

STAPLED VERSUS HAND SEWN ANASTOMOSIS IN EMERGENCY ABDOMINAL SURGERY IN A TERTIARY HEALTHCARE CENTRE

¹Dr. Arijit Bagchi and ^{*2}Dr. Purujit Choudhury

¹Post Graduate Trainee of Surgery, Gauhati Medical College & Hospital.

²Professor of Surgery, Gauhati Medical College & Hospital.

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*Corresponding Author

Dr. Purujit Choudhury

Professor of Surgery, Gauhati

Medical College & Hospital.

ABSTRACT

Background: Emergency abdominal surgeries often require bowel anastomosis, with both hand-sewn and stapled techniques being commonly used. The optimal choice of anastomosis method in emergency settings remains debated, particularly in resource-limited environments. **Aim:** To compare the outcomes of hand-sewn versus stapled anastomosis in emergency abdominal surgeries at a tertiary healthcare centre in Guwahati, Assam. **Methods:** This prospective comparative observational study included 78 patients undergoing emergency abdominal surgery requiring bowel anastomosis between May 2023 and April 2024. Patients were divided into hand-sewn (n=52) and stapler (n=26) groups. Outcomes assessed included anastomotic leak rates, operative time, hospital stay, complications (Clavien-Dindo classification), and recovery parameters. **Results:** The stapler group demonstrated significantly shorter mean operative time (172.3 ±39.7 vs 198.4 ± 45.6 minutes, p=0.017). While not statistically significant, the stapler group showed trends towards lower anastomotic leak rates (3.8% vs 9.6%, p=0.362), shorter hospital stays (10.4 ±4.8 vs 12.7 ±5.3 days, p=0.064), and faster return to normal bowel function (3.7 ±1.4 vs 4.2 ±1.6 days, p=0.169). Overall complication rates were similar between groups (p=0.583). **Conclusion:** While both techniques proved safe, stapled anastomosis showed potential advantages in emergency abdominal surgeries, including significantly reduced operative time and favourable trends in postoperative outcomes. These findings suggest that stapled anastomosis may be preferable in certain emergency cases, particularly when shorter operative times are crucial. However, the choice should still consider individual patient factors, surgeon expertise, and resource availability. Larger, randomised studies are needed to confirm these trends.

KEYWORDS: Hand sewn anastomosis Stapler anastomosis, Emergency exploration.

INTRODUCTION

Bowel anastomosis, the surgical connection of two segments of the intestine, is a critical procedure in gastrointestinal surgery.^[1] This technique is employed in various scenarios, including resection of bowel segments due to malignancy, trauma, or inflammatory conditions.^[2] In emergency settings, bowel anastomosis is often necessitated by conditions such as intestinal obstruction, perforation, or ischemia.^[3]

Historically, surgeons have relied on hand-sewn anastomosis, a method known for its versatility and widespread applicability. However, the introduction of surgical staplers has provided an alternative approach, potentially offering benefits such as reduced operating times and improved uniformity in suture placement.

Bowel anastomosis can be performed using either hand-sewn or stapled techniques.^[5] The choice between these methods often depends on factors such as surgeon

preference, availability of resources, and specific patient characteristics.^[6] However, in emergency settings, this decision may be further complicated by time constraints and the patient's overall condition.^[7]

Complications following bowel anastomosis in emergency surgeries can be significant and include anastomotic leak, surgical site infection, and prolonged ileus.^[8] These complications can lead to increased morbidity, prolonged hospital stays, and higher healthcare costs.^[9] Understanding the factors that influence outcomes in emergency bowel anastomosis is crucial for improving patient care and resource allocation in tertiary healthcare centre.^[10]

The present study aims to compare the outcomes of stapled versus hand-sewn anastomosis in emergency abdominal surgeries at a tertiary healthcare centre i.e., Gauhati Medical College & Hospital in Guwahati, Assam. Gauhati Medical College serves as an excellent

setting to further explore this comparison. As a major medical institution handling a significant volume of emergency abdominal surgeries, it offers a unique opportunity to assess these techniques in a real-world emergency environment.

We hypothesise that there may be significant differences in complication rates, operating time, and length of hospital stay between the two techniques in this specific setting and patient population.^[11]

This research seeks to contribute to the growing body of evidence on optimal anastomotic techniques in emergency surgery, with a particular focus on the unique healthcare landscape of Assam. The findings may help inform clinical decision-making and potentially improve outcomes for patients undergoing emergency bowel anastomosis in similar settings.^[12]

PATIENTS AND METHODS

Study Design and Setting

This prospective comparative observational study was conducted at Gauhati Medical College and Hospital (GMCH), a tertiary healthcare centre in Guwahati, Assam, from May 2023 to April 2024. The study compared hand-sewn and stapled anastomosis techniques in emergency abdominal surgeries requiring bowel anastomosis.

Inclusion Criteria

- Patients aged 18 years and above
- Emergency abdominal surgeries requiring bowel anastomosis
- Consent for participation in the study

Exclusion Criteria

- Patients under 18 years of age
- Elective surgeries
- Patients requiring damage control surgery

Sample Size and Grouping

A total of 78 patients were included in the study. They were divided into two groups:

- Hand-sewn anastomosis group (n=52)
- Stapled anastomosis group (n=26)

No formal sample size calculation was performed. Instead, patients were serially enrolled as they presented and met the inclusion criteria during the study period by consecutive sampling.

Surgical Techniques

Hand-sewn Anastomosis: The hand-sewn technique utilised a two-layer approach. For the inner layer, continuous suturing with polydioxanone 3-0 (PDS 3-0) was employed. The outer layer consisted of interrupted silk 3-0 sutures for reinforcement. Throughout the procedure, the surgeon carefully regulated suture tension, applying just enough pressure to bring the bowel ends together and achieve a watertight seal, while avoiding

excessive tightening that could compromise blood supply to the anastomosis. This meticulous approach aimed to prevent ischemia at the suture line while ensuring the integrity of the connection. (Figure 1)

Stapled Anastomosis: The stapled method employed a linear cutting stapler, which simultaneously transected the bowel and created the anastomosis. This device deployed two double-staggered rows of titanium staples on each side of the cutting line. To enhance the security of the stapled connection, the surgeon applied an additional layer of interrupted silk 3-0 sutures around the staple line. (Figure 2)

Patency of the anastomosis is tested intraoperatively. Proximal protective colostomy was done in colonic anastomoses of the left side of colon. An abdominal drain was inserted in all patients. The operative time was defined as the time from skin incision until skin closure. Anastomotic time was defined as time required for performing the anastomosis. A clinical leak was defined as an anastomotic dehiscence verified by reoperation, the development of an enterocutaneous fistula. Infective complications were recorded. The following data were recorded: Anastomotic leak rates, Mean operative time, Length of postoperative hospital stay, Mean ICU stay, 30-day mortality rate, Postoperative complications according to Clavien-Dindo classification, Postoperative pain scale [Visual Analog Scale], Postoperative ileus, Time to return to normal bowel function, Time to start oral intake, Surgical site infection rates and need for re-exploration.

Both techniques were performed under sterile conditions following standard surgical principles. The choice of anastomosis technique was based on multiple factors: Surgeon's expertise and preference, patient factors such as:- haemodynamic stability of the patients, viability and thickness of the bowel wall, site of anastomosis, nature of the abdominal emergency, time constraints, anticipated postoperative course about the patient's likely recovery and risk factors for complications influenced the decision. The final decision was made by the operating surgeon after considering these factors, aiming to choose the technique that would provide the best outcome for each individual patient in the emergency setting.

Follow-up

Patients were followed up for 30 days post-surgery. Follow-up assessments were conducted at daily during hospital stay, then at 2 weeks and 4 weeks post-discharge.

Data Collection

Data were collected using a standardised proforma. Intraoperative details were recorded by the operating surgeon. Postoperative data were collected by research assistants who were blinded to the anastomosis technique used.

Statistical Analysis

Data were analysed using JASP version 0.19.0. All data collected were tabulated. Continuous variables were expressed as mean \pm standard deviation and compared using Student's t-test or Mann-Whitney U test, as appropriate. Categorical variables were expressed as frequencies and percentages and compared using Chi-square test or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

Informed consent was obtained from all patients or their legal representatives before inclusion in the study. Patient confidentiality was maintained throughout the study process.

RESULTS

Demographic and Clinical Characteristics

Our study comprised 78 patients undergoing emergency abdominal surgery requiring bowel anastomosis, with 52 in the hand-sewn group and 26 in the stapler group. Both groups were comparable in terms of age (hand-sewn: 62.7 ± 13.2 years; stapler: 59.4 ± 15.1 years; $p=0.324$), gender distribution (male predominance in both groups), and BMI. Comorbidities such as diabetes, hypertension, and cardiovascular disease were similarly distributed between the groups. ASA scores were also comparable, indicating that the groups were well-matched in terms of preoperative risk factors. (Refer to Table 1).

Surgical Outcomes and Postoperative Complications (Refer to Table 2)

Anastomotic Leak Rates: The hand-sewn group experienced a higher rate of anastomotic leaks (9.6%) compared to the stapler group (3.8%). Although this difference was not statistically significant ($p=0.362$), it suggests a potential clinical advantage for stapled anastomosis in emergency settings. This trend aligns with some previous studies that have shown lower leak rates with stapled anastomoses, particularly in challenging conditions often encountered in emergency surgeries.

Operative Time: A significant difference was observed in mean operative time, with the stapler group showing a shorter duration (172.3 ± 39.7 minutes) compared to the hand-sewn group (198.4 ± 45.6 minutes, $p=0.017$). This finding is consistent with the general understanding that stapled anastomoses can be performed more quickly, which may be particularly beneficial in emergency situations where reducing operative time is crucial.

Postoperative Recovery: While not reaching statistical significance, there was a noticeable trend towards shorter postoperative hospital stays in the stapler group (10.4 ± 4.8 days vs. 12.7 ± 5.3 days, $p=0.064$). This trend could have important implications for patient recovery and hospital resource utilisation. Similarly, the mean ICU

stay was shorter in the stapler group (2.2 ± 1.9 days vs. 2.8 ± 2.3 days, $p=0.249$) although this difference was not statistically significant, this trend aligns with the overall pattern of potentially faster recovery in the stapler group.

Postoperative pain scale: Postoperative pain scores were slightly lower in the stapler group (5.2 ± 1.9 vs. 5.7 ± 2.1), but this difference is not statistically significant ($p=0.305$). This suggests that the choice of anastomosis technique may have not substantially impact postoperative pain levels.

Postoperative ileus and return to normal bowel function:

The stapler group showed slightly faster returns to normal bowel function (3.7 ± 1.4 days vs. 4.2 ± 1.6 days, $p=0.169$) and earlier initiation of oral intake (3.3 ± 1.2 days vs. 3.8 ± 1.4 days, $p=0.121$). Although they were statistically non significant, these trends suggest potential benefits of stapled anastomosis in terms of faster resolution of postoperative ileus and early return to normal bowel function.

Complications and Mortality: The overall complication rates, as categorised by the Clavien-Dindo classification, were similar between the two groups ($p=0.583$). The majority of the complications in both groups were Grade I or II, indicating that most were minor and manageable without invasive intervention. Notably, there was one mortality (1.9%) in the hand-sewn group and none in the stapler group, although this difference was not statistically significant ($p=0.476$), this warrants consideration in larger studies to determine if there is a true difference in mortality risk between the techniques. Surgical site infection rates were comparable (15.4% in hand-sewn vs. 11.5% in stapler group, $p=0.643$), as was the need for re-exploration (5.8% vs. 3.8%, $p=0.713$) which may be related to the higher anastomotic leak rate observed in the hand sewn group.

Table 1: Demographic and Clinical Characteristics of Study Participants.			
Characteristic	Hand sewn group (n=52)	Stapler group (n= 26)	P-value
Age (years), mean \pm SD	62.7 \pm 13.2	59.4 \pm 15.1	0.324
Gender, n%			0.681
Male	30 (57.7%)	14 (53.8%)	
Female	22 (42.3%)	12 (46.2%)	
BMI (kg/m²), mean \pmSD	27.3 \pm 4.8	26.9 \pm 5.2	0.725
Comorbidities, n%			
Diabetes	14 (26.9%)	8 (30.8%)	0.719
Hypertension	20 (44.2%)	10 (38.5%)	0.624
Cardiovascular disease	11 (21.2%)	7 (26.9%)	0.568
ASA Score, n%			0.893
I	8 (15.4%)	5 (30.8%)	
II	24 (46.2%)	11 (42.3%)	
III	17 (32.7%)	8 (30.8%)	
IV	3 (5.8%)	2 (7.7%)	
Indications for surgery			0.762
Intestinal obstruction	22 (42.3%)	10 (38.5%)	
Perforation	13 (25.0%)	8 (30.8%)	
Trauma	9 (17.3%)	5 (19.2%)	
Others	8 (15.4%)	3 (11.5%)	
Anastomosis site, n%			0.589
Small intestine	31 (59.6%)	17 (65.4%)	
Large intestine	21 (40.4%)	9 (34.6%)	
SD: standard deviation; ASA: American Society of Anaesthesiologists			

Table 2: Surgical Outcomes and Postoperative Complications.			
Outcome Measure	Hand-sewn Group (n=52)	Stapler Group (n=26)	P-value
Anastomotic leak, n (%)	5 (9.6%)	1 (3.8%)	0.362
Operative time (min), mean \pm SD	198.4 \pm 45.6	172.3 \pm 39.7	0.017
Length of postoperative hospital stay (days), mean \pm SD	12.7 \pm 5.3	10.4 \pm 4.8	0.064
Postoperative complications (Clavien-Dindo), n (%)			0.583
Grade I	14 (26.9%)	8 (30.8%)	
Grade II	10 (19.2%)	4 (15.4%)	
Grade III	6 (11.5%)	2 (7.7%)	
Grade IV	2 (3.8%)	1 (3.8%)	
Grade V	1 (1.9%)	0 (0%)	
30-day mortality, n (%)	1 (1.9%)	0 (0%)	0.476
Time to return of normal bowel function (days), mean \pm SD	4.2 \pm 1.6	3.7 \pm 1.4	0.169
Time to start oral intake (days), mean \pm SD	3.8 \pm 1.4	3.3 \pm 1.2	0.121
Surgical site infection, n (%)	8 (15.4%)	3 (11.5%)	0.643
Need for reoperation, n (%)	3 (5.8%)	1 (3.8%)	0.713
Postoperative pain score (VAS), mean \pm SD	5.7 \pm 2.1	5.2 \pm 1.9	0.305
Postoperative ICU stay (days), mean \pm SD	2.8 \pm 2.3	2.2 \pm 1.9	0.249



Figure 1: A hand-sewn intestinal anastomosis. The anastomosis site is clearly visible suture lines joining the two bowel ends.

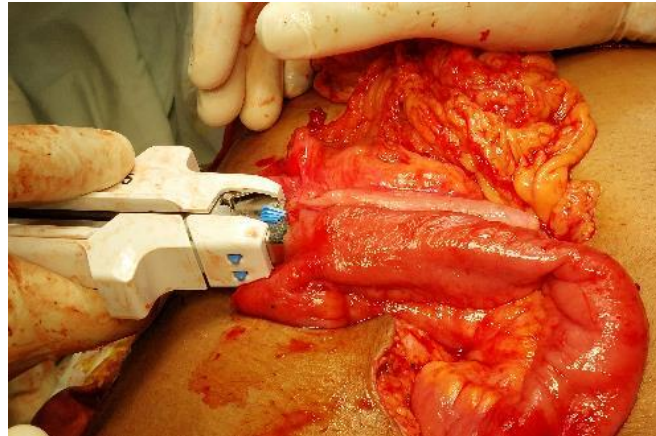


Figure 2: A stapled intestinal anastomosis. A linear cutting stapler is visible, being applied to join two segments of bowel. The stapler's jaws are clamped around the intestinal tissue, ready to simultaneously cut and staple the bowel ends together.

CONCLUSION

This study comparing hand-sewn and stapled anastomoses in emergency abdominal surgeries reveals potential advantages for stapled techniques, including significantly shorter operative times and trends towards lower anastomotic leak rates and faster recovery. While both methods demonstrated overall safety, the stapler group showed favourable trends in postoperative outcomes. However, complication rates were comparable between groups. These findings suggest that stapled anastomoses may offer benefits in emergency settings, particularly for high-risk or time-sensitive cases. Nonetheless, the choice between techniques should consider individual patient factors, surgeon expertise, and resource availability. Larger, multi-centre studies are needed to confirm these trends and provide definitive guidance for clinical practice in our region.

Limitations: This study has several limitations that should be considered when interpreting its results. The relatively small sample size (78 patients) and single-centre design may limit the statistical power and generalisability of our findings. As an observational study, the non-randomised nature could introduce selection bias despite efforts to match baseline characteristics. The 30-day follow-up period may not capture long-term outcomes, and unmeasured confounding factors could influence results. The study lacks a comprehensive cost-effectiveness analysis, which would be valuable given the higher unit cost of stapling devices. Due to the nature of the interventions, blinding was not possible, potentially influencing postoperative care decisions or patient-reported outcomes. The heterogeneity of emergency cases and limited subgroup analysis may mask technique-specific outcomes. These limitations underscore the need for larger, multi-centre randomised controlled trials to validate our findings and provide more definitive guidance for anastomosis techniques in emergency abdominal surgeries.

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