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# Incidence of Anastomotic Leakage in Left Colonic Anastomosis Without Proximal Stoma

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## Abstract

**Background:** Colon resection refers to the removal of all or a portion of the colon for the treatment of a disease. A colonic resection followed by anastomosis is a surgical procedure in which a portion of the large bowel or colon is removed and the remaining ends are then connected.

**Aim and objectives:** To compare between primary left colonic anastomosis with or without a proximal stoma.

**Patients and methods:** This prospective clinical trial, included 50 patients selected from attendees of General Surgery Department of Al-Azhar University Hospitals, Al-Ahrar Teaching Hospital in Zagazig, and Mahalla Liver Teaching Hospital. Our cases were divided into group A: 25 underwent primary left colonic anastomosis with proximal stoma. Group B: 25 underwent primary left colonic anastomosis without proximal stoma.

**Result:** No distinctions of statistical significance were found in either group in terms of age, sex, or BMI. Group A had significantly shorter operative times and shorter hospital stays than group B. Anastomotic leakage was lower among group A compared with group B.

**Conclusion:** Anastomotic leakage was lower among group A compared with group B. So we can conclude that primary left colonic anastomosis with proximal stoma is more satisfactory and efficient than anastomosis without stoma.

**Keywords:** Anastomotic leakage, Left colonic anastomosis, Proximal stoma

## 1. Introduction

Colon resection is the removal of part of or the entire colon, depending on the underlying etiology of the disease that necessitates the removal. A colonic resection followed by anastomosis is a surgical procedure in which a portion of the large bowel or colon is removed and the remaining ends are then connected. This surgery is used in emergency settings when a blockage or severe perforation is present in the digestive tract. It also can be a scheduled operation to remove growths on the large bowel or colon.<sup>1</sup>

As anastomotic leakage is a potentially life-threatening complication that can occur in as many as 20% of cases (or much more in surgical oncology), it is one of the most pressing and enduring problems in colorectal surgery.<sup>2</sup>

The most common type of bleeding that occurs during procedures is venous. Injury to adjacent structures is another potential issue during surgery. The left ureter is the most vulnerable anatomical part. When performing surgery on the left side, in all cases, it needs to be identified. If an intra-operative injury such as a burn from the diathermy or a transection occurs and is immediately diagnosed, it is possible to treat the injury; nonetheless, it is recommended that a ureteric stent be put to limit the risk of stricture. The size and location of the injury should be considered in the postoperative phase for follow-up.<sup>3</sup>

There are several prediction models and anastomosis testing methodologies reported, each with its own set of advantages and disadvantages that could be used to prevent or discover early any potential flaw of the anastomosis. Testing the blood supply of

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the anastomosed tissues with indocyanine green or testing the mechanical integrity of the anastomosis for leakage with air, methylene blue, or tension are common practices for improving the anastomosis's safety and reliability.<sup>4</sup>

A stoma is an incision that has been surgically formed on the surface of the abdomen in order to redirect the flow of excrement. This opening is known as a colostomy. When performed correctly, patients who have had colostomies may see a dramatic improvement in their quality of life. On the other hand, if a patient develops issues that are related to their stoma, this can have a significant impact on both their physical and mental health.<sup>5</sup> Stoma formation is unfortunately associated with a considerable amount of morbidity since it carries a high risk of consequences both in the short and long term. According to the available research, the rate of problems caused by stomas might range anywhere from 20 to 70%. Early complications manifest themselves during the first month after a stoma has been created. Ischemia or necrosis of the stoma, retraction, mucocutaneous separation, and parastomal abscess are all immediate complications. Parastomal hernia, prolapse, retraction, and varices are all examples of late complications.<sup>6</sup>

This work aimed to compare primary left colonic anastomosis with or without proximal stoma.

## 2. Patients and methods

Three hospitals in Egypt, Al-Azhar University Hospitals' General Surgery Department, Al-Ahrar Teaching Hospital in Zagazig, and Mahalla Liver Teaching Hospital conducted the prospective clinical experiment. Samples were collected by the systematic random method in the period between August 2022 and September 2023.

Fifty people participated in the study and were split into three groups at random: group A: 25 underwent primary left colonic anastomosis with a proximal stoma and group B: 25 had undergone primary left colonic anastomosis without proximal stoma.

### 2.1. Inclusion criteria

Left colon resection anastomosis for an adult patient with any left colonic reason eg. Obstruction, perforation, volvulus, elective or urgent surgery, prepared or nonprepared patients.

### 2.2. Exclusion criteria

Inflammatory bowel diseases, post new adjuvant chemotherapy, associated peritoneal marked

contamination or sepsis, and patient presented with associated small intestinal perforation.

### 2.3. Sample size

Research by Van Loon *et al.*<sup>5</sup> served as the basis for this investigation. The sample size was determined with the help of Epi-Info STATCALC by making the following assumptions. A confidence level of 95% on both sides and a power level of 80%. With a 7% margin of error, we get an odds ratio of 1.115. The Epi-Info result suggested a maximum sample size of 44. The number of patients was increased to 50 to account for potential dropouts during the follow-up phase.

### 2.4. Methods

An informed consent was taken from every patient.

Patients who qualify undergo a comprehensive clinical evaluation that includes a thorough history and a thorough physical (including a complete abdominal and local examination).

### 2.5. Procedure

For Colonic anastomosis, all patients undergone manual left colonic anastomosis (hand-sewn left colonic anastomosis) with two layers: continuous mucosal layer and interrupted seromuscular layer with suture material vicryl 3/0, The loop ileostomy (at least 20 cm from the ileocecal junction) loop transverse colostomy was performed (group A). Pelvic drain was inserted. Both types of stomas were trimmed, and bowel consistency was ascertained (1–2) months of construction. A formal 48 h bowel mechanical preparation preceded closure, but no chemical preparation was given for patients. The stoma was carefully mobilized from the abdominal wall to permit sufficient exteriorization with the associated edematous bowel wall. After resection, the loop ileostomy, loop transverse colostomy was closed by end-to-end anastomosis with suture material vicryl 3/0 (continuous mucosal layer and interrupted seromuscular layer) in the stoma wound without midline incision and a suction drain inserted into the wound through anatomical closure layer by layer. Stitch removal 10–14 days. Follow-up continued for 1 month to detect any occurring complications (Figs 1–5).

### 2.6. Ethical consideration

All participants provided their informed consent after being briefed on the study's rationale,

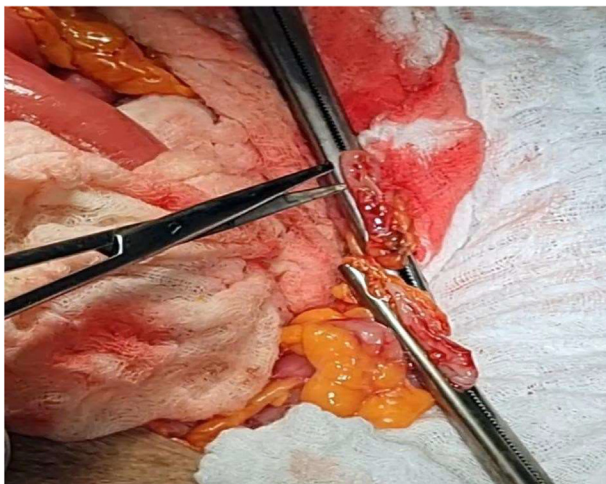


Fig. 1. Proximal and distal ends of the left colon after resection.

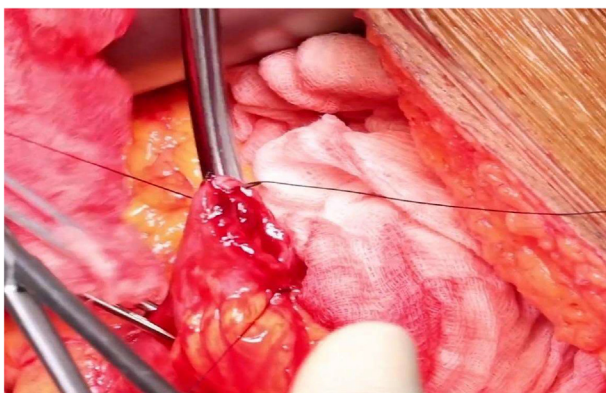


Fig. 2. Two stay sutures at mesenteric and antimesenteric borders.

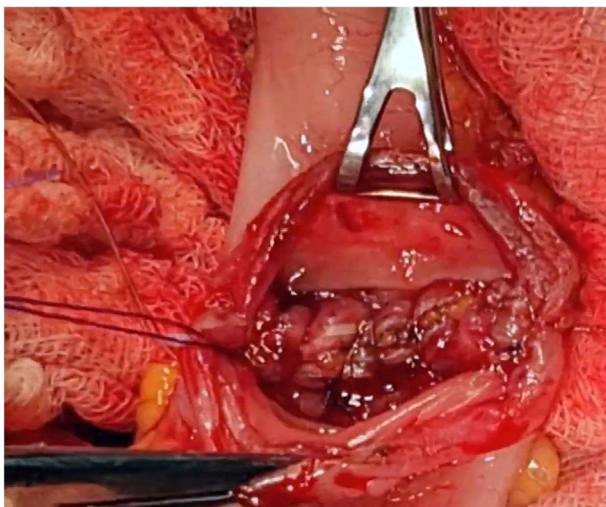


Fig. 3. First layer continuous mucosal sutures of the posterior wall.

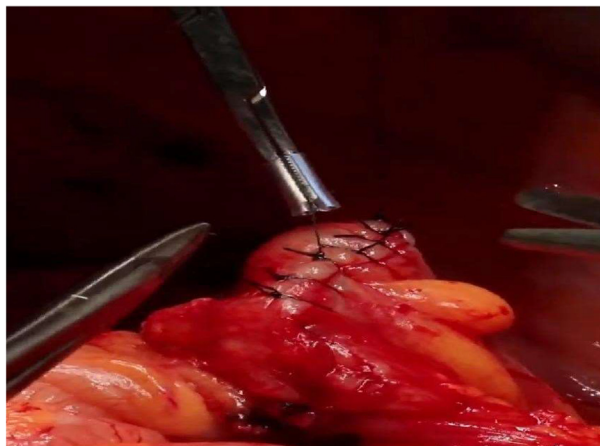


Fig. 4. Second layer interrupted seromuscular sutures of the anterior wall.

methodology, and any relevant goals. Participants and those receiving the service were not subjected to any risks during the trial. Researchers have taken precautions to ensure the confidentiality of all personal information. The volunteers did not have to pay anything out of pocket, and the researchers paid for everything related to the study.

### 2.7. Data management and statistical analysis

For data entry, processing, and statistical analysis, version 25 of the IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA was utilized. We used Kruskal–Wallis tests,  $\chi^2$  testing, Logistic Regression Analysis, and Spearman's Correlation Coefficient to evaluate the data. For each variable, both parametric and nonparametric data were presented, and the appropriate analysis was performed. A *P* value of less than 5% was considered statistically significant.



Fig. 5. Covering ileostomy and midline wound anatomically closed.

*P* value: level of significance [*P* > 0.05: nonsignificant (NS), *P* < 0.05: significant (S), and *P* < 0.01: highly significant (HS)].

### 3. Results

**Table 1.**

With respect to age, sex, and BMI, the two groups tested did not differ significantly from one another, as shown in the table below (Fig. 6, Tables 2 and 3).

This table showed operative time and hospital stay were considerably lower among group B compared with group A. There was highly statistically difference between two groups regarding operative time and hospital stay (Table 4).

From what can be seen in the table, neither group experienced significantly more difficulties than the other. However, anastomotic leakage was minor among group A in contrast to group B (Fig. 7).

### 4. Discussion

The colorectal surgeon's worst nightmare is an intestinal anastomosis that leaks. Leak rates after colonic anastomosis have been reported between 1.5 and 16%, while fatality rates have been reported between 10 and 20%.<sup>7</sup>

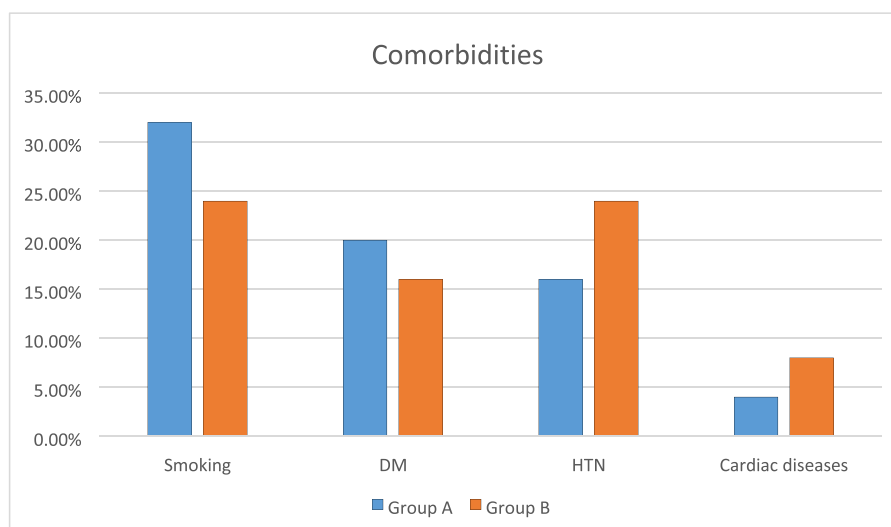
In patients who have undergone a rectal resection, anastomotic leakage (AL) is one of the most serious problems that might arise. Previous research has

*Table 1. Comparison of the demographics of the two groups.*

Variable	Group A (n = 25) [n (%)]	Group B (n = 25) [n (%)]	t/ $\chi^2$	<i>P</i>
Age (years) Mean $\pm$ SD	54.87 $\pm$ 5.27	56.67 $\pm$ 5.94	1.13	0.263
Sex				
Female	11 (44)	12 (48)	0.081	0.777
Male	14 (56)	13 (52)		
BMI (kg/m <sup>2</sup> ) Mean $\pm$ SD	26.82 $\pm$ 3.77	27.36 $\pm$ 3.58	0.402	0.691

$\chi^2$ , Chi square test; t, Independent T test.

*P* value less than 0.05 indicates nonsignificant.



*Fig. 6. Comorbidities between the two studied groups.*

*Table 2. Comparing the prevalence of comorbidities in the two groups.*

Variable	Group A (n = 25) [n (%)]	Group B (n = 25) [n (%)]	$\chi^2$	<i>P</i>
Smoking	8 (32)	6 (24)	0.397	0.529
DM	5 (20)	4 (16)	0.136	0.713
HTN	4 (16)	6 (24)	0.500	0.480
Cardiac diseases	1 (4)	2 (8)	0.355	0.552

*P* value greater than 0.05 indicates nonsignificant. DM, diabetes mellitu; HTN, hypertension.

There was no statistically significant difference in the prevalence of co-occurring disorders between the two groups, as shown in the table.

Table 3. Operative data between the two studied groups.

	Group A (n = 25)	Group B (n = 25)	t	P
Operative time (min) mean $\pm$ SD	195.43 $\pm$ 10.71	173.85 $\pm$ 9.11	7.67	<0.001
Hospital stay (day) mean $\pm$ SD	8.54 $\pm$ 2.27	5.39 $\pm$ 1.25	6.1	<0.001

t: Independent T test.

P value less than 0.001 indicates highly significant.

Table 4. Postoperative complications among the two groups.

Variable	Group A (n = 25) [n (%)]	Group B (n = 25) [n (%)]	$\chi^2$	P
Seroma	2 (8)	1 (4)	0.355	0.552
Wound infection	2 (8)	2 (8)	–	1
Anastomotic leakage	1 (4)	8 (32)	4.878	0.027
Stoma complications	1 (4)	0	1.02	0.315
Deep infection	1 (4)	1 (4)	–	1
DVT	0	1 (4)	1.02	0.315

found a wide variety of risk factors for AL, including but not limited to: age, sex, obesity, diabetes, American Society of Anesthesiologists (ASA) score, neoadjuvant chemoradiotherapy, surgical duration, smoking, and emergency surgery.<sup>8</sup>

We found that the two groups lack substantial differences in age, sex, and BMI. Our findings mirrored those of Sultan and colleagues who set out to identify risk variables for clinically substantial anastomotic leak following large bowel reconnection. From a total of 647 patients, 127 (19.63%) were eligible for inclusion in their study. Nineteen patients, or 15%, were discovered to have an anastomotic leak (group 1), while 108 patients, or 85%, were found to have no such leak (group 2). The average age was 52.41  $\pm$  16.34, with 82 men (64.6% of the sample) and 45 women (35.4% of the sample).

Differences in age, sex, and BMI possessed a significant statistical difference between the groups.<sup>9</sup>

Our findings corroborated those of van Loon and colleagues who compared the postoperative outcomes of individuals in their 60 s and 70 s who had undergone left-sided CRC surgery in the Netherlands and had either a primary anastomosis (PA) or an endostomy (EO). Median age was 79 years old and there were a total of 3286 patients in the trial, with 2661 (81%) receiving a PA and 625 (19%) receiving an EO. There were no statistically significant differences between the groups with a focus on age, sex, or BMI.<sup>5</sup>

The purpose of the study by Zenger *et al.* was to evaluate the postoperative morbidity, rehospitalization rates, and total expenses associated with a ghost ileostomy (GI) versus a defunctioning

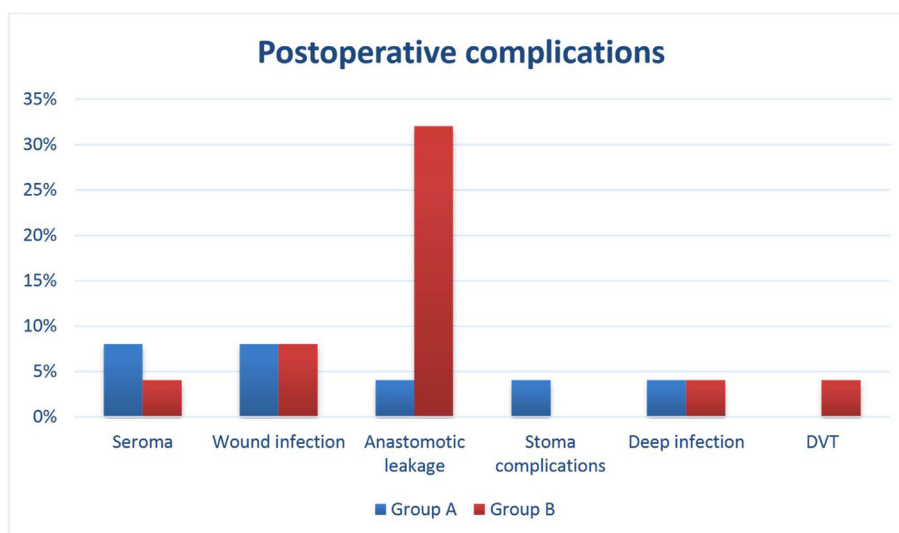


Fig. 7. Postoperative complications between the two studied groups.

ileostomy (DI) in patients who received low anterior resection (LAR) for rectal cancer. The following 123 patients were included in the study: There were 42 people in the GI group and 81 people in the DI group. Differences in age, sex, and BMI the groups were statistically significant.

Comparing the two groups, the rates of comorbidities were not significantly different between the two groups.<sup>6</sup>

Our study was consistent with van Loon *et al.* who reported that the prevalence of co-occurring disorders did not differ significantly between the two groups.<sup>5</sup>

Also, Pellino *et al.* who reported that more over half of patients had at least one concomitant medical condition.<sup>10</sup>

Operative time and hospital stay were considerably lower among group B compared with group A. There was highly statistically difference between two groups regarding operative time and hospital stay.

Our study was consistent with Sultan *et al.* who reported that differences in operative time across the groups were statistically significant.<sup>9</sup>

Also, Foda *et al.* who reported that there was significance between the studied groups regarding intraoperative time ( $P = 0.001$ ).<sup>11</sup>

In our current study, group A had a substantially shorter mean hospital stay than group B did.

Our findings supported with Foda *et al.* who reported that there was significance between the studied groups regarding the postoperative hospital stay ( $P = 0.001$ ).<sup>11</sup> Also, El-Badawy, who reported that there was significance between the studied groups regarding hospital stay.<sup>12</sup>

In reference to problem occurrence, neither group differed from the other significantly. However, Anastomotic leakage was lower among group A compared with group B.

The results of our investigation were in line with those of Foda, and colleagues who found that it was not different enough to be measured statistically in postoperative complications between the two groups tested ( $P$  value  $> 0.05$ ), with the exception of stomal problems ( $P$  value = 0.001). There were 103 cases of anastomotic leakage in group A, compared with 7 in group B.<sup>11</sup>

In contrast, Furnée *et al.* who reported that there was a significant difference regarding operation complications, and Anastomotic leakage.<sup>13</sup>

Also, van Loon *et al.* who reported that in 98% ( $n = 2603$ ) of PA patients, the presence or absence of an anastomotic leakage and/or abscess was documented. Anastomotic leaking and/or abscess did not occur more often in patients with a nonfunctional

stoma than in those with a functional stoma (6.2% vs. 7.0%,  $P = 0.680$ ).<sup>5</sup>

Multiple rehospitalizations are necessary for patients with defunctioning ileostomy DI because of stoma problems (particularly fluid and electrolyte imbalances) and the requirement for a procedure for stoma closure. Because of these factors, life is less satisfying and more expensive.<sup>14</sup>

Higher rates of complications and longer hospital stays have been linked to proximal diversion in the context of blocked colorectal cancer, as suggested by the research of Shwaartz *et al.* Patient condition, surgeon expertise, and intraoperative results should all be considered when deciding how to treat patients with blocked colorectal cancer. Nevertheless, while conducting a primary anastomosis with diversion, we need to be aware of the high morbidity risk that is there. They also discovered that Primary anastomosis with proximal diversion was associated with significantly higher rates of poor outcomes, including wound infection, longer hospital stays, and readmission within 30 days, compared with other anastomosis techniques.<sup>15</sup>

#### 4.1. Conclusion

Regarding our results, Anastomotic leakage was lower among group A compared with group B. So we can conclude that primary left colonic anastomosis with proximal stoma is more satisfactory and efficient than anastomosis without stoma.

#### Disclosure

The authors have no financial interest to declare in relation to the content of this article.

#### Authorship

All authors have a substantial contribution to the article.

#### Conflicts of interest

Authors declare that there is no conflict of interest, no financial issues to be declared.

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