

Comparative Study on the Efficacy of Single-Layer vs. Double-Layer Small Gut Anastomosis in Patients Admitted to a Tertiary Care Center

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Article History	Abstract
Received: 16 June 2023 Revised: 05 Aug 2023 Accepted: 13 Oct 2023	Background: For a number of gastrointestinal diseases, small bowel resection with anastomosis is a common surgical treatment. The choice of anastomotic technique, specifically between single-layer and double-layer approaches, is still up for debate. Methods: Between December 2020 and June 2022, 50 patients who had small intestinal resections participated in this prospective observational study. Single-layer anastomosis (n = 28) and double-layer anastomosis (n = 22) groups of patients were created. Anastomotic leaks, postoperative complications, hospital stay, bowel function recovery, and patient satisfaction were all included in the outcome measures. Chi-squared and t-tests were utilized in the statistical analysis. Results: There was no statistically significant difference between the anastomotic leak rates of 7.1% in the single-layer group and 4.5% in the double-layer group ($p > 0.05$). Similar postoperative problems, hospital stays (averaged 6 days), recovery times for bowel function (averaged 3 days), and patient satisfaction levels were seen in both groups. Conclusion: Current study shows that single-layer and double-layer techniques yield equivalent results in small bowel resection and anastomosis. The fact that these procedures have similar anastomotic leaks, postoperative complications, hospital stays, and bowel function restoration times suggests that the surgeon's preference and experience may influence the decision. Both groups have great patient satisfaction, suggesting that the anastomotic approach has little to no impact on patient treatment.
CC License CC-BY-NC-SA 4.0	Keywords: Small Bowel Resection, Anastomosis, Single-Layer, Double-Layer, Gastrointestinal Surgery

1. Introduction

In gastrointestinal surgery, the small gut anastomosis technique, which involves surgically fusing two small intestine segments, is crucial. The single-layer and double-layer anastomosis techniques are two of the many techniques that are available, and they have been the focus of discussion and criticism within the surgical community for a long time. As the name suggests, single-layer anastomosis is joining the ends of the tissue to form an intestinal connection using a single layer of sutures. Contrarily, a double-layer anastomosis uses two layers of sutures, with the outer layer intended to strengthen and support the connection even more. Numerous considerations, such as the surgeon's inclination, the particular clinical setting, and previous surgical procedures, affect the decision between these techniques. Both approaches have supporters and detractors, each of whom extols the merits of their preferred way [1-5].

Single-layer anastomosis is praised for its simplicity and shorter operating time, which may lower the amount of anesthesia and surgical stress experienced by patients. Advocates claim that it can result in a more rapid recovery and less overall tissue stress. The potential for greater anastomotic leakage and postoperative problems, however, worries some opponents [6-8].

Contrarily, supporters of double-layer anastomosis claim that it provides a stronger and more secure connection. It is believed that the inner layer, which is frequently made up of an uninterrupted absorbable suture, will improve tissue apposition and watertight sealing, hence decreasing the possibility of leakage. However, this approach is frequently thought to be more time-consuming and technically challenging, which can lengthen the surgery [6-10].

For a variety of reasons, including cancer, inflammatory bowel illness, strictures, and trauma, surgeons conducting small intestinal resections must choose between single-layer and double-layer anastomosis. The continual argument about which strategy is better than another highlights the demand for in-depth analysis to clarify each method's benefits and drawbacks [10-15].

This study was conducted to evaluate the efficacy of single-layer vs. double-layer small gut anastomosis in patients.

2. Materials And Methods

This Study Design: This study uses a prospective, observational methodology. It will be carried out at a tertiary care facility from December 2020 to June 2022 over an 18-month period. 50 patients who require small bowel resection and anastomosis will be included in total. 28 patients will be enrolled in each group (single-layer and double-layer anastomosis) to account for potential loss to follow-up. Patients who underwent small intestinal resection and anastomosis throughout the study's time frame were eligible for inclusion.

- Patients ready to take part and give their informed consent.
- Patients with surgical contraindications are excluded.
- Pre-existing conditions in patients have a substantial impact on surgical results.

Randomization: To ensure allocation concealment, patients will be randomly assigned to either the single-layer or double-layer group, depending on the treating surgeon's preference.

Data collection: Basic patient data, including age, gender, and medical history, will be kept on file. Surgical information will be recorded, including the reason for the operation, the site of the anastomosis, and the qualifications of the surgeon. Surgical technique and other intraoperative findings, such as bowel preparation, will be recorded. Data on postoperative problems (anastomotic leaks, infections, and bleeding), length of hospital stay, and recovery period for bowel function will be gathered. An electronic database that is standardized will have all of the data.

Surgical Method: The anastomosis in the single-layer group will be done using just one layer of sutures. The anastomosis in the double-layer group will entail two layers of sutures. The operating surgeon will decide on a procedure based on personal preference and clinical judgment. To maintain consistency between the two groups, standardized surgical protocols will be used.

Measures of Results: The frequency of anastomotic leakage serves as the key outcome indicator. Postoperative complications (wound infections, hemorrhage, strictures) are examples of secondary outcome measures.

Duration of hospitalization: It's time for bowel movement to resume; overall patient happiness and healing.

Data will be evaluated using the proper statistical techniques, such as Fisher's exact tests or chi-squared tests for categorical variables. T-tests will be used to assess continuous variables. Statistical significance will be determined by a p-value below 0.05. To investigate possible changes in outcomes based on surgical indications or patient characteristics, subgroup analysis may be carried out.

3. Results and Discussion

Between December 2020 and June 2022, 50 patients who underwent small bowel resection and anastomosis at a tertiary care facility were enrolled in the study. With a 10% potential loss to follow-up, these patients were evenly split into two groups: 28 in the single-layer anastomosis group and 22 in the double-layer anastomosis group.

Baseline Factors: Patients in the single-layer group had a mean age of 54, whereas those in the double-layer group had a mean age of 56. In both groups, the gender distribution was essentially equal. Malignancies, inflammatory disorders, strictures, and trauma were only a few of the many conditions that required surgery. **Table 1**

The two groups' degrees of surgical experience were comparable.

Anastomotic leaks were the primary outcome in the single-layer anastomosis group, where they occurred in 2 out of 28 patients (7.1%). 1 out of 22 patients (4.5%) in the group that had double-layer anastomosis experienced an anastomotic leak. The rate of anastomotic leakage was not statistically different between the two groups (p-value > 0.05). **Table 2**

Secondary outcomes: Both groups experienced postoperative complications such as wound infections, hemorrhage, and strictures, but there were no statistically significant differences between them. **Table 3**

Both groups experienced hospital stays that lasted an average of six days. In both groups, it took an average of 3 days for bowel function to resume. There were no discernible differences between the two groups in terms of the overall patient recovery and satisfaction scores.

Subgroup Analysis: Based on surgical indications, subgroup studies did not find any appreciable differences in results between the two anastomotic procedures. The outcomes were true despite variations in patient traits and surgical indications. **Table 4**

Table 1: Baseline Characteristics of Study Participants

Characteristic	Single-Layer Anastomosis Group	Double-Layer Anastomosis Group
Mean Age (years)	54	56
Gender (Male/Female)	14/14	11/11
Indication for Surgery		
- Malignancy	10	8
- Inflammatory	8	7
- Stricture	6	5
- Trauma	4	2
Surgeon Experience		
- Junior	12	10
- Senior	16	12

Table 2: Primary Outcome - Anastomotic Leaks

Outcome	Single-Layer Anastomosis Group	Double-Layer Anastomosis Group
Anastomotic Leaks	2 (7.1%)	1 (4.5%)
p-value	>0.05 (Not significant)	

Table 3: Secondary Outcomes

Outcome	Single-Layer Anastomosis Group	Double-Layer Anastomosis Group
Postoperative Complications		
- Wound Infections	5 (17.9%)	4 (18.2%)
- Bleeding	3 (10.7%)	2 (9.1%)
- Strictures	2 (7.1%)	1 (4.5%)
Length of Hospital Stay (days)	6 (avg)	6 (avg)
Time to Return of Bowel Function (days)	3 (avg)	3 (avg)
Patient Satisfaction (High/Neutral/Low)	23/4/1	20/2/0

Table 4: Subgroup Analysis - Anastomotic Leaks by Surgical Indication

Surgical Indication	Single-Layer Anastomosis Group	Double-Layer Anastomosis Group
Malignancy	1 (10%)	1 (12.5%)
Inflammatory	1 (12.5%)	0
Stricture	0	0
Trauma	0	0
p-value	>0.05 (Not significant)	

The results of the study provide critical new knowledge on the relative effectiveness of single-layer and double-layer small gut anastomosis in patients having their small bowels removed. The rates of anastomotic leakage between the two operations did not show a statistically significant difference, according to the results. Secondary outcomes such surgical complications, length of hospital stay, when bowel function returned, and patient satisfaction was also comparable between the single-layer and double-layer anastomosis groups.

Anastomotic Leaks as the Primary Outcome: The lack of any detectable variation in anastomotic leakage frequency between the two groups is a striking finding. Anastomotic leaks are a serious issue in gastrointestinal surgery due to the possibility of sepsis and peritonitis, two conditions that might have fatal implications. Both single-layer and double-layer techniques may be able to maintain the integrity and seal of the anastomosis, as shown by the same rates of leakage in the two groups. This outcome is consistent with a few other studies that discovered comparable leak rates for the two strategies [11-13].

Secondary outcomes:

- **Postoperative Complications:** There were no discernible differences between the groups in the incidence of postoperative complications such as wound infections, bleeding, and strictures. This demonstrates that the risks associated with these issues are similar for the two methods.
- **Length of Hospital Stay:** The average length of hospital stays for both groups was 6 days. This finding implies that the choice of anastomotic technique had no impact on the overall length of stay for patients.
- **Time to Return of Bowel Function:** Both groups had comparable times for the return of bowel function, with an average of 3 days. This implies that whether a single-layer or double-layer anastomosis was used during surgery had no effect on how well the bowel worked afterwards.
- **Patient Satisfaction:** The overall level of patient satisfaction was high and was reported by both groups of patients. This demonstrates that both anastomotic approaches for small bowel resection were usually well received by the patients.

Analyzing subgroups: The results of the two anastomotic methods did not significantly differ based on surgical indications, according to subgroup studies. This suggests that a variety of clinical circumstances, including cancer, inflammatory illnesses, strictures, and trauma, may benefit from the preferred strategy [11-15].

Limitations:

- Because of the very small sample size, the results' applicability may be constrained.
- The study only employed one tertiary care centre; therefore, the results might not apply to other surgical settings.
- The bias and experience of the surgeon may have affected the anastomotic method selection, introducing confounding variables.

4. Conclusion

It can be claimed that this work contributes to the current debate over single-layer versus double-layer small gut anastomosis in the context of small bowel resection. Both methods can be regarded as safe and advantageous due to the fact that anastomotic leak rates and secondary outcomes did not significantly differ between them. The surgeon's preference and level of comfort may ultimately

determine whether procedure is used. To validate these findings and provide more specific guidance to surgeons making this essential surgical decision, larger studies and multi-center trials are required.

References:

1. Singh R, Najmi HI, Chahal RK, Nikhil D. A Comparative Study of Single-Layered Versus Double-Layered Intestinal Anastomosis. *Cureus*. 2022;14(3):e23088. Published 2022 Mar 12. doi:10.7759/cureus.23088
2. Kar S, Mohapatra V, Singh S, Rath PK, Behera TR. Single Layered Versus Double Layered Intestinal Anastomosis: A Randomized Controlled Trial. *J Clin Diagn Res*. 2017;11(6):PC01-PC04. doi:10.7860/JCDR/2017/24817.9983
3. Garude K, Tandel C, Rao S, Shah NJ. Single layered intestinal anastomosis: a safe and economic technique. *Indian J Surg*. 2013;75(4):290-293. doi:10.1007/s12262-012-0487-7
4. Aniruthan D, Pranavi AR, Sreenath GS, Kate V. Efficacy of single layered intestinal anastomosis over double layered intestinal anastomosis-an open labelled, randomized controlled trial. *Int J Surg*. 2020;78:173-178. doi:10.1016/j.ijsu.2020.04.066
5. Sajid MS, Siddiqui MR, Baig MK. Single layer versus double layer suture anastomosis of the gastrointestinal tract. *Cochrane Database Syst Rev*. 2012;1:CD005477. Published 2012 Jan 18. doi:10.1002/14651858.CD005477.pub4
6. Li YX, Wang F, Xu TL, et al. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2021;24(11):969-976. doi:10.3760/cma.j.cn441530-20210814-00330
7. He YJ, Ma TH, Zhu MM, et al. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2019;22(11):1034-1040. doi:10.3760/cma.j.issn.1671-0274.2019.11.006
8. Aslam V, Bilal A, Khan A, Bilal M, Zainulabideen, Ahmed M. Gastroesophageal anastomosis: single-layer versus double-layer technique--an experience on 50 cases. *J Ayub Med Coll Abbottabad*. 2008;20(3):6-9.
9. Ma PF, Cao YH, Zhang JL, et al. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2020;23(10):969-975. doi:10.3760/cma.j.cn.441530-20191010-00445
10. Close K, Epstein KL, Sherlock CE. A retrospective study comparing the outcome of horses undergoing small intestinal resection and anastomosis with a single layer (Lembert) or double layer (simple continuous and Cushing) technique. *Vet Surg*. 2014;43(4):471-478. doi:10.1111/j.1532-950X.2014.12143.x
11. Bao MDL, Ge L, Su H, et al. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2021;24(5):433-439. doi:10.3760/cma.j.cn.441530-20200505-00255
12. Zhang X, Zhang W, Yuan M, et al. Application of double layered end-to-end anastomosis with continuous manual suture for completing digestive tract reconstruction in totally laparoscopic distal gastrectomy. *BMC Surg*. 2021;21(1):213. Published 2021 Apr 26. doi:10.1186/s12893-021-01207-1
13. Burch JM, Franciose RJ, Moore EE, Biffl WL, Offner PJ. Single-layer continuous versus two-layer interrupted intestinal anastomosis: a prospective randomized trial. *Ann Surg*. 2000;231(6):832-837. doi:10.1097/0000658-200006000-00007
14. Burch JM, Franciose RJ, Moore EE, Biffl WL, Offner PJ. Single-layer continuous versus two-layer interrupted intestinal anastomosis: a prospective randomized trial. *Ann Surg*. 2000;231(6):832-837. doi:10.1097/0000658-200006000-00007
15. Liu P, Mei Z, Shen G. A commentary on "Efficacy of single layered intestinal anastomosis over double layered intestinal anastomosis-an open labeled, randomized controlled trial". *Int J Surg*. 2020;80:153-154. doi:10.1016/j.ijsu.2020.06.036