

## ORIGINAL ARTICLE

# Single Versus Double Layer Anastomosis of Small Intestine. A Prospective Study at Lahore General Hospital Lahore, Pakistan

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## ABSTRACT

**Objectives:** To compare the outcome of single layer interrupted with conventional double layer small bowel anastomosis in terms of anastomotic leak, operative time and length of hospital stay.

**Patients and Methods:** This prospective comparative study was conducted in Surgical Unit-II, Postgraduate Medical Institute at Lahore General Hospital, Lahore over a period of six months from December 2009 to June 2010. A total of 100 adult patients, requiring small bowel anastomosis were considered eligible for enrolment in study. They were randomized to have either a single layer interrupted extra-mucosal anastomosis (Group A) or conventional double layer anastomosis (Group B). Anastomotic leak, time required to complete the anastomosis and hospital stay in both the groups were main outcome measures.

**Results:** The mean age of patients in group A and B was 28.58±10.80 and 32.38±10.07 years respectively. Intestinal tuberculosis was the commonest disease requiring resection and anastomosis followed by the traumatic injuries of small intestine. Time required to complete the single layer anastomosis was significant less than double layer anastomosis group (P=0.0001). However there was no significant difference in the complications rate of both the groups (P=0.55). Hospital stay in single layer group was 6.74±0.83 days whereas it was 8±0.90 days in double layer group (P=0.0001).

**Conclusion:** Single layer interrupted extra mucosal anastomosis is a better technique than double layer anastomosis, because it is associated with short operative time, better healing, comparable leakage rate and shorter hospital stay.

**Key words:** Anastomosis, single layer anastomosis; double layer anastomosis, Leakage, Fistula, complications, small intestine

## INTRODUCTION

Intestinal anastomosis has been successfully performed for more than 150 years by employing a variety of techniques, material and devices.<sup>1</sup> Historically two- layer anastomosis, using interrupted seromuscular silk sutures and a running absorbable suture for a transmural inner layer has been practiced by majority of the general surgeons for most of the surgical situations.<sup>2,3</sup> The main concern about this technique is the significant tissue ischemia in suture line and narrowing of the lumen, which ultimately leads to poor healing and anastomotic dehiscence.<sup>2-5</sup>

Recently, single layer extra-mucosal interrupted anastomosis has become popular among the surgeons as it requires less time, easy to learn and cost effective.<sup>1, 6-11</sup> It allows accurate tissue apposition; incorporate the strongest layer

(submucosa) of gut into suture line, minimal damage to submucosal vascular plexus and least disturbance to lumen.<sup>12</sup> However, surgeons are worried about the potential hazard of anastomosis leak, associated with this technique, which carries significant morbidity and mortality. Up till now numerous clinical studies have demonstrated that single layer anastomosis is safe and effective method which is associated with improved post operative return to normal bowel function without any significant difference in the anastomotic leak compared to the conventional double layer anastomosis.<sup>1-10</sup>

Therefore this study was planned to compare the outcome of single layer extra mucosal interrupted intestinal anastomosis with double layer conventional method of small bowel anastomosis in terms of anastomotic leak,

operative time and length of hospital stay in our local set up.

## PATIENTS AND METHODS

This prospective comparative study was conducted on 100 adult patients with small intestinal pathologies needing surgical resection and anastomosis, admitted through Accident and Emergency and Out-patients Department in Surgical Unit II, Lahore General Hospital Lahore over a period of 6 months from December 2009 to June 2010. These patients were randomized into, Group A and Group B by closed envelope method. Group A included 50 patients, who were subjected to single layer interrupted extra-mucosal anastomosis, while the group B comprised of other 50 patients, who had conventional double layer anastomosis.

The patients with history of diabetes mellitus, chronic renal failure, chronic heart disease or patients on steroids or chemotherapy were excluded from the study. Moreover, the patients, who were haemodynamically unstable, having frank peritonitis of longer duration, were also excluded from the study. The research protocol was approved by local research and ethical committee. Informed consent was taken from all the patients.

Patients of both the groups were adequately resuscitated by intravenous fluids, and antibiotics before surgery. Naso-gastric tube and Foley's catheter were inserted in all the patients. All the patients were operated through the midline incision by the training surgical residents under the supervision of qualified surgeons or by qualified surgeon themselves.

In Group-A single layer interrupted extra-mucosal anastomosis was performed with Polyglactin 910 (Vicryl 2/0 or 3/0) on round body needle. Two stay sutures were placed at both mesenteric and anti-mesenteric ends. First posterior and then the anterior layer was completed by placing the sutures at the equal distance of about 3 mm apart. In Group B, double layer anastomosis was performed by two complete layers of sutures, first layer of through and through sutures followed by a layer of sero-muscular Lembert stitches with Polyglactin 910 (Vicryl 2/0 or 3/0) on round body needle. At the end, lumen of the gut was checked for narrowing by bi-digital examination.

All the patients received postoperative ceftriaxone (1gm I/V BID) and metronidazole (500

mg IV; TID) for five day. The patients of both the groups were carefully monitored postoperatively for their vital signs, abdominal distension, return of bowel sounds, signs of peritonitis and leukocytosis. Naso-gastric tube and Foley's catheter were removed after 48 hours postoperatively. Patients were allowed to take oral sips, then fluid and semisolids on the return of bowel activity. Postoperative leakage was assessed clinically. Ultrasound abdomen-pelvis and X-ray abdomen were done in doubtful cases only. In case of leak, after optimization of the patient emergency exploration and temporary ileostomy was constructed.

Patients were discharged home, when they were pain free, fully mobile, tolerating oral diet. They were advised to come for follow up in the surgical clinic. The data regarding demography, mode of presentation, diagnosis, and procedure performed and the outcome measures (duration of procedure, hospital stay, anastomotic leakage) were collected on a Proforma. Duration of procedure was defined as the time between the placement of first stitch and the cutting of the excessive suture material from the last stitch. Post operative hospital stay is the time from the operation to the discharge from the hospital. Anastomotic leak was defined as the visible intestinal contents in the drain or in the wound or obvious disruption of suture line during re-exploration.

The data analysis was done by using Statistical Package for the Social Sciences (SPSS) version 16.0. Mean of numerical or continuous variables were compared by student T- test. Categorical data comparison was made by Fischer exact test. The Probability value (P- value) of less than 0.05 was considered as statistically significant.

## RESULTS

One hundred adult patients were enrolled for this study. They were randomized to have either single layer extra-mucosal anastomosis (Group A) or double layer conventional intestinal anastomosis (Group B). These 100 patients had 104 anastomoses. The same technique was used for an extra anastomosis in the patient of any group. Both the groups were comparable in terms of their demographic features, type of diseases and the mode of admission (Table No 1).

There was no significant difference in the complication rate of both the groups (Table 2).

However the time required to complete the anastomosis was significant shorter in group A than that of group B (18.54 versus 25.56 minutes; P=0.0001). Similarly the hospital stay was longer in group B compared to group A (8 versus 6.74 days P= 0.0001). One patient, who developed fistula in group A had enteric perforation. He was re-explored and underwent exteriorization of both ileal ends out as ileostomy and mucous fistula. One patient had traumatic perforation while the

other had tuberculous stricture in group B who developed anastomotic leakage. Both the patients were re-explored and had ileostomy and peritoneal lavage. The patients who developed intra-abdominal collections were managed by ultrasound guided per-cutaneous catheter drainage and broad spectrum intravenous antibiotics.

**Table 1:** Comparison of study groups

Variables	Single layer (Group A)	Double layer (Group B)	P value
<b>No of anastomosis</b>	<b>51</b>	<b>53</b>	
Age (years)	28.58±10.80	32.38±10.07	0.0719
Sex (M/F)	34:16	30:20	
Elective surgery	12(24%)	14(28%)	1.000
Emergency surgery	38(76%)	36(72%)	1.000
Traumatic perforation	13(26%)	12(24%)	0.8153
Intestinal tuberculosis	16(32%)	18(36%)	0.8330
Enteric perforation	10(20%)	11(22%)	0.8097
Malignancy	7(14%)	6(12%)	1.000
Gangrenous bowel	4(8%)	3(6%)	1.000

**Table 2:** Outcome of both groups

Variables	Single layer (Group A)	Double layer (Group B)	P value
Number of anastomosis	51	53	
Mean time of anastomosis construction (minutes)	18.54±1.62	25.56±1.54	0.0001
Mean Hospital stay (days)	6.74±0.83	8.00±0.90	0.0001
Anastomotic Leakage	1(2%)	2(4%)	
Abdominal collections	4(8%)	6(12%)	
Total complications	5(10%)	8(16%)	0.5500

## DISCUSSION

Intestinal anastomosis is a common general surgical procedure, carried out in most of the situations, like obstruction or perforation of bowel due to trauma or other inflammatory and neoplastic conditions.<sup>3</sup> Intestinal infectious diseases like tuberculosis and typhoid were the most common diseases which required resection and anastomosis in our study. Abdominal injuries leading to mesenteric tears and traumatic perforation constitute the second largest group, which require resection and anastomosis. The same pattern of indications for resection and anastomosis has been observed in other local

series.<sup>3, 10</sup> These diseases are fairly common in this part of the world because of poor hygienic living conditions and deteriorating law and order situation in this country. Hence the majority of our patients (74%) were admitted through accident and emergency department as reported by others.<sup>3, 4, 10</sup>

Intestinal anastomosis can be performed by using stapled and hand sewn techniques. Stapled techniques decrease the operative time, and contamination, but are expensive, and should be used with caution in the presence of severe bowel inflammation.<sup>13</sup> Therefore hand sewn anastomosis is a commonly practiced technique in our public

sector hospitals. Hand sewn anastomosis can be performed with continuous or interrupted method using one or two layers of sutures. Historically double layer anastomosis has been the preferred technique until the late seventies of the last century.<sup>11</sup> This method takes longer to construct and is technically more challenging to perform because it requires the identification of individual layers of gastrointestinal tract and then their appropriate approximation. It also reduces the intestinal lumen due to multiple layer closure that leads to significant tissue damage and ischemia resulting in prolonged intestinal recovery and increases the risk of anastomotic leak.<sup>11</sup>

As an alternative, single layer technique emerged in early eighties of the 20th century. It incorporates the strongest sub-mucosal layer, allows accurate tissue approximation, appropriate alignment, good local blood supply and tension free equally spaced stitches which leads to better healing and maintaining the adequate bowel lumen.<sup>11</sup> The ultimate success of any technique is its ability to heal without leakage. Anastomotic leak has catastrophic consequences for patient's health and cost of care.<sup>14-17</sup>

We encounter one patient (2%) of anastomotic leak in single layer group while two patients (4%) developed anastomotic dehiscence in double layer group. Burch JM et al<sup>1</sup> reported a leak rate of 3.1% and 1.5% in single and double layer groups respectively. They have also calculated an average leak rate of 1.7% in 3027 patients of single layer anastomosis in published series. Mirza SM et al<sup>9</sup> observed 2% leak rate in single layer compared to 8% leak in double layer group. Similarly Mehmood Y<sup>3</sup> et al and Rajput MJ et al<sup>10</sup> did not find any significant difference in the leak rate of both the study groups. Shikata S et al<sup>2</sup> in a meta-analysis of six randomized controlled trial couldn't demonstrate the higher incidence of leak in single layer compared to double single layer anastomosis.

In our study, there was a significant difference in the time required to construct the anastomosis between the groups (18.54 versus 25.56 minutes; P=0.0001). Nonetheless we didn't include the time required to prepare the bowel ends, which is obviously more in double layer technique. Burch JM<sup>1</sup> reported a mean time of 20.8 minute and 30.7 minute to construct single and double layer anastomosis respectively. Similarly Mehmood Y<sup>3</sup> concluded that the single layer can be performed in shorter time than double layer anastomosis.

We didn't evaluate the cost of suture material used in both the techniques. However a significant difference in the cost of suture materials between two techniques was observed by Burch JM et al<sup>1</sup> (\$4.5 for single-layer compared to \$35.4 for two-layer anastomosis) because of more suture material consumption in double layer group. Shikata S et al<sup>2</sup> supported single layer anastomotic technique as an optimal choice in most of the surgical situations because of its cost effectiveness in the use of suture material and time economy for its construction.

Single layer extra-mucosal anastomosis obviously has a large lumen than double layer. Therefore, gastrointestinal functions return to normal in shorter time, which ultimately leads to short hospital stay. Moreover it can also be explained due to good blood supply at the cut edges of bowel and the least damage to sub-mucosal plexuses. Both the factors lead to rapid vascularization and mucosal healing which increases the strength of anastomosis in first few post operative days.<sup>18, 19</sup>

We observed a significant difference in the hospital stay between the groups (8 versus 6.74 days P= 0.0001). Mehmood Y<sup>3</sup> and Burch JM et al<sup>1</sup> both found a longer hospital stay among their patients who had double layer anastomosis than single layer group, though the difference was not statistically significant. Maurya et al<sup>20</sup> also showed that the single-layer group could tolerate oral fluids earlier, hence the duration of parenteral alimentation was shorter compared to two-layer patients (4.8 days versus 6.7 days).

Mortality remained nil in our study. It can be attributed to the strict selection criteria for anastomosis in this study. Patients who were haemodynamically unstable, had frank peritonitis of longer duration or had other adverse general factors for anastomosis healing were subjected to stoma on the first operation. Rajput MJ et al<sup>10</sup> reported a mortality of 1.38%, whereas Samiullah<sup>4</sup> had the mortality of 3.2% in double layer group while it was nil in single layer group.

## CONCLUSION

Single layer interrupted extra mucosal anastomosis is a better technique than double layer anastomosis in a variety of surgical conditions, because it is associated with short operative time, better healing, comparable leakage rate and shorter hospital stay.

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