A STUDY OF RISK FACTORS INFLUENCING ANASTOMOTIC LEAK FOLLOWING SMALL BOWEL OBSTRUCTION

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ABSTRACT

BACKGROUND

Anastomotic leak is an important cause for postoperative mortality and morbidity in patients who have undergone small bowel anastomosis. The aim of this study to find out significance of various factors influencing anastomotic leak.

MATERIALS AND METHODS

In a total of 68 patients who have undergone bowel anastomosis from Jan 2014 to Jan 2016 were followed up and grouped according to the occurrence into leak and non-leak group. The common factors between these two groups were compared to know the significance of each factors in anastomotic leak.

RESULTS

It has been found that ASA score>III, total protein, anaemia, peritoneal contamination, mean duration of surgery, and post-operative hypotension were significantly associated with anastomotic leak.

CONCLUSION

Adequate attention should be paid to various intraoperative and postoperative factors which influence anastomotic leak, in small bowel obstruction, to keep mortality and morbidity to a minimum.

KEYWORDS

Anastomotic Leak, Small Bowel, Peritoneal Contamination, Bowel Gangrene.

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BACKGROUND

Anastomotic leaks are an important and common cause of morbidity and mortality in patients undergoing bowel surgeries. Errors in surgical techniques have been incriminated in cause of such leaks, but studies have found out various other causes, including many that are beyond the immediate control of operating surgeon. Hence, surgeons have to be aware of all preoperative, intraoperative and postoperative factors influencing anastomotic healing, which compromise the healing process.

In our institution, we deal with a lot of bowel surgeries. Resection anastomosis is commonly done, the majority being emergency cases. We have observed that a number of these cases develop anastomotic leaks even in experienced hands. It is therefore evident that factors other than technical aspects should be considered. Knowledge of such factors and awareness of their relative contribution to the occurrence of leaks can help the surgeon to adopt measures which would help in bringing down the incidence of the problem.[1]

We analyse factors which contribute to anastomotic leaks in our institution in this study, in order to improve the management of patients undergoing bowel surgeries which in turn will improve the outcome of the operated patients.

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AIMS AND OBJECTIVES

1. To ascertain the contribution of anastomotic leakage to post-operative morbidity and mortality in patients undergoing small bowel surgery.
2. To identify patients who will be at higher risk of anastomotic leak following small bowel surgery.
3. To identify the relative importance of various risk factors contributing to anastomotic leak following small bowel intestinal anastomosis.
4. Strategies for prevention of anastomotic leakage in high-risk groups.

Principles of Safe Bowel Anastomosis.[2]

1. Good exposure, meticulous handling of tissues, aseptic precautions and careful dissection.
2. Adequate mobilisation of the bowel is necessary to have a tension-free anastomosis.
3. Correct placement of sutures or staples is very essential.
4. The luminal disparity of the two organs to be anastomosed has to be checked.
5. The blood supply to the cut ends of the bowel to be anastomosed has to be preserved.
6. Ensure that the anastomosis is performed between disease free bowel and there is no distal obstruction. Inflammation, infection, neoplasm or foreign bodies disrupt healing process.

The advent of the stapler has brought about much reduction in the time needed for the creation of an anastomosis,[3] perhaps, having also taken away the element of surgical skill that is required to assemble a hand sutured one. As the staple lines are of most reliable quality and help in constructing the anastomosis in difficult locations, stapled anastomosis helps in producing a larger stoma diameter, causes minimal trauma, less adhesions and produce minimal inflammatory response.[4]

Definition of Anastomotic Leak

Anastomotic leak has been previously defined as a leak of luminal contents from a surgical joint between two hollow viscera. The escape of luminal contents from the site of the anastomosis into an adjacent localised area, detected by imaging, in the absence of clinical symptoms and signs should be recorded as subclinical leak.[5]

The leakage may be an uncontrolled leak**,** where it is walled off by omentum or bowels to form localised abscess, or if the fluid collection is drained surgically or percutaneously, it becomes a controlled fistula.

Determinants of Anastomotic Failure

Basic surgical principles dictate that certain factors be met to achieve ample healing at the site of wound, and this applies to an intestinal suture line too. These include a good blood supply at the anastomotic site, proper technique in its construction, an adequate lumen and lack of distal obstruction.[6]

LOCAL FACTORS

Intra-Abdominal Sepsis

The intra-abdominal infection retarding intestinal healing has been established through the demonstration of impaired synthesis of colonic reparative collagen and disordered regulation of collagen gene expression in the face of intra-abdominal sepsis.[7] This is due to the fact that the transcription and synthesis of matrix metalloproteinases (MMP-20 zinc dependent endopeptidases) which normally metabolises the collagen are upregulated in the presence of sepsis. Thus, bacterial contamination at the anastomotic site increases the chance of leakage and decreases the anastomotic strength in the initial few days.

Blood Supply and Tissue Oxygenation

A good blood supply to the ends of the bowel being anastomosed together is imperative for adequate healing and prevention of anastomotic disruption.[8] Surgical mobilisation of the bowel is a crucial factor in determining the perfusion at the site of anastomosis.

Various methods have been employed in the past to assess the viability of bowel ends intraoperatively, including subjective evaluation, intra-arterial dye injection and Doppler ultrasound. Sheridan and co-workers used a surface electrode to assess the tissue, they encountered a leak rate of 10% in fifty patients, they analysed tissue oxygen tension of less than 20 mmHg in the anastomosed region was significantly associated with subsequent disruption, as was a decrease in tissue oxygen tension to below 50% of the pre-resection level. They concluded that relative tissue hypoxia was a major determinant of anastomotic leakage.[9]

Mechanical Bowel Preparation

Adequate mechanical bowel preparation prevents anastomotic dehiscence. Using low residue diets before surgery and mechanical bowel clearance with the use of polyethylene glycol on the day before surgery is commonly being followed. The only disadvantage of bowel preparation is diarrhoea leading to fluid and electrolyte loss prior to surgery. However, the reports on these issues are controversial.

Antibiotics

The benefit of perioperative use of prophylactic antibiotics in reducing anastomotic leakage is not certain. In a review of the literature, overall anastomotic dehiscence was reported to be 9.5% when no antibiotics were given versus 4.5% with antibiotic prophylaxis. In elective surgery, the antibiotics can be given parenterally or orally. Preoperative decontamination of the bowel with antibiotics significantly reduces the incidence of anastomotic dehiscence.

Abdominal Drains

The reason for favouring placing drains is that they drain the excess fluid before infection sets in and also acts as an indicator of anastomotic leak. Those who argued against the use of drains claim that the drain provide a retrograde pathway for the microorganism to migrate into the peritoneal cavity from outside, erodes the anastomotic line, increases adhesion formation and also causes discomfort to the patient. Therefore, the surgeon should use his or her discretion based on experience.[10] It is essential to remove the drain as soon as the drain stops functioning.

SYSTEMIC FACTORS/Age

Earlier studies have cited increasing age as a possible risk factor for intestinal anastomotic dehiscence,[11] but experiments conducted by Stoop and others, it was felt that additional, hitherto unidentified factors existed in elderly patients who independently contributed to poor wound anastomotic healing rather than advanced age alone.[12]

Abdominal Trauma

The behaviour of repaired intestine in the setting of blunt and penetrating abdominal trauma was analysed by Behrman and colleagues, in their study of 101 small bowel and 66 colonic cases. They encountered a leak rate of 8.7% in cases of small bowel resection and anastomosis (4 of 48), although none of the enterorrhaphies in the study leaked (55 out of 101). It is pointed out that splanchnic hypoperfusion, which arises as a part of the body's general reaction to trauma and hypovolaemia due to the vascular supply which is unique to the intestinal tract as it slowly and selectively downregulates its perfusion in states of hypovolaemic shock, is a major factor that impedes anastomotic healing.

Blood Transfusions

The incidence of peri-anastomotic abscesses noted to be significantly higher in those receiving blood transfusions as compared to controls that received just crystalloids. Significant reductions in bursting pressures and hydroxyproline content in the region of anastomosis were found in the transfused group.[13] Wober and colleagues did a retrospective study, neither total intraoperative blood loss

nor duration of surgery was found to have a bearing in the occurrence of the same.

Malnutrition

The repercussions of malnutrition are seen in the process of wound healing. Poor anastomotic healing is associated with anaemia, diabetes mellitus, malnutrition caused due to hypoalbuminaemia and vitamin deficiencies.[14] Demptsy stated that serum albumin, serum transferrin, triceps skin fold thickness and cutaneous direct hypersensitivity tests were the best markers of that state. The prognostic nutritional index (PNI) takes these factors into account when calculating the percentage risk of operative morbidity and mortality. Hypoalbuminaemia was found to be a reliable predictor of sepsis and infection. This finding was corroborated by Kudsk and co-workers[15] who found that serum albumin levels below 3.25 g/dL were associated with increased post-operative complications.

Systemic Diseases

Systemic conditions which cause delay in gastrointestinal healing are anaemia, jaundice and uraemia.[16] These metabolic diseases are probably associated with malnutrition which are the underlying cause for these effects. HIV infections leading to AIDS complex is an important cause for poor anastomotic healing and carries very high dehiscence rate. Previous irradiation or chemotherapy is associated with poor anastomotic healing.

Medications

Non-steroidal anti-inflammatory drugs (NSAIDs) impairs collagenolysis. Other studies noted that NSAIDs have favourable impact on anastomotic healing by increasing the collagen production.[17] Due to these conflicting results the active use of NSAIDs to be avoided.

Transforming growth factors (TGF-B)[18] are normal inclusions of granules of platelets and are released during the early phases of the healing process. It acts as a chemotactic factor for fibroblasts and macrophages. It also promotes the production of collagen by intestinal smooth muscle cells, fibroblasts and also macrophages. It also modulates the expression of collagenase. The only disadvantage of TGF-B is excessive formation of adhesions in the injured peritoneum.[19] Irvin and Goligher, in their retrospective human study, found poor nutritional status, surgeries for malignancy, the lack or poor bowel preparation, old age (>60 years) and bowel fixity in the region of an anastomosis, all to be significantly associated with clinical leaks,[20] anastomotic dehiscence; namely chronic obstructive pulmonary disease, bowel obstruction , presence of peritonitis, corticosteroid usage, intraoperative transfusion of more than 2 units of blood and a serum albumin levels of less than 3 g%.

Male gender, a past history of previous abdominal surgery and the presence of cancer remained significant after multivariate analysis. The risk of anastomotic leakage increased when ≥2 risk factors were present (P<0.01). The overall mortality was higher in patients with anastomotic leakage (14.3%; P=0.01). F. Lujan et al in his study demonstrated anastomotic leak rate of 3.8%, and also he found that prior chemotherapy, anticoagulation, intraoperative blood loss, surgical site infection, and intraoperative blood transfusions, were associated significantly with higher rates of anastomotic leak. Mortality rate was higher among patients with anastomotic leakage (13.3%) against patients without anastomotic leakage (1.7%).[12] Open surgeries carried a higher risk as compared to laparoscopic surgeries.

Regardless of other risk factors, the incidence of surgical site infection was significantly high in transfused patients (25%). Hypoproteinaemia (Total serum protein level ≤ 6 g/dL) and anaemia (Serum haemoglobin level ≤11 g/dL) remained significant in the logistic regression model.

MATERIALS AND METHODS

This prospective analytical study was conducted in the Department of General Surgery, Chengalpattu Medical College between January 2014 to January 2016. All patients above the age of thirteen years undergoing bowel anastomosis in the study period, who satisfied inclusion criteria, were analysed and followed up until their discharge from hospital or death.

These Patients were Ultimately Divided into two Groups

Group 1: (Controls): Patients undergoing bowel surgery without anastomotic leak.

Group 2: (Cases): Patients undergoing bowel surgery with subsequent anastomotic leak.

METHODOLOGY

Detection of suture line disruption was based on the following:

1. Demonstration by re-laparotomy.
2. Demonstration by dye or contrast studies.
3. Efflux of bowel contents from wound or drain site.
4. Demonstration of any localised collection of bowel contents in the abdominal cavity by ultrasonography or CT-guided aspiration.

The attending surgeon's preoperative diagnosis was also noted as per the patient's record. The vital parameters of each patient viz pulse rate, blood pressure, and respiratory rate were recorded at admission.

Intraoperative variables studied included the presence of gross peritoneal contamination, the nature of peritoneal contaminant, the site of pathology in small bowel, the vascular supply at the region of surgical closure, presence of any distal obstruction. The amount and nature of intraoperative fluids given, the presence of any adverse intraoperative haemodynamic event, and intraoperative diagnosis was noted. Postoperatively, several factors were taken into account such as use of vasopressor support, ventilator support, antibiotics used, use of steroids and time of starting oral fluids.

Patients who had anastomotic leak (test) were compared with patients whose anastomosis which did not leak (control).

Results were tabulated and the statistical analysis was done using chi-square test.

OBSERVATION AND RESULTS

A total of 68 patients were included in the study, the majority of them being emergencies (80.9%). As per the inclusion criteria, all enteroenteric and enterocolic anastomosis were analysed for the factors that could predispose to anastomotic leakage.

Of the 68 patients, 46 were male and 22 were female, out of which 55 cases were operated on emergency basis and 13 were operated as elective cases. Among the 68 cases, 6 patients had Chronic Obstructive Pulmonary Disease, 17 patients had Diabetic Mellitus and 33 patients were found to have Hypertension.

There were 29 alcoholics and 33 smokers. There were 52 small-to-small bowel anastomosis and 16 small-to-large bowel anastomosis, among 9 in former and 4 in the later leaked. All anastomoses were hand sewn and constructed in two layers using 3-0 Vicryl for inner layer (interrupted or continuous) and 3-0 silk for outer interrupted seromuscular layer. In this study, there were totally 13 anastomotic leaks among the 68 (19.1%) cases.

Among the 13 cases of anastomotic leak, five patients were managed conservatively and eight patients had undergone re-laparotomy, in which seven patients of the later had undergone surgical exteriorisation of the leak site and the remaining one patient had undergone re-anastomosis. There were totally four deaths in our study, and all of them belonged to the leak group.

PATIENT VARIABLES

Age Distribution

Variables	Leak	No Leak	P Value
Age	49.92±12.	44.34±14.27	0.59
Duration of Symptom	47.3±26.3	25.43±26.1	0.092

The age of the subjects in this study ranged from 15 to 80 years, with a mean of 45.41±14.01 years, the mean in the leak group was 49.92±12.23 years whereas the corresponding value for the non-leak group was 44.34±14.27 years. This difference between groups was found to be significant (P=0.59).

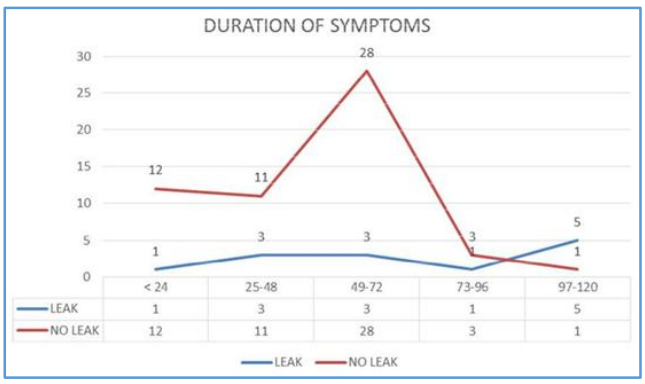
Gender Distribution

Variables	Leak	No Leak	P Value
Male	7	39	0.24
Female	6	16	
Table 2			

Seven men (15.2% of all male) and six women (27.3% of all female) had anastomotic leak. There was no significant difference between men and women for the occurrence of leak.

Duration of Symptoms Table 1

The duration of symptoms ranged from 48 to 120 hours, with an overall mean of 29.61±26.10 hours. The mean duration in the leak group was 47.3±26.38 hours as compared to 25.43±26.10 hours in the non-leak group. This mean duration of symptom between the groups was not statistically significant (P=0.092).



Comorbid Factors

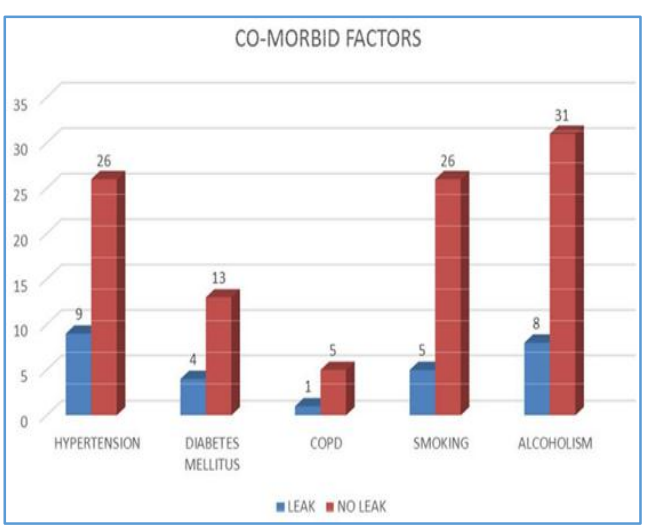
Variables	Leak	No Leak	P value
Hypertension	9/13	26/55	0.15
Diabetes mellitus	4/13	13/55	0.59
COPD	1/13	5/55	0.87
Smoking	5/13	26/55	0.56
Alcoholism	8/13	31/55	0.73
Table 3			

In the leak group, nine patients had hypertension, whereas in the non-leak group twenty six patients had hypertension. This difference has no significant association with the occurrence of anastomotic leak (P=0.15).

In the leak group, four patients had diabetes mellitus as compared to non-leak group where the corresponding values were 13 patients. This difference was found to be statistically not significant (P=0.59).

In the leak group, one patient had chronic obstructive pulmonary disease as compared to non-leak group where 5 patients had COPD. This difference was found to be statistically not significant (P=0.87).

In the leak group, there were eight alcoholics and in the non-leak group there were thirty one alcoholics. There were five smokers as compared to twenty six smokers in non-leak group. This difference in regards to smoking (P=0.56) and alcoholism (P=0.73) were found to be statistically insignificant for anastomotic leak.



ASA Grading

Variables	Leak	No leak	P Value
ASA < III	5	42	0.008
ASA ≥ III	8	13	
Total	**13**	**55**	
Table 4			

The American Society of Anaesthesiologists' (ASA) grade of III or more was seen in 8 out of 13 patients in leak group whereas 13 out of 55 patients had as ASA grade of ≥ III in non-leak group. This was significantly associated with the occurrence of anastomotic leak (p=0.008).

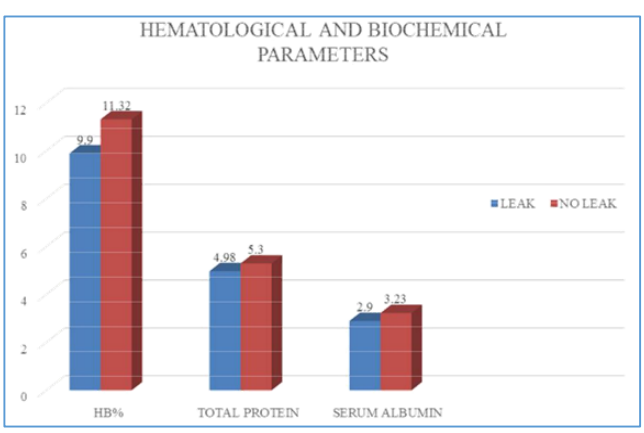
Haematological and Biochemical Parameters

Variables	Leak	No Leak	P Value
Haemoglobin (g/dL)	9.9±1.4	11.32±0.9	0.001
Serum total (g/dL)	4.98±0.32	5.3±0.39	0.006
Serum albumin (g/dL)	2.9±0.42	3.23±0.29	0.002
Table 5			

The haemoglobin values between leak and non-leak group showed a significant difference (p=0.001), the mean values for the leak group being 9.9±1.4 g/dL as compared to the non-leak group being 11.32±0.9 g/dL.

Serum albumin values showed a significant difference between the leak and non-leak groups which is lower in the leak group (p=0.002), the mean values in the leak group being 2.90±0.42 g/dL and in the non-leak group being 3.23±0.29 g/dL.

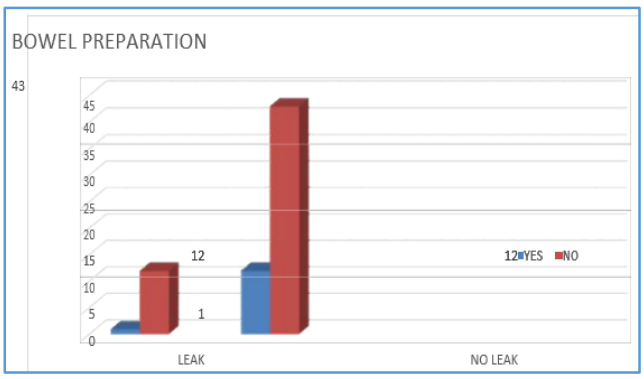
Total protein was significantly lower in the leak group (4.98±0.32 g/dL) as compared to the non-leak group (5.3±0.39 g/dL). This difference has significant association with anastomotic leak (p=0.006).



Bowel Preparation

Variables	Leak	No Leak	P Value
Yes	1	12	0.25
No	12	43	
Table 6			

Out of 13 patients who underwent bowel preparation, one developed leak and out of 55 patients who did not undergo bowel preparation 12 developed leak. This difference between two groups were not significant (p=0.25).



Indication for Bowel Surgery

Diagnosis	Leak	No Leak	Total
Obstruction	4	17	21
Gangrene	1	15	16
Perforation	7	11	18
Malignancy	1	12	13
Total	**13**	**55**	**68**
Table 7			

Of the 68 cases we studied, intestinal obstruction was found in twenty one cases (30.9%), small bowel gangrene in sixteen cases (23.5%), small bowel perforation in eighteen cases (26.5%), and thirteen cases (19.1%) were operated for malignancy. No single group has a significant association with the occurrence of anastomotic leak (p=0.062).

Intra Operative Variables

Variables	Leak	No Leak	P Value
Duration of surgery	167.69±16.9	144±20.61	0.003
Peritoneal contamination	9/13	17/55	0.025
Table 8			

The duration of surgery in the study ranged from 100 to 190 minutes with a mean of 148.67±21.97 minutes. The mean in leak group is 167.69±16.9 minutes as compared to the non-leak group where the mean was 144±20.61 minutes, which showed significant difference (p=0.003).

The presence of gross peritoneal contamination, as evidenced by the finding of bile, food, pus or faecal matter in the peritoneal cavity, showed a significant association with the occurrence of anastomotic leak (p=0.025).

Anastomotic Leak Detected Postoperatively by

1. Efflux from suture site.
2. CECT.
3. USG/USG-guided aspiration.
4. Barium study.

CT confirmed diagnosis in 19 patients (27.9%), CECT is more useful in the diagnosis of anastomotic leak than barium studies, but in few leaks cases, contrast barium enema is useful specially in ileocolic is superior to other investigations. When anastomotic leak is suspected CECT is the preferred diagnostic modality, when imaging is required. Techniques of anastomosis does not show any influence of anastomotic leak, frequency of ileocolic anastomotic leak is marginally higher in the small bowel anastomosis. Proximal protective faecal

diversion is useful in reducing the percentage of anastomotic leak, based on intraoperative findings, immunocompromised, associated systemic diseases. Albumin level<3 g/L, use of corticosteroids, blood transfusion, COPD, and distal obstruction all affect small bowel anastomosis.

Level of Anastomosis

Variables	Leak	No Leak	Total
Ileocolic	4	12	16
Ileoileal	7	33	40
Jejunojejunal	2	10	12
Total	**13**	**55**	**68**

Table 9

A total of 40 ileoileal, 16 ileocolic and 12 jejunojejunal anastomosis were constructed in the study period of which 7, 4 and 2 leaked respectively. Therefore, type of anastomosis has no significant association with the occurrence of anastomotic leak (p=0.78).

The level of anastomosis (i.e. enteroenteric or enterocolic) did not have a significant association with recurrence of anastomotic leak (0.49).

Type of Anastomosis

Variables	Leak	No Leak	P Value
End-to-end anastomosis	9	43	0.49
End-to-side anastomosis	4	12	
Total	**13**	**55**	

Table 10

Intraoperative Hypotension

Variables	Leak	No Leak	P Value
Yes	8	1	9
No	5	54	59
P value	0.00		

Table 11

Intraoperative hypotension (Taken as a drop of the systolic blood pressure to 80 mmHg or less) occurred in 9 patients out of whom 8 had anastomotic leak. This difference was found to be statistically significant (p =0.00).

Post-Operative Hypotension

Eight out of fifteen patients who developed postoperative hypotension developed anastomotic leak which was evident by a significant p value of 0.0001 thereby indicating that postoperative hypotension plays a significant role in the development of anastomotic leak.

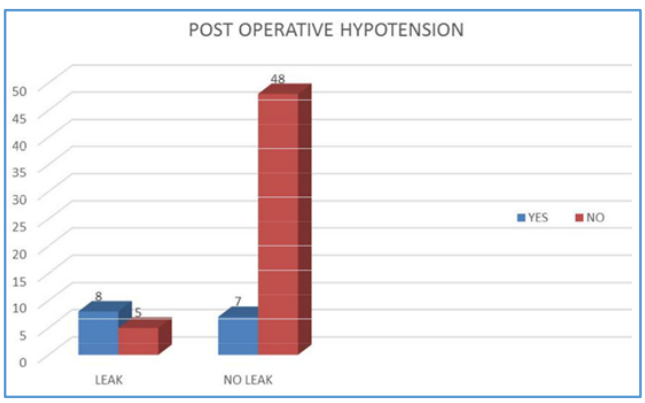


Figure 1: Showing Anastomotic Leak (Preoperative)

Figure 2: Showing Site of Previous Anastomosis with Leak

DISCUSSION

The construction of anastomosis is fraught with potential problems for the surgeon, anything short of meticulous attention to it can have devastating consequences. However, anastomotic disruption occurs frequently despite the greatest attention to technical detail.

This prospective study spanning 2 years had 68 patients with 68 anastomoses between them. Our present study was conducted to clarify the issues relating to causes of small bowel anastomotic leakage with specific reference to emergency surgeries, as the majority of cases (80.9%) we analysed were emergency.

Age Distribution

The mean age of subjects in our series was 45.41±14.01 years. Other studies have reported higher mean ages, but none have conclusively stated that advanced age is a risk factor for anastomotic leak.

Hesp and co-worker subdivided the bowel anastomosis into 4 groups based on aetiology. Those patients forming the 'inflammatory' group of intra-abdominal infections and inflammatory bowel disease had a mean age of 41 years. 'Vascular' cases comprised mainly by strangulated hernias and mesenteric vascular occlusions had a higher mean age of 53 years.

Stoop and coworkers found from their animal studies that advanced age is not an independent risk factor for the breakdown of intestinal anastomosis. The lower mean age we encountered could be due to the higher prevalence of specific and nonspecific small bowel perforations in our series, which is usually seen to affect individuals in the prime of their lives. Chaikof noted a mean age of 51.8±21.8 years in his work in non-traumatic small bowel perforations, which pertained mainly to non-infective causes. Higher mean ages have been reported in other studies on large bowel anastomosis but this could be a reflection of the higher incidence of colorectal malignancies in those series.

Ashok kumar[21] and co-workers found that advanced age is a risk factor for anastomotic leak in colonic anastomosis with a median age of 47 years in their study group.

Gender Distribution

Forty six males (67.6%) and Twenty two female patients (32.4%) constituted our study group. No significant association with leakage was noted in either group. Golup et al made similar observations, noting no gender association for leakage.

Duration of Symptoms

Since our series focused mainly on emergency cases, we felt the need to highlight the possible importance of duration of preoperative symptoms in association with leakage. However, our data failed to reveal any significance between both groups in this regard (p=0.09). A scrutiny of previous studies did not reveal any observation in this regard, although one does mention that the number of preoperative hospital days was not significantly associated with disruption.

Comorbid Factors

The presences of diabetes mellitus, chronic obstructive pulmonary disease (COPD) or systemic hypertension were found to have no association with the occurrence of leaks in our sample populations, though the numbers were small. Similar results were obtained when analysing history of smoking and alcohol intake in our patients. Pickleman et al[22] also found that hypertension was a risk factor in the development of small intestinal anastomotic leakage. Diabetes has been shown in many studies not to have a significant association with disruption. Chronic obstructive pulmonary disease was noted to be an independent predicator of leakage in one study.

Malnutrition

The implications of malnutrition on anastomotic healing have been well established in previous studies. A low serum albumin was noted to be predictive of anastomotic leak in our series (p=0.002). Our findings corroborate the conclusion of other workers who noted the association between hypoalbuminaemia and deranged wound healing,

In our study, it was observed that low haemoglobin level was also associated with significant occurrence of anastomotic leak with the mean haemoglobin percentage in the leak group being 9.9±1.4 g%.

An ASA grade of three or more was associated with increased risk of leakage in our study (p=0.008). Our findings corroborate the conclusion of other workers, Golub Albes and co-workers who reported the association of increasing ASA grade with anastomotic complication.

Aetiological Factors

The patients in our study were grouped into four main categories based on intra operative findings via intestinal obstruction, small bowel perforation, gangrene gut and those with malignancy. Some studies have underlined the importance of intestinal obstruction as a determinant of anastomotic leak although we were not able to arrive at similar conclusions. Hesp and co-workers had opined that re-anastomoses were prone for subsequent re-leak, and our study validated their findings but with only one case.

Intraoperative Factors

We noted that the mean duration of surgery in the leak group was significantly higher than in the non-leak group (p=0.03). This is most probably reflective of the difficulties faced intraoperatively which might later predispose to anastomotic leakage.

We found that the presence of peritoneal contamination had an association with the occurrence of anastomotic leakage (p=0.01). This factor was also found to be independently predictive of anastomotic leakage by investigator in two other separate studies.[23]

Post-Operative Factors

Tissue perfusion and decreased oxygen tension at the anastomotic site are known to adversely affect its healing.[24] Postoperative hypotension may reduce the tissue perfusion because in these circumstances the gastrointestinal tract shunts its own blood supply to support perfusion of other vital organs. Adequate oxygen delivery is a prerequisite to the hydroxylation of lysine and proline during collagen synthesis. Thus, post-operative hypotension by affecting tissue oxygen supply affects anastomotic healing.

Small intestinal anastomotic leak remains a major problem in the setting of emergency surgery. Many of the factors causing disruption may not be amenable to immediate correction in the pre-operative period. A patient who has risk factors for anastomotic dehiscence may be a candidate for enterostomy rather than an anastomosis to help tide the crisis over. Patients undergoing re-laparotomy for anastomotic leakage should have exteriorisation of the leak site done.

CONCLUSION

Small intestinal anastomotic leak remains a major problem in the setting of emergency surgery. Many of the factors causing disruption may not be amenable to immediate correction in the pre-operative period. A patient who has risk factors for anastomotic dehiscence may be a candidate for an enterostomy rather than an anastomosis to help tide the crisis over. Patients undergoing re-laparotomy for anastomotic leakage should have exteriorisation of the leak site done.

Hence, adequate attention should be paid to the various preoperative, intraoperative and postoperative factors which influence anastomotic leakage in small bowel anastomosis in order to keep the morbidity and mortality to a bare minimum.

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