

# The Role of Diversion Stoma after Colonic Anastomosis

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## ABSTRACT

**Introduction:** Colonic resections are increasingly performed by the general surgeon for a variety of indications. Anastomosis of the Colon has always been viewed with caution by general surgeons, due to a higher incidence of complications following colonic anastomosis as compared to small bowel anastomosis. A diversion stoma potentially decreases the risk of these complications, but adds morbidity to the procedure. This study was carried out to analyze the risk factors which would guide the surgeon in performing a diversion stoma.

**Material and methods:** 54 consecutive patients undergoing colonic resection and anastomosis at our institution were studied. The known risk factors for complications were noted in these patients as also the incidence of various complications.

**Results:** A total of 17 patients had anastomotic leak. 16 patients had wound infection. Age greater than 60 years, Hypoalbuminaemia and anaemia were identified as significant risk factors in the development of these complications.

**Conclusion:** While colonic anastomosis would appear to be inherently more liable for complications, these may be avoided by creating a diversion stoma. A diversion stoma, itself is attended by morbidity and imposes yet another surgical procedure on the patient. However, by a careful identification of risk factors in a given patient, a diversion stoma may be judiciously performed, decreasing the overall morbidity and mortality from colonic anastomosis.

**Keywords:** Colonic Resection, Colonic Anastomosis, Anastomotic Leak, Complications of Colonic Surgery.

## INTRODUCTION

Colonic resection and anastomosis is probably the most common alimentary tract surgery done by the present day general surgeons.<sup>1</sup> Resection done for various pathological causes, require an anastomotic method to restore continuity of the remaining intestine. It is this aspect of alimentary tract surgery that is associated with dangerous life threatening complications.<sup>2-3</sup> The breakdown of the suture line may result in peritonitis, fecal fistula formation and other fatal septic complications.

Safety in gastrointestinal surgery depends to a great extent on the technical expertise of the operating surgeon in his performance of the anastomosis; in following the fundamental principles of gastrointestinal suturing.<sup>4</sup>

There are, however, multiple factors involved in the healing of the anastomosis. These, largely the host related factors, influencing the anastomotic healing play an important role in the final outcome. Our knowledge of the gastrointestinal surgery has developed gradually over the centuries from a mystical to a scientific level. Today, operations on the gastrointestinal tract are among the most frequent surgical procedures. Our knowledge of the gastrointestinal healing has advanced and we have greater understanding of the impact of local and systemic factors on the anastomotic healing. Nevertheless, anastomotic

leakage and dehiscence remain frequent and serious problems associated with high morbidity and mortality.

We have selected the large bowel for this study because of the reason that the large bowel has solid contents, greater bacterial load, lesser blood supply and thinner wall as compared to small bowel. So large bowel resection and anastomosis is challenging as compared to small bowel anastomosis.<sup>5,6</sup> Complications in large bowel anastomosis are more common and life threatening, as compared to small bowel surgery.

One way of addressing the risk of anastomotic leakage is the performance of a diverting stoma. This decreases the chances of anastomotic leak which is a life threatening complication due to solid content and bacterial overload, as mentioned earlier. However, the diverting stoma after colonic anastomosis will itself increase the morbidity in the form of prolonged hospitalization, stoma care, stoma related complications and psychological effects on patients.<sup>7</sup> It also requires an added surgical procedure, for stoma closure. So to perform a diverting stoma or not is a cumbersome decision which involves the assessment of multiple factors.

We have attempted to study the effect of various host related factors on the outcome of large bowel anastomosis and determine incidence of early surgical complications of anastomosis in all the patients undergoing Colonic anastomoses for various indications. The host factors studied were selected, based on the factors known to affect anastomotic healing, according to available evidence in the literature.<sup>9-11</sup>

Our study aimed to assess the following specific aspects.

1. To study the incidence of early complications (anastomotic leak, intra-abdominal abscess, post op wound infection) following large intestinal anastomosis during ward stay.
2. To identify the risk factors for anastomotic leakage following large intestinal anastomosis
3. To study mortality rates for large intestinal anastomosis during ward stay. Identification of those factors that predispose to the development of complications would aid in deciding whether an anastomosis requires diversion or not.

## MATERIAL AND METHODS

54 consecutive patients of large bowel resection and anastomosis performed at the B.Y.L. Nair Charitable hospital Mumbai in the period from 1st July 2014 to 31st December 2015 were included

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in the study, based on inclusion and exclusion criteria.

**Inclusion criterion:** All the patients aged above 18 years and undergoing large intestinal resection and primary anastomosis were included in the study. Only patients undergoing hand sewn anastomosis and open surgery were included in the study. This was so, since laparoscopic colonic resections are not carried out routinely at our institutions and the few cases of laparoscopic resection and anastomosis done during the study period were by surgeons who were on their learning curve.

**Exclusion criteria:** Patients undergoing re-exploration were excluded from the study. Patients having co-morbid conditions like Diabetes Mellitus, Hypertension and Ischaemic heart disease and all patients in whom a diverting proximal stoma was created were excluded from the study.

In all patients, the diagnosis was made based on clinical presentation along with results of investigations. Detailed history of patients was recorded. Records of Hematological investigations including Hemoglobin, Serum Proteins and Albumin, Blood Urea, Serum Electrolytes -Sodium and Potassium were noted. Records of Radiological investigations like X-Rays and CT Scans were noted as applicable. The findings of endoscopy and biopsy were also noted.

It was explained to all patients that they were being recruited in this study and their consent was obtained in writing. Permission from the hospital ethics committee was also obtained for the study.

As mentioned above, all patients underwent open resection as required by the disease process with a hand sewn anastomosis. Anastomosis was either end – to–end or side-to-side, as per the discretion of the operating surgeon. In all patients, a double layered anastomosis using non-absorbable sutures was carried out.

All surgical procedures maintained standard of care. The data of the 54 patients was collected, tabulated and analysed.

Important complications in the post operative period were noted, including: Anastomotic leak, Wound infection, Intra-abdominal abscess.

The patient-related variables chosen for the analysis were risk factors which are known to influence the outcome of large

bowel resection and anastomosis particularly the occurrence of the anastomotic leak; these were observed and recorded.

The risk factors recorded in this study were: Old age (60 years and above), Sex, Hypoalbuminemia (serum albumin levels of less than 3.5g/dl), Anemia (hemoglobin of less than 10g/dl) and whether the surgery was done as an emergency or elective surgery.

## STATISTICAL ANALYSIS

All the recorded variables were tabulated and analysed with chi square test. The chi square test was manually performed by one of the author (DSM). The results obtained were confirmed by Graphpad software available at <http://www.graphpad.com/quickcalcs/catMenu/>.

## RESULTS

Patients in our study underwent a variety of colonic resections, including Right hemicolectomy, transverse colectomy, Left hemicolectomy and Sigmoidectomy. Table-1 summarizes the procedures performed and the indications for each of them.

A total of 17 patients had anastomotic leak. Of these, 7 patients out of a total of 38 in the age group below 60 years had anastomotic leak. Among patients above the age of 60 years, 10 out of a total of 16 had anastomotic leak. This was statistically significant ( $P = 0.014$ ).

There were 23 patients with serum albumin greater than or equal to 3.5 g/dl. Of these, 3 patients had anastomotic leak. Among 31 patients with serum albumin less than 3.5 g/dl, 14 had anastomotic leak. This was statistically significant ( $P=0.027$ ).

35 patients had haemoglobin greater than or equal to 10 g/dl. 4 patients out of these had anastomotic leak. Among 19 patients with haemoglobin less than 10 g/dl, 13 had anastomotic leak. This was statistically significant ( $P=0.001$ ).

3 patients out of the 23 in the group with serum albumin greater than or equal to 3.5 g/dl had wound infection. Among 31 patients whose serum albumin was less than 3.5 g/dl, 13 had wound infection This was statistically significant ( $P=0.046$ ).

5 patients out of 35 in the group with Haemoglobin greater than or equal to 10g/dl had wound infection. Among 19 patients with haemoglobin less than 10g/dl, 11 had wound infection. This was

Procedure	Indication
Right hemicolectomy (21)	Ileocaecal Tuberculosis- 5 (23.8%) Ca Caecum- 5 (23.8%) Ileocolic Intussusception – 3 (14.28%) Colocolic Intussusception – 3 (14.28%) Ca Ascending Colon – 3 (14.28%) Ca Hepatic Flexure – 2 (9.52%)
Transverse colectomy (8)	Ca Transverse Colon – 2 (25%) Transverse Colon Perforation – 5 (62.5%) Stab Injury – 1 (12.5%)
Left hemicolectomy (9)	Gangrene Of Splenic Flexure – 3 (33.33%) Ca Splenic Flexure – 2 (22.22%) Ca Descending Colon – 2 (22.22%) Gangrene Descending Colon – 1 (11.11%) Descending Colon Perforation – 1 (11.11%)
Sigmoidectomy (16)	Ca Sigmoid – 4 (25%) Sigmoid Volvulus – 6 (37.5%) Sigmoid Diverticulum – 3 (18.75%) Gangrene Of Sigmoid – 2 (12.5%) Sigmoid Laceration – 1 (6.25%)

**Table-1:** Various colonic resections performed and the indications for these. The Percentage figures in parenthesis show the percentage for the indication from among patients undergoing the particular procedure.

statistically significant ( $P < 0.001$ ).

4 patients of the 38 in the age group below 60 years had intra-abdominal abscess. Among patients above the age of 60 years, 8 out of 16 had intra-abdominal abscess. This is statistically significant ( $P=0.005$ ).

1 patients out of the 23 in the group with serum albumin greater than or equal to 3.5 g/dl had intra-abdominal abscess. Among 31 patients whose serum albumin was less than 3.5 g/dl, 11 had intra-abdominal abscess. This was statistically significant ( $P=0.017$ ).

2 patients out of 35 in the group that had Haemoglobin greater than or equal to 10g/dl had intra-abdominal abscess. Among 19 patients whose Haemoglobin was less than 10g/dl, 10 patients had intra-abdominal abscess. This was statistically significant ( $P < 0.001$ ).

There was one death among 38 patients in the age group below 60 years. Among patients above the age of 60 years, 5 out of 16 died. This was statistically significant ( $P= 0.009$ ).

1 patients out of 35 in the group with Haemoglobin greater than or equal to 10g/dl died. Among 19 patients, whose Haemoglobin was less than 10g/ dl, 5 patients expired. This was statistically significant ( $P=0.03$ ).

Out of 36 Male patients, 11 patients had anastomotic leak. Among 18 female patients, 6 had anastomotic leak. This was not statistically significant ( $P=0.83$ ).

5 patients out of 20 those who are taken up as elective cases had anastomotic leak. Among 34 those who are taken up for emergency surgery, 12 patients had anastomotic leak. This was not statistically significant ( $P=0.43$ ).

## DISCUSSION

Colonic resections are attended by several complications. It is customary to classify complications of any surgical procedure into those occurring intra-operatively and those occurring post-operatively. Intra-operative complications of colonic surgery include bleeding, ureteric and bladder injuries among others. The most significant post-operative complication is, Anastomotic Leak from a colonic anastomosis since it is potentially life threatening, carrying a mortality of 6% - 22% in the literature.<sup>11</sup> Colonic anastomoses can develop other post-operative complications as well, including wound infection, intra-abdominal abscess and prolonged ileus. Many surgeons would rather perform a diverting stoma for all colonic anastomoses, rather than risk these complications. However, a diverting stoma is not without its own risks and complications. It also involves stoma care till the time that the stoma can be safely closed, as also another surgical procedure, viz. Stoma Closure. This has led to authors recommending a diversion stoma in only selected cases.<sup>12</sup>

Several attempts have been made to identify the risk factors that would make a colonic anastomosis particularly susceptible to complications.

McDermott et al found that male sex, age above 60 years and emergency surgery were risk factors for anastomotic leak.<sup>13</sup> However, in our study, although age above 60 years was a risk factor for anastomotic leak as well as intraabdominal abscess and wound infections, Male sex and emergency surgery did not appear to be significant.

Kotoč et al found male gender and low serum Albumin to be a

risk factors.<sup>5</sup> Iancu et al found anaemia and hypoalbuminaemia to be risk factors for anastomotic leak in colonic anastomosis.<sup>14</sup> Both these factors were found to increase the risk of anastomotic leak in our study.

Our study, conducted on 54 patients includes all colonic anastomoses. Further study, including rectal and anal anastomosis as a separate group need to be carried out.<sup>15</sup> We also need to differentiate the need for diversion in patients undergoing ileocolic and right sided colo-colic anastomosis. Points of surgical technique, including a comparison of end-to-end and side-to-side anastomosis and also comparisons between hand sewn versus stapled anastomosis in this situation need to be made.

## CONCLUSION

The most common and troublesome complication after large bowel resection and anastomosis is anastomotic leak. Other complications include wound infection, and intra-abdominal abscess.

Patients with low serum albumin, below 3.5g/dl, anaemia, with Haemoglobin less than 10g/dl and advanced age above 60 years have a greater risk of anastomotic leak. A diversion stoma in the form of an ileostomy or a proximal colostomy may be considered in these patients.

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