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Original Research Article

A STUDY ON THE FACTORS INFLUENCING THE RESULT OF INTESTINAL ANASTOMOSIS

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ABSTRACT

Background: Anastomotic leak is a highly concerning condition following intestinal anastomosis. The incidence of anastomotic leak ranges from 0.5% to 30% in the literature, with a resultant death rate of 10% to 15%. Numerous risk factors are recognized as being connected with it. This study aimed to identify and assess these predisposing characteristics.

Materials and Methods: An observational study was conducted in the Department of General Surgery, Trichy SRM Medical College Hospital & Research Centre, Tamil Nadu, India, from May 2022 to May 2024. This study encompassed all patients who received hand-sewn gastrointestinal anastomosis, both in elective and emergency contexts. 60 cases were examined.

Results: Nine percent of cases of post-operative anastomotic leakage resulted in a fatality rate. Leakage was associated (p=0.02) with increasing age, and 74% of patients had leaks were male. Anastomotic dehiscence was significantly associated with the following risk factors: diabetes mellitus (p=0.05), pallor (p=0.01), low hemoglobin (p=0.003), altered TLC count (p=0.007), low blood protein (p=0.001), low albumin (p=0.001), and longer surgery times (p=0.02). Predisposing factors that were not statistically significant included blood creatinine levels, hyperbilirubinemia, peritoneal cavity pollution, elective or emergency procedures, and the length of the anastomosis process.

Conclusion: This study identified and evaluated the various risk factors linked to anastomotic leaks, determining that age, sex, anemia, sepsis, hypoproteinemia, hypoalbuminemia, and prolonged operative time are significant. We concluded that managing these factors will reduce the likelihood of anastomotic dehiscence.

Keywords: Anastomotic leak, Dehiscence, Intestinal anastomosis, Risk factors, Anaemia, Hypoalbuminemia.

INTRODUCTION

An common and worrisome side effect after intestinal anastomosis surgery is an anastomotic leak. By reestablishing continuity between two previously divided gut segments by intestinal anastomosis, we are able to restore communication. A diseased section of the intestine must also be removed during the treatment. It is a frequently performed surgical procedure that is carried out both on an elective and emergency basis.

Hand-sewn anastomosis and stapled anastomosis are the two most common anastomotic techniques. Due to the ease of use, low cost of suture materials, and familiarity with the procedure, the hand-sewn or suture anastomosis is the recommended method. On the other hand, time-saving stapling devices are advantageous, especially for surgeries that require several anastomoses; nevertheless, their limited availability, high cost, and reliance on technology over the surgeon's skill reduce their use.

Anastomotic leak incidence is often observed to be between 2% and 5%, but varies from 0.5% to 30% in the literature.[1-3]

It usually happens in the third to sixth post-operative day range.

When a patient presents with fever, abdominal pain, prolonged ileus, failure to thrive, and leukocytosis, one should remain suspicious; however, the exact presentation varies greatly depending on the location, severity, and involvement of surrounding tissues of the leak. In severe cases, the patient can show signs of hemodynamic instability, sepsis, or peritonitis. The literature reports a mortality rate ranging from 10% to 15%. Adequate exposure and access, optimal vascularity of both stumps, absence of fecal contamination, proper use of sutures and staples, and approximatement of all intestinal wall layers without tension or distal blockage are all critical elements for a successful anastomosis.[4-6]

When these fundamental principles of intestinal anastomosis are broken, the suture line at the anastomotic site fails or is disrupted, posing a risk for septic complications, peritonitis, and the development of fecal fistulas. These dangers were first recognized more than a century ago by Travers, Lembert, and Halsted. Moreover, in addition to the previously mentioned reasons, a deeper comprehension of gastrointestinal healing indicates that anastomotic leaks are also linked to other common risk factors, including patient nutrition, anemia, hypoalbuminemia, smoking, alcohol abuse, high-dose steroids, and preoperative chemotherapy.

These data show the significant morbidity brought on by anastomotic leakage. The purpose of this study was to evaluate the variables influencing intestinal anastomosis healing.[7-9]

MATERIALS AND METHODS

A prospective study was conducted at Department of General Surgery, Trichy SRM Medical College Hospital & Research Centre, Tamil Nadu, India between May 2022 to May 2024. This study included all patients who received hand-sewn gastro-intestinal anastomosis, whether it was performed as a planned surgery or as an urgent intervention. 60 instances were analyzed in all.

Inclusion Criteria

The inclusion criteria consisted of patients aged 18 to 75 years. Individuals requiring intestinal resection and anastomosis, or reversal of loop ileostomy or loop colostomy with full stoma removal.

Exclusion Criteria

The study's exclusion criteria were persons with an intestinal stoma positioned prior to the anastomotic site, patients who had undergone intestinal anastomosis at multiple places, and patients diagnosed with malignancy.

If deemed necessary, further cardiac assessment was conducted. Before the surgery, various diagnostic techniques, including ultrasonography, endoscopy, CT scan, MRI, and tissue biopsy, were conducted based on the individual needs of each patient.

RESULTS

Table 1: General patient characteristics, (n=60)

Variables	Overall
Age (years)	
Mean±SD	39.36±14.79
Median	38.45
Range	18-72
Gender (%)	
Male	40 (66)
Female	20 (34)
Comorbidities (%)	
Diabetes	14 (24)
Hypertension	8 (13)
Tuberculosis	1 (1.6)
Type of surgery (%)	
Elective	32 (55)
Emergency	28 (45)

Table 2: Risk factors

Risk factors	Leak present		Leak absent		P value
	N	%	N	%	
Age (years)					
<20	1	1.6	5	8.3	
21-30	2	3.3	17	28.33	
31-40	2	3.3	12	20	
41-50	2	3.3	9	15	0.02*
51-60	1	1.6	5	8.3	
61-70	1	1.6	2	3.3	
>70	0.0	0	1	0.0	
Mean±SD	39.14±10.87		38.26±11.60		
Gender					

Male	6	10	28	45	0.62
Female	3	5	23	38	
Diabetes mellitus					
Yes	4	6.6	6	10	0.05*
No	5	8.3	45	75	
Hypertension					
Yes	3	5	8	13.3	0.42
No	6	10	43	71	

Table 3: Clinical and biochemical risk factors

Risk factors	Leak present		Leak absent		P value
	N	%	N	%	
Pallor					
Yes	2	3.3	11	18.3	0.01*
No	7	11.7	40	66.7	
Pedal edema					
Yes	4	6.6	2	3.3	0.001***
No	5	8.3	49	81.7	
Haemoglobin (g/dl)					
<12	5	8.3	22	36.7	0.003**
>12	4	6.6	29	48.3	
Mean±SD	8.97±0.75		1.57±2.57		
Creatinine (mg/dl)					
≤1.2	5	8.3	24	40	0.9
>1.	4	6.6	27	45	
Total leucocyte count (cubic mm)					
4000-11,000	3	5	29	48.3	0.007**
<4,000 and >11,000	6	10	22	36.7	
Mean±SD	9674±4741		9547±3157		
Total protein (g/dl)					
6-8 (Normal)	3	5	32	53.3	0.001***
<6 (Abnormal)	6	10	19	31.7	
Mean±SD	5.09±0.63		6.4±0.64		
Albumin levels (g/dl)					
≥3 (Normal)	6	10	35	58.3	0.001***
<3 (Abnormal)	3	5	16	26.7	
Mean±SD	2.43±0.23		3.45±0.32		

Table 4: Risk factors related to surgery

Risk factors	Leak present		Leak absent		P value
	N	%	N	%	
Elective O. T.					
Yes	3	5	34	59.4	0.05
No	6	10	17	40.5	
Emergency O. T.					
Yes	4	6.6	21	40.5	0.05
No	5	8.3	30	59.4	
Site of anastomosis					
Ileo-Ileal	6	10	41	75.6	
Ileo-Jejunal	0	0	3	1.4	
Ileo-Transverse colon	3	5	3	12.5	0.44
Colo-Colic	0	0	0	0.0	
Ileo-Descending colon end to side	0	0	2	1.4	
Jejuno-Jejunal	0	0	2	14	
Contamination of peritoneal cavity					
Present	4	6.6	22	32.4	0.07
Absent	5	8.3	29	65.3	
Duration of surgery (hours)					
≤2.5	0	0	25	40	0.01*
>2.5	9	15	26	60	
Mean±SD	4.12±0.54		2.75±0.43		
Time for anastomosis (min)					
≤30	3	5	23	38	0.10
>30	6	10	28	62	
Mean±SD	36.57±5.3		30.34±6.07		
Mortality					
Present	9	15	0	0	0.001***
Absent	0	0	51	100	
Length of hospital stay (days)					
<15	4	6.6	6	10	
15-30	4	6.6	42	70	0.67
>30	1	1.6	3	5	
Mean±SD, median	13±12, 11.0		12.45±3.0, 13		

DISCUSSION

The healing of the intestinal anastomosis remains difficult because of numerous factors that affect the healing process, even when an experienced surgeon performs a technically sound surgery. The only type of anastomosis used during laparotomies was hand-sewn because our institution lacked the necessary equipment and knowledge to execute stapler anastomosis. The objective of this study is to assess the various risk factors associated with intestinal anastomosis.

According to the study, 10% of anastomosis patients experienced anastomotic leakage, which resulted in a 100% death rate (9 out of 9) for the affected group. Leaks occurred in 2.7% of patients in a 2007 Hyman et al. research; however, Saha et al. found 4% incidence and 61.5% mortality rate. According to studies by Luján et al. and Trencheva et al., there were 3.8% and 5.7% leak incidences, respectively, and 13.3% and 5.7% death rates and it was statistically significant (p=0.001).[10-12]

In contrast to other studies, such as Hyman et al., Luján et al., and Turrentine et al., which reported a mean age of 59.1 years, 64.2±18.7 years, and a median age of 59 years, respectively, the average age of patients with anastomotic leak in this study was 39.36±14.79 years, with a median of 38.45.[13-15]

Irvin et al. found that anastomotic dehiscence was correlated with age, and that the incidence was significantly higher in patients who were older than 60. In our research, age was a statistically significant risk factor (p=0.02). According to the results of Hyman et al., Trencheva et al., and Turrentine et al., who reported male percentages of 51.5%, 68.6%, and 51.4%, respectively, men had the highest incidence of leakage (75%). Gender, however, did not prove to be a statistically significant variable in our analysis, which is consistent with some research but not with others. While hypertension was judged negligible, research by Vignali et al. showed that diabetes is an independent risk factor, supporting our findings that diabetes is a statistically significant factor (p=0.05). According to Cooke et al., the combined pre-operative comorbidities (p=0.008), which included diabetes and hypertension, were statistically significant. Turrentine et al.'s 2014 study found that hypertension was not a significant risk factor.[15,16]

The results of this study showed that hemoglobin levels were very low in patients with anastomotic dehiscence. All patients had anemia, with an average of 9.14±0.92 g/dl, which was statistically significant (p=0.003). Low hemoglobin levels of <11 g/dl, <11 g/dl, and <9 g/dl, respectively, have been linked to an increased risk of leaks, according to research by Saha et al., Hayden et al., and Farghaly et al. This is probably because they reduce the amount of oxygen that reaches tissues, which raises the possibility of ischemia. In our investigation, there was a substantial correlation between a 62.5% incidence of anastomotic integrity compromise and sepsis, as determined by leucocytosis or leukopenia. But in 62.5% of patients with leaks, peritoneal cavity contamination found during surgery was found to be statistically negligible.[17,18]

Pre-operative sepsis was found to be a statistically significant predisposing factor for leakage by Sakr et al. and Jina et al., although it was not significant by Turrentine et al. According to Irvin et al., anastomotic effects were unrelated to intra-abdominal sepsis. Serum protein and albumin levels were statistically significant (p=0.001), with mean values of 5.18±0.82 mg/dl and 2.66±0.44 mg/dl, respectively, in patients with anastomotic leaks (87.5%) in this study. Hypoproteinemia and hypoalbuminemia have been recognized by Irvin, Goligher et al., Yamamoto et al., and Mäkelä et al. as important risk factors for anastomotic dehiscence. Patients in our study who had pre-operative pedal edema (6.25%) underwent cardiac testing; the results were negative, indicating that hypoproteinemia was most likely the cause of the edema.[18,19]

A statistically significant 50% of patients with pedal edema experienced a leak (p=0.001). This confirmed that low levels of albumin and protein had a negative impact on anastomosis integrity and tissue repair. Analyses of our study showed that all anastomotic leakage issues were substantially linked with the length of surgery, with all leaks occurring in surgeries longer than 2.5 hours. The time spent was 199.21 minutes on average. At p=0.02, this outcome was statistically significant. According to the findings of Buchs et al., Choi et al., Kawada et al., and Silva-Velazco et al., anastomotic dehiscence is considerably influenced by extended operating duration. In our analysis, the longer anastomosis time did not statistically significantly affect the poor anastomotic outcomes; nonetheless, the majority of leaks (87.5%) happened when the anastomosis time exceeded 30 minutes. Small bowel ileo-ileal anastomosis had the highest incidence of leaks in this experiment (62.5%), followed by ileo-transverse anastomosis (37.5%); nevertheless, there was no statistically significant difference between the two. A number of factors limited our study, such as the small sample size, the lack of diversity in the data about different anastomosis methods, and the inconsistent results linked to certain surgeons, as they would allow for a more thorough examination.[19,20]

CONCLUSION

This work indicates that the primary cause of increased disease incidence and mortality rates is anastomotic dehiscence. Through the identification of various risk factors, individuals can adopt more cautious preoperative and postoperative measures to

reduce the likelihood of gastrointestinal anastomotic leaks, potentially improving outcomes.

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