Section: General Surgery

Original Research Article

A COMPARATIVE STUDY OF SINGLE-LAYERED EXTRAMUCOSAL VERSUS TRADITIONAL DOUBLE-LAYERED INTESTINAL ANASTOMOSIS

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ABSTRACT

Background: Intestinal anastomosis is a critical procedure in both elective and emergency abdominal surgeries. The choice of technique can affect postoperative recovery, complication rates, and overall resource utilization. Single-layered extra mucosal anastomosis has been proposed as a faster and more economical alternative to traditional double-layered anastomosis. The aim is to compare the efficacy of double and single layered anastomosis in terms of safety, time required for the anastomosis, cost of the procedure and post-operative follow up. **Materials and Methods:** The present study was a Descriptive cross-sectional study. This Study was conducted from January 2024 to January 2025 in the Department of General Surgery, MGM Medical College and Hospital, Jamshedpur. The study population of 60 patients presenting to the Emergency Department. **Result:** The single-layered group demonstrated faster recovery: return of bowel sounds (1.9 ± 0.6 vs 2.6 ± 0.8 days; p = 0.001), first bowel movement (2.9 ± 0.5 vs 3.7 ± 0.8 days; p = 0.001), ICU stay (2.4 ± 0.5 vs 4.2 ± 1.5 days; p = 0.001), and hospital stay (7.5 ± 1.5 vs 9.7 ± 3.2 days; p = 0.001). Anastomotic leak occurred in 6.7% of patients in both groups, and overall postoperative complications were comparable (single-layered: 20% vs double-layered: 26.7%; p = 0.161), indicating similar safety profiles. **Conclusion:** Single-layered extramucosal intestinal anastomosis is as safe as the traditional double-layered technique, while offering faster postoperative recovery and reduced hospital stay, making it an effective and economical alternative in both elective and emergency surgeries.

INTRODUCTION

Intestinal anastomosis is one of the most frequently performed and critical procedures in abdominal surgery. It is commonly performed in conditions such as intestinal obstruction, perforation, trauma, ischemia, inflammatory bowel disease, and malignancy.[1] The integrity of an intestinal anastomosis is a major determinant of postoperative morbidity and mortality, as anastomotic failure can result in leakage, peritonitis, sepsis, prolonged hospital stay, and increased mortality.[2] Therefore, selecting an optimal anastomotic technique remains a fundamental concern for surgeons.

Traditionally, the double-layered intestinal anastomosis has been considered as the standard technique. This method consists of an inner continuous layer incorporating the mucosa and submucosa and an outer interrupted seromuscular layer.[3] Although widely practiced, the double-layered technique has several drawbacks, including longer operative time, increased tissue handling, higher suture material usage, greater cost, and possible compromise of blood supply to the anastomotic site.[4] Excessive inversion of bowel edges due to the seromuscular second layer can lead to ischemia and may predispose to stricture formation and delayed healing.

In contrast, the single-layered extra-mucosal anastomosis technique has gained popularity as a simpler and physiologically sound alternative. This technique involves placing sutures through the all the layers of bowel while excluding the mucosa, thereby preserving the submucosal vascular plexus, which is essential for wound healing.[5] The submucosa is recognized as the strongest layer of the intestinal wall, and accurate approximation of this layer is critical for achieving a secure anastomosis. Single-layered anastomosis minimizes tissue trauma, reduces ischemia, and promotes better healing.

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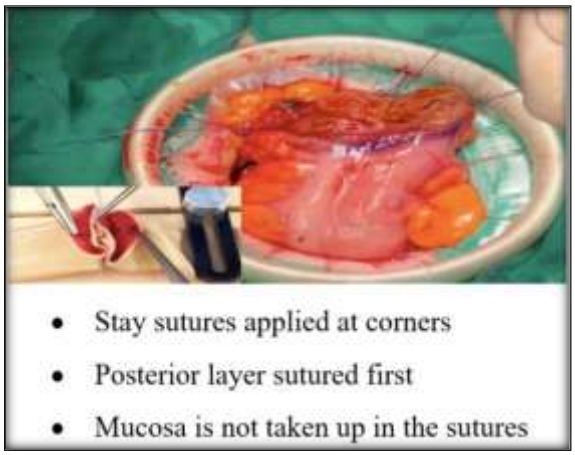
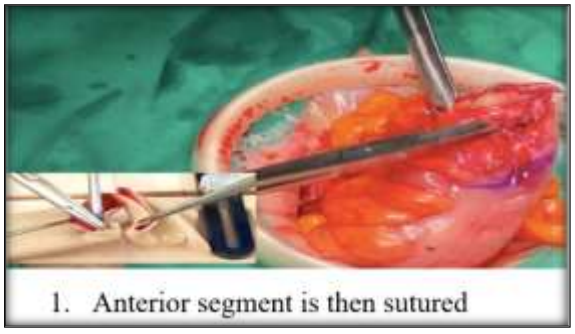
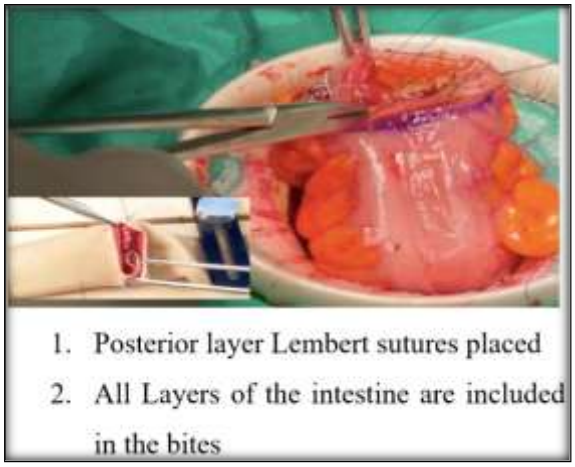
Several studies have demonstrated that single-layered extra-mucosal anastomosis is as safe as the traditional double-layered technique, with comparable rates of anastomotic leak and postoperative complications. Additionally, it offers advantages such as reduced operative time, lower cost, and decreased foreign body reaction due to lesser suture material. These benefits are particularly important in emergency surgical settings and in resource-limited hospitals, where shorter operative duration and cost-effectiveness are crucial.

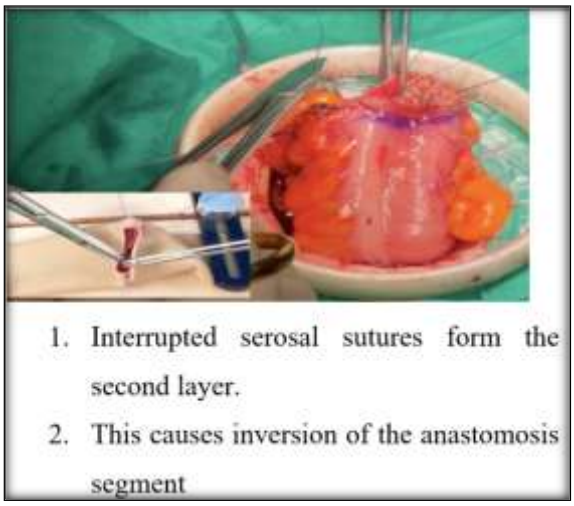






Despite increasing evidence supporting the efficacy of single-layered anastomosis, many surgeons continue to prefer the double-layered technique due to habit and perceived safety.[6] This has resulted in ongoing debate regarding the ideal method of intestinal anastomosis. Hence, further comparative studies are needed to evaluate both techniques objectively.

The present study was undertaken to compare single-layered extra-mucosal and traditional double-layered intestinal anastomosis in terms of safety, time required for anastomosis, cost of the procedure, and postoperative outcomes. The findings of this study may contribute to evidence-based surgical practice and aid in selecting a technique that ensures optimal patient outcomes with efficient use of resources. To compare the efficacy of double and single layered anastomosis in terms of safety, time required for the anastomosis, cost of the procedure and post operative follow up.



MATERIALS AND METHODS

Study design: Descriptive cross-sectional study
Place of study: Department of General Surgery, MGM Medical College and Hospital, Jamshedpur
Period of study: January 2024 to January 2025
Study Population: Patients undergoing intestinal anastomosis in emergency and elective surgical settings
Sample size: 60 patients. Simple random sampling
Inclusion Criteria:
- Patients aged 18–55 years
- Patients requiring bowel anastomosis in emergency or elective surgery
- Patients willing to give informed consent

Exclusion criteria:
- Patients with established peritonitis due to anastomotic leak
- Patients with severe comorbid conditions affecting wound healing

Study Variable:
- Type of anastomosis (single-layered or double-layered)
- Time taken for anastomosis
- Postoperative complications (leak, infection)
- Duration of hospital stay
- Cost of procedure

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spread

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sheet and then analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

RESULTS

Table 1: Age Distribution of Study Participants (n = 60)

Age Group (years)	Number of Patients	Percentage (%)
18–29	12	20
30–39	24	40
40–49	18	30
≥50	6	10
Total	60	100

Table 2: Diagnosis Distribution of Study Participants

Diagnosis	Number of Patients	Percentage (%)
Ileostomy closure	36	60
Intestinal obstruction	16	26.7
Penetrating abdominal injury	8	13.3
Total	60	100

Table 3: Postoperative Parameters (Mean ± SD)

Parameter	Double Layered (n = 30)	Single Layered (n = 30)	p value
Return of bowel sounds (days)	2.6 ± 0.8	1.9 ± 0.6	0.001
First bowel movement (days)	3.7 ± 0.8	2.9 ± 0.5	0.001
ICU stay (days)	4.2 ± 1.5	2.4 ± 0.5	0.001
Hospital stay (days)	9.7 ± 3.2	7.5 ± 1.5	0.001

Table 4: Postoperative Complications and Safety Profile

	Complication	Double Layered (n = 30) n (%)	Single Layered (n = 30) n (%)	Total n (%)	p value*
Anastomotic Leak	No	28 (93.3)	28 (93.3)	56 (93.3)	0.15
	Yes	2 (6.7)	2 (6.7)	4 (6.7)	
Any Complication	No	22 (73.3)	24 (80.0)	46 (76.7)	0.161
	Yes	8 (26.7)	6 (20.0)	14 (23.3)	

Most participants were in the 30–39 years age group (24/60; 40%), followed by 40–49 years (18/60; 30%). Patients aged 18–29 years accounted for 12/60 (20%), while those aged ≥50 years constituted the smallest group (6/60; 10%). This indicates a predominance of cases in the third and fourth decades of life.

The majority of patients underwent ileostomy closure (36/60; 60%). Intestinal obstruction accounted for 16/60 (26.7%) of cases, while penetrating abdominal injuries constituted 8/60 (13.3%). Elective ileostomy closure was thus the most common indication for intestinal anastomosis in the study population.

Patients in the single-layered anastomosis group demonstrated significantly faster postoperative recovery compared to the double-layered group. The mean time for return of bowel sounds was shorter in the single-layered group (1.9 ± 0.6 days) versus the double-layered group (2.6 ± 0.8 days; p = 0.001). Similarly, the first bowel movement occurred earlier in the single-layered group (2.9 ± 0.5 vs 3.7 ± 0.8 days; p = 0.001). ICU stay was also reduced (2.4 ± 0.5 vs 4.2 ± 1.5 days; p = 0.001), as was total hospital stay (7.5 ± 1.5 vs 9.7 ± 3.2 days; p = 0.001). These findings indicate a faster recovery profile with single-layered anastomosis.

Anastomotic leaks occurred in 6.7% of patients in both groups (2/30 in each), with no significant difference between the double- and single-layered techniques (p = 0.15). Overall postoperative complications were observed in 26.7% of patients in the double-layered group (8/30) and 20% in the single-layered group (6/30), while the majority of patients in both groups experienced no complications (73.3% vs 80%). The difference in complication rates was not statistically significant (p = 0.161), indicating that both techniques have comparable safety profiles.

DISCUSSION

The present study evaluated the outcomes of single-layered extramucosal versus traditional double-layered intestinal anastomosis, focusing on postoperative recovery and safety. The age distribution revealed that most patients were in the

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third and fourth decades of life, with 40% in the 30–39-year age group and 30% in the 40–49-year group. This predominance reflects the age group commonly affected by conditions requiring intestinal surgery, such as ileostomy closure and intestinal obstruction, and is consistent with findings from previous studies (Sai &Sugumar, 2020; Singh et al., 2022).[7,8]

Elective ileostomy closure constituted the majority of cases (60%), followed by intestinal obstruction (26.7%) and penetrating abdominal injuries (13.3%). Similar distributions have been reported in earlier comparative studies, where ileostomy closure was a frequent indication for intestinal anastomosis due to its planned nature and favorable operative conditions (Tawar et al., 2012; Yadhu, 2020).[9,10] Emergency cases such as obstruction and penetrating injuries formed a smaller proportion but were important for evaluating the applicability of both techniques across varied clinical settings.

Patients undergoing single-layered extramucosal anastomosis demonstrated significantly faster postoperative recovery compared to those receiving double-layered anastomosis. The time to return of bowel sounds, first bowel movement, ICU stay, and total hospital stay were all significantly reduced in the single-layered group ($p = 0.001$). These findings align with multiple studies reporting that single-layered anastomosis involves less tissue handling, preserves bowel vascularity, and reduces luminal narrowing, thereby facilitating early bowel function and shorter hospitalization (Akil et al., 2023; Ajack et al., 2025).[11,12]

Regarding safety, the incidence of anastomotic leak was identical in both groups (6.7%), with no statistically significant difference. Overall postoperative complications were slightly lower in the single-layered group (20%) compared to the double-layered group (26.7%), although this difference was not statistically significant. These results corroborate earlier studies demonstrating comparable leak rates and complication profiles between the two techniques, suggesting that single-layered anastomosis is as safe as the traditional double-layered method (Tawar et al., 2012; Akil et al., 2023; Ajack et al., 2025).[9,11,12]

The comparable complication rates, combined with significantly improved recovery parameters, highlight the clinical advantages of single-layered extramucosal anastomosis. In addition, previous literature emphasizes additional benefits such as reduced operative time and lower suture costs, making the single-layered technique more economical without compromising patient safety (Sai &Sugumar, 2020; Yadhu, 2020).[7,10] Overall, the findings of this study further strengthen existing evidence supporting the use of single-layered extramucosal anastomosis in both elective and emergency intestinal surgeries.

CONCLUSION

The study demonstrates that single-layered extramucosal intestinal anastomosis is as safe as the traditional double-layered technique, with comparable rates of anastomotic leak and overall complications. Moreover, it provides significant advantages in postoperative recovery, including earlier return of bowel function, shorter ICU stay, and reduced hospital stay. These findings indicate that single-layered extramucosal anastomosis is an effective, safe, and economical alternative for both elective and emergency intestinal surgeries, with the potential to improve patient outcomes while reducing operative time and resource utilization.

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