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Original Article

Hand-Sewn Versus Stapler Anastomosis in Gastrointestinal Surgeries: A Prospective Comparative Study

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ABSTRACT

Background: Gastrointestinal anastomosis is among the most frequent procedures performed in abdominal surgery. Restoration of bowel continuity following resection may be performed by conventional hand sewing procedures or by modern stapling devices. Despite the great progress in surgical technology, there has been a debate as to which anastomosis, stapled or hand sewn, is better in terms of operative time, postoperative complications and surgical results.

Objective: To compare the operative time, postoperative complications, postoperative recovery and overall surgical outcomes between hand-sewn and stapled gastrointestinal anastomosis.

Methods and Materials: The present prospective comparative study was carried out in the Department of Minimal Access and General Surgery, Government Medical College Srinagar from 2023 to 2026. There were 100 patients undergoing gastrointestinal surgery requiring bowel anastomosis in the study. The patients were randomized into two groups: a hand-sewn anastomosis group and a stapled anastomosis group. Demographic data, diagnosis, operative findings, postoperative complications and recovery results were statistically analysed.

Results: Stapled anastomosis had significantly shorter operative time than hand-sewn anastomosis. Anastomotic leak rates were similar between the two groups. The incidence of postoperative wound infection and ileus was slightly lower in the stapled group. Patients with stapled anastomosis had earlier recovery and shorter hospital stay.

Conclusion: Stapled gastrointestinal anastomosis provides a safe and efficient alternative to hand-sewn techniques. The rate of complications is similar in both techniques but the operative time and the post-operative recovery time is less with stapled anastomosis.

Keywords: Hand-sewn anastomosis, stapled anastomosis, gastrointestinal surgery, bowel anastomosis, operative time, anastomotic leak.

INTRODUCTION

Gastrointestinal anastomosis is the basis of modern abdominal surgery and is needed to restore intestinal continuity after resection of diseased intestinal segments. The term “anastomosis” derives from the Greek words “ana” meaning “without”

and “stoma” meaning “mouth,” referring to the communication created between two hollow viscera [1]. A successful gastrointestinal anastomosis is essential for the maintenance of physiological continuity and preservation of digestive function.

Intestinal resection and anastomosis are often required in conditions such as intestinal obstruction, gastrointestinal malignancies, perforation peritonitis, inflammatory bowel disease, abdominal trauma, ischemic bowel disease and congenital gastrointestinal anomalies [2-4]. The success of gastrointestinal surgery is mainly dependent on the integrity of the anastomosis that is created. Failure of the anastomosis can result in serious complications such as anastomotic leak, intra-abdominal sepsis, fecal peritonitis, prolonged hospital stays, reoperation, and mortality [5].

Traditionally, hand-sewn intestinal anastomosis has been the gold standard technique for restoration of bowel continuity [6]. Hand-sewn techniques provide the ability to accurately approximate tissue and versatility in technically difficult situations. Eventually, the conventional two-layer technique was modified to a single-layer extramucosal anastomosis, which resulted in decreased tissue ischemia and minimal luminal narrowing [7].

The advent of mechanical stapling devices revolutionized gastrointestinal surgery. Staplers allow for rapid and uniform approximation of tissue with cutting and stapling at the same time [8]. Modern staplers are made of titanium and are available in the form of circular, linear and transverse staplers. In anatomically challenging areas like the deep pelvis and lower rectum, manual suturing can be technically difficult, making staplers particularly useful [9].

The use of stapling devices, although increasing in popularity, remains controversial as to whether stapled anastomosis is superior to traditional hand-sewn techniques. Multiple randomized controlled trials and meta-analyses have shown decreased operative time with staplers, but the data on reduction in leak rates is still inconsistent [10-12].

In developing countries like India, economic factors are significant in the choice of anastomotic technique. Staplers reduce operative time [13] but their cost is high which limits their widespread use in resource-constrained healthcare settings. Thus, whether the added cost of staplers is justified by the clinical benefits remains an important question to be answered. Government Medical College Srinagar is a tertiary care referral centre with a large number of gastrointestinal surgeries. There is no regional prospective data comparing stapled vs hand-sewn gastrointestinal anastomosis in this population. Hence, present study was undertaken to compare the safety, efficacy, operative parameters and post-operative outcomes of hand sewn versus stapled gastrointestinal anastomosis.

AIMS AND OBJECTIVES

Aims

To compare hand-sewn and stapled gastrointestinal anastomosis in patients undergoing gastrointestinal surgery.

Objectives

1. To compare operative time between hand-sewn and stapled anastomosis.
2. To compare postoperative complications including anastomotic leak, wound infection and ileus.
3. To assess the postoperative recovery and the length of hospital stay in both groups.
4. To determine the relationship of site of surgery and the decision to use anastomotic technique.
5. To evaluate the feasibility and safety of stapled gastrointestinal anastomosis.

MATERIALS AND METHODS

Study Design

Prospective comparative observational study.

Study Setting

Department of Minimal Access and General Surgery, Government Medical College Srinagar.

Study Duration

2023–2026.

Sample Size

100 patients undergoing gastrointestinal surgery requiring bowel anastomosis.

Inclusion Criteria

- Patients aged above 18 years.
- Patients undergoing gastrointestinal surgery requiring bowel anastomosis.
- Patients willing to participate in the study.

Exclusion Criteria

- Patients medically unfit for surgery.
- Patients with diffuse fecal peritonitis unsuitable for primary anastomosis.
- Patients with severe hemodynamic instability.
- Patients refusing consent.

Methodology

Patients were divided into two groups:

- Group A: Hand-sewn anastomosis
- Group B: Stapled anastomosis

Detailed clinical history, physical examination, and routine laboratory investigations were performed preoperatively. Operative findings, type of procedure, duration of surgery, and postoperative outcomes were recorded.

Postoperative evaluation included:

- Time to bowel sound return
- Surgical site infection
- Anastomotic leak
- Postoperative ileus
- Hospital stay
- Mortality

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software. Quantitative variables were expressed as mean ± standard deviation. Categorical variables were expressed as percentages and frequencies. Chi-square test and Student's t-test were used where appropriate. A p-value less than 0.05 was considered statistically significant.

OBSERVATIONS AND RESULTS

Table 1: Age Distribution

Age Group (Years)	Number of Patients	Percentage
18–30	18	18%
31–40	24	24%
41–50	28	28%
51–60	20	20%
>60	10	10%

The majority of patients belonged to the 41–50 years age group.

Figure 1: Age Distribution of Study Population

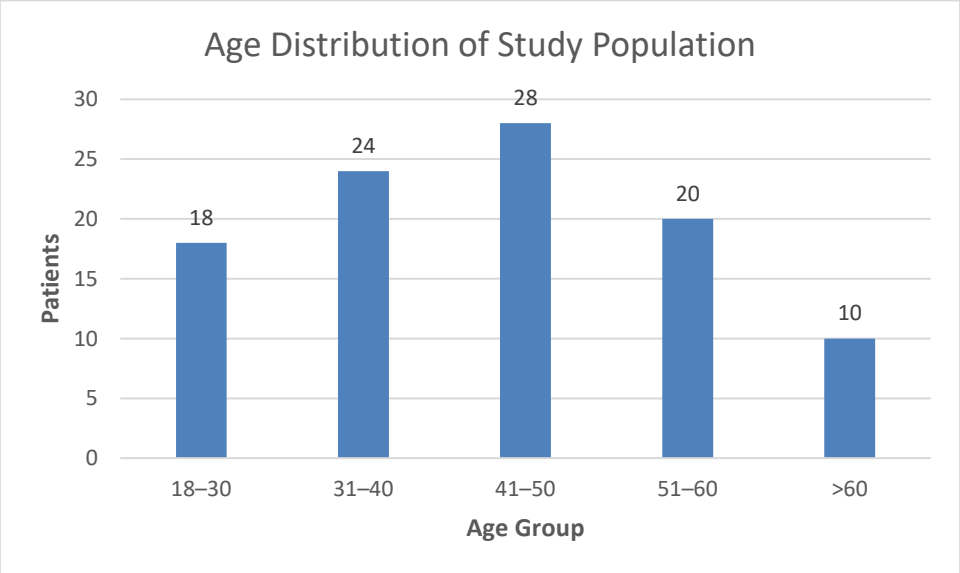

Table 2: Gender Distribution

Gender	Hand-sewn	Stapled	Total
Male	34	38	72
Female	16	12	28

Male patients constituted the majority of the study population.

Table 3: Clinical Diagnosis

Diagnosis	Number of Patients
Gastrointestinal malignancy	28
Intestinal obstruction	24
Perforation peritonitis	18
Trauma	12
Inflammatory bowel disease	8
Others	10

Gastrointestinal malignancy was the most common indication for surgery.

Table 4: Type of Surgical Procedure

Procedure	Number of Patients
Small bowel resection and anastomosis	30
Right hemicolectomy	18
Left hemicolectomy	12
Ileostomy closure	14
Gastrojejunostomy	10
Low anterior resection	8
Others	8

Small bowel resection and anastomosis was the most frequently performed procedure.

Table 5: Operative Time

Anastomosis Type	Mean Operative Time
Hand-sewn	142 ± 18 minutes
Stapled	118 ± 14 minutes

Operative time was significantly shorter in the stapled group.

Table 6: Site of Anastomosis

Site	Hand-sewn	Stapled
Small bowel	24	20
Ileocolic	10	16
Colorectal	8	10
Gastrojejunal	8	4

Stapled anastomosis was used more commonly in colorectal and ileocolic procedures.

Table 7: Postoperative Complications

Complication	Hand-sewn	Stapled
Anastomotic leak	4	3
Wound infection	6	4
Postoperative ileus	5	3
Anastomotic stricture	1	2
Intra-abdominal abscess	2	1

Complication rates were comparable between the two groups.

Table 8: Hospital Stay

Anastomosis Type	Mean Hospital Stay
Hand-sewn	11.2 ± 3.1 days
Stapled	8.6 ± 2.4 days

Patients undergoing stapled anastomosis had shorter hospital stay.

INTERPRETATION OF RESULTS AND CLINICAL CORRELATION

The operative time was significantly reduced in the present study by stapled gastrointestinal anastomosis compared to hand sewn anastomosis. This has clinical implications as increased time in the operating room is associated with increased exposure to anesthesia and peri-operative physiologic stress, particularly in elderly patients or those with co-morbid conditions [10,11].

Most of the patients in the study were of middle-aged group which is the usual age distribution for gastrointestinal malignancies and intestinal obstruction. A male predominance was also observed which correlates with the epidemiology of surgical diseases of the gastrointestinal tract in India [13].

The main indication for surgery was gastrointestinal malignancy. Staplers were found to be useful especially in malignant colorectal and ileocolic procedures where access is limited and handling of tissue is technically challenging [9].

Low and comparable anastomotic leak rates were observed in both groups, suggesting that the meticulous surgical technique and attention to the principles of bowel anastomosis is still more important than the instrument used [5,12]. Adequate blood supply, tension-free anastomosis and gentle tissue handling are still the essentials for successful healing.

The stapled group had slightly lower rates of postoperative wound infection and ileus. Less manipulation of the bowel and less time of exposure may help to decrease the inflammatory response and earlier bowel recovery [11].

The incidence of postoperative stricture was slightly higher in the stapled group. Increased fibrosis around staple lines has been reported in several international studies [10,12].

Length of hospital stay was shorter with stapled anastomosis and recovery was quicker. Shorter hospital stay improves patient satisfaction and better utilization of hospital resources in high volume tertiary care centers.

Staplers are associated with increased procedural cost, but their economic burden may be partly offset by reduced operative duration and shorter hospitalization.

Picture 1: Double Layered Hand Sewn Ileocolic Anastomosis

Picture 2: Side to Side Anastomosis Using Linear GIA stapler

Picture 3: Intracorporeal Hand Sewn Esophagojejunostomy Following Lap Total Gastrectomy

DISCUSSION

The present prospective comparative study was carried out to evaluate and compare hand-sewn and stapled gastrointestinal anastomosis for operative time, postoperative complications and clinical outcomes.

In this study majority of the patients were in 41–50 years age group. Similar results were observed in other gastrointestinal surgical studies where middle aged patients represented the major proportion of admissions [11,13]. The male predominance noted in the present study may be a reflection of the higher incidence of gastrointestinal malignancies, bowel obstruction and trauma in men.

The most common indication for surgery in the current study was GI malignancy. Resections for malignancy are frequently technically challenging and in colorectal surgery staplers provide better access and technical feasibility [9].

One of the most important results of the present study was the reduction of operative time in the stapled group. The mean operative time in stapled anastomosis was significantly less than hand sewn anastomosis. Reducing the operative time is beneficial as it reduces the exposure to anesthesia, the handling of tissues and the operative fatigue of the surgeons [10,11]. Reduced operative time also means more efficient use of operating room space in busy tertiary care centers.

Stapled anastomosis was particularly useful in ileocolic and colorectal procedures, where access into the deep pelvis makes hand suturing technically difficult. Circular staplers allow low pelvic anastomosis and sphincter-preserving surgery in selected patients [9].

Anastomotic leak is the most feared complication after bowel surgery due to its association with severe morbidity and mortality. In the present study, the leak rates were similar between the two groups showing that both techniques are safe when performed correctly. This finding indicates that the surgeon's experience and the importance of the anastomotic principles are more important than the method of construction itself [5, 7, 12].

Anastomotic leakage is still one of the most serious complications after gastrointestinal surgery and depends on a number of patient-related and perioperative factors. In addition to the technical aspects of anastomosis construction, nutritional status is another important factor in determining healing outcomes. Hypoalbuminemia has been consistently described as an independent predictor of impaired wound healing and anastomotic failure . Reduced serum albumin level has detrimental effect on collagen synthesis, tissue regeneration as well as immune function thus making the patient prone to leakage. In addition, systemic inflammatory responses may impair tissue repair processes and delay recovery of the anastomotic site [14,16].

Other than serum albumin, there are physiological parameters that play a significant role in successful anastomotic healing. Adequate hemoglobin concentration is indicative of optimal tissue oxygenation and lower C-reactive protein levels reflect lower inflammatory burden. The lack of prolonged inotropic support is associated with better perfusion and better tissue repair. These factors contribute to uncomplicated healing and better postoperative results [14].

In the present study, diversion procedures such as loop ileostomy were only necessary in a minority of patients with anastomotic leaks. Most patients were successfully treated conservatively with bowel rest, image-guided drainage and broad spectrum intravenous antibiotics. This finding is in line with previous reports that have shown that a significant portion of anastomotic leaks can be handled without requiring reoperation, particularly if detected early and treated adequately [15]. Such findings underscore the importance of individualized treatment strategies and meticulous postoperative surveillance in patients undergoing gastrointestinal anastomosis.

The overall complication profile was comparable in both the groups postoperatively. The stapled group had slightly less wound infection and post-operative ileus. Shorter operative duration and less bowel manipulation may lead to earlier return of bowel function and less postoperative inflammation [11].

There was slightly more anastomotic stricture in the stapled group. This may be due to concentric fibrosis and fixed luminal diameter by circular staplers. However, the overall incidence was still low [10,12].

The present study also found that patients who had stapled anastomosis were discharged earlier from hospital. An earlier discharge was associated with earlier return of bowel function and less postoperative pain. Less hospitalization is good for patients and healthcare systems, leads to lower indirect treatment costs and increases bed turnover.

However, in spite of these advantages, the high cost of stapling devices is still an important limitation in developing countries. Hand-sewn anastomosis is still cost-effective and universally applicable, especially in resource-constrained settings [13].

In this study, it was emphasized that successful gastrointestinal anastomosis depends mostly on basic surgical principles including sufficient vascularity, tension free suture approximation, careful tissue handling and prevention of contamination [5,6].

Strengths of the present study include prospective data collection and evaluation of multiple gastrointestinal procedures. However, limitations include a relatively small sample size and lack of long-term follow up on late stricture formation and recurrence.

Larger multicenter randomized studies with longer follow-up are needed to establish clearer guidelines on the superiority of stapled versus hand-sewn anastomosis in specific gastrointestinal procedures.

Nutritional Factors and Anastomotic Leak

SUMMARY

The present prospective comparative study was undertaken to evaluate hand sewn and stapled gastrointestinal anastomosis. The study was done in 100 patients underwent gastrointestinal surgery at Government Medical College Srinagar.
The main results are:

1. Majority of the patients were in the age group of 41-50 years.
2. The most frequent reason for surgery was gastrointestinal malignancy.
3. Operative time was significantly reduced by stapled anastomosis.
4. Anastomotic leak rate was similar in both groups.
5. Postoperative wound infection and ileus was slightly decreased in the stapled group.
6. Stapled group had slightly higher anastomotic stricture rate.
7. Patients with stapled anastomosis had shorter hospital stay.
8. Both methods were safe and effective.

CONCLUSION

Hand sewn and stapled gastrointestinal anastomosis are both safe and effective techniques when used according to sound surgical principles.
Stapled anastomosis has several advantages including:

- Shorter operative time
- Better performance in technically difficult areas
- Fewer tissue handling
- More rapid recovery from surgery
- Shorter time in the hospital

Hand-sewn anastomosis is still highly reliable, cost-effective and universally applicable, especially in resource-limited settings.

So the choice between hand sewn and stapled anastomosis must depend on:

- Location anatomical
- Surgeon experience
- Resources availability
- Patients condition
- Costing considerations

Mechanical staplers are a significant advance in gastrointestinal surgery but every gastrointestinal surgeon must still be proficient in hand-sewn techniques.

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