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RESEARCH ARTICLE
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FACTORS AFFECTING THE OUTCOME OF INTESTINAL RESECTION AND ANASTOMOSIS: A PROSPECTIVE OBSERVATIONAL STUDY.

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Abstract

Background: Anastomotic leakage is a major complication following intestinal resection, significantly affecting patient outcomes.

Objective: To identify clinical, biochemical, and intra-operative factors influencing anastomotic healing.

Methods: This prospective observational study included 50 patients undergoing intestinal resection and anastomosis at a tertiary care hospital.

Results: The overall leak rate was 16%. Significant predictors of leakage included low hemoglobin (<10 g/dL), hypoalbuminemia (<3.5 g/dL), and elevated renal parameters ($p<0.05$).

Conclusion: Early identification and correction of modifiable risk factors can help reduce anastomotic complications and improve surgical outcomes.

Introduction

The gastrointestinal tract (GIT) is a vital organ system responsible for the digestion and absorption of nutrients and maintaining overall homeostasis. It develops through a complex embryological process, and its structure and function are elaborately discussed in foundational medical texts such as Langman's Medical Embryology and Sabiston Textbook of Surgery [1,3]. Surgical intervention on the intestines is often required in a variety of conditions, including bowel obstruction, ischemia, trauma, inflammatory bowel diseases, and malignancies. Intestinal resection followed by anastomosis is one of the most commonly performed procedures in such scenarios.

Despite advances in surgical technique, instrumentation, and perioperative care, anastomotic leak remains a dreaded postoperative complication, with reported incidences ranging from 2% to 20% [5,8]. Anastomotic leakage is associated with increased postoperative morbidity, sepsis, prolonged hospitalization, re-intervention, and even mortality. The multifactorial nature of anastomotic failure has been well-documented, with several patient-related and technical factors implicated. These include age, sex, comorbidities (such as diabetes, cardiac or renal diseases), nutritional status (including serum albumin), intraoperative blood loss, duration of surgery, level of anastomosis, and surgeon experience [5,8,9,11]. A number of studies have attempted to delineate these risk factors. Alves et al. identified preoperative leukocytosis, intraoperative septic conditions, technical difficulties during anastomosis, and postoperative blood transfusions as independent predictors of anastomotic leak after large bowel resection [5]. Similarly, Luján et al. emphasized the importance

of blood transfusions, open surgical approaches, and preexisting comorbidities in influencing anastomotic outcomes [8]. Jina and Singh further highlighted hypoalbuminemia, sepsis, and blood transfusion >2 units as significant predictors of anastomotic failure [9]. Rullier et al. and Lipska et al. found that male sex, lower anastomotic level, and obesity significantly increased leak risk after colorectal surgery [11,12].

Technical considerations are equally critical. The choice of hand-sewn versus stapled anastomosis, single-layer versus double-layer closure, and orientation (end-to-end, side-to-side) can all influence healing outcomes. Standard surgical manuals, including Bailey and Love, Kirk's Basic Surgical Techniques, and Sabiston, emphasize the principles of tension-free, well-perfused, accurately approximated anastomosis with meticulous technique to optimize outcomes [2,3,4]. Even experimental studies, such as those by Reinertson in veterinary models, support the role of meticulous technique over specific methods [6].

Given the diverse range of factors that can influence anastomotic healing, this study aims to evaluate and analyze both patient-related and intraoperative variables that affect the outcome of intestinal resection and anastomosis in a tertiary care setting. The objective is to identify potentially modifiable risk factors that may be targeted preoperatively to reduce the incidence of anastomotic complications.

Objectives

1. To evaluate the incidence of anastomotic leak following intestinal resection and anastomosis in a tertiary care hospital setting.
2. To identify and analyze the preoperative, intraoperative, and postoperative factors influencing the outcome of intestinal anastomosis.
3. To assess the association between biochemical parameters (hemoglobin, serum albumin, renal function) and the risk of anastomotic leak.

Methodology

This prospective observational study was conducted in the Department of General Surgery at RNT Medical College, Udaipur. A total of 50 patients undergoing intestinal resection and anastomosis were included based on predefined inclusion and exclusion criteria. Detailed data on demographic, clinical, biochemical, and intraoperative factors were collected. Patients were followed postoperatively to assess the incidence of anastomotic leak. Statistical analysis was performed using appropriate tests, with a p-value <0.05 considered statistically significant.

Results

Table 1: Age-wise Distribution of Patients and Anastomotic Leak

Age Group (Years)	No. of Patients	Patients with Leak	Leak Rate (%)
<20	2	0	0.0%
20–60	35	5	14.3%
>60	13	3	23.1%
Total	50	8	16.0%

The majority of patients were in the 20–60 years age group. Although not statistically significant, anastomotic leak was more prevalent in older patients (>60 years), suggesting a possible age-related vulnerability in tissue healing.

Table 2: Sex-wise Distribution and Leak Incidence

Sex	No. of Patients	Patients with Leak	Leak Rate (%)
Male	40	7	17.5%
Female	10	1	10.0%
Total	50	8	16.0%

Male patients comprised the majority of the study population. The leak rate was higher in males compared to females, a trend seen in previous literature, though statistical significance was not established in our sample.

Table 3: Comorbidities and Anastomotic Leak

Comorbidity	No. of Patients	Patients with Leak	Leak Rate (%)
Diabetes Mellitus	3	1	33.3%
Cardiac Disease	2	0	0.0%
Renal Disease	1	1	100.0%
Others	4	1	25.0%
No Comorbidity	40	5	12.5%
Total	50	8	16.0%

Patients with renal dysfunction had the highest leak rate (100%), followed by those with diabetes and other comorbidities. This highlights the need for preoperative optimization in comorbid patients.

Table 4: Hemoglobin and Anastomotic Leak

Hemoglobin (g/dL)	No. of Patients	Patients with Leak	Leak Rate (%)	P-value
<10	7	3	42.9%	0.037*
≥10	43	5	11.6%	
Total	50	8	16.0%	

Anemia (Hb <10 g/dL) was significantly associated with a higher leak rate, indicating that tissue oxygenation plays a crucial role in anastomotic healing. The association was statistically significant (p=0.037).

Table 5: Serum Albumin and Anastomotic Leak

Serum Albumin (g/dL)	No. of Patients	Patients with Leak	Leak Rate (%)	P-value
<3.5	34	7	20.6%	0.005*
≥3.5	16	1	6.2%	
Total	50	8	16.0%	

Patients with hypoalbuminemia (<3.5 g/dL) had a significantly higher leak rate compared to those with normal levels. The difference was statistically significant (p=0.005), underlining the importance of nutritional status in surgical outcomes.

Table 6: Renal Function and Anastomotic Leak

Renal Parameters	No. of Patients	Patients with Leak	Leak Rate (%)	P-value
Elevated	15	4	26.7%	0.004*
Normal	35	4	11.4%	0.008*
Total	50	8	16.0%	

A statistically significant association was observed between elevated renal parameters and anastomotic leak. This underscores the systemic impact of renal impairment on postoperative recovery.

Discussion

Anastomotic leakage remains one of the most significant complications following gastrointestinal surgery, contributing to increased morbidity, mortality, and prolonged hospital stay. In our study, the incidence of anastomotic leak was 16%, which falls within the range reported in various studies (2%–20%) depending on patient characteristics and surgical technique. This is consistent with

findings from Alves et al. [5]. Although our study did not find age to be a statistically significant factor, older patients showed a higher leak rate, consistent with the findings of Jalaj et al. [10]. Male sex was also more commonly associated with leaks, a trend noted by Lipska et al. [11]. Comorbidities like diabetes and cardiac disease showed no statistically significant association, but renal dysfunction was found to significantly increase leak risk, as also noted by previous authors [3,10].

Hemoglobin levels below 10 g/dL were associated with a significantly higher leak rate (p=0.037), aligning with studies by Luján et al. [8]. Similarly, hypoalbuminemia (<3.5 g/dL)
was a strong predictor of leak (p=0.005), supported by findings from Jina and Singh [9].

Standard surgical principles emphasizing tension-free, well-perfused, and accurate anastomosis were followed as outlined in Bailey and Love, Sabiston, and Kirk's surgical techniques [2,3,4]. Reinertson's work also underscores that technical precision outweighs the choice of technique [6]. In summary, the results indicate a multifactorial etiology of anastomotic failure with certain modifiable preoperative risk factors.

Conclusion

This prospective observational study demonstrates that specific preoperative biochemical parameters—namely anemia, hypoalbuminemia, and renal dysfunction—are significantly associated with an increased risk of anastomotic leak following intestinal resection and anastomosis. These findings underscore the importance of thorough preoperative evaluation and optimization of nutritional and metabolic status to improve surgical outcomes. While demographic variables such as age and sex, and comorbidities like diabetes and cardiac disease, showed a trend toward increased leak rates, statistical significance was not achieved—likely due to the limited sample size. Nevertheless, the results affirm the multifactorial nature of anastomotic healing and highlight the need for larger, multicenter studies to develop comprehensive risk prediction models and enhance patient safety in gastrointestinal surgery.

Recommendations

1. Preoperative optimization of hemoglobin and serum albumin levels should be prioritized to minimize the risk of anastomotic leak.
2. Patients with renal dysfunction should be carefully evaluated and stabilized before undergoing intestinal surgery.
3. Larger, multicentric studies are recommended to validate these findings and develop robust risk assessment tools for anastomotic outcomes.

Ethical Permission

The study was conducted after obtaining approval from the Institutional Ethics Committee of RNT Medical College, Udaipur. Written informed consent was taken from all participants prior to inclusion in the study. Patient confidentiality and ethical standards were maintained throughout the research in accordance with the Declaration of Helsinki.

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