

## ORIGINAL RESEARCH

**A Prospective comparative study of single layer vs double layer hand sewn intestinal anastomosis**

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**ABSTRACT**

**Background:** Patients undergoing resection anastomoses for various causes like bowel obstruction, incarcerated hernias, benign and malignant tumors of small and large bowel is not so uncommon. This comparative study endeavours to compare outcome of single layer versus double layer intestinal anastomosis in small and large bowel in terms of duration required to perform intestinal anastomosis, post operative complications like anastomotic leak, duration of hospital stay in each group.

**Materials & Methods:** The patients selected for this study are those who were admitted with various clinical conditions requiring resection and anastomosis of small and large bowel.

**Results:** The maximum number of patients in group A (single layer) were in the age group of 31-40 years i.e. 08 (32%) and in group B (double layer) maximum number of patients were in the age group of 41-50 years i.e. 09 (36%). In group A (single layer) there were 17 (68%) males and 08 (32%) females. In group B (Double layer) there were 15 (60%) males and 10 (40%) females. In our study of fifty cases in both groups terminal ileal stricture was diagnosed in maximum number of patients i.e. 13 (26%) cases. In our study of fifty cases in both groups, resection of terminal ileum and ileoileal anastomosis was performed in maximum number of patients i.e. 21 (42%) cases. Three different types of anastomosis all together in both groups depending up on the position of the viscera. In both the groups end to end type of anastomosis was done in all of the cases, i.e. in group A (single layer) 25 (100%) patients and in group B(double layer) 25(100%) patients. No side to side type of anastomosis or end to side anastomosis was performed in either of groups

**Conclusion:** Duration required to perform a single layer intestinal anastomosis is significantly lesser when compared to double layer.

**Key words:** intestinal anastomosis, Double layer, Gastrointestinal anastomosis

**Introduction**

Gastrointestinal anastomosis has been excited interest in our day to day surgical practice and aim of anastomosis is to make a sound alignment of bowel through which the contents will pass in as early as possible.<sup>1</sup> Patients undergoing resection anastomoses for various causes like bowel obstruction, incarcerated hernias, benign and malignant tumors of small and large bowel is not

so uncommon. Surgery stands major modality of treatment in such cases in diagnosis, treatment and even palliation in few situations.<sup>2</sup>

Bowel anastomoses after resection of bowel may be either end to end anastomoses and side to side or side to end anastomoses depending on surgery and the operating surgeon. Different techniques of intestinal anastomosis are single, double layered closure, staples, glue, laser welding.<sup>3</sup> Various complications following bowel anastomoses are anastomotic leak resulting into peritonitis, abscess, fistula, necrosis, stricture. Various factors contribute to these complications like suturing technique, suture material, presence of concurrent sepsis, vascular compromise and so on.<sup>4</sup> Leakage from the bowel anastomoses in the gastrointestinal tract is major complication and accounts for about 1.3 to 7.7%, that is often associated with increased morbidity and mortality and prolonged stay.<sup>5</sup>

In double layered closure where mucosa and seromuscular layers are sutured separately though haemostatic there is more chance of strangulation of mucosa due because of damage of submucosal vascular plexus.<sup>6</sup> In single layer technique, only seromuscular layer of gut wall is approximated. This technique incorporates the strongest layer (submucosa) of gut and causes minimal damage to the submucosal vascular plexus, anatomy is maintained and hence less chances of necrosis and superior to double layered closure.<sup>7,8</sup> This comparative study endeavours to compare outcome of single layer versus double layer intestinal anastomosis in small and large bowel in terms of duration required to perform intestinal anastomosis, post operative complications like anastomotic leak, duration of hospital stay in each group.

### Materials & Methods

This comparative study was done on patients presenting Sardar Vallabh Bhai Patel Hospital attached to Lala Lajpat Rai Memorial Medical College Meerut, either in emergency or elective undergoing resection anastomosis of bowel from May 2021 to July 2022.

The patients selected for this study are those who were admitted with various clinical conditions requiring resection and anastomosis of small and large bowel. Based on detailed history, thorough clinical examinations, radiological examinations and ultrasound of abdomen, the diagnosis was made. These patients were subjected to the required pre operative investigations; after bowel preparation, ensuring fitness elective surgery was done. Cases were allotted to either group alternatively, requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel. Intestinal anastomosis was carried out in single layer continuous extramucosal technique with 3-0 PDS and double layer continuous technique with 3-0 vicryl taking through all layers and seromucular layer with 3-0 mersilk.

Each case was analyzed with respect to duration required to perform intestinal anastomosis, post operative complications like anastomotic leak, short term and long term intestinal obstruction, stricture formation, secretory diarrhea and the duration of hospital stay The duration of anastomosis begin with placement of first stitch on the bowel and ended when the last stitch was cut. All single layer anastomosis was done with PDS 3-0 pack which had a suture material of 90 cm length. For double layer, 3-0 vicryl was used taking through all layers and seromucular layer with 3-0 mersilk pack which had suture material measuring 90 cm. Cost effectiveness is not studied here in our study. All cases were followed up to discharge and subsequently for a follow up period of 2 weeks. A minimum of 50 cases with the following inclusions and exclusion criteria were selected for the study and were allocated alternatively to each of the comparative study group.

A pretested proforma was used to collect relevant information (patient data, clinical findings, lab investigations, follow up events etc.,) from all the selected patients. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

### Results

**Table I: Distribution of patients**

Age Groups (Years)	Group A (Single Layer)	Group B (Double Layer)
20-30	5 (20%)	5 (20%)
31-40	8 (32%)	6 (24%)

41-50	6 (24%)	9 (36%)
51-60	6 (24%)	5 (20%)
TOTAL	25 (100%)	25 (100%)
<b>MEAN AGE</b>	<b>41.4</b>	<b>41.32</b>

Table I shows that maximum number of patients in group A (single layer) were in the age group of 31-40 years i.e. 08 (32%) and in group B (double layer) maximum number of patients were in the age group of 41-50 years i.e. 09 (36%).

**Table II: Sex distribution**

Gender	Group A (Single Layer)	Group B (Double Layer)
Male	17 (68%)	15 (60%)
Female	08 (32%)	10 (40%)

In our study, in group A (single layer) there were 17 (68%) males and 08 (32%) females. In group B (Double layer) there were 15 (60%) males and 10 (40%) females.

**Table III: Disease group and patients**

Disease group	No. of cases	N (%)
Caecal mass (GIST)	2	4%
Carcinoma ascending colon	5	10%
Carcinoma caecum	1	2%
Caecal perforation	1	2%
Carcinoma transverse colon	3	6%
Carcinoma descending colon	3	6%
Carcinoma rectosigmoid	1	2%
Ileocaecal tuberculosis	7	14%
Jejunal stricture	2	4%
Multiple ileal perforation	2	4%
SMA syndrome	2	4%
Terminal ileal stricture	13	26%
Terminal ileal TB stricture	4	8%
Strangulated inguinal hernia	4	8%

In our study of fifty cases in both groups terminal ileal stricture was diagnosed in maximum number of patients i.e. 13 (26%) cases.

**Table IV: Type and number of procedures performed**

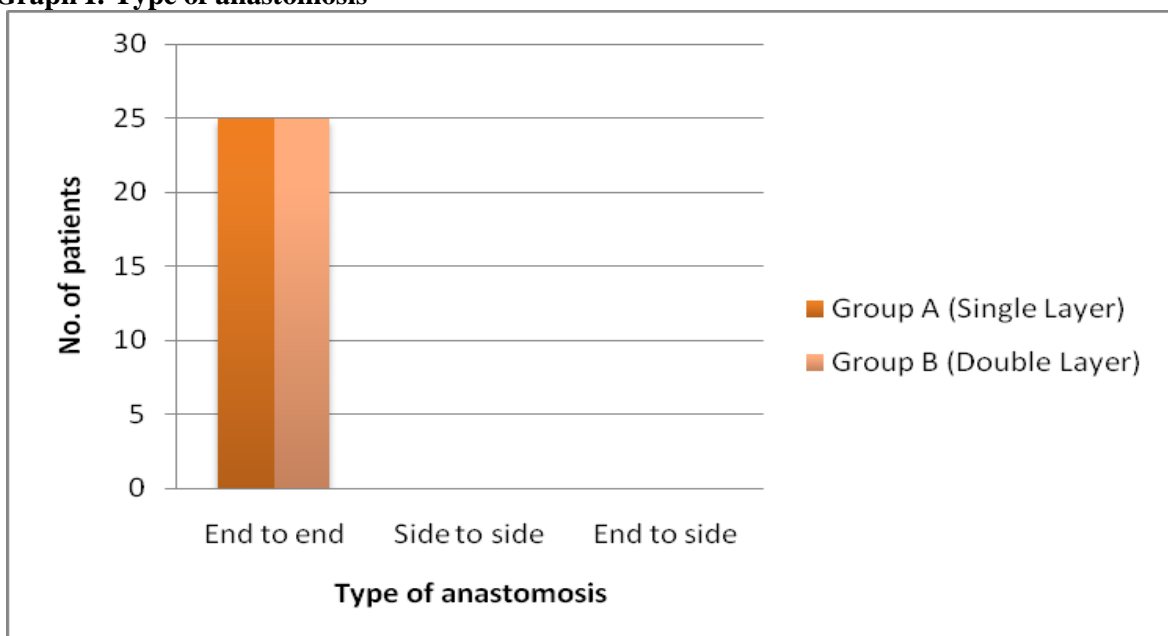
Procedure	No of cases	%
Anterior resection and colorectal anastomosis	1	2%
Left hemicolectomy with colorectal anastomosis	4	8%
Resection of terminal ileum, caecum with ileo-ascending anastomosis	13	26%
Resection of ileum with ileo-ileal anastomosis	21	42%
Right hemicolectomy with ileo- transverse anastomosis	8	16%
Resection of jejunum with jejuno-jejunal anastomosis	2	4%
Resection of jejunum and ileum with jejuno-jejunal anastomosis	1	2%

In our study of fifty cases in both groups, resection of terminal ileum and ileoileal anastomosis was performed in maximum number of patients i.e. 21 (42%) cases.

**Table V: Anastomotic site**

Anastomotic site	Group A (Single Layer)	Group B (Double Layer)
Entero enteric	11 (44)	13 (52)
Entero colic	12 (48)	9 (36)
Colo Colic	2 (8)	3 (12)
Total	25 (100)	25 (100)

This study included a total of fifty anastomosis at different levels of small intestine and large intestine. The maximum number of anastomosis in group A (single Layer) were performed at entero colic level in 12 (48%) patients, next at entero enteric site in 11 (44%) patients and least at colo colic site in 2 (8%) patients. In group B (double layer), out of 25 anastomosis maximum number of anastomosis were performed at entero enteric level in 13 (52%) patients, next common site for anastomosis was at entero colic site in 9 (36%) patients and followed by colo colic site in 3 (12%) patients.

**Graph I: Type of anastomosis**

The study included three different types of anastomosis all together in both groups depending up on the position of the viscera. In both the groups end to end type of anastomosis was done in all of the cases, i.e. in group A (single layer) 25 (100%) patients and in group B(double layer) 25(100%) patients. No side to side type of anastomosis or end to side anastomosis was performed in either of groups.

**Table VI: Final outcome**

Out come	Group A (Single Layer)	Group B (Double Layer)
DEATH	0 (0)	1 (4)
RECOVERED	1 (4)	1 (4)
ASYMPTOMATIC	24 (96)	23 (92)

In this study two patients who had developed anastomotic leak in group B (double layer), among them 1 (4%) patient responded well to conservative management and recovered. one more patient (4%) who had anastomotic leak in group B (double layer) died due to septicaemia and rest 23 patients (92%) were asymptomatic. In group A (single layer) one patient (4%) developed anastomotic leak and recovered with conservative management. p value if found out to be 1.14 and is not significant.

## Discussion

The present study assessed the efficacy and safety of single layered anastomosis in comparison with double layer anastomosis after intestinal resection and anastomosis. The study included two groups single layer and double layer, each group had 25 cases altogether 50 cases. Cases were allotted to either group alternatively, requiring single layer anastomosis and double layer anastomosis for various clinical conditions of small and large bowel. Anastomosis was done at different levels of intestine and depending up on the position of the viscera. The efficacy of both groups were compared in terms of duration required to perform single and double layered intestinal anastomosis, study post operative complications like anastomotic leak in single and double layered intestinal anastomosis, the outcome associated with single and double layered anastomosis and the duration of hospital stay in either of them.

In present series mean age in group A (single layer) was 41.4 years and in group B (double layer) 41.32 years. In Gangat series<sup>9</sup> mean age in group A (single layer) was 37.5 years and in group B (double layer) 40.2 years.

In Khan RAA series<sup>10</sup>, the arithmetical mean duration required to perform an anastomosis procedure was 20 minutes for single layer and 35 minutes for double layer. In Burch ET series duration required to perform a single layer anastomosis was 20.8 minutes and 30.7 minutes for double layer. In our study the mean duration required to construct a single layer anastomosis was 19.04 minutes and 28.80 minutes for double layered anastomosis. The difference in average time is statistically significant as p value <0.001HS in present series. Therefore, in our series the time required to perform anastomosis is well within the average time.

The complication rate in our present series was 1 (4%) patient in single layer and 2 (8%) in double layered anastomosis. In Khan RAA series<sup>10</sup> one (6%) patient had anastomotic leak in single layer and 2 (12%) of patients had anastomotic leak in double layer. Finally, complication rates put all together double layer had more complication in terms of anastomotic leak in both series.

Anastomotic leak is the most feared early complication of intestinal anastomosis. The healing of intestinal anastomosis is broadly divided into three phases: the inflammatory phase, the fibroplasia phase, and the remodelling phase. During the inflammatory phase, the integrity of anastomosis is dependent on mechanical strength provided by sutures. The inflammatory phase is followed by the fibroplasia phase around postoperative days 5-7, characterized by a switch from collagen degradation to collagen deposition that gives strength to anastomosis. Any systemic or local factor that causes delay in transition from inflammatory phase to fibroplasia phase can result in poor healing and anastomotic leak. Systemic conditions that increase the risk of anastomotic leak are anemia, diabetes mellitus, malnutrition with hypoalbuminemia, vitamin deficiencies, and steroid therapy. Local factors such as the presence of irradiated bowel, anastomosis involving disease-affected bowel, and inadequate blood flow are associated with delayed healing and contributes to anastomotic leak.<sup>11</sup>

Anastomotic leak presenting on postoperative day 1 or 2 is invariably due to technical reasons. Anastomotic leak secondary to interference in the normal healing mechanism usually presents around the end of the first postoperative week. Anastomotic leak can present either as frank peritonitis when the leak is uncontrolled or as localized intra-abdominal collection/abscess if the leak is controlled. An uncontrolled leak with diffuse peritonitis is associated with high morbidity and mortality and requires re-exploration. During relaparotomy, a thorough lavage of the peritoneal cavity should be carried out. In most circumstances, it is better to dismantle the anastomosis and bring the bowel loops as stoma. A controlled leak presenting with a localized intra-abdominal abscess can effectively managed conservatively by means of percutaneous drainage of the abscess under imaging guidance and antibiotics.<sup>12</sup>

## Conclusion

Authors found that duration required to perform a single layer intestinal anastomosis is significantly lesser when compared to double layer. There is no significant difference in anastomotic leak between two groups. There is no significant difference in duration of hospital stay in single vs double layered bowel anastomosis. There is no significant difference in occurrence of short- term intestinal obstruction in single vs double layered bowel anastomosis.

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