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Research Article

COMPARATIVE ASSESSMENT OF SURGICAL OUTCOMES IN STAPLED AND HAND-SEWN ANASTOMOSIS IN BOWEL SURGERY

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Abstract: ***Introduction**:* Bowel anastomosis is a critical step in gastrointestinal surgery performed to restore intestinal continuity following resection. The integrity of the anastomosis significantly influences postoperative recovery and surgical outcomes. Hand-sewn anastomosis has long been considered the conventional technique, while stapled anastomosis has increasingly been adopted because of its technical ease and reduced operative time. Despite widespread use of both methods, the optimal technique for minimizing postoperative complications and improving recovery remains controversial.**Aims:** To compare the operative and postoperative outcomes between stapled and hand-sewn anastomosis in patients undergoing bowel surgery.**Materials and Methods:** This prospective comparative study was conducted over a period of 12 months in the Department of General Surgery at Sree Mookambika Institute of Medical Sciences. A total of 56 patients undergoing elective or emergency bowel resection with primary anastomosis were included in the study. Patients were divided into two groups based on the type of anastomosis performed. Group A consisted of 28 patients who underwent stapled anastomosis, while Group B included 28 patients who underwent hand-sewn anastomosis. Parameters evaluated included duration of surgery, time required for anastomosis, return of bowel activity, postoperative hospital stay, anastomotic leak, wound infection, postoperative ileus, and mortality. Statistical analysis was performed with $p < 0.05$ considered statistically significant.**Results:** The mean anastomosis time was significantly shorter in the stapled group (17.9 ± 3.8 minutes) compared to the hand-sewn group (30.2 ± 5.4 minutes) ($p < 0.01$). Patients who underwent stapled anastomosis demonstrated earlier return of bowel sounds than those in the hand-sewn group ($p = 0.01$). The mean duration of hospital stay was lower in Group A (7.9 ± 2.0 days) compared to Group B (10.1 ± 2.5 days) ($p < 0.01$). Anastomotic leak occurred in 1 (3.6%) patient in the stapled group and 4 (14.3%) patients in the hand-sewn group. Surgical site infection was observed in 3 (10.7%) patients in Group A and 6 (21.4%) patients in Group B. Postoperative ileus developed in 2 (7.1%) and 5 (17.9%) patients respectively. **Conclusion:** Stapled anastomosis was associated with shorter anastomosis time, earlier postoperative bowel recovery, reduced hospital stay, and fewer postoperative complications compared to hand-sewn anastomosis.

Keywords: Anastomotic leak; Bowel resection; Gastrointestinal surgery; Hand-sewn anastomosis; Intestinal anastomosis; Stapled anastomosis.

INTRODUCTION

Intestinal anastomosis is one of the most commonly performed procedures in gastrointestinal surgery and represents a crucial step following bowel resection.[1] Restoration of bowel continuity is required in a wide range of surgical conditions including intestinal obstruction, malignancy, perforation, ischemia, inflammatory bowel disease, trauma, and diverticular disease.[2] The success of bowel surgery largely depends on the integrity and healing of the anastomosis, as postoperative complications such as anastomotic leak, fistula formation, wound infection, and postoperative ileus contribute significantly to morbidity, prolonged hospitalization, and mortality.[3]

The fundamental principles of intestinal anastomosis include adequate blood supply, tension-free approximation, meticulous surgical technique, minimal tissue handling, and prevention of contamination.[4] Traditionally, hand-sewn anastomosis has been the standard method for restoring bowel continuity. This technique involves suturing the bowel ends manually using absorbable or non-absorbable suture materials in either single-layer or double-layer fashion. Hand-sewn anastomosis offers flexibility and can be performed in different anatomical situations; however, it is technically demanding, time-consuming, and dependent on surgical expertise.[5,6]

With advances in surgical technology, stapling devices have become increasingly popular in gastrointestinal surgery. Stapled anastomosis utilizes mechanical stapling instruments to approximate bowel ends with uniform staple lines and minimal tissue manipulation.[7] Stapling devices are believed to reduce operative time, provide technical consistency, and facilitate anastomosis in anatomically difficult regions such as the deep pelvis or esophagogastric junction. In addition, stapled techniques may reduce tissue edema and preserve local blood supply, potentially improving anastomotic healing.[8]

Anastomotic leak remains one of the most feared complications after bowel surgery because it is associated with severe sepsis, reoperation, prolonged hospital stay, and increased mortality.[9] Postoperative wound infection and delayed return of bowel function also significantly affect patient recovery and healthcare expenditure. Therefore, identifying the optimal anastomotic technique that minimizes complications and promotes early recovery remains an important objective in gastrointestinal surgery.[10]

Despite the widespread use of staplers, the superiority of stapled anastomosis over hand-sewn techniques remains controversial. Several studies have compared the two methods with varying results. Although both stapled and hand-sewn anastomosis are widely practiced, there remains ongoing debate regarding their comparative benefits in bowel surgery. Limited region-specific prospective studies are available comparing postoperative outcomes between these techniques in mixed gastrointestinal surgical cases. This study was designed to evaluate operative efficiency, recovery parameters, and postoperative complications associated with both methods, thereby helping surgeons identify the most effective and practical anastomotic technique for improving patient outcomes and reducing postoperative morbidity.

AIMS AND OBJECTIVES

- To compare the operative and postoperative outcomes between stapled and hand-sewn anastomosis in patients undergoing bowel surgery.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of General Surgery at Sree Mookambika Institute of Medical Sciences over a period of 12 months from April 2025 to March 2026. The study included 56 patients who underwent bowel resection and primary intestinal anastomosis for various gastrointestinal surgical conditions. Written informed consent was obtained from all patients after explaining the nature and objectives of the study.

Patients aged above 18 years undergoing elective or emergency bowel surgery requiring intestinal resection and primary anastomosis were included in the study. Indications for surgery included intestinal obstruction, perforation, bowel ischemia, malignancy, trauma, inflammatory bowel disease, and benign gastrointestinal conditions requiring bowel resection. Both small bowel and large bowel anastomoses were included.

Patients with generalized fecal peritonitis, severe septic shock, unresectable malignancy, immunocompromised status, or severe malnutrition were excluded from the study. Patients requiring proximal diversion stoma without primary anastomosis, those with previous multiple abdominal surgeries causing extensive adhesions, and patients who were hemodynamically unstable and unfit for definitive surgical reconstruction were also excluded. Pregnant women and patients unwilling to participate in the study were not included.
Patients were divided into two groups based on the type of anastomosis performed intraoperatively. Group A consisted of 28 patients who underwent stapled anastomosis, while Group B included 28 patients who underwent hand-sewn anastomosis.

A detailed clinical history and thorough physical examination were performed in all patients. Baseline demographic details including age, sex, presenting symptoms, diagnosis, comorbid conditions such as diabetes mellitus and hypertension, and indication for surgery were documented. Routine laboratory investigations including complete blood count, renal function tests, liver function tests, serum electrolytes, blood glucose levels, coagulation profile, and radiological investigations were carried out in all patients. Preoperative optimization including fluid resuscitation, correction of electrolyte imbalance, blood transfusion when required, and administration of broad-spectrum antibiotics was performed according to institutional protocol.

All surgeries were performed under general anaesthesia by experienced general surgeons. The decision regarding the type of anastomosis was made intraoperatively based on surgeon preference, bowel condition, and availability of stapling devices. In the stapled group, gastrointestinal staplers were used to perform side-to-side or functional end-to-end anastomosis depending on the site and indication of surgery. In the hand-sewn group, anastomosis was performed manually using absorbable sutures in either single-layer or double-layer interrupted technique according to standard surgical principles. Adequate bowel vascularity, tension-free approximation, and meticulous tissue handling were ensured in all cases. Intraoperative parameters including duration of surgery, time required for completion of anastomosis, blood loss, and intraoperative complications were recorded. Postoperatively, all patients received standard care including intravenous fluids, antibiotics, analgesics, and nasogastric decompression when indicated. Patients were monitored for return of bowel sounds, passage of flatus, initiation of oral feeding, duration of hospital stay, and postoperative complications including anastomotic leak, surgical site infection, postoperative ileus, wound dehiscence, and mortality. Anastomotic leak was diagnosed clinically and radiologically based on the presence of abdominal pain, fever, peritonitis, feculent drain output, or imaging evidence of leak.

All collected data were entered into a structured proforma and analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Statistical

analysis was performed using chi-square test and independent t-test wherever appropriate. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 56 patients undergoing bowel resection with primary intestinal anastomosis were included in the study. Patients were equally divided into Group A (stapled anastomosis) and Group B (hand-sewn anastomosis), with 28 patients in each group. The majority of patients belonged to the 41–50 years of age group in both study groups. Age distribution was comparable between stapled and hand-sewn anastomosis groups, ensuring uniform baseline characteristics. (Table 1)

Age Group (years)	Group A n (%)	Group B n (%)	Total n (%)
≤40	6 (21.4%)	5 (17.9%)	11 (19.6%)
41–50	10 (35.7%)	11 (39.3%)	21 (37.5%)
51–60	8 (28.6%)	7 (25.0%)	15 (26.8%)
>60	4 (14.3%)	5 (17.9%)	9 (16.1%)

Table 1: Age Distribution of Study Population

Both groups were clinically comparable with respect to gender distribution, associated diabetes mellitus, and surgical indications. Intestinal obstruction was the leading indication for bowel resection in the study population. (Table 2)

Variable	Category	Group A n (%)	Group B n (%)	p-value
Gender	Male	17 (60.7%)	18 (64.3%)	0.78
	Female	11 (39.3%)	10 (35.7%)	
Diabetes Mellitus	Present	9 (32.1%)	10 (35.7%)	0.77
	Absent	19 (67.9%)	18 (64.3%)	
Indication for Surgery	Intestinal obstruction	12 (42.9%)	11 (39.3%)	0.91
	Perforation	7 (25.0%)	8 (28.6%)	
	Malignancy	6 (21.4%)	5 (17.9%)	
	Others	3 (10.7%)	4 (14.3%)	

Table 2: Clinical Profile and Indications for Surgery

Stapled anastomosis significantly reduced operative duration and anastomosis time compared to hand-sewn technique. Lower intraoperative blood loss was also observed in the stapled group, indicating better operative efficiency. (Table 3)

Parameter	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
Total duration of surgery (minutes)	102.4 ± 14.6	124.8 ± 18.2	<0.01*
Time taken for anastomosis (minutes)	17.9 ± 3.8	30.2 ± 5.4	<0.01*
Intraoperative blood loss (mL)	148.6 ± 32.4	182.5 ± 40.7	0.02*

Table 3: Operative Parameters

Patients who underwent stapled anastomosis demonstrated faster postoperative recovery with earlier return of bowel activity and initiation of oral feeding. Hospital stay was significantly shorter in the stapled group. (Table 4)

Parameter	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
Return of bowel sounds (days)	2.7 ± 0.8	3.5 ± 1.0	0.01*
Time to oral feeding (days)	3.1 ± 0.9	4.0 ± 1.1	0.01*
Duration of hospital stay (days)	7.9 ± 2.0	10.1 ± 2.5	<0.01*

Table 4: Postoperative Recovery Parameters

The incidence of postoperative complications was lower in the stapled anastomosis group compared to the hand-sewn group. Although statistical significance was not reached for individual complications, stapled anastomosis showed a favorable postoperative outcome profile. (Table 5)

Complication	Group A n (%)	Group B n (%)	p-value
Anastomotic leak	1 (3.6%)	4 (14.3%)	0.16
Surgical site infection	3 (10.7%)	6 (21.4%)	0.27
Postoperative ileus	2 (7.1%)	5 (17.9%)	0.22
Wound dehiscence	1 (3.6%)	3 (10.7%)	0.29
Mortality	0 (0.0%)	1 (3.6%)	0.31

Table 5: Postoperative Complications

A significantly higher proportion of patients in the stapled anastomosis group experienced uneventful postoperative recovery. Overall complication rates were comparatively higher in the hand-sewn group. (Table 6)

Outcome	Group A n (%)	Group B n (%)	p-value
Uneventful recovery	22 (78.6%)	16 (57.1%)	0.04*
Complications present	6 (21.4%)	12 (42.9%)	0.05*

Table 6: Overall Postoperative Outcome Comparison (n = 56)

Postoperative complications were significantly associated with advanced age, diabetes mellitus, prolonged operative duration, hand-sewn anastomosis, and longer hospital stay. Stapled anastomosis demonstrated better postoperative outcomes with comparatively fewer complications.

Variable	Category	Complications Present n (%)	Complications Absent n (%)	p-value
Age Group	≤50 years	4 (14.8%)	23 (85.2%)	0.04*
	>50 years	10 (34.5%)	19 (65.5%)	
Diabetes Mellitus	Present	8 (42.1%)	11 (57.9%)	0.02*
	Absent	6 (16.2%)	31 (83.8%)	
Type of Anastomosis	Stapled	6 (21.4%)	22 (78.6%)	0.05*
	Hand-sewn	12 (42.9%)	16 (57.1%)	
Duration of Surgery	≤120 minutes	5 (17.9%)	23 (82.1%)	0.03*
	>120 minutes	9 (32.1%)	19 (67.9%)	
Hospital Stay	≤8 days	4 (14.3%)	24 (85.7%)	0.01*
	>8 days	10 (35.7%)	18 (64.3%)	

Table 7: Correlation of Clinical Variables with Postoperative Complications

DISCUSSION

A total of 56 patients who underwent bowel resection with primary intestinal anastomosis were included in the present study, with 28 (50.0%) patients each in the stapled and hand-sewn anastomosis groups. The majority of patients belonged to the 41–50 years of age group, accounting for 21 (37.5%) cases, followed by 15 (26.8%) patients in the 51–60 years of age group. Male patients constituted 35 (62.5%) of the study population. Intestinal obstruction was the most common indication for surgery, observed in 23 (41.1%) patients, followed by perforation in 15 (26.8%) patients and malignancy in 11 (19.6%) patients. Both groups were comparable with respect to demographic characteristics, associated comorbidities, and indications for surgery. Similar demographic findings were reported by Alam MR et al.11, Islam AT et al.12 and Ghafoor MT et al.13 who observed no statistically significant baseline differences between stapled and hand-sewn groups.

The study demonstrated that stapled anastomosis was associated with significantly improved operative efficiency. The mean duration of surgery in the stapled group was 102.4 ± 14.6 minutes compared to 124.8 ± 18.2 minutes in the hand-sewn group. Likewise, the mean time required for completion of anastomosis was significantly lower in the stapled group (17.9 ± 3.8 minutes) than in the hand-sewn group (30.2 ± 5.4 minutes). Reduced operative duration may decrease tissue handling, intraoperative fatigue, and surgical stress. Similar findings were reported by Biswas S et al.14 who demonstrated significantly shorter operative and anastomosis times in the stapled group. Maatooq MA et al.15 Hussain T et al.16 and Kshirsagar VV et al.17 also reported marked reduction in operative duration with stapled anastomosis compared to conventional suturing techniques.

Intraoperative blood loss was lower in the stapled group, suggesting better procedural precision and reduced tissue trauma. Comparable observations were made by Biswas S et al.14 although the difference in blood loss between groups was not statistically significant in their study. Stapled anastomosis also allowed easier handling in technically difficult and inaccessible areas, contributing to improved surgical workflow.

Postoperative recovery was comparatively faster among patients who underwent stapled anastomosis. Return of bowel sounds occurred earlier in the stapled group (2.7 ± 0.8 days) compared to the hand-sewn group (3.5 ± 1.0 days). Oral feeding was also initiated earlier in the stapled group. Similar findings were reported by Boobalan M et al.18 who observed earlier bowel recovery and commencement of oral feeding following stapled anastomosis. Hussain T et al.16 and Viswanth GS et al.19 similarly demonstrated significantly earlier return of bowel activity in patients treated with stapled techniques.

Comparable observations were made by Kumar et al.20 who reported significantly shorter operative duration with stapled techniques during subtotal gastrectomy and gastrojejunostomy. The study also demonstrated earlier return of bowel sounds, earlier initiation of oral feeding, shorter hospital stay, and faster return to work in the stapler group compared to the hand-sewn group. The authors concluded that stapled anastomosis promotes rapid postoperative recovery and provides a safe and effective alternative to conventional hand-sewn techniques, especially in technically difficult gastrointestinal procedures.

The mean duration of hospital stay was significantly shorter in the stapled group (7.9 ± 2.0 days) compared to the hand-sewn group (10.1 ± 2.5 days), reflecting faster postoperative recovery and reduced morbidity. Comparable reduction in hospital stay was reported by Alam MR et al.11, Islam AT et al.12 Ghafoor MT et al.13 and Viswanth GS et al.19 all of whom concluded that stapled anastomosis facilitated earlier discharge and quicker return to routine activity.

Postoperative complications were more frequent in the hand-sewn group. Anastomotic leak occurred in 1 (3.6%) patient in the stapled group compared to 4 (14.3%) patients in the hand-sewn group. Surgical site infection was noted in 3 (10.7%) patients undergoing stapled anastomosis and 6 (21.4%) patients undergoing hand-sewn anastomosis. Postoperative ileus developed in 2 (7.1%) patients in the stapled group and 5 (17.9%) patients in the hand-sewn group. Similar findings were observed by Kshirsagar VV et al.17 who reported significantly lower leak and surgical site infection rates in the stapled group. Boobalan M et al.18 and Alam MR et al.11 also demonstrated lower postoperative complications with stapled techniques.

However, some studies showed comparable complication rates between the two techniques. Islam AT et al.12 and Viswanth GS et al.19 reported no statistically significant difference in anastomotic leak rates between stapled and hand-sewn groups, although stapled anastomosis demonstrated advantages in operative efficiency and postoperative recovery.

Overall complications in the present study were significantly associated with advanced age, diabetes mellitus, prolonged operative duration, and hand-sewn anastomosis. Uneventful postoperative recovery was observed in 22 (78.6%) patients in the stapled group compared to 16 (57.1%) patients in the hand-sewn group. Similar associations between prolonged operative duration and postoperative morbidity were observed by Kshirsagar VV et al.17 who also reported increased leak rates in patients with low serum albumin levels.

Conclusion

Stapled anastomosis demonstrated superior perioperative outcomes compared to hand-sewn anastomosis in patients undergoing bowel surgery. It was associated with shorter operative duration, reduced anastomosis time, earlier return of bowel function, shorter hospital stay, and lower postoperative complication rates. Although both techniques were found to be safe and effective, stapled anastomosis showed better overall recovery and reduced postoperative morbidity. Advanced age, diabetes mellitus, prolonged surgery, and hand-sewn technique were significantly associated with higher postoperative complications. Therefore, stapled anastomosis may be considered a preferable option in bowel surgery for achieving improved surgical outcomes and enhanced postoperative recovery.

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CONFLICTS OF INTEREST

There are no conflicts of interest

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