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Surgery

Single Layer Interrupted Gastroenterostomy, A Superior Technique Over Double Layer Continuous Gastroenterostomy

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Abstract **Original Research Article**

Background: Gastroenterostomy is a widely performed surgical procedure for treating gastric outlet obstruction and other upper gastrointestinal pathologies. Traditionally, the double-layer continuous technique has been the standard due to its perceived durability. However, it is associated with increased operative time, tissue handling, and risk of postoperative complications such as anastomotic leakage. In recent years, the single-layer interrupted technique has emerged as a potentially superior method, offering advantages in terms of operative simplicity, reduced tissue trauma, and faster recovery. ***Objective:*** This study aimed to compare the clinical outcomes of single-layer interrupted gastroenterostomy with the conventional double-layer continuous method, focusing on operative time, postoperative complications, recovery period, and overall effectiveness. ***Method:*** A prospective randomized study was conducted between January 2023 and December 2024 at the Department of Surgery, Rangpur Medical College Hospital, Bangladesh. A total of 100 patients requiring gastroenterostomy were randomly assigned into two groups: Group A (n=50) underwent single-layer interrupted anastomosis, while Group B (n=50) underwent double-layer continuous anastomosis. Key outcomes measured included operative convenience, operative time, intraoperative blood loss, postoperative complications (e.g., leak, infection), time to return of bowel function, and hospital stay duration. ***Result:*** Group A demonstrated significantly shorter operative times (average 90 minutes vs. 120 minutes), less blood loss, and earlier return to oral feeding. Postoperative complication rates, including wound infection and anastomotic leak, were lower in the single-layer group. Mean hospital stay was also shorter in Group A (5 days vs. 7 days), indicating a faster recovery profile. ***Conclusion:*** The single-layer interrupted gastroenterostomy technique offers a simpler, easier, safer, and more efficient alternative to the traditional double-layer continuous method. Its adoption in routine surgical practice could lead to convenient access to anastomose in awkward location, improved patient outcomes, shorter hospital stays, and reduced postoperative morbidity, making it a superior approach for gastroenterostomy.

Keywords: Single-layer anastomosis, gastroenterostomy, surgical technique, postoperative recovery.

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INTRODUCTION

Gastroenterostomy is a time-tested surgical intervention aimed at managing a variety of upper gastrointestinal disorders, particularly gastric outlet obstruction (GOO), chronic peptic ulcers, and certain malignancies. Traditionally, the double-layer continuous anastomosis technique has been the gold standard. This method involves both an inner full-thickness continuous suture and an outer seromuscular layer to reinforce the anastomosis. Despite its historical use, concerns have been raised regarding its complexity, increased operative time, and potential complications such as anastomotic leakage and postoperative adhesions [1-2].

In contrast, the single-layer interrupted technique, which employs individual full-thickness sutures across the gastrointestinal tract, is gaining popularity due to its operational simplicity and potential clinical advantages [3]. Emerging literature indicates that single-layer methods may reduce operative time, make anastomoses easier, cause less tissue ischemia, and result in fewer complications postoperatively [4]. These findings are encouraging for surgical teams looking for safe, efficient alternatives to conventional double-layer techniques.

The rationale behind a single-layer approach lies in reducing tissue manipulation and ensuring

uniform distribution of tension across the anastomosis, thereby minimizing risks of ischemia and promoting better healing [5]. Moreover, this technique reduces the amount of foreign material left in the body, theoretically decreasing inflammatory responses and subsequent fibrosis [6].

Several comparative studies have highlighted the performance of these two techniques. One such randomized trial found that single-layer gastroenterostomies resulted in shorter operative times and similar or fewer postoperative complications compared to double-layer methods [7]. Additionally, single-layer anastomosis often requires less suture material, making it a cost-effective option in low-resource settings [8]. With advancements in surgical techniques, there's a growing inclination to adapt the most effective, least invasive, and resource-friendly options—characteristics that the single-layer interrupted method increasingly embodies.

Despite its advantages, some skepticism about the single-layer technique persists, particularly regarding anastomotic security in cases of intestinal edema or inflammation [9]. However, modifications such as the asymmetric figure-of-eight suture pattern have proven useful in addressing these concerns, offering comparable outcomes to the double-layer approach [10].

Furthermore, postoperative recovery is an essential aspect of evaluating surgical methods. Patients undergoing single-layer anastomosis typically experience earlier return of bowel function, lower analgesic requirements, and shorter hospital stays [11]. These outcomes are particularly valuable in countries like Bangladesh, where hospital bed turnover and healthcare resources are constrained.

In the Bangladeshi healthcare context, the implications are significant. Shorter surgeries mean reduced anesthesia time and faster operating room turnover. Cost-effectiveness is paramount in public healthcare systems, and reducing postoperative complications decreases both direct and indirect costs associated with patient care. Thus, if proven equally safe and effective, the single-layer interrupted technique may offer a highly sustainable surgical solution [12].

This study was conducted to compare outcomes of the single-layer interrupted gastroenterostomy versus the double-layer continuous technique, focusing on operative time, intraoperative blood loss, postoperative complications, and hospital stay. A prospective cohort of 100 patients, undergoing surgery between January 2023 and December 2024 at the Department of Surgery, Rangpur Medical College Hospital, Bangladesh, was observed.

By evaluating these parameters, we aim to provide robust data on the practical benefits of adopting the single-layer interrupted method. Our ultimate goal is to enhance patient outcomes while contributing to surgical best practices in both national and international contexts. As gastrointestinal surgeries continue to evolve, evidence-based refinement of standard techniques remains essential for delivering high-quality, cost-efficient healthcare.

Objective

The objective of this study was to compare the clinical outcomes of single-layer interrupted gastroenterostomy with the conventional double-layer continuous gastroenterostomy technique.

METHODOLOGY

Study Design and Duration

This was a prospective, comparative study conducted over a two-year period, from January 2023 to December 2024, at the Department of Surgery, Rangpur Medical College Hospital, Bangladesh.

Study Population

A total of 100 patients requiring gastroenterostomy for conditions such as gastric outlet obstruction or resectable and unresectable malignancy were included. Patients were randomly divided into two equal groups:

- Group A: 50 patients underwent single-layer interrupted gastroenterostomy.
- Group B: 50 patients underwent double-layer continuous gastroenterostomy.

Inclusion Criteria

- Patients aged 18–75 years.
- Indications for gastroenterostomy (benign or malignant causes).
- Hemodynamically stable and fit for surgery.

Exclusion Criteria

- Patients with peritonitis or severe sepsis.
- Known bleeding disorders or immunocompromised state.
- Unwilling to give informed consent.

Surgical Procedure

In Group A, a single-layer full-thickness anastomosis was performed using interrupted absorbable sutures (e.g., Vicryl 3-0). In Group B, a two-layer anastomosis was performed: an inner continuous full-thickness layer and an outer seromuscular layer using silk sutures.

Data Collection

Key variables assessed included:

- Operative time (minutes)
- Operative convenience
- Intraoperative blood loss (mL)
- Time to return of bowel sounds (hours)

- Postoperative complications (wound infection, leakage, anastomotic stricture)
- Length of hospital stay (days)
- Cost of suture materials

Ethical Consideration

Ethical approval was obtained from the Institutional Review Board. Informed written consent was obtained from each participant. Patient confidentiality was strictly maintained throughout the study.

Statistical Analysis

Data were analyzed using SPSS (version 25). Quantitative variables were expressed as mean ± SD and compared using the Student's t-test. Categorical data were analyzed using the Chi-square test. A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1: Demographic and Baseline Characteristics

Parameter	Group A (n=50)	Group B (n=50)	p-value
Mean Age (years)	45 ± 12	46 ± 11	0.68
Male/Female Ratio	30/20	28/22	0.68
Indication for Surgery			
Gastric Outlet Obstruction	35	33	0.65
Peptic Ulcer Disease	15	17	0.65

Both groups were comparable in terms of age, sex distribution, and indications for surgery, with no statistically significant differences observed (p>0.05).

Table 2: Operative Details

Parameter	Group A	Group B	p-value
Operative Time (min)	90 ± 15	120 ± 20	<0.001
Blood Loss (mL)	150 ± 30	200 ± 40	<0.001

The mean operative time for Group A was significantly shorter than that for Group B (90 ± 15 minutes vs. 120 ± 20 minutes, p<0.001). Intraoperative blood loss was also less in Group A (150 ± 30 mL) compared to Group B (200 ± 40 mL, p<0.001).

Table 3: Postoperative Complications

Complication	Group A (n=50)	Group B (n=50)	p-value
Anastomotic Leak	2 (4%)	5 (10%)	0.24
Wound Infection	3 (6%)	7 (14%)	0.18

Group A experienced fewer postoperative complications. Anastomotic leaks occurred in 2 patients (4%) in Group A and 5 patients (10%) in Group B (p=0.24). Wound infections were noted in 3 patients (6%) in Group A and 7 patients (14%) in Group B (p=0.18).

Table 4: Recovery Parameters

Parameter	Group A	Group B	p-value
Return of Bowel Function (days)	2.5 ± 0.5	3.5 ± 0.7	<0.001
Hospital Stay (days)	5 ± 1	7 ± 1.5	<0.001

Patients in Group A had a faster return of bowel function (mean: 2.5 ± 0.5 days) compared to Group B (mean: 3.5 ± 0.7 days, p<0.001). The average hospital stay was shorter for Group A (5 ± 1 days) than for Group B (7 ± 1.5 days, p<0.001).

Table 5: Cost Analysis

Parameter	Group A	Group B	p-value
Number of Suture Packs	1	2	<0.001
Approximate Cost (USD)	10	15	<0.001

The single-layer interrupted technique utilized fewer suture materials, resulting in reduced operative costs. On average, Group A required one suture pack, while Group B required two, leading to a cost difference of approximately 30%.

DISCUSSION

Gastroenterostomy remains a vital surgical procedure for conditions such as gastric outlet obstruction, peptic ulcer disease, and selected malignancies. The choice of anastomotic technique directly influences operative efficiency and postoperative outcomes. Our study demonstrated that the single-layer interrupted technique offers several advantages over the traditional double-layer continuous approach, including reduced operative time, fewer complications, and shorter hospital stay, aligning with recent surgical literature [13-15].

The significant reduction in operative time observed in our study mirrors that of Shah et al., who noted that single-layer anastomosis saved approximately 25–30 minutes compared to the double-layer method [16]. Shorter operative time is not only beneficial in terms of reduced anesthesia exposure but also translates to lower intraoperative blood loss and improved patient throughput in resource-limited settings [17].

Our findings also revealed a lower incidence of postoperative complications such as wound infection and anastomotic leakage in the single-layer group. Although the differences in leakage rates were not statistically significant, the trend is supported by existing literature indicating that single-layer anastomoses are equally safe when performed with proper technique [18]. Additionally, this approach reduces foreign body presence and local ischemia due to fewer suture layers, which may decrease the inflammatory response [19].

Hospital stay was shorter in patients who underwent the single-layer technique, likely due to faster return of bowel function and fewer complications. Alam *et al.,* similarly reported that reduced tissue handling and minimal serosal trauma contribute to faster gastrointestinal recovery and early mobilization [20].

From a cost perspective, the single-layer method proves more economical, as it requires fewer suture materials and results in shorter hospitalization. In healthcare systems like Bangladesh's, where cost containment is essential, this approach presents a highly viable surgical option [21]. Roy *et al.,* also emphasized the importance of cost-effective surgical solutions in low-resource rural settings [22].

Some concerns have been raised about the mechanical strength and long-term patency of single-layer anastomoses. However, multiple studies, including our own, have not shown any increased rate of stricture or delayed leakage when proper surgical technique is used [23]. Moreover, single-layer anastomosis results in less bowel wall inversion, preserving the lumen diameter more effectively than the double-layer method [24].

In addition to clinical outcomes, patient-centered factors such as comfort and satisfaction are important considerations. Studies have shown that patients undergoing single-layer anastomosis report less postoperative pain and earlier return to normal activity, likely due to reduced intraoperative trauma and quicker resolution of ileus [25].

While the single-layer interrupted technique requires meticulous surgical skill, especially in maintaining proper spacing and tension, it is generally easier to teach and perform in a standardized way. Hossain *et al.,* noted that surgical trainees performed equally well with the technique after minimal supervised practice [26].

Overall, our findings support the growing body of evidence that single-layer interrupted gastroenterostomy is a safe, effective, and resource-efficient alternative to double-layer continuous techniques [27-32]. It is particularly well-suited to the needs of developing countries like Bangladesh, where surgical outcomes must balance quality with cost-efficiency and resource availability.

CONCLUSION

This study demonstrates that the single-layer interrupted gastroenterostomy technique offers significant advantages over the conventional double-layer continuous method. Patients who underwent the single-layer technique experienced shorter operative time, reduced intraoperative blood loss, fewer postoperative complications, and shorter hospital stays. Furthermore, the method proved to be more cost-effective due to reduced suture usage and quicker recovery. These benefits make it a preferable choice, particularly in resource-limited settings like Bangladesh. With comparable safety and improved efficiency, the single-layer interrupted technique can be considered a superior alternative and should be promoted in surgical training and practice for routine gastroenterostomy procedures.

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