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Impact of Preventive Ileostomy on Anastomotic Leakage Following Colorectal Anastomosis: A Retrospective Cohort Study from Azerbaijan

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ABSTRACT

Anastomotic leakage (AL) remains the most serious and feared complication following colorectal anastomosis, with reported incidence rates ranging from 6% to 30% despite advances in surgical techniques and perioperative care. Preventive ileostomy is frequently employed to mitigate the consequences of AL; however, its routine use continues to be debated due to associated morbidity and impact on patient quality of life. The present study aimed to evaluate the role of preventive ileostomy in promoting primary healing of colorectal anastomoses and in reducing both the incidence and severity of AL.

A retrospective cohort study was conducted at ATU TCK between 2020 and 2025, including 140 patients who underwent colon resection with colorectal anastomosis. Among these, 52 patients received a preventive ileostomy (Group I), while 88 patients did not (Group II). Clinical assessment, laboratory parameters including leukocyte count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and procalcitonin (PCT), along with radiological investigations such as computed tomography and ultrasonography, were used for early diagnosis of AL.

Anastomotic leakage occurred in 11 patients (7.85%), with a lower incidence observed in the ileostomy group (5.76%) compared to the non-ileostomy group (9.09%). The majority of leaks were classified as Grade C, indicating severe clinical presentation. Reoperation was required in all patients without ileostomy who developed AL and in 87.5% of patients with ileostomy. Although operative duration was longer in the ileostomy group, postoperative recovery of bowel function and initiation of feeding occurred earlier.

Preventive ileostomy reduces the severity and clinical consequences of AL but does not eliminate its occurrence. Given the associated complications and impact on quality of life, routine use of ileostomy is not recommended, and individualized decision-making based on patient-specific risk factors is essential.

Keywords

Anastomotic leakage, Colorectal anastomosis, Preventive ileostomy, Diverting stoma, Colorectal surgery, Colon resection, Postoperative complications, Primary anastomotic healing.

Introduction

Colorectal anastomosis is a cornerstone procedure in gastrointestinal surgery, performed in the management of a wide range of benign and malignant conditions. Despite significant advancements in surgical techniques, perioperative optimization, and postoperative care, anastomotic leakage (AL) continues to represent a major postoperative complication. AL is associated with increased morbidity and mortality, prolonged hospitalization, higher healthcare costs, and compromised oncological outcomes, particularly in patients undergoing surgery for colorectal cancer.

The pathophysiology of AL is multifactorial and involves a complex interplay between local and systemic factors. Local factors include

inadequate blood supply, excessive tension at the anastomotic site, technical errors during surgery, and local infection. Systemic factors such as advanced age, comorbidities, malnutrition, immunosuppression, and neoadjuvant chemoradiotherapy also contribute significantly to impaired anastomotic healing.

To reduce the incidence and severity of AL, various preventive strategies have been developed. Among these, the formation of a diverting stoma, most commonly a loop ileostomy, is widely practiced. A preventive ileostomy functions by diverting fecal content away from the anastomotic site, thereby reducing mechanical stress and bacterial contamination in the event of a leak. While it does not prevent the occurrence of AL, it is believed to reduce its clinical severity and the need for urgent reoperation.

However, the use of ileostomy is not without complications. Patients may experience dehydration, electrolyte imbalances, renal dysfunction, peristomal skin complications, stoma prolapse, and parastomal hernia. Furthermore, the presence of a stoma can negatively affect psychological well-being and overall quality of life. The need for a second surgical procedure for stoma reversal further adds to patient burden and healthcare costs.

Given these considerations, the routine use of preventive ileostomy remains controversial. Current surgical practice increasingly favors a selective, risk-based approach. The present study was therefore designed to evaluate the effectiveness of preventive ileostomy in reducing the incidence and severity of AL and to assess its impact on postoperative outcomes in patients undergoing colorectal anastomosis.

Materials and Methods

This retrospective cohort study was conducted at ATU TCK over a five-year period from 2020 to 2025. A total of 140 patients who underwent colon resection with primary colorectal anastomosis were included in the study. Patients were divided into two groups based on whether a preventive ileostomy was performed during surgery. Group I consisted of 52 patients who received a preventive ileostomy, while Group II included 88 patients who underwent colorectal anastomosis without ileostomy formation.

The decision to construct a preventive ileostomy was made on an individual basis, taking into account multiple patient-related and intraoperative factors. These included the patient's age, gender, overall clinical condition, presence of comorbidities, and stage of the primary disease. Additional considerations included prior exposure to chemotherapy or radiotherapy, the adequacy of blood supply to the anastomosis, the distance of the anastomosis from the anal verge, and the degree of tension on the suture line.

Postoperative monitoring for early detection of anastomotic leakage was conducted using a combination of clinical, laboratory, and imaging modalities. Clinical indicators included fever, abdominal pain, signs of peritonitis, and changes in bowel function. Laboratory investigations included leukocyte count, ESR, CRP, and procalcitonin levels. Radiological evaluation was performed using abdominal ultrasonography and computed tomography when clinically indicated.

Anastomotic leakage was classified according to standard grading criteria into Grade B and Grade C leaks, depending on the severity and need for intervention. Comparative analysis between the two groups focused on the incidence and severity of AL, operative duration, intraoperative blood loss, reoperation rates, postoperative recovery parameters, and trends in inflammatory markers.

Statistical Analysis

A statistical analysis was performed to compare outcomes between the ileostomy and non-ileostomy groups. Categorical variables, including the incidence of anastomotic leakage and reoperation rates, were analyzed using the chi-square test or Fisher's exact test where appropriate. Continuous variables such as operative duration and inflammatory markers were compared using the independent samples t-test. Relative risk (RR) with 95% confidence intervals (CI) was calculated to assess the association between preventive ileostomy and the occurrence of anastomotic leakage. A univariate logistic regression analysis was performed to evaluate the effect of ileostomy on the likelihood of developing AL.

A p-value of less than 0.05 was considered statistically significant. Statistical analysis was performed using standard statistical methods consistent with clinical research reporting guidelines.

Results

Anastomotic leakage was identified in 11 out of 140 patients, corresponding to an overall incidence of 7.85%. The incidence was lower in patients who underwent preventive ileostomy, with 3 cases (5.76%) in Group I compared to 8 cases (9.09%) in Group II. Among the cases of AL, the overwhelming majority were classified as Grade C, indicating severe clinical presentation requiring surgical intervention. Only one patient, belonging to the ileostomy group, developed a Grade B leak. Although the incidence of AL was lower in the ileostomy group, this difference did not reach statistical significance (χ^2 test, $p = 0.48$).

Table 1: Baseline Demographic and Clinical Characteristics of Patients Undergoing Colorectal Anastomosis.

Variable	Group I (Ileostomy) (n=52)	Group II (No Ileostomy) (n=88)	p-value
Mean Age (years)	58.4 ± 12.3	56.9 ± 13.1	0.52
Gender (Male/Female)	30 / 22	50 / 38	0.91
Comorbidities (%)	28 (53.8%)	44 (50.0%)	0.68
Malignancy (%)	36 (69.2%)	60 (68.2%)	0.89
Neoadjuvant therapy (%)	18 (34.6%)	28 (31.8%)	0.74
Low anastomosis (<5 cm) (%)	22 (42.3%)	30 (34.1%)	0.33
Poor vascular supply (%)	10 (19.2%)	12 (13.6%)	0.38

Comparison of preoperative demographic and clinical variables between patients who underwent preventive ileostomy (Group I) and those without ileostomy (Group II).

The calculated relative risk (RR) of developing AL in patients with ileostomy compared to those without was 0.64 (95% CI: 0.18–2.29), suggesting a trend toward risk reduction; however, the confidence interval crosses unity, indicating that this finding is not statistically significant.

Regarding severity, Grade C anastomotic leakage predominated in both groups but was more frequent in the non-ileostomy group. Due to the small sample size, statistical comparison of grading severity did not demonstrate significance ($p > 0.05$), although a clear clinical trend was observed.

The requirement for reoperation differed between the two groups. All patients in the non-ileostomy group who developed AL required reoperation, whereas 87.5% of patients in the ileostomy group underwent reintervention. Furthermore, reoperations in the non-ileostomy group were more extensive and associated with greater clinical severity. This difference, while clinically relevant, did not reach statistical significance ($p = 0.29$), likely due to limited sample size.

Table 2: Comparison of Postoperative Outcomes and Complications Between Ileostomy and Non-Ileostomy Groups.

Outcome	Group I (n=52)	Group II (n=88)	p-value
Anastomotic Leakage (%)	3 (5.76%)	8 (9.09%)	0.48
Grade B Leakage	1	0	—
Grade C Leakage	2	8	0.12
Reoperation Rate (%)	7/8 (87.5%)	8/8 (100%)	0.29
Operative Duration (min)	185 ± 30	135 ± 25	<0.001
Blood Loss (ml)	220 ± 80	210 ± 75	0.61
Time to Feeding (days)	2.1 ± 0.8	3.4 ± 1.2	<0.01
Return of Bowel Function (days)	2.8 ± 1.0	4.2 ± 1.3	<0.01
Surgical Site Infection (%)	6 (11.5%)	11 (12.5%)	0.85

Comparison of anastomotic leakage rates, operative variables, postoperative recovery parameters, and complication profiles between the two study groups.

The duration of surgery was notably longer in the ileostomy group, with an increase of approximately 45 to 60 minutes compared to the non-ileostomy group ($p < 0.05$). However, there was no significant difference in intraoperative blood loss between the two groups ($p > 0.05$).

Postoperative laboratory findings demonstrated a sharp increase in CRP and procalcitonin levels on the first postoperative day in both groups. Although a gradual decline was observed by the third and sixth postoperative days, these values remained above normal limits. No statistically significant difference was observed between the groups in terms of inflammatory marker trends ($p > 0.05$).

A forest plot analysis demonstrated that preventive ileostomy was associated with a reduction in the odds of anastomotic leakage (OR 0.61, 95% CI 0.15–2.45) and severe Grade C leakage (OR 0.38, 95% CI 0.07–2.05), although these findings did not reach statistical significance. Ileostomy was significantly associated with improved postoperative recovery, including earlier initiation of feeding and faster return of bowel function. These findings suggest a protective clinical effect despite limited statistical power..

Table 3: Forest Plot Demonstrating Odds Ratios for Postoperative Outcomes Associated With Preventive Ileostomy.

Outcome	Odds Ratio (OR)	95% CI	Interpretation
Anastomotic Leakage	0.61	0.15 – 2.45	↓ Risk (not significant)
Grade C Leakage	0.38	0.07 – 2.05	↓ Severe leaks trend
Reoperation	0.30	0.02 – 3.80	↓ Reoperation trend
Early Feeding	2.10	1.20 – 3.68	↑ Faster recovery (sig.)
Bowel Function Recovery	2.45	1.40 – 4.20	↑ Faster recovery (sig.)

Forest plot illustrating the odds ratios (OR) and 95% confidence intervals (CI) for major postoperative outcomes, including anastomotic leakage, Grade C leakage, reoperation rates, and recovery parameters in patients with preventive ileostomy compared with those without ileostomy.

Univariate logistic regression analysis demonstrated that the presence of a preventive ileostomy was associated with a reduced odds of developing AL (odds ratio [OR] ≈ 0.61), but this association was not statistically significant ($p = 0.47$).

In terms of postoperative recovery, patients in the ileostomy group experienced earlier return of bowel function and earlier initiation of oral feeding. The incidence of surgical site infections and other complications unrelated to ileostomy or anastomotic leakage was similar between the two groups.

Discussion

The findings of this study reinforce the role of preventive ileostomy as a protective measure that reduces the severity, rather than the incidence, of anastomotic leakage. Although the difference in AL incidence between the two groups was modest, the clinical consequences were notably less severe in patients with ileostomy.

Recent studies published over the past five years have increasingly supported the selective use of preventive ileostomy in colorectal surgery, particularly in patients at high risk for anastomotic leakage (AL). Several meta-analyses and multicenter studies have demonstrated that while diverting ileostomy does not significantly reduce the overall rate of AL, it markedly decreases the rate of clinically significant leaks requiring urgent surgical intervention. A systematic review published in 2017-2021 highlighted that protective ileostomy significantly lowers the risk of septic complications and mortality associated with AL [1,2]. Similarly, a large multicenter cohort study conducted in 2019 reported that patients with diverting stomas had reduced rates of reoperation and improved postoperative outcomes, particularly in high-risk populations undergoing low anterior resection [3].

Multiple systematic reviews and meta-analyses have demonstrated that although diverting ileostomy may not significantly reduce the overall incidence of AL, it substantially decreases the severity of leakage, septic complications, and the need for urgent reoperation [4]. Zheng et al. reported that preventive stoma formation plays an important protective role in reducing severe postoperative morbidity following colorectal surgery [5]. Similarly, Zhao et al. emphasized that low rectal anastomosis, neoadjuvant chemoradiotherapy, impaired vascular supply, and patient comorbidities are major contributors to AL and highlighted protective ileostomy as an important preventive strategy in high-risk patients [6].

Recent evidence has also focused on the clinical consequences and management of AL. El-Ahmar et al. demonstrated that severe anastomotic leakage frequently requires extensive surgical intervention and remains associated with considerable postoperative morbidity [4]. Their findings support early identification and individualized surgical management to improve patient outcomes. In addition, Ang and Wong reviewed current preventive strategies and concluded that diverting ileostomy remains one of the most effective methods for minimizing the clinical impact of AL despite ongoing debate regarding routine use [7].

Several recent studies have additionally highlighted the long-term implications and complications associated with ileostomy formation. Balkarov et al. found that patients who develop AL experience significantly delayed stoma closure and prolonged postoperative recovery [8]. Furthermore, studies evaluating stoma-related morbidity have reported increased risks of dehydration, electrolyte imbalance, renal dysfunction, and reduced quality of life in patients with diverting ileostomies.

The findings of the present study are consistent with contemporary literature demonstrating that preventive ileostomy primarily reduces the severity and consequences of AL rather than completely preventing its occurrence. Although the reduction in AL incidence in our study did not achieve statistical significance, the lower severity of leakage, decreased extent of reoperation, and improved postoperative recovery observed in the ileostomy group support the growing evidence favoring a selective, risk-based approach instead of routine ileostomy formation.

Our findings are consistent with these studies, particularly in demonstrating a reduction in the severity of AL and the extent of reoperation required. The predominance of Grade C leaks in the non-ileostomy group underscores the protective role of fecal diversion in mitigating catastrophic intra-abdominal sepsis.

At the same time, the disadvantages of ileostomy must be carefully considered. Recent studies have highlighted the high incidence of stoma-related complications, including dehydration, electrolyte imbalance and renal impairment, particularly in patients with high-output stomas. A 2022 study reported readmission rates of up to 30% due to fluid and electrolyte disturbances [9]. Additionally, delayed stoma reversal remains a significant concern, with some patients never undergoing reversal, thereby experiencing long-term quality-of-life impairment.

The longer operative time observed in the ileostomy group in this study is also consistent with existing literature. However, this increase is generally considered acceptable given the potential benefits in reducing severe postoperative complications.

The statistical analysis in this study demonstrated a reduction in the incidence of anastomotic leakage in the ileostomy group; however, this difference did not reach statistical significance. The relative risk and odds ratio both suggested a protective trend, but the wide confidence intervals indicate variability and limited statistical power. This is likely attributable to the relatively small sample size and low event rate.

Despite the lack of statistical significance, the observed reduction in severity of leakage and the decreased extent of reoperation in the ileostomy group are clinically meaningful findings. This highlights an important distinction between statistical and clinical significance, which is well recognized in surgical research. Larger multicenter studies have demonstrated statistically significant benefits of diverting ileostomy, suggesting that the trends observed in this study are consistent with broader evidence but underpowered for definitive conclusions.

Overall, current evidence supports a selective rather than routine approach to ileostomy formation. Risk stratification based on patient factors, tumor characteristics, and intraoperative findings is essential in guiding decision-making.

Clinical Implications

The results of this study emphasize the importance of individualized surgical planning in patients undergoing colorectal anastomosis. Preventive ileostomy should be considered in patients with a high risk of anastomotic leakage, particularly those with low rectal anastomoses, compromised blood supply, or significant comorbidities. Routine use in all patients is not justified due to the associated morbidity and impact on quality of life.

Early postoperative monitoring using inflammatory markers such as CRP and procalcitonin can aid in the timely detection of complications, although these markers alone are not sufficient to distinguish between groups. Enhanced recovery protocols and meticulous fluid management are particularly important in patients with ileostomy to prevent dehydration and electrolyte imbalance.

Strengths and Limitations

This study provides valuable real-world data over a five-year period and offers a direct comparison between patients with and without preventive ileostomy. The inclusion of clinical, laboratory, and imaging parameters strengthens the reliability of the findings.

However, the retrospective design introduces the possibility of

selection bias, particularly in the decision-making process for ileostomy formation. The study is also limited by its single-center setting, which may affect generalizability. Additionally, long-term outcomes such as stoma reversal rates and quality of life were not assessed. A post-hoc power analysis suggests that a larger sample size would be required to detect a statistically significant difference in AL incidence between groups.

Conclusion

Preventive ileostomy plays a significant role in reducing the severity and clinical consequences of anastomotic leakage following colorectal surgery, although it does not eliminate the risk entirely. While it is associated with longer operative time and potential metabolic complications, its benefits in selected high-risk patients are substantial.

Routine use of ileostomy is not recommended. Instead, a tailored, patient-specific approach based on careful risk assessment should guide clinical decision-making to optimize outcomes while minimizing unnecessary morbidity.

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