

ORIGINAL ARTICLE

*A Comparative Study to Assess the Bowel anastomosis Using Double Layered and Single Layered Closure*Arun Kumar Gupta¹, Abhishek Sachar² and Baljit Jassal³^{1,2} Department of Surgery, ³Department of Pharmacology¹K D Medical College, Mathura, Uttarpradesh. ²SBL Civil Hospital, Jalandhar, Punjab.³Punjab Institute of Medical Sciences, Jalandhar, Punjab, India**Abstract:**

Background: Bowel resection and anastomosis address various conditions, including bowel gangrene, polyps, intussusceptions, roundworm infestation with obstruction, tuberculosis with stricture or perforation, and traumatic perforations. Traditional two-layer intestinal anastomosis is time-consuming and intricate, while the single-layer method is quicker and cost-effective, albeit with safety concerns. The objective is to analyze better technique for bowel anastomosis by comparing the single layered versus double layered anastomosis. This study compares pain scores and post-operative nausea vomiting in single layered and double layered anastomosis. **Material and Methods:** The study spanned 12 months, involving 50 patients undergoing small and large bowel resection and anastomosis. After fulfilling inclusion and exclusion criteria, patients were randomized into Group 1 (single-layer anastomosis) or Group 2 (double-layer anastomosis). Pain and postoperative nausea and vomiting were noted in the early postoperative period. The pain was assessed using Numerical Rating Pain score of 10 units, where zero indicated 'no pain' and 10 indicated 'most severe or worst pain'. Severity of nausea was assessed as mild, moderate and severe in terms of interference with daily activities. **Results:** Group 1 experienced mild pain (52%), while Group 2 reported moderate pain (48%). Mild postoperative nausea and vomiting were frequent. Anastomosis took less time in Group 1 (17.24 ± 2.80 minutes) than Group 2 (28.12 ± 2.19 minutes) ($P < 0.05$). Hospital stays were similar. Group 1 had 3 anastomotic leaks and 1 wound infection, while Group 2 had 2 leaks and 2 wound infections. A slightly higher anastomotic leak prevalence in Group 1 lacked statistical significance. **Conclusion:** Single-layer closure demonstrated quicker recovery, better pain scores than double layered closure.

Keywords: Bowel resection, bowel anastomosis, single-layer anastomosis, double-layer intestinal anastomosis, pain scores, post-operative nausea-vomiting, anastomotic leak

Introduction:

Intestinal anastomosis is a surgical operation done for connecting the previously separated sections of the intestine. It was traditionally accomplished in two layers, but had disadvantages like being relatively tedious and time-consuming to complete. The single-layer approach has the potential benefit of taking less time and less expenditure, while safety may be an issue.^[1] In double layered technique, interrupted silk sutures are used for an outer inverted seromuscular layers and continuous sutures for inner transmural.^[6] In the single layered technique, only seromuscular layer is approximate through continuous sutures which causes less damage to submucosal vascular plexus, incorporate strongest submucosal layer, least chances of narrowing of lumen and accurate tissue apposition. The technique for single layered closure is simple, easy, less time, uses less sutures material than the double layered. This technique also theoretically provides better post-operative condition in which bowel anatomy and physiology can return to normal earlier, causing minimal tissue trauma and less narrowing of the lumen.^[7]

Randomized trials or meta-analyses reported no significant differences in the rates of anastomotic leakage, perioperative complications, mortality, or length of hospital stay among these two procedures.^[2-5] But many researchers have observed that single layer anastomosis is better in terms of shorter duration of procedure, shorter hospital length, lesser complications, cost-effectiveness, while *Goligheret al.*^[3] and *Burchet al.*^[4] reported lower prevalence of anastomotic leak with double layer technique. Also, earlier studies did not take into consideration pain and postoperative nausea and vomiting. Hence, the present study was initiated to compare the single layer and double layer anastomosis in terms of duration of the procedure, length of hospital stay, postoperative complications (with special emphasis on postoperative nausea and vomiting) and pain.

Material and Methods:

The present prospective, randomized, comparative study was conducted in the Department of Surgery,

SBSL Civil Hospital, Jalandhar, Punjab during the period of 1 year. All the in-patients undergoing elective or emergency resection and anastomosis of small- and large-bowel, during the study period, formed our study population. Fifty such patients were enrolled.

Patient of age more than 18 years and less than 60 years of any gender; and those undergoing resection and anastomosis of small and large bowel for causes such as intestinal obstruction due to bowel ischemia, strangulated hernia, traumatic bowel injury, bowel tumor, etc. were included. Patient with comorbidities (diabetes mellitus, steroid abuse, etc.); patient having colorectal anastomosis with restricted access; and those not willing to provide their voluntary written consent to participate in the study, were excluded.

The present study was approved by the Institutional Ethics Committee and Scientific Review Committee. All the study related procedures were conducted after obtaining the voluntary written informed consent from each eligible patient.

The enrolled patients were randomized using computer generated numbers into two groups: Group 1(n=25)and Group 2(n=25).Group 1 patients underwent single layer anastomosis and Group 2 patients underwent double-layer anastomosis. Thorough physical and clinical examinations were conducted and preoperative investigations were done. Before posting the patient for surgery, preoperative anesthetic check-up was done and patient was taken for surgery, if found fit. The patients underwent single-layer or double-layer anastomosis based on randomization. Single layered bowel anastomosis was done using silk where extramucosal sutures were taken continuously as a single layer without any reinforcement. The double layered bowel anastomosis was done using vicryl (polygalactic) where the sutures were taken extramucosally as a first layer and then reinforced by suturing seromuscular layer across the previous one using silk as the second layer interrupted. Duration of surgery, length of hospital stay, and complications were noted. Pain and postoperative nausea and vomiting was also noted in the early postoperative period. The pain was assessed using Numerical Rating Pain score of 10 units, where zero indicated 'no pain'and 10 indicated 'most severe or worst pain'. Severity of nausea was assessed using the following scale, which assesses the frequency, intensity and duration of nausea:^[8]

- I. :Mild–Does not interfere with activities of daily living such as dressing, hygiene.
- II. :Moderate – Sometimes interfere with the daily living activities
- III. :Severe– Inability to undertake any activities

Online statistical software GraphPad and Epi Info were used for calculating the P values. Unpaired't' test was used to compare two group independent means and Z test for two sample proportion for comparing the

proportions. P value of<0.05 was taken as statistically significant.

All the patients were explained about their rights during the study, including their right to withdraw at any stage. All the study related expenses were borne by the investigator. Surgery cost, medicines, and hospital stay were all borne by the patients. The present study was not sponsored by any pharmaceutical company or institution.

Results:

In the present study, 50 patients undergoing elective or emergency intestinal anastomosis procedure were included. 25 patients each were randomized to Group 1 and Group 2, respectively. Group 1 patients underwent single-layer anastomosis and Group2 patients underwent double-layer anastomosis.

The mean age of the patients in Group1was 39.00 ±11.54 years and in Group 2, it was 39.04±12.91 years. Both the groups were comparable with respect to age of the patients (P=0.991). (Table1)

Table1: Distribution of patients according to age

Age	Group 1	Group 2
<=20years	1 4.0%	0 0.0%
21-40years	14 56.0%	18 72.0%
41-60years	10 40.0%	7 28.0%
Total	25 100.0%	25 100.0%
Mean age	39.00 ± 11.54	39.04 ± 12.91
Unpaired 't' test 't' value, df	-0.012, df=48	
P value	0.991, Not significant	

There were 5 (20%) females in Group 1 and 3 (12%) females in Group 2. Both the groups were comparable with respect to sex of the patients.

Ileal perforation, ileal stricture, ileocaecal tuberculosis, ileocaecal perforation, caecal perforation, jejunal perforation and carcinoma ascending colon were the diagnoses, for which the patients underwent intestinal anastomosis. Both the groups were comparable with respect to the diagnosis.

Resection with ileoileal anastomosis was done in 14 (56%) patients in Group 1 and 15(60%) patients in Group 2; right hemicolectomy with ileotransverse anastomosis was done in 7 (28%) patients in Group 1 and 6 (24%) patients in Group 2; resection with ileoascending anastomosis was done in 2 (8%) patients each in both groups; and resection with jejunojejunal anastomosis was done in 2 (8%) patients each in both

groups. Both the groups were comparable with respect to type of surgery performed. Site for anastomosis was enterocolic in 15(60%) patients in Group 1 and 17 (68%) patients in Group 2; enterocolic in 10 (40%) patients in Group 1 and 8 (32%) patients in Group 2. Both the groups were comparable with respect to anastomotic site. End-to-end anastomosis was done in all the patients of both groups.

The duration of procedure in Group 1 was 17.24 ± 2.80 minutes and in Group 2, it was 28.12 ± 2.19 minutes. Duration of procedure was significantly longer in Group 2 patients ($P=0.001$). (Table 2)

Table 2: Comparison of mean duration required to perform anastomosis

Groups	No.	Duration required to perform anastomosis [Mean \pm SD] minutes	Unpaired 't' test 't' value, df	P value
Group 1	25	17.24 ± 2.80	-15.305, df=48	0.001 Significant
Group 2	25	28.12 ± 2.19		

The mean length of stay in Group 1 patients was 8.08 ± 0.99 days; and in Group 2 patients, it was 8.52 ± 1.73 days. The mean length of stay was comparable between the two groups ($P=0.277$). Mild pain was seen in 13 (52%) patients in Group 1 and 7 (28%) patients in Group 2; Moderate pain in 9 (36%) patients in Group 1 and 12 (48%) patients in Group 2; and severe pain in 3 (12%) patients in Group 1 and 6 (24%) patients in Group 2. Pain severity was comparable between the two groups ($P=0.199$).

Mild postoperative nausea and vomiting (PONV) was seen in 18 (72%) patients in Group 1 and 16 (64%) patients in Group 2; moderate PONV in 6 (24%) patients in Group 1 and 8 (32%) patients in Group 2; and severe PONV in 1 (4%) patients each in both the groups. Both the groups were comparable with respect to postoperative nausea and vomiting ($P=0.817$).

Anastomotic leak was seen in 3 (12%) patients in Group 1 and 2 (8%) patients in Group 2; and wound infection in 1 (4%) patient in Group 1 and 2 (8%) patients in Group 2. The postoperative complications were comparable between the two groups ($P=0.766$).

One (4%) death was reported in Group 1. 3 (12%) patients in Group 1 and 4 (16%) patients in Group 2 recovered; and 21 (84%) patients each in both groups were asymptomatic at the final assessment. Both the groups were comparable with respect to final outcome ($P=0.564$) (Table 3).

Table 3: Distribution of patients according to final outcome

Final Outcome	Group 1	Group 2
Death	1 4.0%	0 0.0%
Recovered	3 12.0%	4 16.0%
Asymptomatic	21 84.0%	21 84.0%
Total	25 100.0%	25 100.0%

Pearson Chi-square value = 1.143, df=2, P value=0.564, Not significant

Discussion:

The present study was done to compare single layered and double layered closure of bowel anastomosis. The majority of the patients in both groups were between the ages of 21 and 40. Patients in Group 1 had a mean age of 39.00 ± 11.54 years, whereas those in Group 2 had a mean age of 39.04 ± 12.91 years. The mean ages of the two groups did not differ significantly ($P > 0.05$). Our findings are supported by Singh et al.,^[9] Nemma et al.,^[10] Patro et al.,^[11] and Ayub et al.^[12] also reported comparable mean ages between the two group of patients.

In both groups, the majority of the patients were male. The genders of the two groups did not significantly differ ($P > 0.05$). Studies done by Patil et al.^[13] and Khan et al.^[14] also reported a male preponderance, corroborating with our study's finding.

The majority of patients had ileal perforation as their primary cause, which was followed in decreasing order by ileal stricture, ileocaecal tuberculosis, ileocaecal perforation, caecal perforation, jejuna perforation, and cancer ascending colon. The diagnosis and the groups did not significantly correlate ($P > 0.05$). Overall, resection with ileoileal anastomosis was the most often performed operation, followed in decreasing order by right hemicolectomy with ileotransverse anastomosis, resection with ileoascending anastomosis, and resection with jejunojejunal anastomosis. The operation performed had no obvious relationship to the groups ($P > 0.05$).

In both the groups, enteroenteric and enterocolic were the most common anastomotic sites, which were significantly comparable between the two groups ($P > 0.05$).

Although no significant association could be established between postoperative pain level and the groups ($P > 0.05$), the majority of the patients in Group 1 had mild to moderate levels of postoperative pain, while the number of patients with severe post-operative pain was higher in Group 2 than in Group 1. Elsaid et al.^[15]

reported that 74.4% patients experienced some kind of postoperative pain within first 24 hours of surgery in patients undergoing elective surgeries. Type and duration of surgery were found to be significantly associated with postoperative pain. Our study population differs from that of the *Elsaid et al.*^[15] study. The level of moderate to severe PONV was also somewhat greater in Group 2 compared to Group 1, but no statistically significant relationship between the groups and the degree of PONV could be seen ($P>0.05$).

The mean anastomosis time in Group 2 was significantly longer than in Group 1 ($P<0.05$). *Singh et al.*,^[9] *Kumar et al.*,^[16] *Burch et al.*^[4] and *Mehmood et al.*^[17] in their studies also reported a significantly longer time for anastomosis in the double-layer group, supporting our study's finding.

In single-layer group, 12% patients had anastomotic leak and 4% patient had wound infection; while in double-layer group, anastomotic leak was seen in 8% and wound infection in 8% patients. The postoperative complications were comparable between the two groups. *Burch et al.*,^[4] *Shikata et al.*,^[1] *Mehmood et al.*^[17] and *Sajid et al.*^[18] reported that comparable prevalence of anastomotic leak between the single-layer and double-layer groups, which corroborates our study's finding. *Mittal et al.*^[19] found the following complications in patients with single-layer anastomosis: wound infection 16.67%, abdominal collection 10%, wound dehiscence 6.67%, systemic complications 6.67%. For double-layer technique patients, rates were: wound infection 23.33%, wound dehiscence 10%, abdominal collection 6.67%, systemic complications 6.67%, intestinal obstruction 3.33%. *Saboo et al.*^[20] reported similar infection, reintervention, and mortality rates between groups. *Dhamnaskar et al.*^[21] found comparable anastomotic dehiscence rates. Other complications were reported in other studies but not in ours. Overall, our study aligns with these findings, indicating higher anastomotic leak and lower wound infection in the single-layer group, though not statistically significant.

The average length of hospitalization did not differ substantially between the two groups ($P>0.05$). *Singh et al.*^[9] found similar hospital stays for single-layer (8.97 ± 3.08 days) and double-layer (8.93 ± 2.61 days) groups. *Mehmood et al.*^[17] reported comparable stays (6 days single layer vs. 5.87 days double-layer). *Sai et al.*^[22] likewise found no significant difference (single-layer: 12.35 ± 1.75 days, double-layer: 12.0 ± 2.44 days). These studies align with our findings. Contrary to our findings, studies done by *Sharma et al.*^[23], *Owaid et al.*,^[24] *Dhamnaskar et al.*^[21] and *Karet et al.*^[25] found a significantly longer mean hospital stay in the double layer group compared to the single-layer group. One death (4%) occurred in the single-layer group. Recovery rates were 16% for the double-layer and 12% for the single-layer group; the majority were asymptomatic at the final assessment. *Shah et al.*^[26] and *Pathak et al.*^[27] found similar mortality in the single-layer group, while no deaths occurred in the double-layer group. In contrast, *Patroet al.*,^[11] *Nemma et al.*,^[10] *Saboo et al.*,^[20] and *Ayub et al.*^[12] reported deaths in both single and double-layer groups, contradicting our findings.

Conclusion:

Intestinal anastomosis is a difficult surgical procedure due to its complexity and major complications in the postoperative period, leading to higher morbidity and mortality. Single layer anastomotic closure was found to be better than the double layer anastomotic closure in the present study. The time to perform anastomosis was significantly shorter, with very minimal postoperative complications. PONV and postoperative pain was also comparable between the two groups. Although, the hospital stay was similar to the double layered anastomotic closure, we found that single layer anastomotic closure to be safe and with a smaller learning curve and better prognosis. Hence, we recommend the use of single layer anastomosis in comparison to the double layer anastomosis closure.

Sources of supports: Nil

Conflicts of Interest: Nil

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