



## COMPARATIVE EVALUATION OF STAPLED VERSUS HAND-SEWN ANASTOMOSIS IN BOWEL SURGERIES AND THEIR CLINICAL OUTCOMES: A PROSPECTIVE COMPARATIVE STUDY

### Gastro Surgery

|                               |                                                                                                                                                   |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dr. Anushka Boppana</b>    | Postgraduate Resident, Department of General Surgery, Great Eastern Medical School and Hospital (GEMS), Ragolu, Srikakulam, Andhra Pradesh, India |
| <b>Dr. Rajashekara Babu G</b> | HOD, Department of General Surgery, GEMS- Great Eastern Medical School & Hospital, Ragolu, Srikakulam, Andhra Pradesh, India.                     |
| <b>Dr. Ashok Reddy</b>        | Medical Superintendent, Department of General Surgery, GEMS- Great Eastern Medical School & Hospital, Ragolu, Srikakulam, Andhra Pradesh, India.  |

### ABSTRACT

**Background:** Bowel anastomosis is an essential component of gastrointestinal surgery performed for both benign and malignant diseases. Anastomotic integrity significantly influences postoperative morbidity, mortality, recovery, and long-term outcomes. Two major techniques- stapled and hand-sewn anastomosis-are commonly employed, each having distinct advantages and limitations. This study aimed to compare the effectiveness and outcomes of stapled versus hand-sewn bowel anastomosis in patients undergoing gastrointestinal surgeries. **Methods:** A prospective comparative study was conducted in the Department of General Surgery, Great Eastern Medical School and Hospital, Ragolu, Andhra Pradesh, over 18 months. A total of 110 patients undergoing bowel resection and anastomosis were included and divided equally into stapled anastomosis (n=55) and hand-sewn anastomosis (n=55) groups. Patients undergoing elective and emergency gastrointestinal surgeries for benign and malignant conditions were included. Demographic profile, operative variables, duration of anastomosis, postoperative recovery, anastomotic leak, complications, and outcomes were compared. **Results:** Baseline characteristics including age, gender, comorbidities, indications for surgery, and type of anastomosis were comparable between both groups. The mean duration required to perform anastomosis was significantly lower in the stapled group compared with the hand-sewn group ( $14.8 \pm 3.2$  minutes vs  $26.6 \pm 4.6$  minutes;  $p < 0.0001$ ). Anastomotic leak was observed in 3.6% of patients in the stapled group compared with 10.9% in the hand-sewn group. **Conclusion:** Stapled bowel anastomosis significantly reduced anastomosis duration while demonstrating numerically lower, but statistically non-significant anastomotic leak rate compared to hand-sewn anastomosis.

### KEYWORDS

Bowel Anastomosis, Stapled Anastomosis, Hand-sewn Anastomosis, Gastrointestinal Surgery, Anastomotic Leak.

### INTRODUCTION

Bowel surgeries constitute an essential component of gastrointestinal surgical practice and are frequently performed for a wide range of benign and malignant conditions, including intestinal obstruction, bowel perforation, ischemic bowel disease, inflammatory disorders, and gastrointestinal malignancies.

Restoration of bowel continuity following resection through anastomosis represents a critical step in ensuring gastrointestinal function and patient recovery. However, bowel anastomosis remains associated with postoperative complications such as anastomotic leakage, stricture formation, surgical site infection, prolonged hospital stay, and increased mortality.

The success of bowel anastomosis depends on several factors including adequate vascularity, tension-free bowel approximation, meticulous surgical technique, patient-related factors, and perioperative optimisation. Among the available techniques, stapled and hand-sewn anastomoses remain the most widely practiced approaches.

Hand-sewn anastomosis has traditionally been considered the gold standard and offers individualised tissue approximation. However, it is technically demanding and time-consuming.

Stapled anastomosis has gained popularity due to speed, technical ease, and reproducibility. Mechanical staplers provide standardised tissue approximation and may be advantageous in anatomically difficult locations and emergency surgeries.

Several studies and meta-analyses have demonstrated comparable safety outcomes between stapled and hand-sewn techniques, though stapled anastomosis consistently demonstrates reduced operative time.

The present study was undertaken to evaluate the effectiveness of stapled versus hand-sewn bowel anastomosis and compare outcomes in terms of operative duration, anastomotic leak, postoperative complications, and overall surgical recovery.

### MATERIALS AND METHODS

#### Study Design

A prospective comparative study was conducted to evaluate the

effectiveness and outcomes of stapled versus hand-sewn bowel anastomosis in patients undergoing gastrointestinal surgeries.

#### Study Setting and Duration

The study was conducted in the Department of General Surgery, Great Eastern Medical School and Hospital (GEMS), Ragolu, Andhra Pradesh, over a period of 18 months.

#### Sample Size

A total of 110 patients undergoing bowel resection and anastomosis were included in the study and equally divided into:

- **Stapled Anastomosis Group (SA):** 55 patients
- **Hand-Sewn Anastomosis Group (HS):** 55 patients

#### Inclusion Criteria

- Patients undergoing elective or emergency gastrointestinal surgeries requiring bowel resection and anastomosis for benign or malignant conditions.
- Male and female patients undergoing bowel surgeries.
- Patients willing to provide informed written consent.

#### Exclusion Criteria

- Age below 12 years or above 80 years.
- Pregnancy.
- Previous radiotherapy.
- Coagulopathy or anticoagulant therapy.
- Inoperable bowel malignancy.
- Patients refusing consent.

#### Methodology

Patients admitted for elective and emergency bowel surgeries underwent detailed clinical examination and investigations. Based on the operative technique employed, patients were categorised into stapled or hand-sewn anastomosis groups.

Different types of bowel anastomoses, including small bowel-small bowel, ileocolic, colocolic, and colorectal anastomoses, were performed depending on the pathology and operative requirement.

#### Outcome Measures

The following parameters were assessed:

- Duration of anastomosis

- Anastomotic leak
- Postoperative complications
- Clinical recovery and overall surgical outcome

### Statistical Analysis

Data were analyzed using SPSS version 20. Continuous variables were analyzed using independent sample t-test, and categorical variables were analyzed using Chi-square test. A p-value of  $<0.05$  was considered statistically significant.

## RESULTS

### Baseline Characteristics

A total of 110 patients were included in the study, with 55 patients each in the stapled and hand-sewn groups. Baseline demographic characteristics, comorbidities, indications for surgery, and surgical profile were comparable between both groups.

### Age Distribution

The majority of patients belonged to the **51–70 years age group**. No statistically significant difference in age distribution was observed between groups ( $p = 0.864$ ).

### Gender Distribution

Male predominance was observed in both groups. The stapled group included **30 males (54.5%) and 25 females (45.5%)**, whereas the hand-sewn group included **36 males (65.5%) and 19 females (34.5%)**. No statistically significant difference was noted ( $p = 0.692$ ).

### Comorbidities

Anaemia was the most common comorbidity in both groups, followed by diabetes mellitus and hypertension. No statistically significant difference was observed ( $p = 0.657$ ).

### Indications for Surgery

Malignancy was the most common indication for surgery in both groups, followed by intestinal obstruction and bowel perforation. No statistically significant difference was noted ( $p = 0.742$ ).

### Nature of Surgery

Most surgeries were elective in both groups, with no statistically significant difference between stapled and hand-sewn groups ( $p = 0.568$ ).

### Type of Anastomosis

Ileocolic anastomosis was more common in the stapled group, while small bowel-small bowel anastomosis predominated in the hand-sewn group. However, no statistically significant difference was noted ( $p = 0.84$ ).

### Duration of Anastomosis

The mean duration required for bowel anastomosis was significantly lower in the stapled group ( **$14.8 \pm 3.2$  minutes**) compared with the hand-sewn group ( **$26.6 \pm 4.6$  minutes**). This difference was highly statistically significant ( $p < 0.0001$ ).

### Anastomotic Leak

Anastomotic leak occurred in **2 patients (3.6%)** in the stapled group compared with **6 patients (10.9%)** in the hand-sewn group, indicating a lower leak rate among patients undergoing stapled anastomosis ( $p = 0.14$ ).

### Postoperative Outcomes

Stapled anastomosis demonstrated superior operative efficiency with a lower trend toward postoperative morbidity. Both techniques were found to be safe and clinically effective for restoration of bowel continuity.

## DISCUSSION

Bowel anastomosis remains one of the most critical components of gastrointestinal surgery and significantly influences postoperative outcomes. The present prospective comparative study evaluated the effectiveness and outcomes of stapled versus hand-sewn bowel anastomosis in 110 patients undergoing elective and emergency gastrointestinal surgeries.

The demographic characteristics in the present study were comparable between both groups. Most patients belonged to the **51–70 years age group**, with male predominance in both groups. Comparable demographic distribution minimised confounding bias and enabled meaningful comparison of surgical outcomes.

Comorbidities were similarly distributed between both groups, with anaemia being the most common associated condition, followed by diabetes mellitus and hypertension. Uniformity of comorbid conditions ensured balanced comparison of healing outcomes and postoperative morbidity.

Malignancy constituted the most common indication for surgery in both groups, followed by intestinal obstruction and bowel perforation. This finding reflects current trends in tertiary care gastrointestinal surgical practice where bowel resections are frequently performed for malignant disease.

One of the most significant findings of the present study was the marked reduction in operative duration associated with stapled anastomosis. The mean duration of anastomosis was  **$14.8 \pm 3.2$  minutes** in the stapled group compared with  **$26.6 \pm 4.6$  minutes** in the hand-sewn group ( $p < 0.0001$ ), indicating substantially improved operative efficiency. Similar findings have been reported by Matos et al. and Scatizzi et al., who demonstrated significantly shorter operative time with stapled bowel anastomosis.

Anastomotic leak remains the most feared complication of bowel surgery because of its association with prolonged hospitalisation, increased morbidity, reoperation, and mortality. In the present study, anastomotic leak occurred in **3.6%** of patients in the stapled group compared with **10.9%** in the hand-sewn group. Although statistical significance could not be definitively established because of sample size limitations, the numerically lower leak rate observed in stapled anastomosis suggests a possible clinical advantage.

Several systematic reviews and meta-analyses have reported broadly comparable safety outcomes between stapled and hand-sewn bowel anastomosis with respect to postoperative complications and mortality. However, stapled techniques consistently demonstrate advantages in operative efficiency, standardisation, and ease of technical performance.

Despite the advantages observed with stapled anastomosis, hand-sewn anastomosis remains an effective and reliable technique, especially in resource-limited settings and situations where staplers may not be readily available. Furthermore, hand-sewn techniques allow greater flexibility in tissue handling and remain an essential surgical skill.

The findings of the present study suggest that stapled anastomosis may provide operative advantages while maintaining favourable clinical outcomes. Nevertheless, both techniques remain safe and clinically effective for restoration of bowel continuity.

### Limitations

The present study was conducted at a single tertiary care center with a relatively limited sample size. Long-term follow-up evaluating quality of life, functional outcomes, and late postoperative complications such as stricture formation was not assessed. Further multicenter studies with larger populations are required for stronger conclusions.

## CONCLUSION

Both stapled and hand-sewn bowel anastomosis techniques are safe and effective methods for restoring bowel continuity following gastrointestinal surgery. However, stapled anastomosis demonstrated significant advantages in terms of reduced operative duration and a lower incidence of anastomotic leak.

The mean duration of anastomosis was significantly shorter in the stapled group, suggesting superior operative efficiency and potentially reduced anesthesia-related risks. Although both methods demonstrated acceptable postoperative outcomes, stapled anastomosis may provide added advantages in selected patients.

Based on the findings of the present study, stapled anastomosis may be preferred in selected gastrointestinal procedures because of improved operative efficiency and favourable postoperative outcomes. Nevertheless, hand-sewn anastomosis remains a dependable and effective alternative, particularly in resource-constrained settings.

## DECLARATIONS

### Human Ethics

Ethical approval for the study was obtained from the Institutional Ethics Committee of Great Eastern Medical School and Hospital,

Ragolu, Andhra Pradesh.

### Consent

Written informed consent was obtained from all participants prior to inclusion in the study.

### Conflict of Interest

The Authors declare no conflict of interest.

### Funding

No external funding was received for this study.

### ACKNOWLEDGEMENTS

The Authors sincerely acknowledge the Department of General Surgery, Great Eastern Medical School and Hospital, Ragolu, Andhra Pradesh, for their guidance and support throughout the study.

### REFERENCES

1. Matos D, Castro AA, Atallah AN, Wille-Jørgensen P. Stapled versus hand-sewn methods for colorectal anastomosis surgery. *Cochrane Database Syst Rev*. 2012;(2):CD003144.
2. Lustosa SA, Matos D, Atallah AN, Castro AA. Stapled versus hand-sewn methods for colorectal anastomosis surgery: a meta-analysis. *Sao Paulo Med J*. 2002;120(5):132–136.
3. Neutzling CB, Lustosa SA, Proenca IM, da Silva EM, Matos D. Stapled versus hand-sewn methods for colorectal anastomosis after resection of colorectal cancer. *Cochrane Database Syst Rev*. 2012;(2):.
4. Watson DJ, Davies N, Devitt PG, Jamieson GG. Importance of technique in fundoplication surgery and comparison of outcomes. *Br J Surg*. 2001;88(2):224–228.
5. Vignali A, Fazio VW, Lavery IC, et al. Factors associated with the occurrence of leaks in stapled rectal anastomoses: a review of 1,014 patients. *J Am Coll Surg*. 1997;185(2):105–113.
6. Law WL, Chu KW, Ho JW, Chan CW. Risk factors for anastomotic leakage after colorectal resection and its impact on survival. *Br J Surg*. 2007;94(8):1022–1029.
7. Walker KG, Bell SW, Rickard MJFX, et al. Anastomotic leakage is predictive of diminished survival after potentially curative resection for colorectal cancer. *Ann Surg*. 2004;240(2):255–259.
8. Clinical Outcomes of Surgical Therapy Study Group. A comparison of laparoscopically assisted and open colectomy for colon cancer. *N Engl J Med*. 2004;350(20):2050–2059.
9. McArdle CS, McMillan DC, Hole DJ. Impact of anastomotic leakage on long-term survival of patients undergoing curative resection for colorectal cancer. *Br J Surg*. 2005;92(9):1150–1154.
10. Alves A, Panis Y, Trancart D, Regimbeau JM, Pocard M, Valleur P. Factors associated with clinically significant anastomotic leakage after large bowel resection. *Ann Surg*. 2002;235(4):499–506.
11. Sauer R, Becker H, Hohenberger W, et al. Preoperative versus postoperative chemoradiotherapy for rectal cancer. *N Engl J Med*. 2004;351(17):1731–1740.
12. Docherty JG, McGregor JR, Akyol AM, Murray GD, Galloway DJ. Comparison of manually constructed and stapled anastomoses in colorectal surgery. *Br J Surg*. 1995;82(1):61–63.
13. Mirnezami A, Mirnezami R, Chandrakumaran K, Sasapu K, Sagar P, Finan P. Increased local recurrence and reduced survival from colorectal cancer following anastomotic leak: systematic review and meta-analysis. *Ann Surg*. 2011;253(5):890–899.
14. Matthiessen P, Hallböök O, Rutegård J, Simert G, Sjö Dahl R. Defunctioning stoma reduces symptomatic leak after low anterior resection of the rectum for cancer. *Ann Surg*. 2007;246(2):207–214.
15. Scatizzi M, Kroning KC, Boddi V, et al. Stapled versus hand-sewn ileocolic anastomosis during open right colectomy for cancer: prospective randomized study. *World J Surg*. 2010;34(5):1093–1099.
16. Simillis C, Purkayastha S, Yamamoto T, et al. Meta-analysis comparing conventional end-to-end anastomosis vs stapled side-to-side anastomosis in Crohn disease. *Ann Surg*. 2007;245(1):72–78.
17. Urschel JD, Blewett CJ, Young JE, Miller JD, Bennett WF. Hand-sewn or stapled esophagogastric anastomoses after esophagectomy? *Dis Esophagus*. 2001;14(3-4):212–217.
18. Markar SR, Karthikesalingam A, Vyas S, Hashemi M. Systematic review and meta-analysis of hand-sewn versus stapled esophagogastric anastomosis. *J Gastrointest Surg*. 2011;15(5):876–884.
19. MacRae HM, McLeod RS. Hand-sewn versus stapled anastomosis in colon and rectal surgery: systematic review and meta-analysis. *Dis Colon Rectum*. 1998;41(2):180–189.
20. Dumville JC, Coulthard P, Worthington HV, et al. Tissue adhesives for closure of surgical incisions. *Cochrane Database Syst Rev*. 2014;(11):CD004287.