

# Anastomotic Leaks after Gastrointestinal Operations- A Prospective Cohort Study

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## ABSTRACT

**Introduction:** Anastomotic leak is the release of intestinal contents into the abdomen at the site of surgical stitch line, where two ends of the bowel have been joined for restoration of the gastrointestinal continuity. There are considerable variations in incidence of anastomotic leaks following gastrointestinal operations which have motivated the present study.

**Aim:** To prospectively follow all the patients who underwent gastrointestinal surgeries and look for clinical signs of anastomotic leak in postoperative period.

**Materials and Methods:** Study population comprised of 613 patients who underwent gastrointestinal operation at a Tertiary Care Hospital during the period from September 2011 to September 2013. After taking Institutional Ethical Committee Clearance enrolment in the study was done with written and informed consent. The site of leak, postoperative day of leak was diagnosed and noted based on clinical examination and radiological investigations.

It was a prospectively designed descriptive study so no specific tests were applied. Statistical analysis and percentages were calculated using SPSS 16.0 software.

**Results:** Most of the leaks occurred between eighth to ninth postoperative day and most of the obstruction occurred on sixth and seventh postoperative day. Incidence of anastomotic leaks in the study group was 3.26%. Incidence of anastomotic leaks in small bowel anastomosis is 0.489% compared to large bowel leaks reported to be 0.815%. Peritonitis was present in majority of patients presenting with leak. Incidence of obstruction in recto sigmoid anastomosis was 1.957%.

**Conclusion:** The study suggests that as we move distally in Gastrointestinal Tract (GI) the incidence of anastomotic leak increases and it becomes maximum for colorectal surgeries. Anastomotic complication depends on various factors like age, sex, mode of presentation, procedure done, Hb%, dehydration, nutrition, blood sugar, albumin, peritonitis etc.

**Keywords:** Faecal fistula, Peritonitis, Postoperative obstruction

## INTRODUCTION

Complications are part and parcel of any surgery. In relation to gastrointestinal operations anastomotic leak is the most dreaded postoperative complication followed by obstruction [1]. Leaks can develop at the site of anastomosis or elsewhere. The frequency of anastomotic leaks ranges from 1% to 24% [2]. The rate of leakage is generally considered to be higher for elective rectal anastomosis (12-19%) than for colonic anastomosis (11%) [3].

Bowel obstruction occurring within first six weeks postoperatively is classified as an early postoperative bowel obstruction, acute fibrinous adhesions are responsible for over 90% of such cases i.e., immediate postoperative, other causes are internal herniation, intra-abdominal abscess, intramural haematoma, local oedema and anastomotic leak [4].

The significant increase in number of therapeutic intra-abdominal surgeries in the second half of 20<sup>th</sup> century has led to an increase in the frequency of postoperative adhesive obstruction [5]. About 80% of bowel obstruction occurs in small intestine and the other 20% in colon [6]. The mortality ranges from up to three percent for simple obstruction to up to 30% when there is vascular compromise or perforation of the obstructed bowel depending on the clinical settings [7]. The surgeries most commonly related with adhesive bowel obstruction in postoperative period are those involving the structures in the lower abdomen and pelvis such as colon and rectum [8]. Hence, the aim of the present study was to prospectively follow all the patients who underwent gastrointestinal surgeries and look for clinical signs of anastomotic leak in postoperative period.

## MATERIALS AND METHODS

This was a Prospective Cohort study conducted in the Department of General surgery at Tertiary Care Hospital during the period from September 2011 to September 2013. All the patients admitted and

operated in the hospital for various gastrointestinal conditions as emergency/routine surgery and also referred cases from other centres were the subject of the study. A total of 613 consecutive cases of various types of gastrointestinal operations were followed. It was a sample size of convenience and continuous sampling. Institutional ethical committee clearance enrolment in the study was done with written and informed consent (IEC No.-IEC/IRB-NO-VSS/66/2011).

**Inclusion criteria:** All the patients underwent laparotomies in routine or emergency wherein anastomosis of small or large bowel was done to restore the gastrointestinal continuity.

**Exclusion criteria:** Hepatobiliary cases redo laparotomies and patients who underwent anastomosis with proximal diversion were excluded from the studies.

The diagnosis was based on comprehensive clinical history of the cases, through physical examination, routine laboratory investigations and radiological examinations. Each case was closely followed-up in postoperative period and any development of postoperative faecal fistula was noted. Complications were managed surgically by faecal diversion or conservatively depending on merit of the individual case.

## Management Protocol

Mostly the patients of GI leaks and obstructions fistulae were managed conservatively and only a few required operative intervention. The patients were managed according to the following procedures. First the patients were resuscitated to improve their general condition and blood haemoglobin level. The skin excoriation by discharge was prevented by local dressing. The dressing was done with antiseptic solution (5% povidone iodine), siloderm ointment, egg albumin and zinc oxide, soframycin/betadine ointment. Many cases the discharge was collected in stoma bag. Patients were supplemented with nutrition both parenterally and enterally according to the type

of leak: **a) Parenteral nutrition:** 5% dextrose, dextrose saline, blood transfusion, amino acid solution, ringer's lactate, darrow's solution, vitamin B complex (MVI), calcium sandoz with Vitamin C; **b) Enteral nutrition:** High protein containing diets. Control of infection was initially done by broad spectrum antibiotics then according to the report of culture sensitivity of fistula discharge. Conservative treatment was employed only when investigation revealed that the enterocutaneous fistulae have communication with bowel that is in continuity with bowel distal to the fistula. Operative treatment was employed when the bowel was not in continuity/grossly diseased/evidence of distal bowel obstruction. They include bypass/diversion, bowel resection and end to end anastomosis, abscess drainage, excision of fistula, fistula closure. Indications for operation were persistent drainage, abscess/peritonitis, Intestinal obstruction, abdominal wound dehiscence.

**Follow-Up**

All the patients were observed carefully during hospital stay. If there was any complication of anastomotic leaks, the management was done accordingly. Total duration of hospital stay was noted. After being discharged from hospital, attempts were made to maintain postal correspondence regularly to follow-up the cases. However some of them stopped corresponding after some time and they were presumed to have no complaint.

**STATISTICAL ANALYSIS**

Statistical analysis was performed using JASP Team (2020). JASP (Version 0.12.2) (Computer software). Data is expressed as median and interquartile range, mean and percentage.

**RESULTS**

During the study period 20 cases of anastomotic leaks and eight cases of obstruction and two cases of leaks with obstructions were observed who were managed as conservatively or surgically. Maximum complications occurred in the age group of 11 to 60 years Most of the leak was found in 2<sup>nd</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 6<sup>th</sup> decade (13.33%), followed by 4<sup>th</sup> decade (10%) and maximum obstruction occurred in 3<sup>rd</sup> decade (10%) [Table/Fig-1] (Mean age 37 years). Out of 20 patients 11 were male (55%) and 9 were females (45%). Anastomotic leak was the most common complication followed by postoperative obstruction. Most of the leaks occurred on fourth postoperative day and most of the obstruction occurred on sixth and seventh postoperative day [Table/Fig-2]. Peritonitis was present in majority of patients presenting with leak [Table/Fig-3]. Majority of the leak occurred in patients who underwent colorectal surgeries (60%) [Table/Fig-4].

Age (years)	Number of cases (N=30)			Percentage		
	Leak	Obstruction	L+O	Leak	Obstruction	L+O
0-10	0	0	0			
11-20	4	-	1	13.33	-	3.33
21-30	4	3		13.33	10.00	
31-40	3	1		10.00	3.33	
41-50	4	2		13.33	6.66	
51-60	4	2		13.33	6.66	
> 60	1		1	0.66		3.33
Total	20	8	2	66.66	26.66	6.66

[Table/Fig-1]: Age distribution of patients with anastomotic leaks.

Leak with obstruction occurred in two cases. One case was of ileal perforation following blunt trauma for which resection and ileo-ileal anastomosis was done and the other case was ileocolic intussusception for which resection and end to end anastomosis was done [Table/Fig-2].

The three small bowel leaks healed spontaneously with conservative treatment [Table/Fig-5]. Three of the large bowel leaks healed gradually with decreasing faecal output [Table/Fig-6], but one of them required

Postoperative day	No of cases (N=30)			Percentage		
	Leak	Obstruction	L+O	Leak	Obstruction	L+O
1	-	-	-			
2	-	-	-			
3	1	-	-	3.33		
4	6	-	-	20		
5	3	1	1	10	3.3	3.3
6	3	3	1	10	10	3.3
7	-	3	-		10	
8	2	1	-	6.66	3.33	
9	3	-	-	10		
10	-	-	-			
11	-	-	-			
12	1	-	-	3.33		
13	1	-	-	3.33		
Total	20	8	2	66.66	26.66	6.66

[Table/Fig-2]: Postoperative day of the cases with anastomotic leak.

Peritonitis	Leak	Obstruction	Leak (%)
Present	13	5	65
Absent	7	3	35
Total	20	8	100

[Table/Fig-3]: Development of peritonitis in relation with leaks and obstructions.

	Small bowel surgeries	Large bowel surgeries	Colorectal surgery	Total
Leaks	3 (15%)	5 (25%)	12 (60%)	20

[Table/Fig-4]: Association with Pathology (per-operative) encountered at Operation.



[Table/Fig-5]: Photograph showing colocolic fistula from drain site after primary resection and anastomosis of sigmoid volvulus.



[Table/Fig-6]: Photograph showing colostomy bag fitted for colocolic fistula.

re-exploration and proximal diversion. Four out of 12 cases of colorectal anastomosis required re-exploration. One of them was re-anastomosed with omental patch and the remaining three underwent divided sigmoid colectomy with distal mucous fistula. Rest of the patients responded well to conservative and supportive management.

## DISCUSSION

During the study period a total of 613 cases of gastrointestinal operations were followed that included 251 (40.94%) cases where resection and anastomosis was done. Incidence of anastomotic leaks in the study group was 3.26% (n, total leak=20) (N, patients followed=613) but there is considerable variation in the incidence of anastomotic leak depending on the pathology, other co morbid conditions and the site of anastomosis. Various literatures have reported postoperative anastomotic leak of ranging from 10% to 15% [9-11]. No leak occurred in any of the patients undergoing gastric anastomosis. Incidence of anastomotic leaks in small bowel anastomosis is 0.489% (n, total small bowel leak=3) (N, patients followed=613). Incidence of anastomotic leak in large bowel anastomosis is 0.0815% (n, total large bowel=5) (N, patients followed=613) and in rectosigmoid anastomosis is 1.957% (n, total rectosigmoid leak=23) (N, patients followed=613). So we notice that there is a clear increase in anastomotic leaks incidence as we move distally. A similar pattern of incidence of anastomotic leaks in small bowel anastomosis is 0.489% compared to large bowel leaks reported to be 9.8% has been reported by Sakr A et al., [12]. The incidence of obstruction in the entire study group was 1.30% (n, total obstruction=8), which also varies according to the type of operation and other co morbid conditions of the patient. Incidence of obstruction in gastric surgeries was 0.163% (n, gastric obstruction=1). Incidence of obstruction in small bowel surgeries is 0.326% (n, small bowel obstruction=2). Incidence of obstruction in large bowel operations was 0.326% (n, large bowel obstruction=2). Incidence of obstruction in rectosigmoid surgeries were 0.652% (n, rectosigmoid obstruction=4). Incidence of leak with obstruction was 0.326% (n, leak with obstruction=2), occurring in a case of ileal perforation following blunt trauma for which resection and ileocolic anastomosis was done and the other case was ileocolic intussusception for which resection and end to end anastomosis was done.

Incidence of leaks was spread from second to sixth decade with maximum obstruction seen in patients in third decade (10%) of life. So age bears no strict correlations with these complications. Minimum age was 11 years and maximum age was 70 years. The male to female ratio was 1:2. Mäkelä JT et al., has also shown a higher incidence of leak in males may be due to increased risk factors in males [13]. Maximum number of cases (53.33%) presented with the initial symptoms of pain in abdomen followed by intestinal obstruction (33.33%). Previous abdominal operation, done in immediate past for any other condition, has a definite causal association. As far as initial blood pressure is concerned, low diastolic blood pressure seems more important prognostically. Only one third of the patients of anastomotic leak and obstruction had haemoglobin level above 10 gm/dL and the remaining patients required perioperative blood transfusion. Kirchhoff P et al., have also shown that intraoperative blood transfusion had definite risk of leak particularly in colorectal surgeries [14]. Fifty percent of patients of anastomotic leak and 6.66% of patients with obstruction had poor preoperative albumin level below 3.5 gm/dL. Hypoalbuminemia causes compromised collagen synthesis and impaired healing leading to anastomotic leak [15].

More than 70% patients of anastomotic leak and obstruction had leucocytosis preoperatively. Leucocytosis is a marker of acute infection which can be due to peritonitis or fecal contamination. This may hamper anastomotic healing [16]. Preoperative serum potassium abnormality was more prevalent than serum sodium

abnormality. A 13.33% of cases of anastomotic leak 6.66% of obstruction and all the patients with leak with obstruction had blood urea level above normal upper limit. Thirty percent cases of anastomotic leak, 6.66% cases of obstruction and all the patient of leak with obstruction had serum creatinine level above 1.5 mg/dL. 36.33% patients had preoperative sepsis/SIRS, out of which anastomotic leak comprises 26.66% and rest by obstruction or both. Of all the anastomotic leaks 60 percent were those who were operated in emergency and only 40 percent leak occurred in patients who were electively operated. Bayar B et al., also observed that emergency cases developed more anastomotic leaks and obstructions than elective cases [17]. Ninety percent of leaks in the study occurred where operating time was more than one hour. Cortina CS et al., has demonstrated that increasing operative time by one hour increases chances of leak by 1.3 times [18]. Majority of the anastomotic leak patients (65%) had perioperative peritonitis in the study. Li YW et al., have also concluded that presence of peritonitis predisposes to the risk of postoperative anastomotic leaks and obstruction [19].

## CONCLUSION(S)

The present study concentrates on multiple possible predisposing factors responsible for the development of anastomotic leaks after gastrointestinal operations. The incidence of anastomotic leak increases as we move distally in the gastrointestinal tract with maximum rate of anastomotic leaks in colorectal surgeries and rate of obstruction is also maximum in colorectal surgeries. Majority of the complications have responded well with conservative management and only a few requiring surgical intervention. A high index of suspicion for diagnosis and dedicated supportive treatment is key to good outcome.

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