

## A COMPARATIVE STUDY BETWEEN STAPLER AND HAND-SEWN ANASTOMOSIS IN GASTROINTESTINAL SURGERIES

Mageshwaran Boobalan<sup>1</sup>, Malathy Dharmarajan<sup>2</sup>, R.Udhayasuriyan<sup>3</sup>, Srividya Subramaniam<sup>4</sup>

Received : 14/01/2023

Received in revised form : 12/02/2023

Accepted : 22/02/2023

**Keywords:**

Continuous suturing, Curvilinear staplers, Duration of operation, Bowel function recovery, Hospital stay.

Corresponding Author:

**Dr. Srividya Subramaniam,**

Email: drsrividgadgoms@gmail.com

DOI: 10.47009/jamp.2023.5.4.208

Source of Support: Nil,

Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2023; 5 (4); 1035-1039



<sup>1</sup>Senior Assistant Professor, Department of General Surgery, Government Tiruvannamalai Medical College, Tamilnadu, India

<sup>2</sup>Associate Professor, Department of General Surgery, Government Tiruvannamalai Medical College, Tamilnadu, India

<sup>3</sup>Assistant Professor, Department of General Surgery, Government Tiruvannamalai Medical College, Tamilnadu, India

<sup>4</sup>Assistant Professor, Department of General Surgery, Government Medical College, Tiruppur, Tamilnadu, India

### Abstract

**Background:** Intestinal anastomosis is a highly common operation performed in elective and emergency surgical settings anytime tumours of the gastrointestinal system, both benign and malignant, are removed or resected. Hand-sewn or mechanical stapling can be used to perform intestinal anastomosis. The study aimed to compare the procedures of hand-sewn anastomosis versus stapler anastomosis, along with their intraoperative and postoperative outcomes. **Materials and Methods:** 50 patients hospitalised in our surgical ward and emergency department at Coimbatore Medical College Hospital between June 2016 and July 2017 were divided into two groups based on the kind of anastomosis, hand-sewn or stapler. Hand-sewn anastomosis was performed using a two-layer, continuous suturing method. Linear cutting, linear non-cutting, circular, and curvilinear staplers were utilised in anastomosis. The factors evaluated include operation duration, hospital stay, postoperative leak, gastrointestinal function restoration, and postoperative morbidity. The most frequent anastomosis procedures are gastro-jejunostomy anterior and posterior, jejunojejunostomy, ileocolic, and colorectal. **Result:** The overall duration of the anastomosis is shorter in the stapler group than in the hand-sewn group, having a strong predictive value. The appearance of bowel noises and the beginning of oral feeding occurred earlier in the stapler, with considerable predictive significance. The total length of hospital stay was shorter in the stapler group than in the hand-sewn group, with statistically significant predictive value. Regarding complications, the stapler group had less than the hand-stitched group. **Conclusion:** Stapler anastomosis reduced surgical time, early postoperative recovery of bowel functions, postoperative hospital stay, and anastomotic leak compared to traditional hand-sewn anastomosis.

## INTRODUCTION

Intestinal tumours, obstructions, and peritonitis caused by abdominal trauma or perforated bowel are common surgical problems that can be treated with resection and anastomosis, which joins two parts of the bowel together with accurate approximations and a good blood supply to both parts.<sup>[1]</sup> The anastomotic process is one of the most important variables affecting surgical outcomes. The primary element of gastrointestinal surgery after excision of bowel loops is anastomosis of the gut loops.<sup>[2]</sup> Hand-sewn and stapled sutures are the most often used anastomotic procedures in GI surgery.<sup>[3]</sup> The mainstay of

gastrointestinal surgery is the seromuscular suture method. As reported by Matheson of Aberdeen, single-layer extra mucosal anastomosis is more often utilised currently because it can induce less tissue necrosis or luminal constriction and has mostly supplanted catgut and silk.<sup>[4]</sup>

The development of mechanical sutures by stapler devices is a technical innovation that aids in the anastomosis of bowel loops with less tissue harm and a shorter treatment time.<sup>[5]</sup> Staplers were invented to solve the apparent problem of patency (security against blood or bowel contents leaking) in anastomoses in particular. The Stapler method is currently widely utilised by numerous surgeons. It is more beneficial than hand-stitched anastomosis

regarding safety, ease of access, process length, and efficiency.<sup>[6]</sup> Many surgeons are sceptical about the stapler's usage at crucial anastomosis sites. Over the last 30 years, the evolution of trustworthy, disposable staplers has dramatically revolutionised surgical practice. Technical flaws in modern devices are uncommon, and anastomosis in difficult-to-reach locations is simpler.<sup>[7]</sup>

The time necessary for anastomosis, function restoration, good hemostasis, tissue damage reduction, and avoidance of postoperative morbidity, such as leak (sepsis), are all aspects to consider.<sup>[8]</sup> Accurate approximation without stress and a strong blood supply, whether suturing or stapling, is critical. Staplers have been designed to meet the majority of these requirements. Some randomised trials in colorectal surgery have found no differences in the rate of leakage, hospital stay length, or morbidity between these two anastomosis techniques.<sup>[9]</sup> Another research found no difference between hand-stitched and stapler-based anastomosis regarding stricture creation, anastomotic haemorrhage, anastomotic time, reoperation rate, death rate, or intra-abdominal abscess formation.<sup>[10]</sup>

Staplers can cut and staple simultaneously, eliminating the need for clamping. The higher cost of staplers is countered by the shorter operating time.<sup>[11]</sup> Circular staplers provide greater access in low pelvic surgery, preventing many patients from needing a permanent colostomy. Suturing or stapling can be used to perform anastomosis.<sup>[12]</sup> As a result, it is useful to investigate the two ways to bowel anastomosis. Very few studies have compared the superiority of stapled vs hand-sewn anastomosis in general procedures for digestive tract tumours, and the results are contradictory.

### Aim

The study aimed to compare the time length of surgery, hospital stay, duration of bowel function restoration, and postoperative morbidity using hand-sewn anastomosis and stapler anastomosis procedures.

## MATERIALS AND METHODS

This prospective research was conducted at Coimbatore Medical College Hospital from June 2016 to July 2017. During the study period, patients admitted to the surgical ward and emergency department for gastrointestinal anastomosis (> 13 years of age) were separated into two groups based on the anastomosis process, hand-stitched or stapler technique.

### Exclusion criteria

Patients above the age of 13, pancreaticoduodenectomy with triple bypass, hepato-enteric anastomosis, and patients who had already had chemoradiation were all excluded from the trial.

### Anastomosis method

Patients were divided into groups based on the kind of anastomosis, hand-sewn or stapler. Hand-sewn

anastomosis is performed using a two-layer, continuous suturing method. Linear cutting staplers were employed in anastomosis. The factors evaluated include operation length, hospital stay, postoperative leak, gastrointestinal function restoration, and postoperative morbidity. The most frequent anastomosis procedures are gastro-jejunosomy anterior and posterior, jejunojunosomy, ileocolic, and colorectal.

### Statistical Analysis

The data were statistically evaluated using the independent samples T-test to compare mean values between techniques and Chi-square testing to compare the proportions of the two values.

## RESULTS

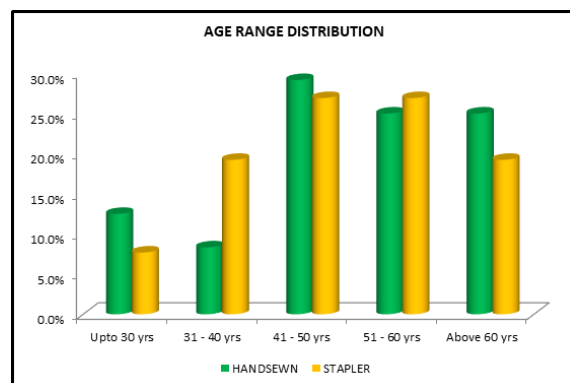


Figure 1: Anastomosis-type distribution based on the age range

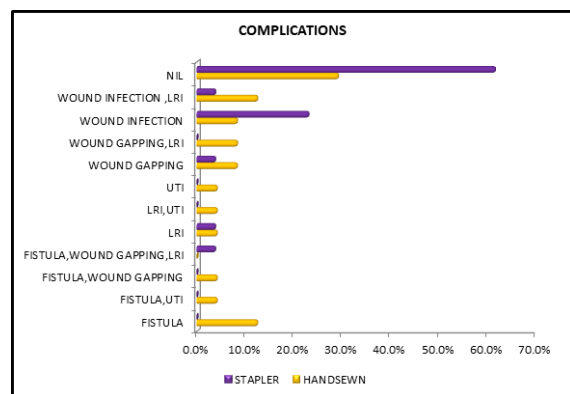


Figure 2: Anastomosis-type distribution of postoperative complications

Among 50 patients in the study, 58% were males, and 42% were females. Among the 50, 24 were grouped under hand sewn and 26 under stapler. 54.2% of males received hand-sewn anastomosis, while 61.5% received stapler-based anastomosis. Among women, 11 and 10 patients received hand sewn and stapler anastomosis, respectively. Among 46% of elective surgeries, ten underwent hand-sewn anastomosis, and 11 underwent stapler-based anastomosis. Among 54% of emergency surgeries, 14 and 13 underwent hand-sewn and stapler-based anastomosis, respectively. The patients were categorised into five age ranges, up to 30, 31 – 40, 41-50, 51-60, and > 60

years, resulting in the highest number of patients under age group 41 – 50 (28) and 51 – 60 (26), with the highest frequency of those receiving hand sewn anastomosis under 41 - 50 (29.2%) and least under age group 31-40 years (Figure 1). For stapler anastomosis, age groups 41 – 50 and 51-60 were the highest (26.9%), and the least was up to 30-year age group [Figure 1].

The surgery took 2.8 and 2.28 hours with respective usage of hand-sewn and stapler-based anastomosis, with a corresponding postoperative GIT motility of 6 and 4 days, respectively. Hospital stay was 15 and 12 days in hand-sewn and stapler-based anastomosis, respectively. Hand-sewn anastomosis group were

observed with more instances of postoperative complications [Figure 2].

Mean surgery duration for hand sewn and stapler-based anastomosis was 158.38 and 127.88, respectively, with a corresponding Postoperative GIT motility of 5.58 and 4.23 days leading to a proportionate mean hospital stay duration of 14.79 and 12.27 days [Table 1].

Anastomosis duration, the appearance of bowel noises and the beginning of oral feeding. The total length of hospital stay has a substantial prognostic value [Table 2]. There was no mortality in either group.

**Table 1: Patient distribution based on description and grouping**

Parameters	Descriptive	Group	
		Hand sewn	Stapler
Age in years	51.10 ± 15.165	52.04± 15.763	50.23 ± 14.849
Duration of Surgery in minutes	142.52 ± 28.767	158.38± 26.857	127.88 ± 22.234
Postoperative Git motility in Days	4.88 ± 0.849	5.58 ± .584	4.23 ± .430
Hospital stay in Days	13.48 ± 2.178	14.79 ± 1.414	12.27 ± 2.070

**Table 2: Independent samples test**

INDEPENDENT SAMPLES TEST										
	Equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	SE Dif	95% Confi. Interval of the Diff	
									Lower	Upper
Age	Assumed	.094	.761	.418	48	.678	1.811	4.329	-6.894	10.515
	Not assumed			.417	47.062	.678	1.811	4.340	-6.919	10.541
Duration Of Surgery	Assumed	.431	.515	4.386	48	.000	30.49	6.952	16.513	44.467
	Not assumed			4.353	44.808	.000	30.49	7.005	16.380	44.600
Post Operative Git Motility in Days	Assumed	6.188	.016	9.383	48	.000	1.353	.144	1.063	1.642
	Not assumed			9.269	42.082	.000	1.353	.146	1.058	1.647
Hospital Stay in Days	Assumed	1.78	.188	4.990	48	.000	2.522	.506	1.506	3.539
	Not assumed			5.065	44.340	.000	2.522	.498	1.519	3.526

## DISCUSSION

The hand-sewn approach is traditionally the primary surgical technique for fashioning anastomosis in gastrointestinal surgery. A revolutionary approach must be effective and quick without sacrificing safety to win widespread acceptance. It is beneficial to study the two methods of bowel anastomosis.<sup>[13]</sup> There have been few studies comparing stapled vs hand-sewn anastomosis in general surgeries for digestive tract malignancies, and the findings are conflicting. As a result, the current study compared the time length of surgery, hospital stay, duration of bowel function restoration, and postoperative morbidity utilising hand-stitched and stapler anastomosis approaches. The findings of a 50-patient trial comparing hand-stitched anastomosis with stapler anastomosis were analysed. The duration of operation, resumption of oral feeds, return of gastrointestinal tract motility,

postoperative hospital stay, and complications differ for both hand-stitched and stapler anastomosis groups. They had 18 benign instances in their research (15 in the hand-stitched group and 3 in the stapler group). The remaining instances (52 in all) were cancerous. The majority of the benign cases required hand-stitched anastomosis. The majority of prior investigations have solely included cancer patients. This analysis included all patients with elective GI anastomosis, regardless of pathology (benign or malignant).

The overall duration of the anastomosis is shorter in the stapler group than in the hand-sewn group. The mean value of stapler anastomosis time was 127.88 minutes compared to 158.38 minutes for hand-sewn anastomosis with substantial predictive value. A likely shorter duration of anastomosis time using staplers was reported earlier by Bangaru et al.<sup>[13]</sup> They also reported faster recovery in terms of bowel

sounds and starting of oral feeds within patients of the stapler group, similar to our study. Yet, our study reports statistical insignificance of values between the groups. The appearance of bowel sounds and the commencement of oral feeds were sooner in the stapler group, and the mean value of stapler anastomosis was 4.23 days compared to 5.58 days for hand sewn with substantial predictive value. The change was statistically significant but clinically insignificant.

Shortening the surgery duration entails less surgical stress, intra-operative blood loss, less local infection, and a lower risk of surgical complications. As a result, individuals in the stapler group spent less time in the hospital. Compared to the manually stitched group, the total length of hospital stay was shorter in the stapler group. The mean value of total hospital stay in stapler anastomosis was 12.27, compared to 14.79 in the hand-stitched group, with a statistically significant predictive value. Another study found that stapling anastomosis reduces postoperative hospitalisation in individuals with stomach and esophageal tumours.<sup>[14]</sup> The superiority of stapler-based anastomosis in indicating fast postoperative recovery might be explained by minimal surgical trauma surrounding stapler anastomosis and anastomotic tissue contra-position, preventing injury to the stomach mucosa from the cutting thread.<sup>[3]</sup>

Regarding difficulties, the stapler group had less than the hand-sewed group. Only one incidence of postoperative fistula was reported in Stapler anastomosis, but four cases were detected in hand-sewn anastomosis. Regarding wound infection with lower respiratory tract infection, the stapler anastomosis group had one instance, whereas the hand-sewn group had three. Most problems occurred in emergency procedures rather than elective surgeries in the stapler and hand-sewn anastomosis. Wound gapping was present in 5 of the hand-sewn instances and only 2 of the stapler cases. While Bangaru et al. reported no significant differences in postoperative complications.<sup>[13]</sup>

Anastomotic leak in emergency operations leading to fistula was 3.8% (one case) in stapler and 16.7% (four cases) in hand stitched anastomosis in our series. Three of the five instances with anastomotic leak were treated as emergencies, whereas the other two were treated as elective surgery. One case of stapler anastomosis developed an anastomotic leak, which was treated as an emergency treatment for small bowel and caecal gangrene, with resection of the small intestine, caecum, and jejunocolic anastomosis. Four incidences of anastomotic leak developed in hand-sewn anastomosis. Two instances were treated as emergencies, while the others were treated as elective procedures. Liu et al. found that stapler suturing is superior to manual suturing in terms of reducing the incidence of anastomotic leakage in gastric carcinoma and colorectal cancer, as well as the incidence of anastomotic haemorrhage in gastric carcinoma, colorectal cancer, and esophageal cancer. According to his findings, the stapler suture

substantially reduced the occurrence of stump leaking for colorectal cancer compared to the hand-sewn approach.<sup>[3]</sup> There was one anastomotic leak in the hand-sewn group after the Whipples surgery in this research. It was handled cautiously.

Compared to the hand-sewn approach, the stapler suture successfully reduced the occurrence of stump leaking for colorectal cancer. There was no statistically significant difference in anastomosis leak between the hand-stitched and stapler groups. This followed major meta-analyses, and comprehensive reviews indicate no significant difference in terms of intestinal function restoration, postoperative hospital stay, and postoperative complications. It is recognised that the stapler method generally reduces total operating time and provides better access to difficult-to-reach areas.<sup>[15,16]</sup> We found comparable outcomes regarding surgical time and hospital stay, but the stapled approach was preferable in decreasing many problems. A few studies have shown that stapler anastomosis has superior outcomes in reducing problems, consistent with our findings.<sup>[17,18]</sup> Stapled esophagogastric anastomosis may be more efficient than hand-sewn in preventing stricture development without increasing gastroesophageal reflux.<sup>[19,20]</sup>

## CONCLUSION

There are few studies on the functional return of organs following surgery in individuals with digestive tract malignancies. The stapling approach did, however, dramatically decrease the time to GI normal motility following surgery for both gastric and intestinal cancer patients. Stapler anastomosis was less time-consuming than traditional hand-sewn anastomosis. As a result, it can be utilised in patients with poor general health and emergency procedures. Compared to hand-sewn anastomosis, stapler anastomosis required less time to regain bowel functions and less hospitalisation. Hand-sewn anastomosis had a greater rate of anastomotic leak leading to fistula than stapler anastomosis. According to our findings, stapler anastomosis outperforms traditional hand-sewn anastomosis.

## REFERENCES

1. Yang XF, Pan K. Diagnosis and management of acute complications in patients with colon cancer: bleeding, obstruction, and perforation. *Chin J Cancer Res* 2014;26:331–40.
2. Ambe PC, Kurz NR, Nitschke C, Odeh SF, Möslein G, Zirngibl H. Intestinal ostomy. *Dtsch Arztebl Int* 2018;115:182–7.
3. Liu BW, Liu Y, Liu JR, Feng ZX. Comparison of hand-sewn and stapled anastomoses in surgeries of gastrointestinal tumors based on clinical practice of China. *World J Surg Oncol* 2014;12:292.
4. Leslie A, Steele RJC. The interrupted sero submucosal anastomosis - still the gold standard. *Colorectal Dis* 2003;5:362–6.
5. Mehta A, Sharma P, Pancholi M, Patel P. A retrospective comparative study on stapler verses hand sewn technique in

- gastrointestinal anastomosis of twenty-five cases each. *Int Surg J* 2023;10:399–402.
6. Ghosh S, More N, Kapusetti G. Surgical staples: Current state-of-the-art and future prospective. *Med Nov Technol Devices* 2022;16:100166.
  7. Chekan E, Whelan RL. Surgical stapling device-tissue interactions: what surgeons need to know to improve patient outcomes. *Med Devices (Auckl)* 2014;7:305–18.
  8. Genser L, Manceau G, Karoui M, Breton S, Brevart C, Rousseau G, et al. Postoperative and long-term outcomes after redo surgery for failed colorectal or coloanal anastomosis: retrospective analysis of 50 patients and review of the literature. *Dis Colon Rectum* 2013;56:747–55.
  9. Zeebregts CJ, Heijmen RH, Van den Dungen JJ, Van Schilfgaarde R. Non-suture methods of vascular anastomosis. *Br J Surg* 2003;90:261–71.
  10. Ishihara S, Watanabe T, Nagawa H. Intraoperative colonoscopy for stapled anastomosis in colorectal surgery. *Surg Today* 2008;38:1063–5.
  11. Zhang E-L, Huang Z-Y, Chen X-P. Rationality and necessity of vascular stapler application during liver resection (Review). *Exp Ther Med* 2021;21:498.
  12. Waqas A, Mykoniatis I, Sidiqi N, Ahmed A, Stefan S, Naqvi S, et al. Early experience of undertaking robotic-assisted total mesorectal excision in rectal resections, avoiding a diverting stoma: Key enhancement of the anastomosis for No Stoma technique - A case series. *Surg Innov* 2023;30:158–65.
  13. Bangaru H, Veitla RMR, Pigilam M, Kunwargiri GK. Comparative study between staplers and conventional(hand-sewn) anastomosis in gastrointestinal surgery. *Indian J Surg* 2012;74:462–7.
  14. Weijian W, Jianrong S. DL: Comparative study of complications after mechanical suture and hand suture in surgical treatment of esophageal and gastric cardiac carcinoma. *J Regional Anat Operative Surg.* 2006;15:76-7.
  15. Chandramohan SM, Gajbhiye RN, Agwarwal A, Creedon E, Schwiers ML, Waggoner JR, et al. A randomised study comparing outcomes of stapled and hand-sutured anastomoses in patients undergoing open gastrointestinal surgery. *Indian J Surg* 2013;75:311–6.
  16. Markar SR, Karthikesalingam A, Vyas S, Hashemi M, Winslet M. Hand-sewn versus stapled oesophago-gastric anastomosis: systematic review and meta-analysis. *J Gastrointest Surg* 2011;15:876–84.
  17. Xu Q-R, Wang K-N, Wang W-P, Zhang K, Chen L-Q. Linear stapled esophagostomy is more effective than hand-sewn or circular stapler in prevention of anastomotic stricture: a comparative clinical study. *J Gastrointest Surg* 2011;15:915–21.
  18. Deng B, Wang R-W, Jiang Y-G, Tan Q-Y, Zhao Y-P, Zhou J-H, et al. Functional and menometric study of side-to-side stapled anastomosis and traditional hand-sewn anastomosis in cervical esophagostomy. *Eur J Cardiothorac Surg* 2009;35:8–12.
  19. Luechakietisak P, Kasetsunthorn S. Comparison of hand-sewn and stapled in esophagogastric anastomosis after esophageal cancer resection: a prospective randomised study. *J Med Assoc Thai* 2008;91:681–5.
  20. Cooke DT, Lin GC, Lau CL, Zhang L, Si M-S, Lee J, et al. Analysis of cervical esophagogastric anastomotic leaks after transhiatal esophagectomy: risk factors, presentation, and detection. *Ann Thorac Surg* 2009;88:177–84; discussion 184-5.