic anastomosis leak developed in two (5.12%) patients in group A and in one (5.55%) group B, (Table 6).

Patient adaptation: Two patients died in group (A) were excluded from this part of the study.

The mean number of bags per day; Two bags for group A (average 1-6) and 5 bags (average 4-7) in group B. Leakage from the

appliance and skin irritation developed in 17 patients (45.94%) in group A and in nine (50%) patients in group B. Medication needed for eight (44.44%) patients in group B and no medication needed for patients in group A. Bad odor occurs in 24 patients (64.86%) in group A and two (11.11%) patients in group B. Psychosocial squeal developed in 27 patients (72.97%) with group A and in 11 patients (61.11%) in group B, (Table 7).

Post stoma closure complications; Post stoma closure complications included wound infection, fistula and incisional hernia. Three patients died prior to stoma closure and were excluded from this part of the study.

Wound infection: there were three patients (8.10%) in group A and one patient (5.88%) in group B. Incisional hernia: four patients (10.81%) in group A and one patient (5.88%) group B developed incisional hernia. Fistula: one patient (1.85 %) in group A developed fistula while no patient in group B developed fistula, (Table 8).

Mortality: Three patients died during the period of the study. Two patients (5.12%) in group A and one patient (5.55%) in group B, (Table 9). The 1st patient (group A) died due to distal colonic anastomotic leak. The 2nd in (group A) with intestinal obstruction died due to respiratory failure postoperatively. The 3rd patient (group B) was multiple injured with long bones fracture; he died due to pulmonary embolism.

Table 1: Age and gender distribution.

Ages (Years)	Colostomy (Group A)		Ileostomy (Group B)		Total
	Male	Female	Male	Female	
10–19	2	1	1	-	4(07.01%)
20 – 29	5	1	2	-	8(14.03%)
30 – 39	9	5	4	2	20(35.08%)
40 – 49	6	1	4	1	12(21.01%)
50 – 59	5	2	2	1	10(17.54%)
> 60	1	1	1	-	3(05.26%)
Total	28 (49.12%)	11 (19.29%)	14 (24.56%)	4 (07.01%)	57 (100%)

Table 2: Mechanism of injury and type of procedure.

Mechanism of injury		Surgical procedure	Protective procedure		Total
			Ileostomy	Colostomy	
Traumatic		**Colonic injury repair**	9	21	47 (82.45%)
		Colonic resection & end-end anastomosis	5	12	
Non-traumatic	**Sigmoid volvulus**	**Colonic resection & end-end anastomosis**	1	2	10 (17.55%)
	Colorectal tumor		2	4	
	Perforated diverticulitis		1	-	
Total			18 (31.55%)	39 (68.45%)	57

Table 3: Time of stoma formation.

Time	Ileostomy	Colostomy	Total
< 15 min	1 (5.55%)	-	1(1.75%)
15 – 30 min	12(66.66%)	22(56.41%)	34(59.64%)
> 30 min	5 (27.77%)	17(43.58%)	22(38.59%)

Total	18(31.57%)	39(68.43%)	57 (100%)

Table 4: Wound infection after stoma formation.

	Male	Female	Total (%)
Colostomy (group A)	6/27	3/11	9/38 (23.68)
Ileostomy (group B)	2/14	1/4	3/18(16.66)
Total	8/31	4/15	12/56 (21.42)

Table 5: Stoma complications.

Complication	Colostomy (Group A)			Ileostomy (Group B)		
	Male	Female	Total No. (%)	Male	Female	Total No. (%)
Hernia	2/27	-	2/37(5.4)	-	1/4	1/17(5.88)
Prolapse	5/27	2/10	7/37(18.97)	1/13	-	1/17(5.88)
Retraction	1/27	-	1/37(2.7)	-	-	-
Necrosis	2/27	-	2/37(5.4)	-	-	-
Stenosis	-	-	-	-	-	-

Table 6: Distal colonic anastomosis leak.

Type of stoma	Distal colonic anastomotic leak	%
Colostomy (Group A)	2/39	5.12
Ileostomy (Group B)	1/18	5.55
Total	3/57	5.26

Table 7: Patient adaptation.

Patient's adaptation	Colostomy (Group A)	Ileostomy (Group B)	Total
Number of bags changed daily (Average)	1-6 bags (2 bags)	4-7 bags(5 bags)	-
Leakage from the appliance & skin irritation No. (%)	17/37 (45.94%)	9/18 (50%)	26/55(47.27%)
Need for medication No. (%)	-	8/18(44.44%)	8/55(14.54%)
Bad odor	24/37(64.86%)	2/18(11.11%)	26/55(47.27%)
Psychosocial squeal	27/37(72.97%)	11/18(61.11%)	48/55(87.27%)

Table 8: Post-closure complications.

Type of stoma	Wound infection No. (%)	Incisional hernia No. (%)	Fistula No. (%)
Colostomy (Group A)	3/37 (8.1)	4/37(10.81)	1/37(2.7)
Ileostomy (Group B)	1/17 (5.88)	1/17(5.88)	-
Total	4/54 (7.4)	5/54(9.25)	1/54(1.85)

Table 9: Mortality.

	Male	Female	Total No. (%)
Colostomy (Group A)	1/28	1/11	2/39 (5.12)
Ileostomy (Group B)	1/14	0/4	1/18 (5.55)
Total	2/42	1/15	3/57 (5.26)

Discussion

The use of a protective stoma is an effective application that can reduce the rate of anastomotic leakage in patients who have distal colonic anastomosis. The morbidity associated with protective stomas and the complications of stoma closure are negligible compared with the reoperations required for anastomosis leakage in the absence of a protective stoma. Therefore, the presence of a defunctioning stoma can be useful for patients undergoing colorectal surgery and is recommended during distal colonic injury[16].

In this study, the median age of patients was 38± years and the male to female ratio was (2.8:1). The higher incidence of male patients is due to the fact that most of our cases were emergency cases and according to our present circumstances, males are more subjected to emergency trauma situations than females.

Regarding the indication for surgery, (82.45%) of patients had trauma and (17.55%) non-traumatic distal colonic pathology. This incidence varies greatly from the incidence found by Russel A William et al in 1997, who found that the incidence was 57.40% and 57.40% for traumatic and non-traumatic cases, respectively[17]. This difference is mainly due to the higher incidence of trauma in our country as compared to other countries due to the current situations.

The average operative time for the creation of stoma was 23 minutes in group A, and 18 minutes in group B. These results are comparable to those obtained by William NS, Nasmyth DG in England who report an average creation of 20 minutes for loop colostomy and 15.2 for loop ileostomy[18]. Approximate results of 20.3 and 15 minutes for creation of ileostomy and colostomy respectively reported by Law and Lertsithichai[5,19]. Although statistically is not significant, the time for creation of loop ileostomy is shorter.

Regarding the post-operative complications; wound infection developed in (23.07%) in group A and (16.66%) in group B. This is comparable to those reported by Konishi T et al in 2006 who report a rate of 21.31% in loop colostomy and 14.32% for ileostomy[20]. Lower percent were reported by Popovic M and Petrovic M in 2001 who found that wound infection rate for loop ileostomy was 8% and that for colostomy was 14, 87%[21]. These high rates of wound infection in our study are explained by the fact that we dealt with dirty or contaminated operations (emergency cases). Although the post-operative complications in group A were more than that of group B, but statistically are not significant.

Para stomal hernia: developed in two patients (5.12%) in group A, one patient (5.55%) in group B. These results are comparable to those obtained by Saghir JH et al[22], Arumugam PJ et al, his study included 49 patients colostomy and 48 ileostomies) who found that the parastomal hernia rate after loop ileostomy was 3% and for loop colostomy was 2%[23]. Edwards DP et al (study included 36 loop colostomies, 34 loop ileostomies) found that para-stomal hernia was 5.55 in loop colostomy, 0% in loop ileostomy[24].

Prolapse developed in seven patients (17.94%) in group A, and one patient (5.55%) in group B. This is comparable to the study done by Carne PW, Robertson in 2003 who found that the prolapse rate for loop ileostomy was 2.4% and that for colostomy was 19%[25]. Edward DP et al[24] studies showed no prolapse in loop ileostomy. In the present study, the same patient (in group B) developed parastomal hernia and prolapse, he was asthmatic and on steroid. These might be regarded as risk factors. A study by Justin T Kim and Ravin R Kumar in 2006 concludes that risk factor in parastomal hernia and stoma prolapse include obesity, increased intra-abdominal pressure, chronic obstructive pulmonary disease (COPD), bowel redundancy, weak

fascia and technical factors[26]. Stoma retraction: developed in one patient (2.56%) in group A, and non in group B. this result was reported by Law WL et al (study of 80 patients)[5] and Khoury GA et al (study of 61 patients)[27] which were 0% in both groups. Stoma retraction is caused by excessive tension on the bowel, early removal of rod and stoma placed at a poorly selected site, ischemia can also produce retraction, and it is associated with stenosis in such a situation, which explains higher incidences in loop colostomy due to short mesentery[26]. Stoma necrosis developed in two patients (5.12%) in group A, and 0% group B. These results are similar to those obtained by Parmar KL et al in 2011 which showed (7%) necrosis in group (A) and no necrosis in group (B)[28]. The overall complication rate for loop ileostomy was (11.11%) which were less than that for colostomy (30.76%), it is not statistically significant with a P value of 0.1; this might be due to the small number of cases in our analysis.

Distal colonic anastomotic leak: developed in two patients (5.12%) in group A, and one patient (5.55%) in group B. These results are comparable to those obtained by Shabbir J, Britton in 2010[29] in which the leak rate was 4% for loop ileostomy and 2% for loop colostomy. Also, these results approached those obtained by Nastro P et al in 2010[30] and Law WL et al[5] who found that the anastomotic leak did not occur in loop ileostomy and Edwards DP et al[10] found that anastomotic leak did not occur after loop colostomy. All of our patients underwent emergency surgery without any preparation and most of them with dirty operations; this may explain the difference in anastomotic leak rate. There is no statistical significant difference in anastomotic leak rate between both groups as the P value is 0.76.

Patient adaptation; five parameters were included (number of bags changed per day, leakage from appliance with skin irritation, need for medication to reduce stomal output, bad odor and psychosocial acceptance by the patient). There is a statistical difference in only two parameters. The mean number of bags per day, 2 bags for group A and 5 for group B, This result is similar to a study done by Khoury GA et al in 1986 (2 bags in group A and 4 bags in group B)[27]. Leakage from the appliance and skin irritation, developed in (45.94%) in group A and in (50%) patients in group B. This result is similar to a study done by Gooszen AW et al who says there was no difference between type of stoma and rate of leakage from appliance (46% for group A and 49% for B)[31]. The commonest causes of leakage from appliance are stoma bag hole is too large, bag applied incorrectly, skin too moist, stoma in a dip or crease and stoma retraction[32].

In the present study, most patients developed leakage from appliance due to moist skin and bad appliance quality which cause poor appliance adhesion to the skin. Medications were prescribed for eight (44.44%) in group B, while no one in group A. P value is 0.000007 which is significant. The frequently used medications are: Antidiarrheal drugs (loperamide), Codeine phosphate and proton pump inhibitor. We used loperamide to reduce the number of bags used per day. This result is comparable to the result obtained by Williams NS et al in 1986[18]. Bad odor output was noted in 24 patients (61.53%) in group A, and 2 patients (11.11%) in group B. P value 0.00038 which is significant. There was no significant difference between the incidence of leakage from appliance with skin irritation and psychosocial acceptance between both groups. This result is similar to results obtained by Gooszen AW et al in 2000[31]. Post stoma closure complication includes wound infection in three patients (8.10%) in group A and one (5.88%) in group B. This result is similar to study done by Pittman DM et al in 1986 (showed 6.5% in group A)[33]. Incisional hernia developed in four patients (10.81%) in group A and one patient (5.88%) in group B. This result is similar to a study done by, Pokorny H et al in 2005 (9% for both group)[34]. This differs from a study by Edwards DP, Leppintgton-Clarke A, in which there was no incisional

hernia in group B and (13.56%) in group A[10]. Post closure fistula developed in one patient (1.85%) in group A and non in group B. This result is comparable to that found by Edwards DP, Leppintgton-Clarke A in 2001[24].

Ten patients (17.54%) in both groups (A and B) develop complication, eight patients (21.62%) in group A and two patients (11.76%) in group B, which is similar to a study done by Pokorny H et al[34] in 2005 who found that the overall complication rate was 20% but it differs from the rate found by Pittman DM, Smith LE in 1985 which was 30%[33]. There is no statistical significant difference between development of complication and the type of stoma created. The P value is 0.65.

Mortality rate in our collection was 5.26 % (3 patients). These results are similar to those reported by A K Saha, P M Sagar in 2008 who found that the mortality rate was 2.5%[35] and also to that reported by Herwig Pokorny, Harald Herkner in 2005 which was 3%[34].

Four randomized controlled trials have compared these two different techniques, two in favor of loop transverse colostomy, as they found that intestinal obstruction and ileus were more common after loop ileostomy[5,31] and two have recommended ileostomy because the frequency of herniation pre- and post-colostomy closure as well as wound infection were higher in colostomy group[10,24]. In other non-randomized publications, the construction of a loop ileostomy is the choice of preference due to occurrence of stoma prolapse in the colostomy group[35].

In conclusion; the incidence of overall complications of loop ileostomy are less than that for loop colostomy. Most of them are not statistically significant. Post closure complications occur less frequently with loop ileostomy than with loop colostomy. In general, loop ileostomy provides the same protection for distal colonic anastomosis with fewer incidences of complications. We recommend studies with larger number of patients and longer period to adequately assess the superiority of loop ileostomy.

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IMJ 2017;63(1):78-86.