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Research Article

A Clinical Study on Factors Predisposing to Anastomotic Leak

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HIGHLIGHTS

1 Identifying risk factors for anastomotic leaks.

2 Clinical study reveals crucial leak predictors.

3 Surgical outcomes influenced by multiple factors.

4 Key predisposing elements in leak cases.

5 Understanding causes of post-surgical leaks.

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ABSTRACT

Anastomotic leaks represent a significant complication in intestinal surgery, leading to increased morbidity and mortality. This clinical study aimed to identify factors predisposing patients to anastomotic leaks. Conducted prospectively from August 2022 to January 2023 at Rangaraya Medical College, the study included 151 cases of intestinal resection and anastomosis. Factors were categorized into patient-related, surgery-related, and postoperative categories. The analysis revealed that age, nutritional status, and pre-existing conditions like diabetes and chronic corticosteroid use significantly impacted leak rates. Older patients and those with poor nutritional status exhibited higher leak incidences. Chronic corticosteroid therapy was strongly associated with an increased risk of leaks ($P < 0.001$), while preoperative hemoglobin levels also showed significant correlation ($P < 0.05$). Surgery-related factors, including the type and duration of the procedure and intraoperative blood loss, were found to influence outcomes significantly. Longer surgeries and those with substantial blood loss had higher leak rates. Postoperative care, particularly nutritional support and early detection of complications, was critical in mitigating leak risks. The timely management of complications and the provision of adequate nutrition were crucial for better recovery and reduced leak rates. Statistical analysis, including chi-square and multivariate logistic regression, underscored the significance of these associations. The study highlights the importance of a comprehensive, multidisciplinary approach to patient care, encompassing preoperative optimization, meticulous surgical techniques, and vigilant postoperative management to reduce the incidence of anastomotic leaks. These findings suggest that targeted interventions in these key areas could significantly improve surgical outcomes and patient safety. In conclusion, a holistic approach to patient management, addressing both preoperative and postoperative factors, is essential in minimizing the risk of anastomotic leaks and enhancing overall patient outcomes.

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INTRODUCTION

Resection and anastomosis are crucial surgical procedures involving the removal of a diseased organ segment with sufficient viable margins, followed by the rejoining of the cut ends to preserve anatomical continuity. The most frequently performed resection and anastomosis involve the intestines. In this clinical study, various factors influencing the success of intestinal resection and anastomosis were analyzed. These factors were categorized into three main groups: patient-related, surgery-related, and post-operative factors. The outcome of intestinal resection and anastomosis is inherently multifactorial. The healing of an anastomosis depends on a comprehensive approach that includes correcting metabolic abnormalities and providing necessary nutritional supplements, which significantly contribute to the proper healing of the anastomotic site[1,2].

Patient-related factors include age and general health, nutritional status, pre-existing conditions, and medications. Older patients often have a higher risk of complications due to comorbidities such as cardiovascular diseases, diabetes, or compromised immune systems, which can impede the healing process. Malnutrition can adversely affect wound healing, as adequate protein and caloric intake are essential for tissue repair and immune function. Conditions like diabetes mellitus, renal insufficiency, or chronic obstructive pulmonary disease (COPD) can negatively impact the healing process and increase the risk of anastomotic leaks. Additionally, certain medications, such as corticosteroids or immunosuppressants, can hinder the body's natural healing mechanisms and predispose patients to complications[3].

Surgery-related factors encompass surgical technique, duration of surgery, intraoperative blood loss, and the type of resection. The precision of the surgical technique is paramount; the choice of sutures, the tension on the anastomosis, and the handling of tissues can all influence the healing process. Longer surgeries are associated with increased risks of complications due to prolonged anesthesia and the potential for tissue desiccation and bacterial contamination. Significant blood loss during surgery can lead to hypoperfusion of tissues, impairing healing and increasing the risk of anastomotic failure. The specific segment of the intestine resected and the extent of resection can also influence the healing process, as some areas of the intestine have better blood supply and tissue quality, which are conducive to better healing[4].

Post-operative factors include monitoring and early detection, nutritional support, management of complications, and patient mobility. Close monitoring of patients post-operatively is crucial for the early detection of complications. Signs of infection, leakage, or other issues should be promptly addressed. Post-operative nutritional support, including enteral or parenteral nutrition, can significantly influence recovery by ensuring that patients receive adequate nutrients to promote better healing. Timely management of post-operative complications such as infections, abscesses, or fistulas is critical, as prompt intervention can prevent the worsening of these conditions and support recovery. Encouraging early mobilization can reduce the risk of complications such as deep vein thrombosis (DVT) and improve overall outcomes[5].

Achieving a successful outcome in intestinal resection and anastomosis requires a holistic approach. This includes preoperative optimization, intraoperative care, and postoperative management. Thorough preoperative assessment and optimization of the patient's health status are essential, involving improving nutritional status, managing chronic conditions, and carefully planning the surgical approach. Employing meticulous surgical techniques, minimizing intraoperative blood loss, and ensuring optimal tissue handling are critical components of successful surgery. Providing robust postoperative care with close monitoring, effective nutritional support, and timely management of complications is key to improving outcomes[6].

The success of intestinal resection and anastomosis is influenced by a multitude of factors spanning the preoperative, intraoperative, and postoperative periods. By addressing these factors comprehensively, healthcare providers can enhance the healing process and reduce the incidence of anastomotic leaks. This study underscores the importance of a holistic approach to patient care, from preoperative optimization to meticulous surgical techniques and vigilant postoperative management.

MATERIALS AND METHODS

Aims and Objectives

The primary aim of this study is to investigate the factors that influence the outcome of intestinal anastomosis and identify those that predispose patients to anastomotic leaks. The study focuses on two main categories of factors: patient-related factors and surgical factors.

Study Design

This research was conducted as a prospective study. A total of 151 cases requiring intestinal resection and anastomosis, both in elective and emergency settings, were selected from our institution. The study period spanned from August 2022 to January 2023.

Inclusion Criteria

1. Individuals of all age groups
2. Patients requiring intestinal resection and anastomosis in either an emergency or elective setting

Exclusion Criteria

1. Pregnant women
2. Immunocompromised patients

The study examined various factors categorized into pre-operative, intra-operative, and post-operative factors.

Pre-Operative Factors

1. Age: The age of the patients was recorded.
2. Sex: The gender of the patients was noted.
3. Biochemical Parameters: Hemoglobin levels, albumin levels, and renal function parameters were measured and recorded for each patient.

Intra-Operative Factors

1. Etiology: The underlying cause necessitating surgery, such

as gangrene, malignancy, or trauma, was documented.

2. Delay in Surgery: The time from patient admission to the incision was noted to assess any delays.

3. Type of Anastomosis Based on Bowel Orientation: The type of anastomosis performed was classified as end-to-end, end-to-side, or side-to-side.

4. Type of Anastomosis Based on Bowel Involved: The specific segments of the bowel involved in the anastomosis were documented.

5. Type of Anastomosis Based on Layers: The anastomosis was categorized based on whether it was single-layered or multi-layered.

6. Pre and Intraoperative Blood Transfusion: The requirement for blood transfusion before and during surgery was recorded.

Post-Operative Factors

1.Total Parenteral Nutrition (TPN) Transfusion: The administration of TPN post-operatively was noted to understand its impact on patient recovery and anastomotic healing.

By systematically analyzing these factors, the study aims to provide a comprehensive understanding of the elements that contribute to successful intestinal anastomosis and identify those that increase the risk of anastomotic leaks. The insights gained from this study are expected to improve surgical outcomes and guide clinical practices in managing patients undergoing intestinal resection and anastomosis.

All the variables obtained were analyzed using the Chi-square test with continuity correction to reduce the number of eligible independent variables. Factors that achieved a significance level of p=0.05 were further analyzed using multivariate analysis with a forward stepwise logistic regression test.

RESULTS

Table 1. Age Distribution in Cases of Intestinal Anastomosis

Age group (years)	Total no. of cases (No.)	Total no. of cases (%)	Cases with leak (No.)	Cases with leak (%)
0-10	9	5.96%	1	11.11%
11-20	13	8.61%	0	0.00%
21-30	26	17.22%	4	15.38%
31-40	37	24.50%	7	18.92%
41-50	21	13.91%	3	14.29%
51-60	25	16.56%	7	28.00%
>60	20	13.25%	2	10.00%

Figure 1. The bar diagram showing the age distribution in cases of intestinal anastomosis. The bars represent the total number of cases in each age group, with a segment indicating the number of cases with leaks.

Table 1 presents the age distribution of cases of intestinal anastomosis and highlights the prevalence of anastomotic leaks across different age groups. The table is organized into seven age groups, ranging from 0-10 years to over 60 years. The total number of cases in each age group is provided, along with the corresponding percentages, the number of cases with leaks, and the percentage of cases with leaks within each age group. The age group 31-40 years has the highest number of cases, accounting for 24.50% (37 cases) of the total, with 7 of these cases experiencing leaks (18.92%). The 21-30 years age group has the second highest number of cases, with 26 cases (17.22%) and 4 leaks (15.38%).

The table indicates variability in the incidence of anastomotic leaks across different age groups. Notably, the 51-60 years age group has the highest leak percentage at 28.00%, despite representing 16.56% of the total cases. In contrast, the 11-20 years age group has no cases with leaks, suggesting a potentially lower risk of complications in younger patients. The data also shows that while older patients (over 60 years) account for 13.25% of the cases, their leak percentage stands at 10.00%, which is relatively lower compared to the 51-60 years age group. This distribution underscores the need for age-specific considerations in the management and monitoring of patients undergoing intestinal anastomosis to minimize the risk of anastomotic leaks.

Table 2. Sex Distribution

Sex	Total no. of cases (No.)	Total no. of cases (%)	Cases with leak (No.)	Cases with leak (%)	χ^2 value	P value
Male	87	57.62%	15	62.50%	0.076	>0.05
Female	64	42.38%	9	37.50%	-	-

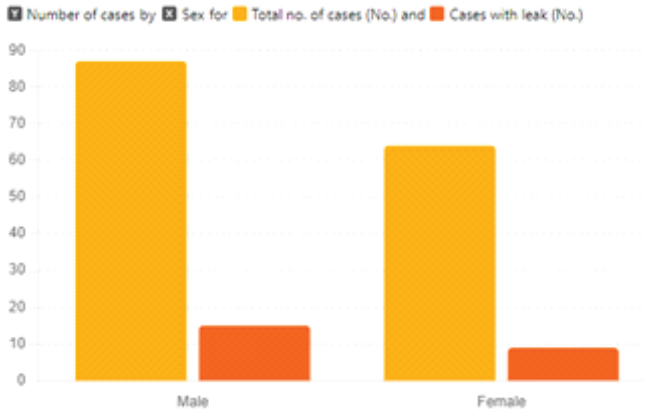

Figure 2. The bar diagram showing the sex distribution in cases of intestinal anastomosis. The bars represent the total number of cases for each sex, with a segment indicating the number of cases with leaks.

Table 2 provides a breakdown of sex distribution in cases of intestinal anastomosis, highlighting the total number of cases, the percentage of cases, the number of cases with leaks, the percentage of cases with leaks, and statistical values including the chi-square (χ^2) value and P value. According to the table, there were 87 male patients (57.62% of the total) and 64 female patients (42.38% of the total). Out of these, 15 males (62.50%) experienced an anastomotic leak, compared to 9 females (37.50%). This indicates a higher occurrence of leaks in male patients compared to female patients.

The statistical analysis using the chi-square test yields a χ^2 value of 0.076 with a P value greater than 0.05. This suggests that there is no statistically significant difference between the male and female groups regarding the incidence of anastomotic leaks. The P value greater than 0.05 implies that any observed difference in leak rates between sexes could be due to random variation rather than a true difference in risk. Thus, while the raw data shows a higher percentage of leaks in males, this difference is not statistically significant according to the chi-square test.

Table 3. Economic Status Wise Incidences

Economical status	Total no. of cases (No.)	Total no. of cases (%)	Cases with leak (No.)	Cases with leak (%)	χ^2 value	P value
Low	101	66.89%	16	15.84%	-	-
Middle	39	25.83%	3	7.69%	0.803	>0.05
High	11	7.28%	5	45.45%	-	-

Figure 3. The bar diagram showing the economic status-wise incidences in cases of intestinal anastomosis. The bars represent the total number of cases for each economic status, with a segment indicating the number of cases with leaks.

Table 3 presents the distribution of cases of intestinal anastomosis based on economic status, alongside the incidence of anastomotic leaks within each economic group. The economic status is categorized into three groups: Low, Middle, and High. The majority of cases fall into the Low economic status category, with 101 cases, accounting for 66.89% of the total. In this group, 16 cases experienced leaks, corresponding to 15.84% of the Low economic status cases. The Middle economic status group had 39 cases (25.83%), with 3 cases of leaks, representing 7.69% of this group. The High economic status group had the fewest cases, with 11 cases (7.28%), but a notably higher leak percentage of 45.45%, with 5 cases experiencing leaks.

The chi-square (χ^2) value for the comparison between the Middle and Low economic status groups is 0.803, with a P value greater than 0.05. The data indicates that while individuals in the High economic status group have a higher percentage of anastomotic leaks, the overall statistical comparison primarily between the Middle and Low groups does not show significant variation, implying that economic status, within these ranges, might not be a decisive factor in the incidence of leaks. However, the higher leak rate in the High economic status group could warrant further investigation to understand underlying causes.

Table 4. Relationship of Various Abdominal Conditions with Incidence of Anastomotic Leaks

Obstruction	Group	Total cases (No.)	Total cases (%)	Cases with leak (No.)	Cases with leak (%)	x^2 value	P value
Ileal	Patients with obstruction	21	13.91	3	14.29	-	-
Colonic	Patients with obstruction	14	9.27	4	28.57	-	-
Sigmoid volvulus	Patients with obstruction	6	3.97	1	16.67	-	-
Total	Patients with obstruction	30	19.87	6	20.00	5.372	<0.05
Not present	Patients with obstruction	26	17.22	3	11.54	-	-
Present	Patients with peritonitis	23	15.23	2	8.70	3.281	<0.05
Ileolial	Patients in stoma closure	9	5.96	2	22.22	-	-
Ileocolic	Patients in stoma closure	16	10.60	1	6.25	-	-
Colocolic	Patients in stoma closure	6	3.97	2	33.33	-	-

Table 4 examines the relationship between various abdominal conditions and the incidence of anastomotic leaks. It categorizes patients based on the type of obstruction and specific conditions, listing the total number of cases, the percentage of total cases, the number of cases with leaks, the percentage of cases with leaks, and statistical values including the chi-square (χ^2) value and P value.

Patients with ileal obstruction constituted 21 cases (13.91% of the total), with 3 leaks (14.29%). For colonic obstruction, there were 14 cases (9.27%), with a higher leak incidence of 4 cases 28.57%). Patients with sigmoid volvulus obstruction had 6 cases (3.97%) and 1 leak (16.67%). When considering the total cases with obstruction, there were 30 cases (19.87%) and 6 leaks (20.00%). The chi-square value for this group was 5.372 with a P value less than 0.05, indicating a statistically significant difference in leak incidence compared to patients without obstruction.

For patients with and without peritonitis, there were 23 cases with peritonitis (15.23%) and 2 leaks (8.70%), compared to 26 cases without peritonitis (17.22%) and 3 leaks (11.54%). The chi-square value for this comparison was 3.281 with a P value less than 0.05, again indicating a statistically significant difference. In the stoma closure groups, ileocolic cases had the highest leak percentage, with 2 leaks out of 6 cases (33.33%). Ileal and ileocolic stoma closure cases had 9 cases (5.96%) and 16 cases (10.60%) respectively, with leak percentages of 22.22% and 6.25%. These findings suggest a significant impact of certain abdominal conditions on the risk of anastomotic leaks, especially in cases involving colonic obstruction and stoma closures.

Table 5. Association of Chronic Corticosteroid Therapy with a Leak Rate.

Chronic steroid intake	Total no. of cases (No.)	Total no. of cases (%)	Cases with leak (No.)	Cases with leak (%)	χ^2 value	P value
Yes	55	36.42	18	32.73	15.42	<0.001
No	96	63.58	6	6.25	-	-

Table 5 presents the association of chronic corticosteroid therapy with the incidence of anastomotic leaks. The table compares patients who have been on chronic steroid intake with those who have not, listing the total number of cases, the percentage of total cases, the number of cases with leaks, the percentage of cases with leaks, and the statistical values including the chi-square (χ^2) value and P value.

Among patients on chronic steroid therapy, there were 55 cases (36.42% of the total), with 18 cases experiencing leaks, resulting in a leak rate of 32.73%. In contrast, among patients not on chronic steroid therapy, there were 96 cases (63.58% of the total), with only 6 cases experiencing leaks, corresponding to a leak rate of 6.25%. The chi-square value for this comparison is 15.42, with a P value less than 0.001, indicating a highly significant statistical difference.

The data suggests a strong association between chronic corticosteroid therapy and an increased risk of anastomotic leaks. Patients on chronic steroid therapy had a significantly higher leak rate compared to those not on steroid therapy. The highly significant P value (<0.001) underscores the robustness of this finding, suggesting that chronic steroid use is a substantial risk factor for anastomotic leaks. This highlights the need for careful consideration and management of patients on chronic corticosteroid therapy who are undergoing surgeries involving intestinal anastomosis.

Table 6. Blood investigations.

Investigation	Total cases (No.)	Total cases (%)	Cases with leak (No.)	Cases with leak (%)	χ^2 value	P value
Hb >10	27	17.88	5	20.83	3.65	<0.05
Hb <10	18	11.92	4	16.67	-	-
TLC <11000	23	15.23	2	8.33	23.20	<0.001
TLC >11000	12	7.95	6	25.00	-	-
Serum creatinine <1.2	37	24.50	1	4.17	12.54	<0.001
Serum creatinine >1.2	9	5.96	2	8.33	-	-
Serum albumin >3	16	10.60	3	12.50	16.76	<0.001
Serum albumin <3	9	5.96	1	4.17	-	-

Table 6 provides a detailed analysis of various blood investigations in relation to the incidence of anastomotic leaks. The investigations include hemoglobin (Hb) levels, total leukocyte count (TLC), serum creatinine levels, and serum albumin levels. For each parameter, the table lists the total number of cases, the percentage of total cases, the number of cases with leaks, the percentage of cases with leaks, and statistical values including the chi-square (χ^2) value and P value.

For hemoglobin levels, 27 cases had Hb >10, accounting for 17.88% of the total, with 5 cases experiencing leaks (20.83%). For Hb <10, there were 18 cases (11.92%), with 4 leaks (16.67%). The chi-square value for Hb >10 is 3.65 with a P value <0.05, indicating a significant association with leak rates.

Regarding the total leukocyte count, 23 cases had TLC <11000 (15.23%), with 2 leaks (8.33%). In contrast, 12 cases had TLC > 11000 (7.95%), with a higher leak rate of 6 cases (25.00%). The chi-square value for TLC <11000 is 23.20 with a P value <0.001, suggesting a strong significant difference in leak rates.

Serum creatinine levels were analyzed, showing that 37 cases had serum creatinine <1.2 (24.50%), with only 1 leak (4.17%). In contrast, 9 cases had serum creatinine >1.2 (5.96%), with 2 leaks (8.33%). The chi-square value for serum creatinine <1.2 is 12.54 with a P value <0.001, indicating a significant association with leak rates.

For serum albumin levels, 16 cases had serum albumin >3 (10.60%), with 2 leaks (12.50%). Meanwhile, 9 cases had serum albumin <3 (5.96%), with only 1 leak (4.17%). The chi-square value for serum albumin >3 is 16.76 with a P value <0.001, suggesting a significant association with leak rates.

Overall, the table highlights significant associations between certain blood parameters (such as higher TLC, lower serum crea-

-tinine, and higher serum albumin) and the incidence of anastomotic leaks, emphasizing the importance of these factors factors in patient management and risk assessment.

Table 7. Pre and Intraoperative Blood Transfusion

Blood Transfusion	No. of cases	Percentage of cases (%)	Anastomotic leak	Leak percentage (%)
Blood given	97	64.24	19	79.17
Blood not given	54	35.76	5	20.83

Table 7 presents data on the relationship between preoperative and intraoperative blood transfusions and the incidence of anastomotic leaks. The table categorizes patients based on whether they received a blood transfusion or not, listing the total number of cases, the percentage of total cases, the number of anastomotic leaks, and the leak percentage within each group.

Among the 97 cases where blood was given, representing 64.24% of the total cases, there were 19 instances of anastomotic leaks, resulting in a high leak percentage of 79.17%. In contrast, among the 54 cases where blood was not given, accounting for 35.76% of the total cases, there were only 5 instances of anastomotic leaks, corresponding to a leak percentage of 20.83%.

The data suggests a strong association between the administration of blood transfusions and the incidence of anastomotic leaks. The significantly higher leak percentage in patients who received blood transfusions (79.17%) compared to those who did not (20.83%) indicates that blood transfusions might be a contributing factor to the increased risk of leaks. This finding underscores the need for careful evaluation and monitoring of patients who receive blood transfusions during the perioperative period, as they appear to be at a higher risk for developing anastomotic leaks.

Table 8. Based on Bowel Involved

Bowel involved	No. of cases	Percentage of cases (%)	Anastomotic leak	Leak percentage (%)
SS	76	50.33 %	14	58.33 %
SL	29	19.21 %	8	33.33 %
LL	46	30.46 %	2	8.33 %

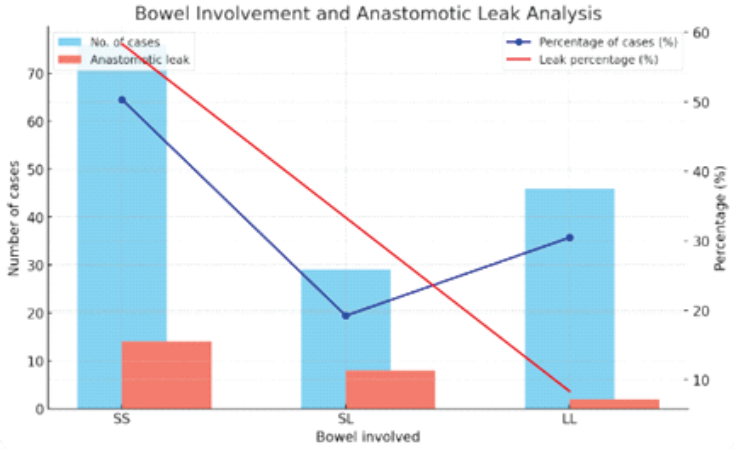

Figure 4. The bar diagram showing the number of cases and anastomotic leaks, along with the percentages of cases and leak percentages for different bowel involvement types (SS, SL, LL).

Table 8 examines the incidence of anastomotic leaks based on the specific bowel segments involved, categorizing cases into SS (Small-Small bowel), SL (Small-Large bowel), and LL (Large-Large bowel). The table details the number of cases, the percentage of total cases for each category, the number of anastomotic leaks, and the leak percentage for each type of bowel involvement.

The data indicates that the SS category has the highest number of cases, with 76 out of the total, representing 50.33% of the cases. Among these, there were 14 anastomotic leaks, resulting in a high leak percentage of 58.33%. This suggests that anastomotic procedures involving the small bowel are particularly prone to leaks.

In the SL category, there were 29 cases, accounting for 19.21% of the total. There were 8 anastomotic leaks in this group, yielding a leak percentage of 33.33%. This indicates a moderately high risk of leaks when the anastomosis involves both small and large bowel segments.

The LL category had 46 cases, making up 30.46% of the total. This group experienced the fewest leaks, with only 2 cases, resulting in a leak percentage of 8.33%. This significantly lower leak percentage suggests that anastomotic procedures involving

only large bowel segments are less
susceptible to leaks compared to those involving the small bowel or a combination of small and large bowel.

Overall, the table highlights a clear variation in leak rates based on the type of bowel involved in the anastomosis, with procedures involving the small bowel showing a much higher propensity for leaks. This information is critical for surgical planning and risk management in gastrointestinal surgeries.

DISCUSSION

Clinical anastomotic leakage (CAL) following intestinal surgery is a major complication that poses significant challenges for surgeons and nurses. It leads to increased morbidity and mortality, prolongs hospital stays, and adversely affects functional and oncologic outcomes [7].

Intestinal surgery is often associated with extended hospital stays, averaging 8 days for open surgery and 5 days for laparoscopic surgery. It also sees a high rate of surgical site infections, reaching up to 20%, and incurs substantial costs. During the hospital stay for elective colorectal surgery, the incidence of perioperative nausea and vomiting (PONV) can be as high as 80% in patients with specific risk factors. Post-discharge, readmission rates following colorectal surgery have been reported to be as high as 35.4% [8].

However, the prevalence of clinical anastomotic leakage was found to be lower than in studies conducted at Al Azhar University in Cairo, Egypt, BRD Medical College in India, and Mansoura University Hospital in Egypt. The possible reason for this discrepancy may be that our study participants included only primary anastomosis cases, excluding secondary anastomosis such as colostomy or ileostomy closures. Additionally, there were differences in the indications for anastomosis, which often involved malignancy in the other studies, and variations in study design. Furthermore, it is supported by studies showing that patients who underwent primary anastomosis and had a malignant nature of the disease experienced higher rates of leakage[9].

Although there have been improvements in surgical procedures and experience, anastomotic leakage remains one of the most severe complications in intestinal surgery. Beyond the immediate clinical consequences, such as intra-abdominal abscess, peritonitis, sepsis, and increased in-hospital morbidity and mortality, it also has long-term implications. These include impaired pelvic organ function, increased local cancer recurrence, cancer-specific mortality, the need for permanent stoma, and a generally poor prognosis [10].

The most common location for intestinal anastomosis is the large intestine, accounting for 50.9% of cases. The rates of anastomotic leaks vary depending on the type of anastomosis, with entero-enteric anastomosis having the lowest leak rate (1–2%) and colorectal/coloanal anastomosis having the highest leak rate (4–26%). Other rates include ileocolic (1–4%), colo-colic (2–3%), ileorectal (3–7%), and ileoanal pouch (4–7%) [6]. Surgical-related risk factors, such as the location of the anastomosis, laparoscopic versus open approaches, and handsewn versus stapled anastomoses, are directly related to the risk of a leak. Patient risk factors significantly associated with an increased risk of anastomotic leakage (AL) include male gender, diabetes (perioperative hyperglycemia and elevated hemoglobin A1c), an American Society of Anesthesiologists (ASA) score of ≥3, older age, smoking, serum albumin <4 g/dL, weight loss, anemia, blood transfusion, chemo-radiation, perianastomotic drain placement, mechanical bowel preparation, tumor size, increased operative time, emergency surgery, preoperative chemotherapy, and intra-operative transfusion. Conversely, the placement of a pelvic drain has been associated with a decreased risk of AL [11,12,13].

Our studies indicate that age significantly impacts anastomotic healing, with older patients showing a higher risk for anastomotic leaks. This is likely due to the diminished regenerative capacity and increased comorbidities associated with aging. On the other hand, female patients appear to have a lower incidence of anastomotic leaks compared to males, suggesting a possible protective effect. This difference necessitates further investigation into the biological or hormonal factors that may contribute to better outcomes in female patients[14].

There was no significant difference in overall pre- and intraoperative compliance to ERAS® Society guidelines between groups. Only preadmission patient education remained as a significant ERAS variable associated with less AL. AL was associated with longer length of stay (LOS), higher morbidity rate and higher rate of reoperation[15].

The economic status of patients plays a crucial role in the incidence of anastomotic leaks. Patients from lower economic backgrounds showed a higher rate of leaks compared to those from middle and high economic statuses. This disparity may be attributed to differences in access to healthcare, nutritional status, and comorbid conditions that are more prevalent in lower socioeconomic groups. Addressing these underlying factors through targeted interventions could help reduce the risk of anastomotic leaks in economically disadvantaged populations[16,17].

The type of anastomosis and surgical technique significantly affect leak rates. End-to-side anastomosis and anastomosis between the small and large bowel were associated with higher leak rates. Moreover, laparoscopic approaches appeared to have better outcomes compared to open surgery, likely due to reduced tissue trauma and better visualization. Total parenteral nutrition (TPN) was found to be protective, aiding in better anastomotic healing. Preoperative and intraoperative factors, such as timely surgery, appropriate transfusion practices, and careful management of comorbid conditions, are crucial in reducing the incidence of anastomotic leaks and improving overall patient outcomes.

OUTCOME AND CONCLUSION

Age adversely affects anastomotic healing, with older patients being at a higher risk for anastomotic leaks. This increased risk is likely due to decreased regenerative capacity and the presence of comorbidities. Female patients, on the other hand, appear to have a lower incidence of anastomotic leaks, suggesting potential protective biological or hormonal factors.

Economic status also plays a significant role in the incidence of anastomotic leaks. Patients from lower economic backgrounds have a higher leak rate, possibly due to limited access to healthcare, poor nutritional status, and a higher prevalence of comorbid conditions. Addressing these disparities could help reduce the risk of leaks in these populations. Surgical-related factors, such as the type of anastomosis and the surgical technique used, significantly influence leak rates. End-to-side anastomosis and anastomosis between the small and large bowel are associated with higher leak rates. Laparoscopic approaches generally yield better outcomes compared to open surgeries, likely due to reduced tissue trauma and better visualization.

Chronic corticosteroid therapy is strongly associated with increased risk of anastomotic leaks. Patients on long-term steroids require careful monitoring and possibly preoperative optimization to mitigate these risks. Conversely, the use of total parenteral nutrition (TPN) appears to be protective, aiding in better healing of the anastomosis. Preoperative and intraoperative care, including timely surgery, appropriate transfusion practices, and careful management of comorbid conditions, are crucial in reducing the incidence of anastomotic leaks. A comprehensive, multidisciplinary approach that includes preoperative optimization, meticulous surgical technique, and robust postoperative care is essential to improve patient outcomes and minimize the risk of anastomotic leaks.

Conflicts of interest: No any conflicts of interest for this study among the authors.

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