

## Comparison Study of Single Layer versus Double Layer Anastomosis in Bowel Surgery in Western India

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### Abstract

**Introduction:** Recently several reports have appeared advocating the benefits of single layer extramucosal (serosubmucosal) anastomosis over conventional double layer anastomosis. The present study has been conducted to compare single layer technique with double layer anastomosis and to see cost effectiveness of suture material used and time taken for procedure. **Methods:** Total 100 patients (both males and females) requiring intestinal anastomosis admitted in the Department of General Surgery, SMIMER hospital, Surat from July 2012 to November 2014 were included. In post-operative period, patient was monitored for any unexplained fever, distension of abdomen, time taken for bowel movements to come, postoperative day on which patient passed flatus and postoperative day on which patient tolerated the food. The patients were also monitored for anastomotic leak, wound infection, intra-abdominal abscess. **Results:** Mean time taken for anastomosis in single layer technique was  $11.34 \pm 2.65$  minutes and for double layer technique was  $23.58 \pm 4.36$  minutes. ( $p < 0.001$ ) Mean hospital stay in single layer technique was  $11.46 \pm 2.44$  days while it was  $11.57 \pm 2.35$  days in double layer technique. ( $p 0.818$ ) Total 5 patients out of 100 cases, developed wound infections (10%) and all cases were operated in emergency. **Conclusion:** Single layer anastomosis requires less time to construct, cost effective, reduces the operation time, without increase in risk of anastomotic leak and other complications. So, we came to conclude that the single layer interrupted anastomosis is equivalent to the two layer traditional

intestinal anastomosis.

**Keywords:** Intestinal Anastomosis; Single Layer; Double Layer; Bowel Surgery.

### Introduction

A significant proportion of the operations on the gastrointestinal tract involve the repair of the gut and it is this aspect of surgery of alimentary canal which is associated with dangerous complications. The breakdown of suture line or repaired site may result in peritonitis, fecal fistula and serious or fatal septic complications. Anastomotic breakdown remains a major cause of morbidity and mortality and prolonged stay after operations on the gastrointestinal tract [1].

Intestinal anastomosis has been successfully performed for more than 150 years using a variety of techniques, materials, and devices. Of the various methods of intestinal anastomosis two layered interrupted anastomosis using various types of suture material is the most common type used by surgeons worldwide. In this anastomosis inner layer mucosal approximation is done using continuous transmural absorbable suture to prevent leakage, which is further reinforced by seromuscular suture leading to approximation of the serosal surface of the bowel using interrupted silk suture [2].

The shortcoming of the double layered anastomosis is that it is a bit tedious, time consuming to fashion, and leaves an invaginated cuff of tissue with impaired vascularity protruding into the lumen of intestine thereby producing narrowing, also the invaginated tissue produces more of inflammation and ischemic necrosis, predisposing the repaired site to diminished tensile strength and increased chance of leakage.

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Recently, several reports have appeared advocating the benefits of single layer extramucosal (serosubmucosal) anastomosis. The proponents of single layer extramucosal anastomosis advocate that it causes less narrowing of the lumen and maintains good vascularity of anastomotic site. Further, this anastomosis requires less time to fashion, costs less than any other method and have a lower risk of complications and leakage [3,4].

Of late many reports have suggested the single layer interrupted extramucosal (serosubmucosal) anastomosis as the gold standard for anastomosis involving large or small bowel [5]. This anastomosis requires less time to fashion, costs less than any other method, and may have a lower risk of leakage [6].

With these background, the present study has been conducted to determine the suitability of single layer technique for intestinal anastomosis, to study the rate/risk of complications of single layer anastomosis compared with double layer anastomosis and to see cost effectiveness of suture material used and time taken for procedure.

**Methods**

In this observational study, 100 patients (both males and females) requiring intestinal anastomosis admitted in the Department of General Surgery, SMIMER hospital, Surat from July 2012 to November 2014 were included. All the patients requiring gastrointestinal anastomosis, both elective as well as emergency were chosen randomly. Patients suffering from other systemic diseases and those requiring anastomosis to the stomach, and duodenum were excluded from the study. Approval from Institutional Ethical Committee was sought before commencing study. Written consent was taken from participant or from the relatives in case participant is unable to give consent.

The patients were randomly divided into two groups of 50 each. In 50 cases of single layer anatomosis, only single foil of 3/0 Black Relyonsilk 20 mm RB needle non-traumatic, 76 cm suture material was used to complete the anastomosis. In 50 cases of double layer anastomosis, one foil of polyglactin 910 (3-0) 25 mm RB needle non-traumatic, 90 cm and another foil of 3/0 Black Relyonsilk 20 mm RB needle non-traumatic, 76

cm suture material were used, for both layers of anastomosis to complete.

In post-operative period, patient was monitored for any unexplained fever, distension of abdomen, time taken for bowel movements to come, post-operative day on which patient passed flatus and postoperative day on which patient tolerated the food. The patients were also monitored for anastomotic leak, wound infection, intra-abdominal abscess. USG abdomen was done wherever required.

Cost effectiveness was calculated based on the number and type of suture used for the anastomoses. Return of the bowel function was assessed by the time when the patient first passed flatus, first signs of bowel sound, postoperative day when the patient was started orally, and the day when the patient passed motion. Total postoperative hospital stay of the patient was noted.

Continuous data were analyzed using the Student t test. The Fisher exact test and the Pearson chi-square test were used to analyze categorical data. P value <0.05 was considered to indicate statistical significance. All data analysis was performed using SPSS 16.0 for Windows (SPSS Inc., Chicago).

**Results**

Bowel anastomosis were done for various indications in 100 cases admitted in SMIMER medical college, Surat. In 50 cases single layer anastomosis and in another 50 cases double layer anastomosis done.

Mean age of participants in single layer anastomosis group (Group A) was 35.32±20.64 years while it was 39.18±16.96 years for double layer anastomosis group (Group B). (p 0.31) In present study, all age groups are included, in which 20-39 years age group has higher incidence of intestinal anastomosis (Table 1).

Male to female ratio in present study, in Group A was 3.16:1 and in Group B, it was 4:1. Gender is almost equally distributed among single as well as double layer anastomosis. Male have more preponderance among both type of anastomosis.

Abdominal pain and tenderness observed significantly (p=0.009) more among patients distributed among those who undergo double layer anastomosis. Rest of all

**Table 1:** Distribution of study participants according to age group and gender

Age group (in years)	Single layer anastomosis N=50 (%)	Double layer anastomosis N=50 (%)
0-19	12 (24%)	4 (8%)
20-39	20 (40%)	24 (48%)
40-59	10 (20%)	16 (32%)
60-79	8 (16%)	6 (12%)
<b>Gender</b>		
Male	38(76%)	40(80%)
Female	12(24%)	10 (20%)

symptoms and signs were comparable in single as well as double layer anastomosis without significant difference (Table 2).

Air fluid levels in x ray abdomen standing are significantly more ( $p=0.012$ ) observed among those patients who had undergone double layer anastomosis. Dilated bowel loops in USG abdomen and pelvis are significantly more ( $p=0.012$ ) observed in those patients who had undergone double layer anastomosis (Table 3).

Patients before operation were undergone investigations like RBS, B.urea, S.creatinine, S.na+, S.k+, S.bilirubin. There is no significant difference in the

investigations of both type of anastomosis for above mentioned parameters (Table 4).

According to Table 5, equal number of anastomosis were performed of each type in single layer as well as double layer. Out of 100 patients 82 (82%) patients arrived in emergency. Among them 46 patients were treated with double layer anastomosis while 36 by single layer method.

According to table 6, in both types of anastomosis mean oral day is 4<sup>th</sup> POD. Both type of anastomosis having mean oral day same without significant difference ( $p-0.11$ ).

**Table 2:** Comparison of Clinical Presentation

Clinical Presentation	Single layer anastomosis N=50 (%)	Double layer anastomosis N=50 (%)	p value
<b>Symptoms</b>			
Pain	36 (72%)	46 (92%)	0.009
Fever	16 (32%)	20 (40%)	0.405
Vomiting	22(44%)	30 (60%)	0.109
Abdominal Distention	24 (48%)	30 (60%)	0.229
<b>Signs</b>			
Tenderness	36 (72%)	46 (92%)	0.009
Guarding	36 (72%)	32 (64%)	0.391
Rigidity	34 (68%)	28 (56%)	0.216
Pallor	44 (88%)	48 (96%)	0.14
Jaundice	6 (12%)	4 (8%)	0.505
Edema feet	4 (8%)	6 (12%)	0.505

**Table 3:** Radiological investigations

Radiological technique	Findings	Single layer anastomosis N=50	Double layer anastomosis N=50	p-value
X-ray abdomen standing	Free Gas	22	22	1
	Air Fluid Level	12	24	0.012
USG Abdomen and pelvis	Free Fluid	34	40	0.171
	Dilated Bowel loops	12	24	0.012

**Table 4:** Comparison of Biochemical parameters between study groups

Biochemical parameters	Single layer anastomosis N=50 Mean $\pm$ SD	Double layer anastomosis N=50 Mean $\pm$ SD	p-value
RBS	100.06 $\pm$ 26.112	93.46 $\pm$ 19.342	0.53
B_UREA	38.8 $\pm$ 18.473	38.94 $\pm$ 19.157	0.97
S_CREATININE	1.118 $\pm$ 0.5927	1.098 $\pm$ 0.4792	0.853
S_Na	123.5 $\pm$ 7.0977	126.82 $\pm$ 9.8513	0.056
S_K	3.912 $\pm$ 0.758	4.14 $\pm$ 0.8066	0.148
S_BILIRUBIN	0.904 $\pm$ 0.2785	0.948 $\pm$ 0.2922	0.443

**Table 5:** Region of bowel affected

Types of anastomosis	Single layer anastomosis N=50	Double layer anastomosis N=50	Total
Duodeno-Jejunal	2	2	4
Jejuno-jejunal	4	4	8
jejuno-ileal	2	2	4
ileo-ileal	25	25	50
gastro-jejunal	10	10	20
ileo-colic	5	5	10
colo-colic	2	2	4
Total	50	50	100

Mean time taken for anastomosis in single layer technique was 11.34±2.65 minutes and for double layer technique was 23.58±4.36 minutes. (p <0.001) Mean hospital stay in single layer technique was 11.46±2.44 days while it was 11.57±2.35 days in double layer technique (p 0.818).

Wound infection was found in 2 (4%) patients in group - A and 3 (6%) patients in group - B developed wound infection. Total 5 patients out of 100 cases, developed wound infections (10%) and all cases were operated in emergency. Postoperative leak was seen in 2 (4%) patients of single layer anastomosis while it was seen in 3 (6%) patients in double layer anastomosis group. One mortality had occurred in group - B (2%) which was due to septicemia with multi-organ failure, associated with other co-morbidities like DM, HT, ARF and IHD. (Table 7).

Relyonsilk was used as suture material used in single layer technique while in double layer technique Relyonsilk as well as polyglactin 910 were used. Thus effective anastomosis can also be made possible subsiding cost of polyglactin 910 and making cost effective anastomosis.

**Discussion**

Intestinal anastomosis is a surgical procedure to establish communication between two formerly distant portions of the intestine. This procedure restores intestinal continuity after removal of a pathological condition affecting the bowel. Intestinal anastomosis is one of the most commonly performed surgical procedures, especially in the emergency setting, and is also commonly performed in the elective setting when resections are carried out for benign or malignant lesions of the gastrointestinal tract. A disastrous complication of intestinal anastomosis is anastomotic leak resulting in peritonitis, which is associated with high morbidity and mortality. Proper surgical technique and adherence

to fundamental principles is imperative to ensure successful outcome after intestinal anastomosis. Intestinal anastomosis can be performed by a hand-sewn technique using absorbable or no absorbable sutures or stapling devices [7].

In present study mean oral day of single layer anastomosis was 4.4 days which was less than double layer anastomosis was 4.88 days. In study Shikata et al. [8] mean oral day for group A is 4.5 days and 5.2 days for group-B. In study Samullah et al.[9] mean oral day of group-A is 4.8 days and for group-B is 4.9 days. In study Burch et al.[2] mean oral day is 4.6 days for group-A and for group-B is 5.6 days. In study Maurya et al. [10] mean oral day of group-A is 4.8 days and for group-B is 6.7 days.

Mean oral day for single layer anastomosis was less than double layer anastomosis probably due to single layer group tolerated oral fluids earlier and duration of intravenous alimentation was shorter for single layer group.

In present study time taken for anastomosis in single layer anastomosis is 11.34 mins and for double layer anastomosis is 23.58 mins. In Shikata et al. [8] study time taken for group-A is 23.4 min and 36.9 min for group-B. In study Samullah et al. [9] time taken for group A is 10.1 min and for group-B is 20.5 min. In study Burch et al. [2] time taken for group-A is 20.8 min and 30.8 min for group-B.

According to present study single layer anastomosis required significantly less time to construct than double layer anastomosis which was comparable with other studies due to double layer of the bowels were taken.

In present study single layer anastomosis hospital stay was 11.46 days and for double layer anastomosis was 11.57 days. In other studies Shikata et al. [8], Samullah et al. [9], Burch et al.[2], Maurya et al.[10] hospital stay for single/double layer anastomosis was 9.9/13 days, 10.5/14.75 days, 7.9/9.9 days, 11.4/18.6 days. In single layer anastomosis speed approaches that

**Table 6:** Comparison of Oral day

Oral Day (POD)	Single layer anastomosis N=50 (%)	Double layer anastomosis N=50 (%)
4	38 (76)	38 (76)
5-7	10 (20)	6 (12)
8-10	2 (4)	4 (8)
>10	0 (0)	2 (4)
Mean oral day	4.40 ± 0.96	4.88 ± 1.86

**Table 7:** Post-operative complications

Complications	Single layer anastomosis N=50 (%)	Double layer anastomosis N=50 (%)	p-value
Wound infections	2 (4%)	3 (6%)	1.05
Intraabdominal abscess	1 (2%)	1 (2%)	1
Burst abdomen	0(0%)	1 (4%)	0.82

of a stappled anastomosis, as mentioned by W. H. F. Thompson [11].

Hospital stay was comparable between two anastomosis and no significant difference was observed in between single as well as double layer anastomosis which if compare with other studies which shows slightly less hospital stay for single layer anastomosis then double layer anastomosis may be due to early starting of enteral feeding among single layer anastomosis and less intravenous alimentation of drugs.

In present study 2(4%) leaks were present in single layer anastomosis and 3(6%) leaks were present in double layer anastomosis. Anastomotic leak in present study was compared with other studies Shikata et al. [8], Samullah et al. [9], Burch et al. [2], Maurya et al. [10] by single/double layer anastomosis, 1(2.2%)/2(4%), 0(0%)/2(5%), 2(3.3%)/1(1.5%), 4(6.6%)/20(17.8%). According to A. W. bronwell [12] noted no leakage in the single layer group as compared to 3 cases out of 143 (2%) in multiple layer anastomosis. According to L.P. Fielding and Sarah Stewart Brown [13], the patient age, the form of clinical presentation (elective, obstruction, perforation) the suturing technique and the grade of surgeon carrying out the anastomosis were not associated with any overall differences in anastomotic leakage.

Anastomotic leak was having similar rate in both types of anatomosis single as well as double layer which also comparable with most of the other studies. In present study not much significant difference was observed between the postop leaks for both single as well as double layer anastomosis which was comparable with other studies. Single layer anastomosis having slightly less leak and abscess than double layer may be due to more development of edema and tension at the suture site in double layer anastomosis than comparison with single layer anastomosis.

### Conclusion

Single layer anastomosis requires less time to construct, cost effective, reduces the operation time, without increase in risk of anastomotic leak and other complications. So, we came to conclude that the single layer interrupted anastomosis is equivalent to the two layer traditional intestinal anastomosis.

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