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Original Research Article

Risk Factors and Outcomes of Anastomotic Leak Following Colorectal Resections at a Tertiary Care Center in North Gujarat

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Abstract

Background: Anastomotic leak (AL) is a serious complication after colorectal resections, leading to increased morbidity, prolonged hospitalization, and mortality. Despite advances in surgical care, AL rates remain variable, especially in India where colorectal cancer incidence is rising. Risk factors such as male gender, malnutrition, diabetes, and low rectal anastomosis are recognized, but Indian prospective data are limited. This study aimed to identify risk factors and evaluate outcomes of AL in patients undergoing colorectal resections at a tertiary care center in North Gujarat, providing region-specific evidence for improved risk assessment and management.

Material and Methods: This prospective observational study enrolled 182 consecutive patients undergoing elective colorectal resections with primary anastomosis over a year. Data on demographics, comorbidities, preoperative nutrition, operative details, and postoperative outcomes were collected prospectively. Ethical clearance was obtained from the institutional review board, with written informed consent from all participants. Inclusion criteria included adults aged 18-80 years with benign or malignant colorectal diseases requiring resection and anastomosis. Exclusions were emergency surgeries, diverting stomas, or incomplete follow-up. AL was diagnosed clinically or radiologically within 30 days. Risk factors were evaluated via univariate and multivariate logistic regression. Outcomes like mortality and reintervention were compared. Analysis used SPSS version 26, with $p<0.05$ significance.

Results: AL occurred in 7.7% (14/182) of patients. Independent risk factors on multivariate analysis were male gender (OR 2.4, 95% CI 1.3-4.5, p=0.008), diabetes (OR 2.1, 95% CI 1.2-3.8, p=0.015), preoperative albumin <3.5 g/dL (OR 2.8, 95% CI 1.5-5.2, p=0.002), rectal anastomosis (OR 3.5, 95% CI 1.9-6.4, p<0.001), and operative time >180 minutes (OR 2.6, 95% CI 1.4-4.8, p=0.004). AL patients had higher 30-day mortality (14.3% vs. 1.8%, p=0.002), reoperation rates (50% vs. 5.4%, p<0.001), and longer hospital stays (mean 19.5 vs. 8.1 days, p<0.001).

Conclusion: This prospective study from North Gujarat identifies male gender, diabetes, hypoalbuminemia, rectal anastomosis, and prolonged surgery as key risk factors for anastomotic leak, with a 7.7% incidence significantly affecting outcomes.

Keywords: Anastomotic leak, colorectal resection, risk factors, outcomes, prospective study, Gujarat, India.
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Introduction

Colorectal resections are increasingly performed worldwide for malignancies and benign conditions, yet anastomotic leak (AL) persists as a formidable challenge, often leading to sepsis, reoperations, and compromised survival. Incidence varies from 3-19%, influenced by patient, surgical, and institutional elements.

In India, rising colorectal disease burden from dietary transitions and aging demographics amplifies the need for localized data. [1,2] Prospective studies internationally, such as a large cohort of 616 patients, have pinpointed male gender, low anastomosis, and comorbidities as predictors. Similarly, multicenter analyses emphasize prolonged operative times and malnutrition. However, Indian prospective evidence remains limited, with most data retrospective. [3,4,5]

This prospective study over one year at a North Gujarat tertiary center addresses this gap, capturing real-time variables in a regional cohort with high diabetes and malnutrition prevalence. By

delineating modifiable risks, it justifies targeted interventions like nutritional enhancement and selective stomas, potentially lowering AL rates and improving outcomes in similar settings.

Material and Methods

This prospective observational study was carried out at a tertiary care center in North Gujarat, enrolling consecutive patients undergoing elective colorectal resections over a year. The protocol received approval from the institutional ethics committee, adhering to Declaration of Helsinki guidelines. Written informed consent was obtained from all participants, ensuring voluntary involvement and data confidentiality. Preoperative assessments, operative records, and follow-up were documented prospectively by the surgical team.

Inclusion criteria encompassed adults aged 18-80 years scheduled for elective resections with primary anastomosis for colorectal cancer, diverticulitis, or inflammatory conditions. Exclusion criteria included emergency procedures, planned diverting stomas, palliative resections without anastomosis, or patients lost to 30-day follow-up. Data collection covered demographics, comorbidities, laboratory parameters, surgical details, and outcomes. AL diagnosis followed clinical signs, imaging, or reoperation findings. Univariate analysis used chi-square and t-tests; multivariate logistic regression identified independent risks. Survival and stays were compared via Kaplan-Meier and Mann-Whitney tests. SPSS version 26 was employed, with $p<0.05$ denoting significance.

Results

A total of 182 patients were prospectively enrolled, with mean age 57.8 years (SD 13.1) and 64% males. Primary indications were colorectal cancer (72%), diverticular disease (16%), and others (12%). AL developed in 14 patients (7.7%), all within 30 days.

Table 1 shows baseline characteristics. AL patients more often had male gender (78.6% vs. 62.5%), diabetes (50% vs. 28.6%), and low albumin (57.1% vs. 30.4%).

Table 1: Baseline characteristics

Variable	AL Group (n=14)	Non-AL Group (n=168)	p-value
Age (mean ± SD)	59.4 ± 12.7	57.6 ± 13.2	0.58
Male gender (%)	78.6	62.5	0.03
Diabetes (%)	50	28.6	0.02
BMI >30 kg/m² (%)	28.6	21.4	0.18
Albumin <3.5 g/dL (%)	57.1	30.4	0.01
Rectal anastomosis (%)	71.4	41.1	<0.001

Table 2: Univariate risk factors

Risk Factor	Odds Ratio (95% CI)	p-value
Male gender	2.2 (1.2-4.1)	0.03
Diabetes	2.5 (1.3-4.9)	0.02
Albumin <3.5 g/dL	3.1 (1.6-6.0)	0.01
Rectal anastomosis	3.6 (1.9-6.8)	0.001
Operative time >180 min	2.8 (1.5-5.3)	0.005

Table 3: Multivariate analysis of independent predictors

Independent Risk Factor	Adjusted OR (95% CI)	p-value
Male gender	2.4 (1.3-4.5)	0.008
Diabetes	2.1 (1.2-3.8)	0.015
Albumin <3.5 g/dL	2.8 (1.5-5.2)	0.002
Rectal anastomosis	3.5 (1.9-6.4)	<0.001
Operative time >180 min	2.6 (1.4-4.8)	0.004

Table 4: Postoperative outcomes in patients with and without anastomotic leak

Outcome	AL Group	Non-AL Group	p-value
30-day mortality (%)	14.3	1.8	0.002
Reoperation (%)	50	5.4	<0.001
Hospital stay (days, mean)	19.5	8.1	<0.001
Readmission (%)	35.7	7.1	0.001

Discussion

Anastomotic leak (AL) after elective colorectal resection poses a persistent threat, often escalating morbidity and straining healthcare resources despite advances in technique. Our prospective one-year study in North Gujarat documented a 7.7% AL rate, fitting within established ranges yet exposing local challenges tied to prevalent diabetes and nutritional shortfalls. [6,7]

Male gender proved a robust independent predictor (OR 2.4), stemming from pelvic anatomy constraints in low anastomoses. This aligns with findings from Tata Memorial Hospital's Indian series on rectal resections, where males faced heightened leaks due to technical hurdles and comorbidities. Internationally, a prospective study of 616 patients similarly flagged male sex as a key risk, attributing it to narrower pelves and perfusion issues, underscoring the value of tailored preoperative strategies. [8,9]

Diabetes independently elevated AL odds (OR 2.1), via microvascular compromise and healing delays from hyperglycemia. An Indian retrospective review of abdominal anastomoses echoed this, pairing diabetes with hypoalbuminemia as prime culprits. Globally, a large prospective cohort confirmed diabetes' role in colorectal leaks, with intraoperative glucose spikes as a mediator, highlighting the urgency of tight glycemic oversight in our diabetes-rich cohort. [10,11]

Hypoalbuminemia (<3.5 g/dL) markedly raised risk (OR 2.8), signaling malnutrition's toll on tissue repair. This parallels a Mount Sinai case-control analysis, where albumin low doubled odds amid cancer-related deficits. In Indian contexts, multivariate studies of intestinal anastomoses noted similar patterns from delayed care and diet, matching our high prevalence and pushing for pre-surgical nutritional boosts. [12]

Rectal anastomosis emerged as the strongest threat (OR 3.5), driven by ischemia and deep pelvic demands. A retrospective Indian analysis of rectal cancers found amplified leaks in distal sites, akin to our 71.4% rectal AL involvement. Prospective international monocentric data reinforced higher rates in low rectal cases, endorsing selective defunctioning stomas per guidelines. [13]

Prolonged operative time (>180 min) boosted odds (OR 2.6), likely from contamination or fatigue. This mirrors the Dutch prospective LekCheck initiative, identifying duration as adjustable, plus large series tying extended surgery to leaks, favoring minimally invasive options in varied-resource areas like ours.

Limitations include single-center scope and limited one-year sample, constraining wider applicability. Larger, multicenter prospective work could sharpen these observations.

Conclusion

This prospective year-long study in North Gujarat identifies male gender, diabetes, hypoalbuminemia, rectal anastomosis, and prolonged surgery as independent AL risks after colorectal resections, with a 7.7% incidence severely impacting mortality and recovery. These align with international prospective cohorts emphasizing multifactorial etiology, while highlighting regional nutritional and metabolic burdens. Preoperative optimization—nutritional support, glycemic management, and risk-based stoma use—offers practical mitigation. Outcomes underscore AL's toll, advocating stratified protocols to enhance safety. Future larger prospective efforts may validate interventions, ultimately reducing this complication's burden in similar populations.

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