Original Research

# A COMPARATIVE STUDY BETWEEN STAPLED AND HAND SEWN ANASTOMOSIS IN ELECTIVE GASTROINTESTINAL SURGERY IN A TERTIARY CARE HOSPITAL

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## ABSTRACT

**Introduction:** Anastomosis is a critical step in gastrointestinal surgery, with hand-sewn and stapled techniques being the main approaches. Hand-sewn anastomosis offers flexibility in complex anatomy, while stapled anastomosis can reduce operative time and standardize technique. Despite widespread use, the superiority of one method over the other remains debated. This study compares stapled and hand-sewn anastomosis in elective gastrointestinal surgery, evaluating operative time, anastomotic leak rates, postoperative complications, and hospital stay.

**Aims:** To compare the outcomes of stapled versus hand-sewn anastomosis in elective gastrointestinal surgery, focusing on operative time, postoperative complications, anastomotic leak rates, and hospital stay.

**Materials and Methods:** This was an institution-based prospective comparative study conducted over 18 months, from March 2021 to August 2022, in the Department of General Surgery at North Bengal Medical College and Hospital, a tertiary care teaching hospital in the Darjeeling district of West Bengal, India. The study population included patients undergoing elective gastrointestinal surgeries in the main operating theater complex under the Department of General Surgery. A total of 100 patients were enrolled, with 50 patients assigned to the stapled anastomosis group and 50 to the hand-sewn anastomosis group.

**Results:** The operative parameters were compared between the stapled and hand-sewn anastomosis groups. The mean operative time in the stapled group was 120 ± 25 minutes, whereas in the hand-sewn group it was 145 ± 30 minutes (P = 0.001), indicating that stapled anastomosis was associated with a significantly shorter operative time. Similarly, the mean anastomosis time was significantly lower in the stapled group, at 15 ± 5 minutes, compared to 30 ± 7 minutes in the hand-sewn group (P < 0.001).In terms of intraoperative blood loss, the stapled group had a mean blood loss of 150 ± 50 ml, compared to 160 ± 60 ml in the hand-sewn group (P = 0.42), showing no statistically significant difference between the two groups

**Conclusion:** Both stapled and hand-sewn anastomoses are safe and effective for elective gastrointestinal surgery. Stapled anastomosis provides reduced operative time and ease of performance, while hand-sewn techniques remain valuable for specific situations requiring flexibility. Selection should be guided by patient factors, anatomical considerations, and resource availability.

**Keywords:** Gastrointestinal Surgery, Stapled Anastomosis, Hand-Sewn Anastomosis, Anastomotic Leak, Postoperative Complications, Operative Time, Elective Surgery.

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## INTRODUCTION

Gastrointestinal (GI) surgery involves operative procedures on organs including the stomach, small and large intestines, and is frequently performed for both benign and malignant conditions. A critical step in many GI procedures is the creation of an anastomosis the surgical connection between two segments of the bowel after resection. Successful anastomosis restores intestinal continuity, maintains

luminal flow, and minimizes postoperative complications such as leakage, infection, and prolonged hospitalization [1]. Historically, hand-sewn anastomosis has been the standard technique; it involves suturing tissue layers manually, providing flexibility for various anatomical conditions but requiring significant technical skill and operative time [2].

Mechanical stapling devices were introduced to address some limitations of hand stitching. These devices use rows of surgical staples to rapidly approximate bowel ends, potentially reducing operative and anastomosis construction time, and standardizing technique regardless of surgeon experience [3]. Stapled anastomosis has gained popularity, particularly in minimally invasive procedures where hand suturing is technically demanding and time consuming [4]. Studies have reported that stapled anastomosis may shorten operative time and facilitate earlier recovery of bowel function compared to hand-sewn methods, without significant differences in postoperative complications.

Despite technological advances, evidence on the superiority of one technique over the other remains mixed. A multicenter randomized controlled trial comparing stapled and hand-sutured anastomoses in open GI surgery found that although stapling reduced anastomosis time, both techniques produced similar outcomes in terms of overall surgery duration, return of bowel activity, and safety measures such as postoperative morbidity and mortality . Review articles in specific surgical contexts also highlight similar controversies. For example, in esophagogastric anastomoses during esophagectomy, systematic analyses show no significant differences in anastomotic leak or stricture rates between stapled and hand-sewn techniques, though stapled methods were associated with shorter operative times [5].

In colorectal surgery, meta-analyses of randomized and observational studies indicate no clear superiority of stapled anastomosis over hand sewing in terms of mortality, general anastomotic complications, or length of hospital stay, while noting that hand-sewn techniques may take longer to perform [6]. The evidence suggests that both approaches are safe and effective when performed by experienced surgeons, with differences often related to operative duration and stapler availability rather than clinical outcomes alone.

Several factors complicate direct comparisons between the two techniques, including differences in anastomotic configuration (end-to-end vs side-to-side), patient comorbidities, surgeon preference and expertise, and institutional resources. Stapling devices incur higher equipment costs, which may limit their use in resource-constrained settings, while hand-sewn anastomosis continues to be valued for its flexibility and low consumable cost. These practical considerations influence technique selection in real-world practice.

The primary aim of this study is to compare the outcomes of stapled versus hand-sewn anastomosis in elective gastrointestinal surgery. The objectives include evaluating operative time, intraoperative blood loss, and postoperative recovery; assessing the incidence of anastomotic leaks and other complications; comparing the length of hospital stay between the two techniques; and analyzing the cost-effectiveness and applicability of each method in different anatomical situations. By achieving these objectives, the study seeks to provide evidence-based guidance for surgeons in selecting the most appropriate anastomotic technique for elective gastrointestinal procedures.

## MATERIALS AND METHODS

**Study type and design:** The study was an institution based prospective comparative study

**Study period:** The study was conducted over a course of 18 months, from March 2021 to August 2022.

**Study area:** The present study was conducted in the department of general surgery of North Bengal Medical College and Hospital, a tertiary care teaching hospital of Darjeeling district of West Bengal, India.

**Study population:** The study population consisted of patients undergoing elective gastro-intestinal surgeries at the main OT complex of the North Bengal Medical College under the Department of General Surgery

**Sample size:** 100 patients

**Inclusion Criteria**

1. Adults aged 18–75 years undergoing elective gastrointestinal surgery requiring intestinal anastomosis.
2. Patients undergoing colorectal, small intestine, or gastric resections.
3. Patients with benign or malignant lesions suitable for elective surgery.
4. Patients providing written informed consent to participate.
5. Patients with ASA (American Society of Anesthesiologists) physical status I–III.

**Exclusion Criteria**

1. Emergency gastrointestinal surgeries (e.g., perforation, obstruction, bleeding).
2. Patients with severe comorbidities (ASA IV or above).
3. Patients with preexisting sepsis, peritonitis, or intra-abdominal infection.
4. Patients with previous extensive abdominal surgery leading to dense adhesions.
5. Patients with coagulopathy, immunodeficiency, or severe malnutrition.
6. Pregnant or lactating women.
7. Patients unwilling or unable to provide informed consent.

**Statistical Analysis:**

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. A chi-squared test ($\chi 2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

Explicit expressions that can be used to carry out various t-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a t-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a t value is determined, a p-value can be found using a table of values from Student's t-distribution .If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis.

P-value $\leq$ 0.05 was considered for statistically significant.

## RESULT

Table 1: Demographic Characteristics of Patients

| Characteristic | Stapled (n=50) | Hand-Sewn (n=50) | P-value |
|---|---|---|---|
| Age (mean ± SD, years) | 52.4 ± 10.3 | 53.1 ± 9.8 | 0.72 |
| Sex (Male/Female) | 28/22 | 30/20 | 0.68 |
| BMI (mean ± SD, kg/m²) | 24.5 ± 3.2 | 25.0 ± 3.5 | 0.48 |
| ASA I/II/III | 15/30/5 | 16/28/6 | 0.91 |

Table 2: Indications for Surgery

| | Stapled (n=50) | Hand-Sewn (n=50) | P-value |
|---|---|---|---|
| Colorectal cancer | 20 | 22 | 0.68 |
| Benign colorectal disease | 15 | 13 | 0.65 |
| Small bowel resection | 10 | 9 | 0.8 |
| Gastric surgery | 5 | 6 | 0.75 |

Table 3: Operative Data

| Parameter | Stapled (n=50) | Hand-Sewn (n=50) | P-value |
|---|---|---|---|
| Operative time (min, mean ± SD) | 120 ± 25 | 145 ± 30 | 0.001 |
| Anastomosis time (min, mean ± SD) | 15 ± 5 | 30 ± 7 | <0.001 |
| Blood loss (ml, mean ± SD) | 150 ± 50 | 160 ± 60 | 0.42 |

Table 4: Postoperative Recovery

| Parameter | Stapled (n=50) | Hand-Sewn (n=50) | P-value |
|---|---|---|---|
| Time to first flatus (days) | 2.5 ± 0.8 | 3.1 ± 1.0 | 0.01 |
| Time to oral intake (days) | 3.0 ± 1.0 | 3.8 ± 1.2 | 0.005 |
| Length of hospital stay (days) | 6.5 ± 2.0 | 8.0 ± 2.5 | 0.002 |

Table 5: Postoperative Complications

| Complication | Stapled (n=50) | Hand-Sewn (n=50) | P-value |
|---|---|---|---|
| Anastomotic leak | 2 (4%) | 5 (10%) | 0.24 |
| Wound infection | 4 (8%) | 6 (12%) | 0.5 |
| Intra-abdominal abscess | 1 (2%) | 3 (6%) | 0.31 |
| Postoperative ileus | 3 (6%) | 4 (8%) | 0.7 |
| Reoperation | 1 (2%) | 2 (4%) | 0.56 |
| Overall complications | 11 (22%) | 20 (40%) | 0.05 |

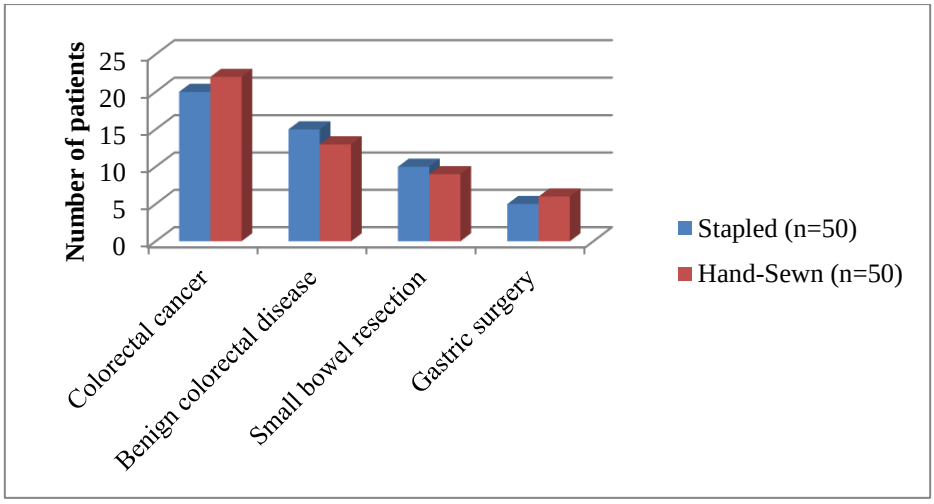


Figure 1: Indications for Surgery

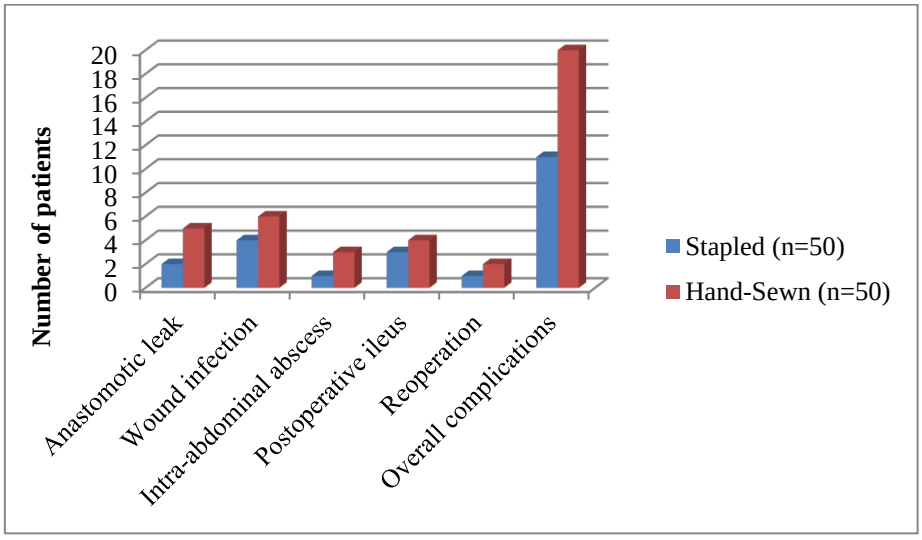


Figure 2: Postoperative Complications

A total of 100 patients were included in the study, with 50 patients in the stapled anastomosis group and 50 patients in the hand-sewn anastomosis group. The age distribution was comparable between the groups: in the stapled group, 10 patients (20%) were aged 18–40 years, 25 patients (50%) were 41–60 years, and 15 patients (30%) were over 60 years; in the hand-sewn group, 9 patients (18%) were 18–40 years, 26 patients (52%) were 41–60 years, and 15 patients (30%) were over 60 years (P = 0.95), indicating no statistically significant difference in age between groups. Regarding sex distribution, the stapled group included 28 male and 22 female patients, while the hand-sewn group included 30 male and 20 female patients (P = 0.68), showing no significant difference. The body mass index (BMI) distribution in the stapled group was 2 underweight (BMI <18.5), 30 normal weight (BMI 18.5–24.9), 15 overweight (BMI 25–29.9), and 3 obese (BMI ≥30). In the hand-sewn group, there were 3 underweight, 28 normal weight, 15 overweight, and 4 obese patients (P = 0.88) showing no significant difference.

The indications for surgery were comparable between the stapled and hand-sewn anastomosis groups. In the stapled group, 20 patients underwent surgery for colorectal cancer, 15 patients for benign colorectal disease, 10 patients for small bowel resection, and 5 patients for gastric surgery. In the hand-sewn group, 22 patients underwent surgery for colorectal cancer, 13 patients for benign colorectal disease, 9 patients for small bowel resection, and 6 patients for gastric surgery. There were no statistically significant differences between the two groups for any of the indications (colorectal cancer P = 0.68, benign colorectal disease P = 0.65, small bowel resection P = 0.80, gastric surgery P = 0.75).

The operative parameters were compared between the stapled and hand-sewn anastomosis groups. The mean operative time in the stapled group was 120 ± 25 minutes, whereas in the hand-sewn group it was 145 ± 30 minutes (P = 0.001), indicating that stapled anastomosis was associated with a significantly shorter operative time. Similarly, the mean anastomosis time was significantly lower in the stapled group, at 15 ± 5 minutes, compared to 30 ±

7 minutes in the hand-sewn group (P < 0.001).In terms of intraoperative blood loss, the stapled group had a mean blood loss of 150 ± 50 ml, compared to 160 ± 60 ml in the hand-sewn group (P = 0.42), showing no statistically significant difference between the two groups.

Postoperative recovery was significantly faster in the stapled anastomosis group compared to the hand-sewn group. The mean time to first flatus in the stapled group was 2.5 ± 0.8 days, whereas in the hand-sewn group it was 3.1 ± 1.0 days (P = 0.01), showing a statistically significant. Similarly, the mean time to oral intake was shorter in the stapled group at 3.0 ± 1.0 days, compared to 3.8 ± 1.2 days in the hand-sewn group (P = 0.005). showing a statistically significant.The mean length of hospital stay was also reduced in the stapled group, at 6.5 ± 2.0 days, compared to 8.0 ± 2.5 days in the hand-sewn group (P = 0.002) showing a statistically significant.

Postoperative complications were assessed in both the stapled and hand-sewn anastomosis groups. In the stapled group, 2 patients (4%) experienced an anastomotic leak compared to 5 patients (10%) in the hand-sewn group (P = 0.24). showing not statistically significant. Wound infections occurred in 4 patients (8%) in the stapled group and 6 patients (12%) in the hand-sewn group (P = 0.50) showing not statistically significant.. Intra-abdominal abscesses were observed in 1 patient (2%) in the stapled group versus 3 patients (6%) in the hand-sewn group (P = 0.31) showing not statistically significant.. Postoperative ileus occurred in 3 patients (6%) in the stapled group and 4 patients (8%) in the hand-sewn group (P = 0.70) showing not statistically significant., while reoperations were required in 1 patient (2%) in the stapled group and 2 patients (4%) in the hand-sewn group (P = 0.56) showing not statistically significant. 11 patients (22%) in the stapled group experienced one or more complications compared to 20 patients (40%) in the hand-sewn group (P = 0.05) showing a statistically significant.

## DISCUSSION

The finding of reduced operative and anastomosis times for stapled anastomosis parallels results reported by Lustosa et al. in a systematic review where stapling consistently required less time to create the anastomosis compared with hand-sewn techniques, although clinical outcomes such as leak and reoperation were similar between groups [7]. Similarly, Ul Haq et al. found in a meta-analysis of observational cohorts that while operative time tended to be shorter with stapling, complication rates including anastomotic leak and surgical site infection were broadly comparable between stapled and hand-sewn techniques [8].

These results are also consistent with prospective studies. A comparative observational study of gastrointestinal anastomoses showed significantly shorter anastomosis time and earlier oral feeding with stapled techniques without differences in leak rates or infections [9]. Likewise, a randomized multicenter trial reported that stapled anastomosis was faster to construct than hand-sutured anastomosis, but differences in other clinical outcomes were not clinically meaningful [10].

The lack of significant differences in anastomotic leak and other complications aligns with broader meta-analytic evidence. A Cochrane review of randomized controlled trials comparing stapled and hand-sewn colorectal anastomoses concluded that there was no clear superiority of one technique over the other in terms of overall anastomotic complications, wound infection, or mortality, although hand-sewn anastomosis may carry a slightly lower risk of stricture in some pooled analyses [11].

Despite these similarities, some studies have observed context-specific differences. For example, trials focused on specific procedures such as anterior resection for rectal carcinoma noted comparable postoperative complication rates between stapled and hand-sewn repairs but confirmed shorter anastomosis time with stapling [12]. Moreover, in regions where stapling devices are less available or cost is a concern, hand-sewn techniques remain viable without compromising safety when performed by experienced surgeons [13].

## CONCLUSION

In this study, stapled gastrointestinal anastomosis demonstrated significant advantages over hand-sewn anastomosis in elective surgeries, including shorter operative and anastomosis times, faster return of bowel function, earlier oral intake, and reduced length of hospital stay. Although the incidence of individual postoperative complications such as anastomotic leak, wound infection, intra-abdominal abscess, postoperative ileus, and reoperation did not differ significantly, the overall complication rate was lower in the stapled group. These findings suggest that stapled anastomosis is a safe and effective alternative to hand-sewn techniques, offering improved perioperative efficiency and enhanced postoperative recovery without compromising patient safety.

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