Role of Covering Ileostomy in Causation of Anastomotic Stricture in Low Anterior Resection for Rectal Carcinoma

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Introduction: Anastomotic stricture is a known complication after low anterior resection (LAR) for rectal cancer, with reported incidence rates between 5% and 19%. It is defined as a narrowing at the anastomotic site, potentially causing bowel obstruction and difficulty with defecation. Multiple factors influence stricture formation, including the level of anastomosis, surgical technique, preoperative chemoradiation, and use of a protective ileostomy. While diverting ileostomies are often used to mitigate the consequences of anastomotic leakage, their role in stricture development remains unclear.

Aim of work: To compare the incidence of anastomotic stricture in patients undergoing LAR with and without covering ileostomy.

Patients and methods: A retrospective cohort study was conducted on 200 patients who underwent LAR for rectal cancer at NCI -Cairo University from April 2022 to March 2024. Patients were divided into two equal groups (With and without ileostomy), and postoperative strictures were assessed using colonoscopy. Data were collected from medical records.

Results: Stricture incidence was 15% in the ileostomy group and 10% in the non-ileostomy group ($p = 0.067$). No statistically significant associations were found with surgical approach, anastomotic technique, preoperative chemoradiation, or ileostomy reversal timing. However, stricture rate significantly correlated with lower anastomosis level (≤5 cm; $p = 0.0119$).

Conclusion: Anastomotic strictures following LAR are multifactorial. While protective ileostomies do not significantly increase stricture risk, the level of anastomosis remains a key factor. Further prospective studies are needed to clarify causative mechanisms and optimize preventive strategies.

Key words: Anastomotic stricture, anastomotic leakage, rectal cancer.

Introduction

Anastomotic stricture (AS) is a common problem that can happen after low anterior resection (LAR) for rectal cancer. The rate of occurrence varies from 2% to 30%, based on the patient's traits, the surgical method, and the care they receive before and after surgery.[1,2] It is marked by abnormal narrowing at the anastomotic site, which causes obstruction complaints, poor bowel function, and a lower quality of life. Even though slightly invasive methods and better healing procedures have been developed, it is still a big problem after surgery.

The choice of anastomotic technique handsewn versus stapled—has been widely studied in relation to stricture formation. While stapled anastomosis is favored for its reproducibility and reduced operative time, it has been associated with localized ischemia that may contribute to stricture development. However, recent evidence shows no significant difference in stricture incidence between the two techniques when sound surgical principles are followed,[3,4] suggesting that technical factors alone may not fully explain stricture incidence

Protective ileostomy is commonly employed to reduce the clinical consequences of anastomotic leakage, especially in low rectal anastomoses. However, recent data have suggested that fecal diversion may negatively affect mucosal adaptation and remodeling, potentially increasing the risk of fibrosis and strictures.[5] Similarly, timing of ileostomy reversal-whether early or delayed has not shown a consistent impact on stricture rates.[6]

Preoperative chemoradiation therapy (CRT), an established component of multimodal treatment for locally advanced rectal cancer, is associated with increased risk of stricture formation due to radiation-induced microvascular damage and fibrosis.[7] Low anastomoses, particularly those within 5 cm of the anal verge, are technically challenging and inherently more susceptible to ischemia, tension, and stricture formation.[2]

Aim of work: To compare the incidence of anastomotic stricture in patients undergoing LAR with and without covering ileostomy.

Patients and methods

In this study, 200 people who had low anterior resection (LAR) for histologically proven rectal

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cancer at the National Cancer Institute-Cairo University between April 2022 and March 2024 were included. There were two equal groups of patients: those with a preventive ileostomy (n=100) and those without one (n=100).

Participants had to be at least 18 years old, of either gender, who did LAR with the goal of curing them.

Emergency surgery, inflammatory gut disease, and distant disease were all reasons why the patient could not participate.

The institutional review board gave its approval, and the people who would be affected by the data study gave their informed permission.

Before surgery, all patients went through the same routine tests. These tests included a clinical exam, a colonoscopy with pathologically proven malignancy, a pelvic MRI for local staging, and a chest and abdomen CT scan to rule out any distant spread. Complete blood count, liver and kidney function, clotting profile, and tumor markers were some of the tests done in the lab. Neoadjuvant chemo-radiotherapy was given to patients with stage II or III cancer based on the advice of a joint tumour board.

A total mesorectal resection was done during the LAR procedure. An anastomosis was made using either a circle clip or hand-sewing, depending on what was going on during the surgery. It was up to the performing surgeon the decision to make a redirecting ileostomy.

Postoperative care included early mobilization and feeding. Ileostomy reversal was planned electively, with early reversal defined as ≤8 weeks. Patients were followed postoperatively with clinical evaluation, imaging, and colonoscopy. The primary endpoint was anastomotic stricture, defined radiologically or endoscopically. Secondary endpoints included factors influencing stricture development.

Statistical analysis and follow-Up

SPSS version 25.0 (IBM Corp., Armonk, NY, USA) was used to analyse the data. aThe Kolmogorov–Smirnov and Shapiro–Wilk tests were used to see if the continuous variables were normal. We used the Student's t-test to compare parametric variables that were shown as means ± standard deviation. The Mann–Whitney U test was used to compare non-parametric variables that were shown as medians and ranges. The Chi-square test or Fisher's exact test was used to look at categorical factors, depending on what was needed.

Logistic regression was applied to significant univariate predictors of anastomotic stricture to determine independent risk factors. Results were expressed as odds ratios (OR) with 95% confidence intervals (CI). A two-tailed p-value <0.05 was considered statistically significant.

Patients were evaluated postoperatively using digital rectal examination (DRE) and colonoscopy at standardized intervals to assess anastomotic integrity. A structured risk stratification model was used to individualize follow-up intensity based on key clinical and surgical predictors.

Source of funding: No fund was needed.

Ethical committee approval

Approval of Institutional Review Board (IRB) was required before start of the study. The study protocol was presented to the scientific ethics committee of Surgical Oncology department, National Cancer Institute. Patients' data were presented anonymously with protection of privacy and confidentiality.

Results

Among the 200 patients who underwent low anterior resection for rectal cancer, anastomotic strictures were observed in 15% of patients with a protective ileostomy compared to 10% in those without ileostomy, a difference that did not reach statistical significance ($p > 0.05$). Regarding preoperative chemoradiation therapy (CRT), 80 patients received CRT, with stricture rates of 15% in the ileostomy group and 12.5% in the non-ileostomy group, again showing no statistically significant difference ($p > 0.05$). Notably, no strictures were reported among the 20 patients who did not receive CRT.

The type of surgery performed—laparoscopic versus open—also showed no significant association with stricture formation, with rates of 12.9% and 15.2%, respectively ($p > 0.05$). However, a statistically significant association was found between anastomotic level and stricture incidence ($p < 0.05$). Patients with low anastomoses (≤5 cm from the anal verge) had the highest stricture rate (21.4%), followed by mid-level anastomoses (6–10 cm) at 10%, and high-level anastomoses (>10 cm) at only 4%.

With regard to anastomotic technique, among patients without ileostomy, both handsewn and stapled anastomoses had an equal stricture rate of 10%. In the ileostomy group, the stricture rate was 16% for handsewn anastomoses and 14% for stapled ones, with no significant difference observed across these groups ($p > 0.05$).

Finally, the timing of ileostomy reversal also did not significantly affect stricture rates. Patients who underwent early reversal (≤8 weeks) had a 14% stricture rate, while those with delayed reversal

(>8 weeks) had a slightly higher rate of 16%, but this difference was not statistically significant (p > 0.05). Table 2 Incidence of Anastomotic Stricture According to Surgical Variable.

Table 1: Integrated summary of statistical methods, follow-Up protocol, and risk stratification for anastomotic stricture

Domain	Details
Statistical methods	- Normality tests: Kolmogorov–Smirnov, Shapiro–Wilk - Tests: Student's t-test, Mann–Whitney, Chi-square, Fisher's exact test - Logistic regression for multivariate analysis (OR, 95% CI) - Significance: p < 0.05
Follow-up schedule	- 4–6 weeks: DRE - 3 months: Colonoscopy + DRE - 6 months: Colonoscopy + DRE - 12 months: Colonoscopy - Annually (Years 2–5): Colonoscopy
Follow-up purpose	Assess anastomotic healing, detect early and late strictures, enable endoscopic intervention as needed
Risk Stratification Factors	Surgical Technique: Stapled (Low risk), Handsewn (Moderate–high risk) Anastomosis Level: High (>10 cm – low), Mid (6–10 cm – moderate), Low (≤5 cm – high) Protective Ileostomy: Absent (Low), Present with delayed reversal (High) Preoperative CRT: No (Low), Yes (High) Patient Comorbidities: Age >70, diabetes, smoking, malnutrition (All high risk)
Scoring System	0 points: Low risk - 1 point: Moderate risk - 2 points: High risk per variable Total score interpretation: 0–2 (Low risk), 3–4 (Moderate risk), ≥5 (High risk)

Table 2: Incidence of anastomotic stricture according to surgical variable

Variable	Categories	Total Patients (n)	Stricture (n)	Stricture (%)	P-value	Statistical Test
Ileostomy	With Ileostomy	100	15	15.0%	>0.05	Chi-squared = 3.36
	Without Ileostomy	100	10	10.0%		
Preoperative CRT	Received With ileostomy	100	15	15%	>0.05	Chi-squared = 0.73
	Received Without ileostomy	80	10	12.5%		
	Not Received	20	0	0.0%	N/A	
Surgery type	Laparoscopic	108	14	12.9%	>0.05	Chi-squared = 3.51
	Open	92	14	15.2%		
Anastomotic level	High (>10 cm)	50	2	4.0%	<0.05	Chi-squared = 8.86
	Mid (6-10 cm)	80	8	10.0%		
	Low(<5cm)	70	15	21.4%		
Anastomotic technique	Handsewn (No Ileostomy)	80	8	10.0%	>0.05	Chi-squared = 0.44
	Stapled (No Ileostomy)	20	2	10.0%		
	Handsewn (Ileostomy)	50	8	16.0%		
	Stapled (Ileostomy)	50	7	14.0%		
Ileostomy reversal timing	Early (≤8 weeks)	50	7	14.0%	>0.05	Chi-squared = 0.323
	Delayed (>8 weeks)	50	8	16.0%		

Discussion

Anastomotic stricture following low anterior resection (LAR) for rectal cancer remains a clinically significant complication that affects postoperative function and quality of life. Despite the evolution of surgical techniques and enhanced recovery protocols, the pathogenesis of this condition is multifactorial and not yet fully understood. Multiple perioperative factors, including fecal diversion, anastomotic technique, chemoradiation therapy, and anatomical level of anastomosis, have been implicated in the risk profile.

The role of protective ileostomy in the development of strictures has been debated. While it is primarily employed to minimize the consequences of anastomotic leakage, some investigators have hypothesized that diversion may impair mucosal adaptation and delay remodeling due to the absence of mechanical and microbial stimulation. Rullier et al. reported that fecal diversion may promote fibrotic changes in the bowel wall through altered intraluminal dynamics and delayed mucosal regeneration.[2] Nevertheless, the protective function of ileostomy in the early postoperative period continues to outweigh these theoretical risks in most clinical scenarios.

Regarding anastomotic technique, stapled and hand-sewn methods have both been widely utilized, with no definitive consensus on superiority. While stapling offers consistent tissue approximation and may reduce localized ischemia, studies such as those by Liang et al. and Chapuis et al. suggest that when performed under optimal conditions, both techniques yield comparable outcomes in terms of stricture formation.[3,4] Hence, the technical skill and intraoperative judgment of the surgeon may be more critical than the specific method employed.

The timing of ileostomy reversal is another area of investigation. Early closure has been associated with better patient satisfaction and reduced stoma-related complications, yet its effect on anastomotic stricture remains unclear. Matsuda et al. reported that early versus delayed closure did not significantly influence the rate of stricture development, suggesting that healing processes at the anastomotic site are more dependent on local perfusion and inflammatory response than on the duration of diversion.[6]

Preoperative chemoradiotherapy (CRT), although essential for oncologic control in locally advanced rectal tumors, is known to impair tissue healing through microvascular damage and increased fibrosis. Marte et al. and Rogers et al. both reported a potential association between CRT and higher incidence of strictures, particularly when combined with other risk factors such as low anastomoses and delayed reversal.[7,8] Despite these concerns, CRT remains an integral part of standard treatment and should not be withheld based solely on fear of fibrotic complications.

Anatomical level of anastomosis is perhaps the most consistently cited risk factor in the literature. McDermott et al. highlighted the vulnerability of ultra-low anastomoses due to reduced perfusion, increased tension, and technical limitations within the confined pelvic space.[1] Even with modern minimally invasive techniques, these challenges persist and demand careful intraoperative planning and meticulous execution

Although statistically significance was found with lower level of anastomoses to have higher incidence of stricture , however this may be referred to the nature of pelvic anatomy, and technical difficulties, rather than the presence of covering ileostomy, which may be important to prevent early anastomotic failure, and may be live serving to the patient

Summary and conclusion

This study evaluated the incidence and risk factors for anastomotic strictures (AS) in 200 patients undergoing low anterior resection (LAR) for rectal cancer. Patients were divided into two groups: with protective ileostomy and without ileostomy.

The study assessed the incidence of anastomotic stricture in both groups and the impact of surgical technique (Handsewn vs. stapled anastomosis), ileostomy reversal timing (Early vs. delayed), preoperative chemo-radiation therapy (CRT) and level of anastomosis.

Key findings include:

- The overall incidence of strictures was 15% in the ileostomy group and 10% in the non-ileostomy group, with no statistically significant difference.
- Stapled anastomosis showed a trend toward fewer strictures compared to handsewn techniques, but this was not significant.
- Ileostomy reversal timing (Early ≤8 weeks vs. delayed >8 weeks) had no significant impact on stricture rates.
- Preoperative chemo-radiation therapy demonstrated higher but non- significant stricture rates.
- Level of Anastomosis the findings of this study demonstrated a statistically significant association between the level of anastomosis and the incidence of anastomotic strictures.
- Although higher incidence of stricture was

found with lower anastomosis, (statistically significant) however with lower tumors, and lower level of anastomoses, the need for covering ileostomy is high, since in low pelvic anastomose, with decreased vascularity, and increase anastomosis tension, the incidence of anastomotic failure is high, and the presence of covering ileostomy may be lifesaving.

Suggestions for future research

Future studies should aim for larger, multicenter, prospective designs to validate these findings, explore additional risk factors, and assess the long-term outcomes of interventions to minimize anastomotic strictures.

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